FACTORS INFLUENCING FEMALE INTENTION TO PARTICIPATE IN SCIENCE TECHNOLOGY ENGINEERING MATHEMATICS (STEM) EDUCATION IN PAKISTAN

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By

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ABSTRACT

FACTORS INFLUENCING FEMALE PARTICIPATION IN SCIENCE TECHNOLOGY ENGINEERING MATHEMATICS (STEM) EDUCATION IN PAKISTAN

Sadia Sajid

Despite global awareness on the issue of gender disparity in STEM education, the situation in developing countries, such as Pakistan, has not improved significantly. The research on female participation in STEM education in Pakistan context is still limited. Hence, to address this problem and fill the research gap, the present research work aims to identify the factors effecting female participation in STEM education in Pakistan. Based on Social Cognitive Career Theory (SCCT) and Theory of Planned Behavior (TPB), the present research proposes a framework of factors effecting female participation in STEM education in Pakistan. The proposed framework encompasses individual (i.e., self-concept, self-efficacy, attitude, career outcome expectancy and behavioral intention) as well as the contextual factors (parental involvement and income level). The quantitative research design is employed for this study and the data collection is done using the survey method. The data was gathered from 202 female students studying at the secondary level of education in five cities of

Pakistan. The data was analyzed by using SPSS v. 23. In total, 10 hypotheses were proposed by the present research whereby the results have supported 7 hypotheses.

The results indicated that self-concept and attitude positively, whereas parental involvement, when taken as an independent variable, negatively predicted female STEM self-efficacy. Furthermore, career outcome expectancy did not significantly predict female STEM *self-efficacy* however, it significantly and negatively predicted the female STEM *intention*. Moreover, the results have also illustrated that self-efficacy is a strong and positive predictor of female intention to pursue STEM education. In addition, the results for the moderating impact of parental income and parental involvement showed that parental involvement has a negative impact on the relationship between female STEM self-efficacy and intend to continue STEM education. As for the moderating impact of parental income, the results indicate that parental income moderates the relationship between STEM self-efficacy and intention in a way that with the increase in parental income, the self-efficacy decreases. However, after the parental income reaches a certain level, the efficacy starts increasing.

The present study has not only contributed towards the body of knowledge by analyzing the relationship of the individual and contextual factors with the

female intention to participate in STEM education, it has also provided a guideline for the government and non-governmental bodies in Pakistan to make suitable strategies in order to promote STEM education in females by reducing the impact of barriers.

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APPROVAL SHEET

This dissertation/thesis entitled "**FACTORS INFLUENCING FEMALE INTENTIONS TO PARTICIPATE IN SCIENCE TECHNOLOGY ENGINEERING MATHEMATICS (STEM) EDUCATION IN PAKISTAN**" was prepared by SADIA SAJID and submitted as partial fulfillment of the requirements for the degree of Master of Philosophy (Social Science) at Universiti Tunku Abdul Rahman.

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It is hereby certified that **Sadia Sajid** (ID No: **1807405**) has completed this dissertation entitled "FACTORS INFLUENCING FEMALE INTENTION TO PARTICIPATE IN SCIENCE TECHNOLOGY ENGINEERING MATHEMATICS (STEM) EDUCATION IN PAKISTAN" under the supervision of Dr. M. Sultana Alam (Supervisor) from the Department of Journalism, Faculty of Arts and Social Science, Dr. Mobashar Rehman (Co-Supervisor)* from the Department of Information Systems, Faculty of Information and Communication Technology, and Dr. Kok Jin Kuan (Co-Supervisor)* from the Department of Psychology and Counselling, Faculty of Arts and Social Science.

I understand that University will upload softcopy of my dissertation in pdf format into UTAR Institutional Repository, which may be made accessible to UTAR community and public.

Yours truly,

Sadia Sajid
(*Student Name*)

DECLARATION

I hereby declare that the dissertation is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UTAR or other institutions.

Name ________________________

(SADIA SAJID)

7 January 2022

Date ________________________

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LIST OF ABBREVIATIONS

STEM	*Science, Technology, Engineering and Mathematics*
SSC	*Secondary School Certificate*
HSSC	*Higher Secondary School Certificate*
F.Sc.	*Faculty of Science*
F.A	*Faculty of Arts*
SCCT	*Social Cognitive Career Theory*
TPB	*Theory of Planned Behavior*
SCT	*Social Cognitive Theory*
AASSA	*The Association of Academies and Societies of Sciences in Asia*
ASER	*Annual Status of Education Report*

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

According to the definition provided by UNESCO (2017), the acronym STEM refers to Science, Technology, Engineering and Mathematics (STEM) disciplines. STEM education covers various traditional and broad disciplines such as medicine, engineering, physics, chemistry, biology, and computer sciences (UNESCO, 2017). STEM education is crucial for global, national, and individual growth. It plays a pivotal role in modern societies (Xie & Killewald, 2012) by augmenting economic and (Kuenzi, 2008; OECD, 2010) technological innovation and sustainable economic growth (Corlu, Capraro & Capraro, 2014; Xie, Fang & Shauman, 2015). Furthermore, it leads to high social status occupations with higher personal income for individuals (Xie & Killewald 2012; Rothwell 2013).

However, despite its importance, STEM occupations continue to see labor shortage (Fatourou et al., 2019). One of the primary reasons behind the labor shortage is that STEM remains a male dominant education stream (Maryann & Patience, 2017). According to Darbyshire (2009), the world has yet to reach the stage where both genders could enjoy equality in STEM education and occupations. Hence, gender disparity persists in STEM education and leads to labor as well as financial (Dezso & Ross, 2012) and intellectual loss (Loyd et al., 2013). Unless both genders contribute to the development of a nation, it cannot flourish (Ur Rahman et al., 2018). Hence, keeping in mind these imperative consequences for the world economy, it is pertinent to address gender disparity in STEM education.

Contrary to the developed and industrialized nations, where the gender parity is improving in STEM education, gender disparity is prevalent among almost all the underdeveloped and low-income countries and among the low-income people (Ur Rahman et al, 2018). Like other low-income economies, Pakistan also faces substantial gender inequality in education (Ur Rehman et al., 2018), particularly in STEM education (World Bank, 2014). Pakistan is a patriarchal society (Chaudhry & Rahman, 2009) which, according to a Human Rights Watch (HRW) report, is described as the world's one of the worst performing countries in the education sector (HRW, 2018). Illiteracy and inequality in education are two of the major challenges with Pakistan (UNDP, 2013). According to Pakistan Bureau of Statistics (PBS, 2017), women comprise of 48.76% of the whole population of Pakistan. Yet, woman's primary role is assumed to be limited to their homes and as a result they are placed at the very bottom end of the education system (Noureen, 2011). Despite improvement in recent years, gender disparity prevails in all levels of education in Pakistan and from all the out-of-school students, girls comprise 57% (World Bank, 2014).

According to Shams (2017), in the third largest province of Pakistan, namely Khyber Pakhtunkhwa, the number of educational institutes for males are much higher than females. Out of the 28,178 public schools, nearly 62% (17,649) schools are for boys whereas merely 38% (10,529) are for girls. According to a report by ASER-Pakistan (2020), there is a significant gap between boys and girls in terms of enrollment in rural areas whereby 61% boys enroll in government schools compared to 39% girls and 59% boys enroll in private schools compared to 41% girls. Furthermore, boys also outclass girls in all forms of educational skills. To STEM education, there is a gap in numeracy skills whereby 43% of boys could perform some numerical function in contrast to 36% of girls in rural areas of Pakistan. The same findings were echoed by a report by UNICEF (2016) that boys outstrip girls at every stage and type of education in Pakistan.

With regards to Pakistan's secondary school system, there are three levels namely middle, higher, and higher secondary. A student must take exams of eight subjects to obtain the Secondary School Certificate (SSC), which is equivalent to the British system of O-Levels. From the eight subjects, five are compulsory including Urdu, English, Mathematics and Pakistan Studies. Once the student successfully obtains SSC, he is eligible to study and obtain Higher Secondary School Certificate (HSSC). HSSC is further divided into two streams namely science and arts streams. The science stream, which is further sub-divided into specialization areas such as pre-medical and pre-engineering, leads to an award in Faculty in Science (FSc.) program. On the other hand, the arts streams lead to award in Faculty of Arts (F.A.) program. (Mujtaba & Reis, 2015).

1.2 Problem Statement

To meet the challenges posed by the industrial and knowledge revolution, it is important to involve women in science and technology education. For Pakistan to achieve national development goals, it is a direly important to fully utilize the potential of women at all levels of STEM related education, training, and development (Nasir, Ahmed & Asrar, 2014). However, while globally the number of women taking up STEM related education and career has significantly increased in recent years (Nasir, Ahmed & Asrar, 2014), in Pakistan, STEM education is still mostly dominant by males where girls discontinue STEM education for various reasons (Hollows, Rab & Schulze, 2017) and as a result woman are *'seriously under-represented'* in most of the STEM related disciplines and careers (PCST, 2020b). According to UNDP (2013), compared to the industrialized nations, Pakistan lags significantly in the number of scientists, mathematicians, and engineers and hence there is a strong need to make advancements in STEM education.

According to the statistics published by the Pakistan Bureau of Statistics (PBS, 2017), at the Secondary School Certificate (SSC) level, females outnumber men in the arts group for passing ratio, but the ratio interchanges when it comes to the science group and the ratio of females compared to males drops significantly. Table 1.1 illustrates the statistics of female and male participation at secondary school level and highlights the gap and gender reversal when it comes to science group. As can be seen, females dominate the arts stream whereas males significantly dominate the science stream.

Table 1.1

Female and Male Passing Ratio at Secondary School Level (PBS, 2017)

	Males	**Females**
Arts Group (Passed students)	183,193 (41%)	260,327 (59%)
Science Group (Passed students)	447,936 (70%)	188,411 (30%)

At the Higher Secondary Certificate (HSC) education level, the situation is similar whereby females (60%) outnumber males (40%) in the arts group. On the other hand, males (82%) significantly outnumber females (18%) in the pre-engineering group and both genders are at parity in the medical group. It can easily be observed that overall males outnumber females in STEM related subjects with a difference of almost double.

Table 1.2

Female and Male Passing Ratio at HSC Level (PBS, 2017)

	Males	Females
Arts Group (Passed students)	99,311 (40%)	148,451 (60%)
Science Group		
Pre-Engineering Group (Passed students)	48,805 (82%)	10,967 (18%)
Medical Group (Passed students)	37,607 (49.6%)	38,194 (50.4%)
Total [in Pre-engineering and Medical Group]	**86,412 (69%)**	**49,161 (31%)**

It is important to highlight that the official available statistics are more than 10 years old, however these are the only official statistics available from the government of Pakistan. Currently, no survey is available with respect to women participation in STEM (PCST, 2020a). According to PCST (2020b), women's talent is not fully utilized in Pakistan and women are underrepresented in majority of the disciplines of STEM.

However, these statistics can be compared to the statistics of female-male ratio from the HSSC level education statistics of the Province of Punjab, which is the largest province of Pakistan in terms of population and the most literate. According to the stats published by PBS (2018), males outnumber females in the fields of pre-engineering and computer sciences (114,101: 58,986 and 91,547: 75,662 respectively).

From the above stats, it is easy to conclude that Pakistan is struggling to bring gender parity in STEM subjects (Awan et al., 2017). According to the Association of Academies and Societies of Sciences in Asia (AASSA, 2015), Pakistan is one of the worst countries in the world, when it comes to female participation in science and technology. Hence, Pakistan has long been considered as international outlier when it comes to gender disparity and the government needs to take measures and bring reforms to retain and encourage participation of females in STEM education (Mujtaba & Reis, 2015).

Despite the unnerving picture of female participation in STEM education in Pakistan, according to Mujtaba and Reis (2015), there is a dearth of research on the factors effecting female decision to pursue STEM education in Pakistan. One of the primary reasons is that most of the research which has attempted to address disparity in STEM education has focused on developed countries (Hollows, Rab & Schulze, 2017). Hence, based on the problem areas and research gap, the present research attempts to address the following problem:

'Females are seriously underrepresented in STEM education in Pakistan. Despite the fact, there is a lack of research work which attempts to understand the factors behind this situation.'

The study attempts to examine the impact of multiple personal factors underlying young women's intention in pursuing STEM education within the Pakistani context. These include self-concept, STEM self-efficacy, attitude towards STEM, intention to pursue STEM education as well as career outcome expectancy). Moreover, the present research also aims to understand the impact of contextual factors including parental involvement as well as the parent's income level on female's decision to undertake STEM education. Parental involvement (i.e., Dewtitt et al., 2013; Perera, 2014), their beliefs and views about science (Boon, 2012) as well as their income level (Glick & Sahn, 2000) are significant for the interest and success of children in STEM related education. According to Jamil et al. (2011), in Pakistan, most of the parents facilitate their children but don't participate in their educational activities.

1.3 Research Questions

The study will answer following research questions:

1. What are the individual and contextual factors pertinent to female participation in STEM education in Pakistan?
2. What is the impact of individual and contextual factors on female's intention to pursue STEM education in Pakistan?
3. What is the moderating impact of parental income and involvement on the relationship between STEM self-efficacy and female intention to pursue STEM education in Pakistan?

1.4 Research Objectives

The current study attempts to achieve following objectives:

1. To identify the factors which affect female participation in STEM education in Pakistan.
2. To examine the impact of individual and contextual factors on women's intention to pursue STEM education in Pakistan.
3. To ascertain the moderating impact of parental involvement and parental income on the relationship between STEM self-efficacy and female intention to pursue STEM education in Pakistan.
4. To statistically validate and propose a framework of factors effecting female participation in STEM Education in Pakistan.

1.5 Proposed Hypotheses

The present research aims to test the following 8 hypotheses to answer the research questions. Hypotheses 1 until 6 pertain to research question 2 whereas hypotheses 7 and 8 pertain to research question 3.

Table 1.3

The Proposed Hypotheses

No.	Hypothesis Statement
H1	Self-concept will positively affect the self-efficacy of women to pursue STEM education
H2	Self-efficacy will positively affect the intention of women to pursue STEM education
H3	Attitude towards STEM will positively affect the female’s STEM self-efficacy.
H4	Career Outcome Expectancy (COE) will positively affect female’s STEM self-efficacy.
H5	COE will positively affect female’s intention to pursue STEM education.
H6	Parental involvement will positively affect female’s STEM self-efficacy.
H7	Parental involvement will moderate the relationship between self-efficacy and female’s intention to pursue STEM education.
H8	Parental income will moderate the relationship between self-efficacy and female’s intention to pursue STEM education.

1.6 Significance of the Study

Theoretically, the present research will examine the impact of the personal and contextual factors on female intention to participate in STEM education, which is a largely neglected area of research in Pakistani context. Moreover, the research aims to encourage the research community of Pakistan to conduct research on this important untapped area to dig important insights.

Practically, the outcome of the research shall provide important insight and guidelines to the governments, policy makers and non-governmental organizations (NGOs) to bring such reforms and make suitable strategies to promote STEM education in females by reducing the impact of barriers. By using the outcomes of this research, the policymakers in Pakistan can adopt such policies which may target not only the female students but also the parents. At an individual level, the study will also help the governments to make policies to target females from the low-income economy.

CHAPTER TWO

LITERATURE REVIEW

2.1 Gender Disparity in STEM Education

Due to the importance of STEM, every year, a growing number of jobs require education in STEM related fields (Lacey & Wright, 2009). However, despite the growing demand of STEM professionals, there is a shortage of supply all over the world (UNESCO, 2017). One of the reasons could be the lack of participation of females in STEM related education and fields.

The AASSA (2015) report highlighted that inequality and disparity among genders in STEM education is striking and still very much common all over the world. According to Kenney et al. (2012), women are not only capable but also have a history of working in STEM related fields. However, their participation in STEM related fields is *"dauntingly low"* (Kenney et al., 2012). According to Rosenbloom (2008), engineering professions comprise of less than 20% of females whereas there are merely 27% of scientists and 31% of chemists. Similarly, according to NSF (2010), in the year 2009, the number of females employed in industries related to mathematics and computer science, decreased to 24.7% from 31%. Furthermore, according to Jiménez et al. (2018), universally, women are underrepresented in STEM fields, not only as a student, but also as a teacher, as a researcher or as a worker. This is even though there is minimal difference in performance between both genders in STEM fields (Jiménez et al., 2018).

Pakistan, which is a member of commonwealth countries, desperately requires STEM professionals as it lacks the number of STEM related professionals as compared to the industrialized nations (UNDP, 2013; Mujtaba & Reiss, 2015). As mentioned earlier, females are *"seriously underrepresented"* in STEM education in Pakistan. However, in contrast to the industrialized nations, the lack of female participation in STEM education has not gained scholarly attention in Pakistan (Mujtaba & Reiss, 2015). Hence, there is a lack of sufficient research on female participation in STEM education in Pakistan.

The present research aims to address this research gap and ventures into the factors effecting female intention to participate in STEM education in Pakistani context.

2.2 Factors Influencing Female Participation in STEM Education

There could be many reasons behind the lack of female participation in STEM education. According to Rosser and Lane (2002), female's lack of participation in STEM education and fields can be attributed to four barriers including pressure to balance family and career, pressure of low numbers of women in STEM fields, stereotypes, and lack of resources.

Previous research has highlighted many factors which effect the female participation in STEM education. These factors can be categorized into personal and environmental / contextual factors. Personal factors include factors such as biology (i.e., Gilbreath, 2015), self-concept and self-efficacy (i.e., Haussler & Hoffman, 2002; Kelly, 2016), preference and interest (i.e., Haussler & Hoffman, 2002; Dayton, 2010; Ceci et al., 2011), attitude (i.e., Saucerman & Vasquez, 2014), motivation (i.e., DeBacker & Nelson, 1999; Koul, Lerdpornkulrat & Chantara, 2011) and confidence (i.e., Dayton, 2010). As for the contextual / environmental factors, they include factors such as negative stereotypes (i.e., Dayton, 2010;

Gilbreath, 2015; Sarkar, Tytler & Palmer, 2014; Kelly, 2016), parental support (i.e., Dabney & Tai, 2013; Hazari, Sadler & Tai, 2008), peers and teachers (i.e., Kelly, 2016) and role models (i.e., Dayton, 2010; Sarkar, Tytler & Palmer, 2014).

By using the Social Cognitive Career Theory (SCCT) and the Theory of Planned Behavior (TPB), the present research attempts to examine the intention of females to pursue STEM education by including personal as well as contextual / environmental factors in a framework. These factors are illustrated in Figure 2.1.

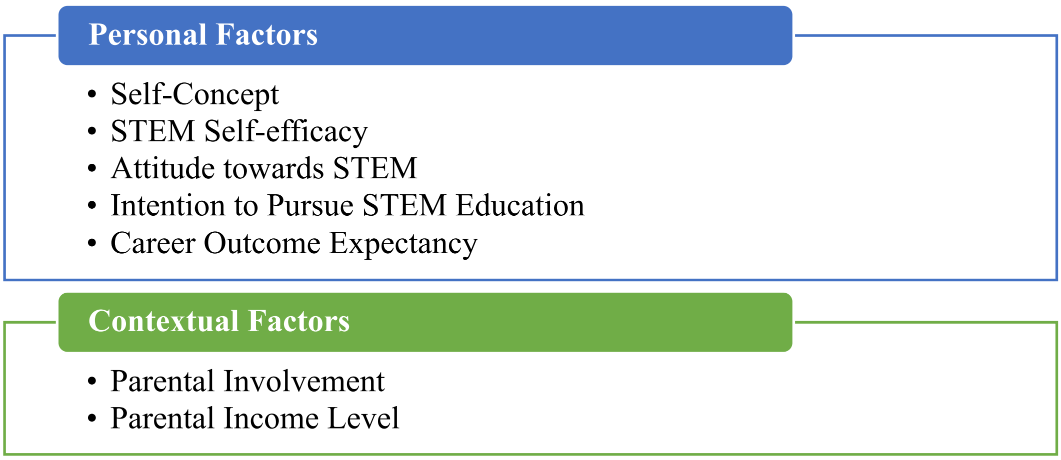

Figure 2.1: Personal and Contextual Factors of the Study

2.3 Conceptual framework

The following section will describe the theories utilized to develop the conceptual framework as well as the variables involved in the present research.

2.3.1 Theoretical Basis

The present study has utilized Social Cognitive Career Theory (SCCT) and Theory of Planned Behavior (TPB) to develop the conceptual framework.

2.3.1.1 Social Cognitive Career Theory (SCCT)

The primary theoretical foundation for the present research is the Social Cognitive Career Theory (SCCT) (Lent, Brown & Hackett, 1993) which is based on Social Cognitive Theory (SCT) (Bandura, 1986). According to Kelly (2016), Bandura's first work (Bandura, 1986), which introduced SCT has been considered as ground-breaking in the field and has generated more than 50k citations alone. SCCT provided a model to explain the human behavior and posited that a human behavior is motivated by the desire to achieve a particular goal based on anticipated outcomes within their socio-cultural environments.

The theory proposes that a student's decision making about career paths involves the interaction of personal cognitive factors (i.e., self-efficacy, outcome expectation and goals) external variables related to environment (i.e., socialization and oppression) and explicit behaviors (i.e., decisions about career) (Ambriz, 2016). SCCT integrates an agency perspective to human behavior, according to which individuals, through their own actions, can produce desired outcomes (Hackett et al., 1992).

Bandura and colleagues have applied SCCT in both academic and career related decision making and behaviors. In the context of examining STEM education choice, SCCT has been cited as an invaluable standpoint (Wang, 2012; Kelly, 2016) and has been applied in the research pertaining to the student's participation in STEM related subjects (i.e., Brown, Lent, & Larkin, 1989; Siegal, Galassi, & Ware, 1985). Bandura argued that the career aspirations of females are at times marginalized by low self-efficacy in STEM related disciplines which are conventionally overshadowed by males. Hence, female choose alternative paths (Bandura, 2002). To understand the development of the female views about STEM education, it is important to explore their confidence, planning and choice related to STEM. Consequently, according to Kelly (2016), researchers have become aware of the limitations and barriers which limit individual's career choice by focusing on factors such self-efficacy, outcome expectations, and goal representations.

According to SCCT, the background affordance affects the learning experience, which result in the development of self-efficacy and outcome expectations. Furthermore, the background affordance factors and person input factors such as gender, race / ethnicity, and health status effect each other and effect the learning experiences. The personal interest of a person, which is affected by self-efficacy and outcome expectations, can lead to the goal orientation which in turn effects the action.

As for the contextual environmental factors, according to SCCT, these factors come into play at a later active stage of educational / career decision making and can moderate or directly affect the relationship between interest – goal or goal – action. (Ambriz, 2016). Figure 2.2, adopted from Lent, Brown, and Hackett (1994), illustrates the SCCT in detail.

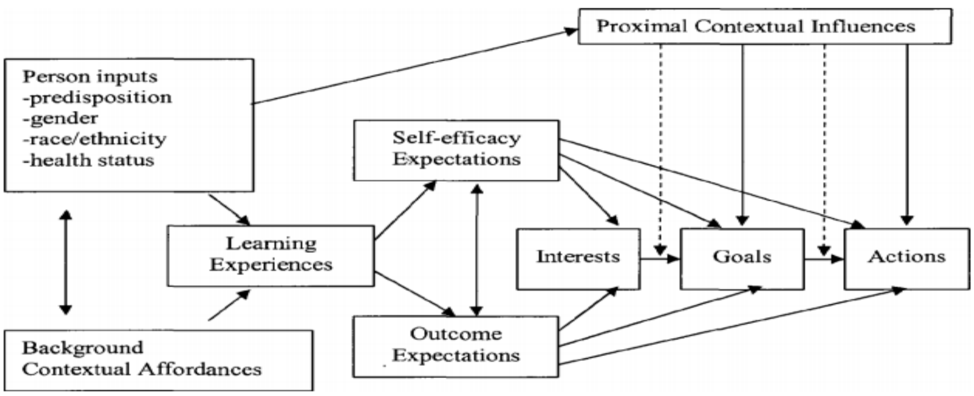

Figure 2.2: Social Cognitive Career Theory (SCCT) adopted from Lent, Brown, and Hackett (1994)

In the present research, the underlying interrelationships among personal cognitive factors and external environmental factors will be examined to understand why women participation in STEM at a disproportionately low rate in Pakistan.

2.3.1.2 Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (TPB) (Ajzen, 1991) is a well-formed theory which attempts to explain the antecedents and psychological mechanisms of human behavior (Choi, 2012). According to the TPB, a human behavior is his actions (Fishbein & Ajzen, 1977). In a more technical manner, according to TPB, an individual's behavior can be defined as:

"*A function of perceived behavioral control and intention, where intention is directly predicted by subjective norms, attitudes toward the behavior, and perceived behavioral control.*" Ajzen (1991)

In accordance with the above definition, human behavior is a manifestation of behavioral intention which is affected by the attitude towards that behavior as well as subjective norms and perceived behavioral control. The Theory of Planned Behavior (TPB) is illustrated in Figure 2.3.

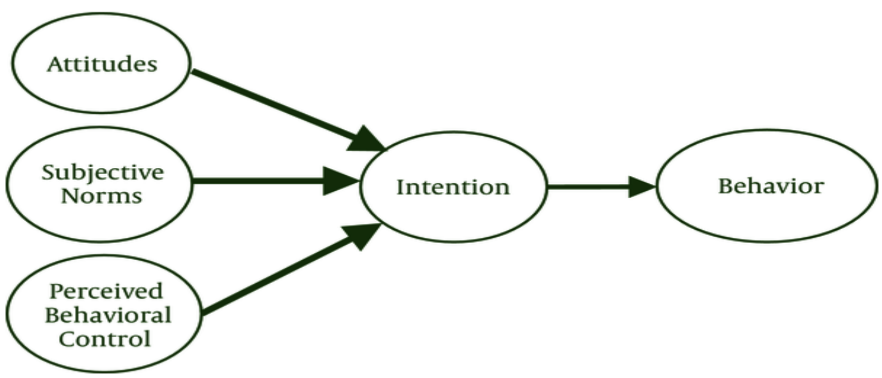

Figure 2.3: Theory of Planned Behavior (TPB) (Ajzen, 1991)

2.3.2 Personal Factors

According to SCCT and the literature, the first category of factors are those factors which are inherent to the person.

2.3.2.1 Self-Concept

Kelly (2016) defined self-concept as the view of a person about his capabilities and skills in a particular domain of academia. It is one of the important constructs in psychology as well as education (Flowers, Raynor & White, 2013). Self-concept can be created by the individual by comparing himself with external entities or with himself (Moller & Marsh, 2014). According to Moller and Marsh (2014), it is externally formulated when an individual compares his performance with the people or peers, and it is created internally when he compares his performance in a particular subject or domain with his own performance in some other domain or subject.

Self-concept can significantly affect a student's performance in a given subject. A student with a strong belief in her abilities can outperforms the one who does not have self-belief (Chang, 2008). It is also considered to be one of the most significant precursors of accomplishment in STEM related subjects (Hoffman, 2002) and aspirations in career (Nagengast & Marsh, 2012). Prior research (i.e., Kaya, 2008; West & Fish, 1973) has also found positive relationship of self-concept with science related achievement.

According to a survey conducted across various countries, women are more critical about their STEM related self-concept than men (OECD, 2015). As a result of overly critical self-concept, women believe that their skills in STEM fields are inferior (Wang et al., 2015, Eccles & Wang, 2016). In Pakistan, there is a strong belief that males are better than females at STEM related subjects and career (Mujtaba & Reis, 2015). According to the research conducted by Mujtaba and Reis (2015), the respondent Pakistani females believed that males are naturally better at learning and understanding STEM subjects. However, most of them believed that it is due to the social influences and not due to biological factors. Hence, it is safe to assume that low self-concept of female towards STEM subjects is prevalent in Pakistan and can greatly influence their decision to participate in STEM education.

According to Rittmayer and Beier (2008), self-concept is often positively related with self-efficacy and both constructs develop in a similar fashion by means of self-assessment of one's achievements. Hence, it is believed that STEM related self-concept may affect the level of achievement in STEM related subjects (Ertl, Luttenberger, & Paechter, 2017). According to Beier and Rittmayer (2008), if an individual has high self-concept and she enjoys doing a particular task, she will have high self-efficacy. Based on this, following hypothesis has been proposed in the present research.

Hypothesis 1: Self-concept will positively affect the self-efficacy of women to pursue STEM education

2.3.2.2 Self-Efficacy

According to Social Cognitive Career Theory (SCCT), self-efficacy is one of the prime antecedents of a student's choice of career (Lent, Brown, & Hackett, 1994). Self-efficacy is defined as the judgement of a person about his/ her abilities to accomplish and organize such courses of action which can lead to the attainment of desired performance in a specific field (Bandura, 1986). There is an ongoing discussion on whether self-efficacy and self-concept are similar or distinct constructs.

Besides career choice, self-efficacy is also one of the crucial antecedents of understanding, perseverance, and accomplishment in STEM related subjects (Cavallo et al., 2004; Lent et al., 1984; Sawtelle et al., 2012). An individual with high STEM related self-efficacy is expected to perform better and persist the STEM discipline (Rittmayer & Beier, 2008). Studies such as Britner and Pajares (2006) found that self-efficacy in science predicts the grades of the student in science class. Self-efficacy also strongly predicts women's vocational choice compared to men (Larose et al., 2006). Furthermore, studies have predicted that women underestimate themselves on whether they can achieve STEM related goals such as the grades or professions resulting in decreased interest in pursuing STEM (Eccles, 1994; Seymour, 1995). In SCCT, self-efficacy is one of the core variables (Ambriz, 2016) and therefore it is pertinent to include the variable in the proposed framework. According to Lent et al. (2015), self-efficacy is one of the strongest predictors of persistence in STEM education. Moreover, according to Fouad and Santana (2017), self-efficacy strongly predicts student's intention, and the intention can be increased by increasing the self-efficacy of students towards STEM subjects. Hence, following hypothesis is proposed.

Hypothesis 2: Self-efficacy will positively affect the intention of women to pursue STEM education

2.3.2.2.1 Self-Concept Vs Self-efficacy

Although self-concept and self-efficacy are often positively correlated with each other, they are distinct (Beier & Rittmayer, 2008). According to Beier and Rittmayer (2008), academic self-concept refers the likeness of a person towards a domain whereas self-efficacy entails a person's assessment of her ability to take necessary steps to achieve a particular goal.

As a result, a student might have a high STEM related self-concept but a low self-efficacy to pass a particular STEM related subject (Rittmayer & Beier, 2008). Moreover, self-efficacy and self-concept are different (Pajares, 2005), as former is more futuristic than the later and focuses on a person's confidence that he/she can achieve a particular target.

2.3.2.3 Attitude towards STEM

Attitude can be defined as a person’s belief about the characteristics of a specific object (Fishbein & Ajzen, 1975). Specifically, attitude towards STEM is defined by Osborne et al. (2003) as *“the feelings, beliefs and values held about an object that may be the enterprise of science, school science, the impact of science on society or scientists themselves”*. It is one of the components of Theory of Planned Behavior (TPB) and is an important predictor of an individual’s preferences, choices, and intention. In TPB, attitude precedes intention whereby a positive attitude leads to a positive intention towards a behavior.

According to Osborne et al. (2003), a student’s choice of pursuing a career is strongly determined by her attitude towards enrolling in that course. Furthermore, attitude has also been considered an important component in science education (Joyce & Farenga, 2000; Osborne, Simon, & Collins, 2003). It is reported that, attitude does not merely effect student’s performance (Linn, 1992) and achievement in science (Rana, 2002; Papanastasiou & Zembylas, 2004) it also effects their participation and interest (Weinburgh, 1995; Greenfield, 1996). According to Tseng et al. (2013), a better understanding of student’s attitude towards a particular course and its relationship with the choice of the course can enable us to bring important changes in curriculum and method of instruction, resulting in enhanced student learning. Hence, it can be concluded that attitude is an important variable to study when it comes to STEM education.

Attitude towards STEM subjects may be seen as a positive or negative averment towards STEM subjects (Kundu & Ghose, 2016). Although, student's attitude towards STEM education is generally positive (Sarwar, Naz & Noreen, 2011), according to Baram-Tsabari and Yarden (2011), there are differences in terms of gender. According to Mahoney (2010), males show more positive attitude compared to females towards STEM education especially for the areas of technology and engineering. Similar conclusions were made by Brotman and Moore (2008).

According to Kundu and Ghose (2016), a student's attitude towards STEM subject (i.e., Mathematics) can have a positive or negative impact on her learning. Moreover, the results of the study conducted by Kundy and Ghose (2016) indicated that attitude towards mathematics (which is a STEM subject) has a strong and positive relationship with self-efficacy. Similarly, Liu, Cho & Schallert (2006) found that attitude and self-efficacy of middle school students were positively related for science subjects. Similar results about the relationship between attitude and self-efficacy were obtained by another research conducted by Canturk and Baser (2007) as well as Stramel (2010).

Based on the literature and theory of planned behavior, we hypothesize the following relationship between attitude and intention to pursue STEM education.

Hypothesis 3: Attitude towards STEM will positively affect the female's STEM self-efficacy.

2.3.2.4 Behavioral Intention

From the Theory of Planned Behavior (TPB), the current research also includes the factor namely behavioral intention. Behavioral intention can be defined as the indication of the amount of hard work and effort an individual is willing to put to perform a behavior (Ajzen, 1991). According to TPB, behavioral intention of a person is affected by the attitude towards that behavior as well as subjective norms and perceived behavioral control. Intention is like the '*goal'* construct in SCCT.

Furthermore, it is argued that self-efficacy and outcome expectation relate to the student's intention to pursue STEM education and goals (Fouad & Santana, 2017). It is also argued that females have a weaker intention to pursue STEM careers than men (Hardin and Longhurst, 2016). It is suggested that by increasing self-efficacy and outcome expectation, the intention and interest of students in STEM education can be increased. (Fouad & Santana, 2017).

In the present research, intention to pursue STEM education is the dependent variable and is directly affected by self-efficacy.

2.3.2.5 Career Outcome Expectancy (COE)

Outcome expectancy is an important cognitive variable in SCCT (Springer et al., 2001). It is defined as the belief of a person about the outcomes of his /her actions in foreseeable future (Bandura, 1989). Career outcome expectancy is defined by Springer et al. (2001) as *"self - perceptions of the anticipated consequences or outcomes that would accrue if the person were employed in the occupation of her/his choice"*. These outcomes could be physical (i.e., monetary), social (i.e., approval, client's wellbeing) or self-evaluation based (i.e., self-satisfaction) (Springer et al., 2001). Furthermore, according to Bandura (1982), outcome expectancy and self-efficacy can affect the actions of a person in different manners. In scenarios where outcome is largely dependent on performance, outcome expectations will contribute just a little over self-efficacy in predicting future choices and actions of a person. On the other hand, in scenarios where the outcome is loosely dependent on performance, outcome expectations will independently affect person's future choices and actions. It is pertinent to note that career outcome expectancy has been linked with secondary school students by earlier researchers such as Fouad and Smith (1997), McWhirter, Rasheed, and Crothers (2000).

According to SCCT, keeping the self-efficacy as constant, a person shall be more motivated to increase his competency and overcome the barriers to pursue a particular career, if she expects positive and highly valued outcomes after choosing that career. According to SCCT, outcome expectation can affect self-efficacy as well as the interest, goals / intention, and actions. It has been reported that STEM related self-efficacy and selection of science related activities (including career) are positively linked (Britner & Pajares, 2006; Parker et al., 2014; Richardson et al. 2012). Moreover, according to Luo et al. (2021), STEM career outcome expectancy positively predicts the intention to pursue STEM career. Furthermore, according to the results of a longitudinal study conducted by Lent et al. (2008), the relationship between self-efficacy and career outcome expectancy is temporal. According to SCCT, career outcome expectancy and self-efficacy positively effect each other. Moreover, the SCCT also suggest the positive impact of career outcome expectancy on interests and goals (intention) to pursue STEM education and careers.

Based on the above, in the present research, career outcome expectation is hypothesized to effect self-efficacy as well as intention of the female students to pursue STEM education.

Hypothesis 4: COE will positively affect female's STEM self-efficacy.

Hypothesis 5: COE will positively affect female's intention to pursue STEM education.

2.3.3 External Factors

2.3.3.1 Parental Involvement

There are numerous studies which suggest the crucial impact of parents and family on the process of female decision-making and as a result their career choice. According to Corcoran and Courant (1987), the daughter's choice of profession is strongly influenced by the mother's profession, particularly if the mother's profession relates with the traditionally female oriented jobs such as education, domestic work, and administration. Furthermore, according to Ferry (2006), working parents provide and teach females with necessary skills, which on one hand gives females a broader understanding of their parent's aptitude and on the other hand assist them in making a career choice. The significance of parental involvement has also been acknowledged by policymakers by incorporating wider policy initiatives for education (Howard & Reynolds, 2008).

Parental involvement can be defined as *"different kinds of behaviors and activities such as attitudes, beliefs, aspirations and expectations toward their child's learning, which parents represent in the home or in the school"* (Henderson & Mapp, 2002). It involves six types of involvements (Sheldon & Epstein, 2005) as illustrated in Figure 2.4:

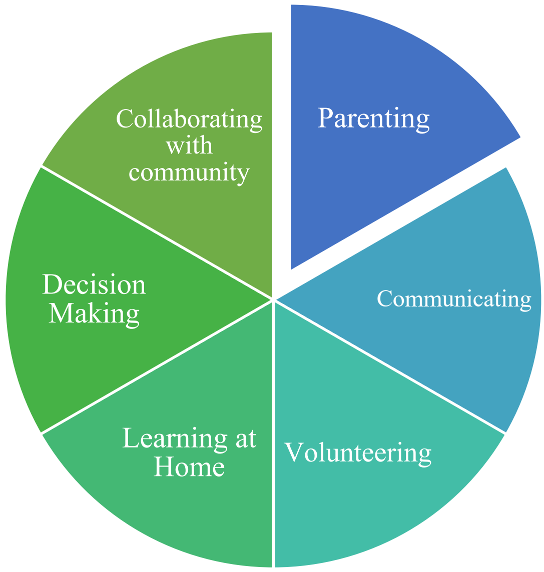

Figure 2.4: Types of Parental Involvement

Parental involvement in children's academic achievement is not only beneficial for the children, but also for parents and teachers (Hornby, 2011). According to Henderson and Mapp (2002), for the children, parental involvement can result in the benefits such as:

- High grades and marks
- Children attending difficult academic programs and earning more credits
- Completing more classes
- Development of good behavior at school and home
- Improvement in attendance, social competence and
- Better adaptation of education system

According to Nugent et al. (2015), parents and caregiver's role is pivotal and that of a gatekeeper when it comes to children's interest and motivation in STEM education. Moreover, Parental influence and involvement are most significant factors to effect children's attitude towards science (Dewitt et al, 2013; Perera, 2014; Sun et al., 2012). Furthermore, the beliefs and views of parents predict the career choices as well as academic outcomes in science (Boon, 2012). Parental involvement has also been suggested to positively influence academic achievement (Hill & Craft, 2003). Same is true for children's achievements in STEM subjects. According to Van Voorish (2011), there is a positive relationship between parental involvement in children's homework and children's achievement in subjects like math and science. It is also noted that parental involvement is positively linked with student's academic self-efficacy (Fan & Williams, 2010). Moreover, according to the results of the study conducted by Nugent et al. (2015), among the impact of peers, educators and family, the impact of family support and involvement is strongest. The study also suggests that if parents emphasize on the importance and significance of STEM subjects, then the children will have higher self-efficacy and a positive career outcome expectancy.

Despite the importance of parental involvement, the variable is often ignored or taken for granted by academicians and educators (Harris & Goodall, 2008; Milner-Bolotin & Marotto, 2018). Hence, it becomes imperative to include this variable in the framework and examine its impact.

Hence, the present study adopts the parental involvement as the contextual factor and attempts to examine its direct impact on self-efficacy as well as moderating impact on the relationship between self-efficacy and intention to pursue STEM education. When studying parental involvement, it is important to remember that it is one of the several constructs under the umbrella of family related constructs such as socio-economic status, parent's education, and parenting styles (Howard, 2015). Based on above theory and literature, following hypothesis have been proposed in the present research.

Hypothesis 6: Parental involvement will positively affect female's STEM self-efficacy.

Hypothesis 7: Parental involvement will moderate the relationship between self-efficacy and female's intention to pursue STEM education.

2.3.3.2 Parental Income Level

According to Glick and Sahn (2000), household income affects the education of children. The authors also suggest that drafting policies to increase the household income will lead to gender parity in school education. The study by Burušić, Šimunović and Velic (2018), also suggested a positive correlation between family income and achievement in STEM education. According to Howard (2010), the relationship between socio-economic status of parents and educational achievement is complex. Howard (2010) further posits that economic disparities also explain the disparities in educational achievement between high socio-economic status and low socio-economic status students. Moreover, Orr (2003) also hypothesized the positive impact of wealth on child's educational achievement. According to Orr (2003), the parents with low income are incapable of supporting their child's education. According to the results of the study conducted by Khan and Rodrigues (2017), the female students, belonging to the lower income families, did not aspire to continue their education in STEM fields. Same was founded by Burušić, Šakić, and Šimunović, (2018) who found a positive relationship between parental income and STEM achievement.

In addition, according to Mandara et al. (2009), students from a lower economic status perform worse than the ones with high economic status. In the context of Pakistani education system, according to Mujtaba and Reis (2015), poverty is one of the reasons behind the disadvantageous status of females. The parents of low-income status do not provide education to females because of financial issues (Mujtaba & Reis, 2015).

However, according to Duncan-Andrade (2009), there is conflicting reports by existing literature on the impact of socio-economic status on educational achievement. Hence, it becomes imperative to delve into the role of parental income in female participation in STEM education.

The present research adopts parental income as the moderating factor and attempts to examine the direct and moderating role of parental income towards female participation in STEM education in Pakistan. Following hypotheses pertain to the impact of parental income.

Hypothesis 8: Parental income will moderate the relationship between self-efficacy and female's intention to pursue STEM education.

2.4 Theoretical Framework

As mentioned earlier, the present study aims to propose and statistically validate a theoretical framework which is based on Social Cognitive Career Theory (SCCT) and Theory of Planned Behavior (TPB). The constructs which are derived from SCCT are self-concept, self-efficacy, and career outcome expectancy. Furthermore, the present research has adopted the factors including attitude and behavioral intention from TPB.

Based on the above-mentioned theories and literature review, Figure 2.5 shows the proposed theoretical framework whereas the proposed hypotheses were shown in Chapter 1, section 1.5, Table 1.3.

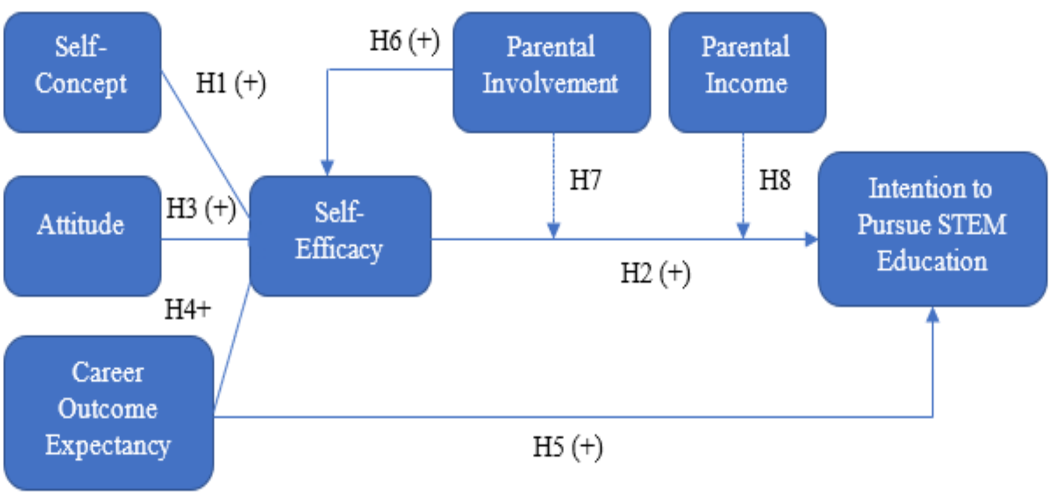

Figure 2.5: Proposed Theoretical Framework

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Overview

This chapter will present the research methodology followed in the present research. This includes the research design, philosophy, approach, strategy, time horizon, population, sampling, and data collection.

The present research follows a positivist philosophy of research, which is also known as objectivist, quantitative, scientific, experimentalist, traditionalist, or functionalist paradigm (Holden & Lynch, 2004). Furthermore, the study follows a deductive / quantitative approach which, according to Sarantakos (2012), is the natural successor of positivism. Furthermore, the study followed survey strategy to collect data. Hence, in a nutshell, the present research is a positivist, deductive / quantitative, survey based, cross-sectional study.

3.2 Sampling

Sampling is one of the important elements of a survey-based research. This section highlights the overall sampling process which includes determination of population, sample size calculation, sampling technique as well as the location.

3.2.1 Population

The population of this study consists of the females studying at secondary level of education in Pakistan. According to the stats published by the by the Government of Pakistan (MFEPT, 2017a), there are nearly 2.025 million girls enrolled in public secondary schools in Pakistan. Hence, the population of the present research is the 2.025 million girls enrolled in public secondary schools.

The reason to choose students at secondary and higher secondary level is that, according to UNESCO (2017), although the gender differences in STEM education can be seen in early childhood care and education, they become even more visible when the option to select subjects is available and continues to increase as the education level increases (UNESCO, 2017). As the level of education reaches the lower secondary, where the choice to choose subjects is available, the difference between both genders become more prominent (McDaniel, 2015; Spearman & Watt, 2013). Furthermore, it is argued that spatial skills which are developed in middle school can promote student's interest in STEM related subjects and it is important to encourage females for STEM education during high school (Hill et al., 2010). Most importantly, this is the level of education when students are prepared for their working careers and professions. Hence, secondary school is the crossroad which opens the opportunities of higher education for graduates and provides the skilled manpower for the job market (MFEPT, 2017b).

3.2.2 Sample Size Calculation

By using the online sample size calculator (Survey Monkey, 2019), the required sample for the population size of 2.025 million was 385. This was calculated using 0.85 confidence level and 0.05 precision level. The survey questionnaire was distributed to 530 students, however due to low response rate (38%) only 202 valid responses were yielded. However, based on non-statistical methods, the final sample size is sufficient. According to Schmidt (1971), the preferred sample size should be 15-20 subjects per variable (SPV). Since, the present research has 7 variables, the required sample is 140. Similar rule was proposed by Harris (2001), according to which the minimum sample size should be above the sum of 50 and the number of predictor variables. Following the rule proposed by Harrell (2001), the required sample is 56. Hence, the collected sample should be considered adequate. Furthermore, according to the tool G-Power, the required sample size is 146. Figure 3.1 shows the sample size calculation using G-power.

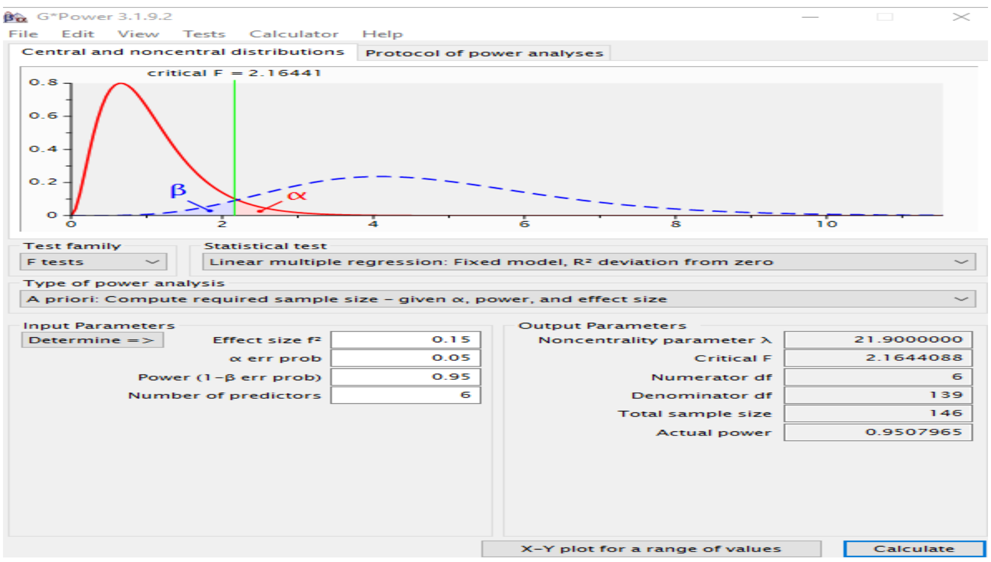

Figure 3.1: The Sample Size Calculation based on G-Power

3.2.3 Sampling Technique and Location

To select the sample, the first step is to determine if probability or non-probability sampling will be used. This study follows a probability sampling method, more specifically multistage simple random sampling. According to Saunders et al. (2009), research questions, objectives and strategy determines the sampling technique one should apply in research. In a research work which adopts survey strategy, probability sampling is the most used method of sampling. Furthermore, the major advantage of using probability sampling approach is that in probability sampling each unit is selected randomly in the final sample (without selection bias) and hence even with a smaller sample size, inferences can be made about the whole population (Statistics Canada, 2010). Moreover, the probability sampling techniques uses statistical methods of selecting a sample, whereas non-probability techniques use researcher's judgment (Saunders et al., 2009). The second stage in sample selection is to choose the right sampling technique. For present research, to select the sample, multistage simple random sampling technique was applied.

3.2.3.1 Multistage Sampling: Stage 1

At first, out of the four provinces and one federal territory, two provinces and the federal territory were randomly selected. The two provinces include Punjab and Khyber Pakhtunkhwa whereas the federal territory is Islamabad. Particularly, from the province of Punjab, data was gathered from the capital of the province namely Lahore and Rawalpindi. Similarly, from KPK, data was gathered from the capital of the province namely Peshawar and Kohat.

The province of Punjab is the largest province in terms of population and has the highest literacy rate of 64.7% (FDGoP, 2019) as well as the largest share in economy of 54.1% (Pasha, 2015). On the other hand, KPK has a relatively low literacy rate of 55.3% (FDGoP, 2019) as well as the share of economy of 13.0% (Pasha, 2015).

3.2.3.2 Multistage Sampling: Stage 2

In the second stage, the cities within these provinces were randomly selected. Out of the 58 cities in Punjab province, 2 cities namely Lahore and Rawalpindi were randomly selected. Furthermore, out of 46 cities in KPK, 2 cities namely Peshawar and Kohat were randomly selected. In addition, the federal territory namely Islamabad was also selected.

3.2.3.3 Multistage Sampling: Stage 3

In the third stage, the schools from these cities were randomly selected. The total number of schools in Lahore are 127, followed by 121 in Rawalpindi, 450 in Peshawar, 288 in Kohat and 99 in Islamabad. From these schools, 5% schools were randomly selected from each city resulting in 6 each from Lahore and Rawalpindi, 22 from Peshawar, 14 from Kohat and 5 from Islamabad.

3.2.3.4 Multistage Sampling: Stage 4

In the fourth stage, students from these schools were randomly selected. For this purpose, 10 students were randomly selected from each school resulting in 60 students each from Lahore and Rawalpindi, 220 from Peshawar, 140 from Kohat and 50 from Islamabad. Hence a total of 530 students were approached.

As a result, the total number of useful responses were 202 (38%) including 37 (61.6%) from Lahore and Rawalpindi each, 42 (19.9%) from Peshawar, 49 (35%) from Kohat and 37(74%) from Islamabad. Figure 3.2 illustrates the flow chart for sampling technique and data collection.

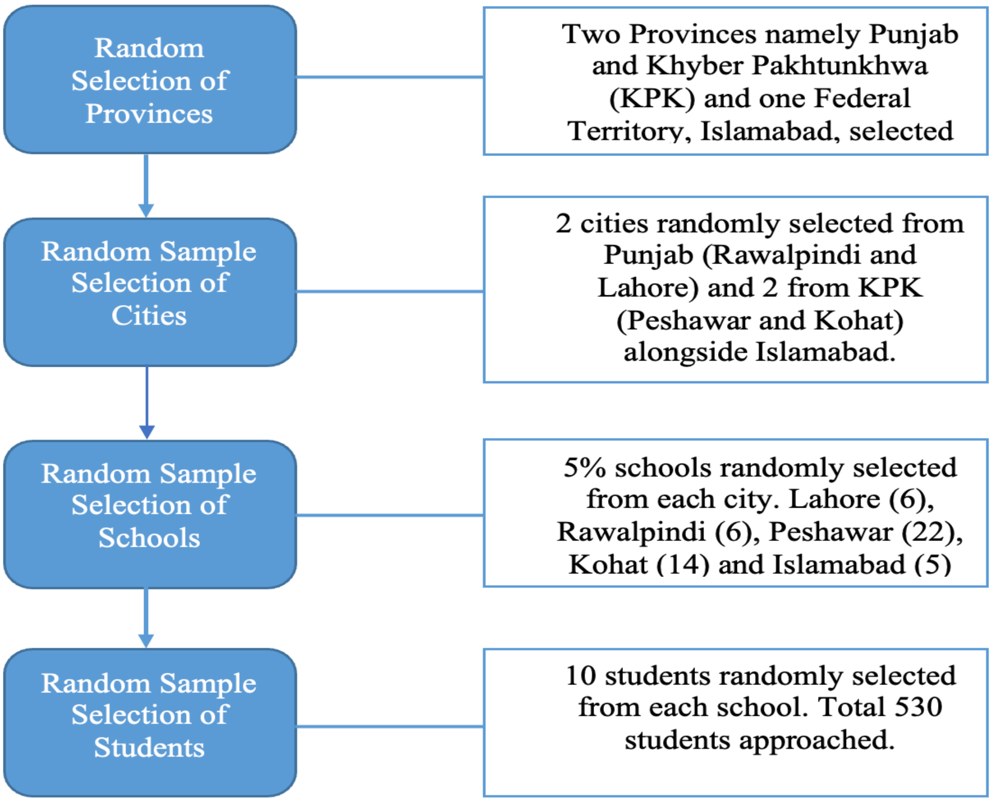

Figure 3.2: Flow Chart for Sampling Technique and Data Collection.

3.3 Data Collection (Fieldwork)

To collect data, following two methods were adopted to receive as much data as possible.

3.3.1 Personally Administered

Through this method, most of the questionnaire were delivered and collected back personally by the researcher. One of the major advantages of such method is the ease of administering the questionnaire (Statistics Canada, 2010).

3.3.2 Enumerator and Online

Due to the time limitations, the second method of appointing an enumerator was also adopted. In this method, an enumerator was designated to disseminate and collect back questionnaire from the respondents (Check & Schutt, 2011). To continue collecting the data in the absence of the researcher, enumerators were assigned in different schools to disseminate and collect the questionnaire. Apart from the above two methods, data was also gathered using online forms.

3.4 Questionnaire Design

To achieve reliability and validity, pre-validated survey scales were adopted from various existing studies. The language of the questionnaire was English as well as Urdu. Furthermore, the questionnaire consists of two sections including the demographic section, which sought the demographic details of the female students as well as the main questions section which sought the responses on the variables of the study. Five-point Likert scale was used. Likert scale allows respondents to specify how strongly they agree or disagree with a particular statement (Saunders et al., 2009). It helps to measure attitudes or opinions more precisely than other Likert scales thus improving the quality of the scale (Revilla, Saris, & Krosnick, 2014). The questionnaire shall measure the variables involved in the study including attitude towards STEM education, self-efficacy and self-concept, career outcome expectancy, intention to pursue STEM education and family involvement. Furthermore, the income level will also be measured as a demographic variable. The questionnaire is presented in Appendix A.

The questionnaire for the variable attitude was adopted from Mahoney (2010). It included questions like "*I do not like STEM subjects"* and *"Assigned work in STEM subjects is easy for me".* Furthermore, the items for perception of parental involvement are adopted from Altinoz (2016). The items for parental involvements included items such as *"My parents ask the STEM subject teacher about my progress"* and *"my parents know what I am learning in STEM subjects."*

In reference to the variable of STEM self-concept, it was adopted from the study of Kulm (1973) and the example of items include *"I feel comfortable in the classes of STEM subject's"* and *"I do well in STEM subject's quizzes.".* Furthermore, the questions for career outcome expectancy are adopted from the study of Springer et al. (2001) and included questions such *as "If I work in STEM related career, I will get a feeling of accomplishment."* and *"If I work in STEM related career, I will be somebody special in the job."* Moreover, the questions for STEM self-efficacy were adopted from Jenson et al. (2011) and example of questions is *"How confident are you that you can get good grades in your STEM courses this semester?"* and *"How confident are you that you can do as well in your STEM classes as other students?"*.

3.4.1 Assessing the Validity and Readability of Questionnaire

Before the final fieldwork and data collection, it is important to assess the validity and readability of the questionnaire. For this purpose, the four-step process proposed by Dillman (2000) was used as shown in Figure 3.3.

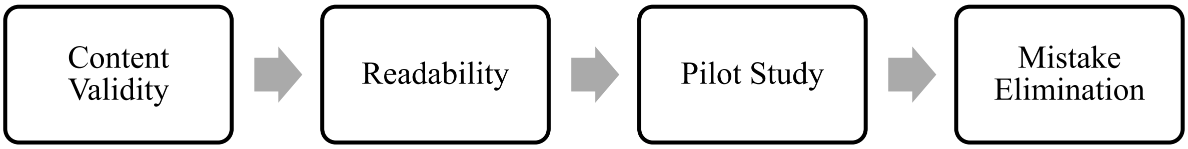

Figure 3.3: Validity and Readability Analysis Process

3.4.1.1 Content Validity

For content validity, one of the methods is to consult a panel of experts from the area of study (Saunders et al., 2009). For this purpose, the questionnaire was distributed to three academicians in the field of education and psychology.

3.4.1.2 Readability

DuBay (2006) has defined readability as *"the ease of reading, created by the choice of content, style, design and organization that fit the prior knowledge, reading, skill, interest and motivation of the audience".* For this purpose, 3 female students and 2 experts from Pakistan were chosen to check the readability and provide feedback on (a) the content, style, length, design, and organization of the questionnaire; (b) whether they can understand the words, sentences and terms used in the items and (c) what do they understand from the statements.

3.4.1.3 Pilot Study

A pilot study is a term used for dual purposes. It is known as feasibility study when it is a small-scale version of the original study and it is known as pre-test when the objective is to test the research instrument before the original survey is conducted (Van Teijlingen et al., 2001; Saunders et al., 2009; Zikmund et al., 2010). In this research, pilot study was conducted for this second purpose. In this context, a pilot study helps to determine the adequacy of the survey instrument from the reference of original respondents (Van Teijlingen et al., 2001; Saunder et al., 2009) as well as what resources will be required for a full-scale study (Van Teijlingen et al., 2001). Moreover, it helps to judge the initial reliability and validity of the survey instrument (Saunders et al., 2009). Saunders et al. argue that pilot study should be conducted even if the researcher has time constraints and even if it calls for conducting it with respondents who do not match the profile of the respondents who will be reached for the original survey (i.e., family and friends). To conduct the pre-test, the questionnaire was sent to 30 female students studying at higher secondary level in Pakistan. According to Fink (2003), 10 respondents are enough for a pre-test of a small-scale study. Based on the results of the pre-test the mistakes shall be eliminated.

The above steps helped in refining the questionnaire in terms of readability, content, language, style, and other important details. With the help of the above steps, the researcher also understood the challenges which she could face in real data collection.

3.5 Data Analysis Technique

For quantitative studies, the collected data shall be quantifiable whereas the values are counted in numerical form (Brown & Saunders, 2008). Quantitative data analysis techniques, such as statistical analysis, help the researcher to explore, explain and present the relationships and trends present in the data (Saunders et al., 2009). The present research used SPSS version 23.0 to conduct the analysis.

Before proceeding to evaluate the relationships between variables, it is important that the data shows acceptable reliability, normality, and multicollinearity. Table 3.1 shows the tests that has been adopted to measure these important tests.

Table 3.1

The Tests Applied for Data Correctness

Validity Type	Indicator	Criterion
Reliability Analysis	Cronbach's Alpha	0.6-0.7 (Hair et al., 2006)
Multicollinearity Analysis	VIF Values	• Between +1 and -1 (Excellent Normality) • Between +2 and -2 (Satisfactory Normality) (George & Mallery, 2006)
Data Normality	Skewness and Kurtosis	If VIF is greater than or equal to 10 then it is said to have a multicollinearity issue. (O'Brien, 2007)

After the appropriateness of measures is established, the evidence to support the theoretical model is provided and the proposed hypothesis was tested in terms of their effect and significance. The tests applied in this stage are highlighted in Table 3.2.

Table 3.2
The Tests Applied for Relationship Testing

Validity Type	Indicator	Criterion
Structural Path Significance	• T-statistics • P-Value	T is great than 0.196 (significance level = 5%) or greater than 0.165 (significance level = 10%)
Estimates of Path Coefficients	Same as standardized beta coefficients	
Coefficient of Determination	Through the R^2 value for endogenous latent variable	• 0.75: Substantial • 0.50: Moderate • 0.25: Weak (Hair, Ringle & Sarstedt, 2011).

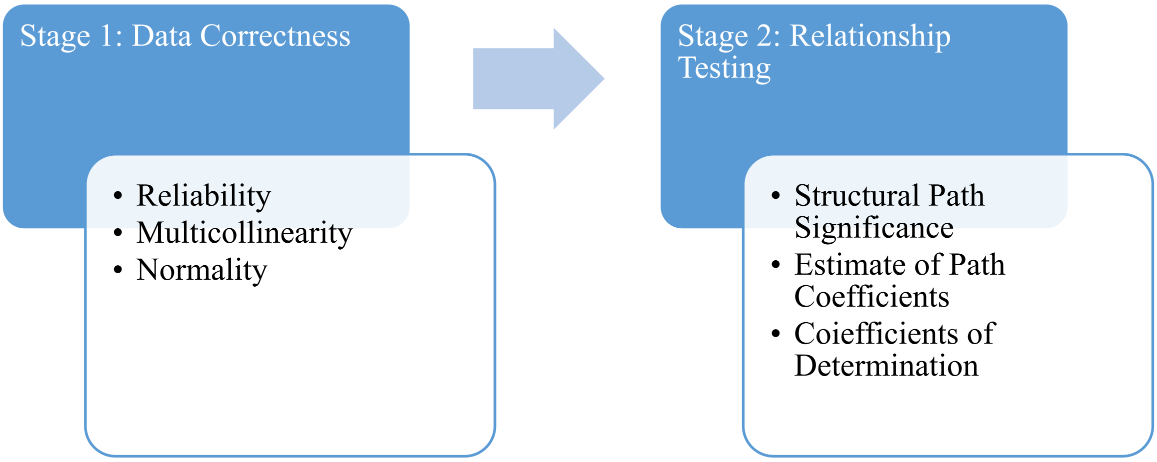

Figure 3.4: Flow Chart for Data Analysis Techniques

3.6 Research Process

The research process followed in this research contained five phases. These five phases are explained in forthcoming sub-sections:

3.6.1 Phase 1

In phase 1, a comprehensive analysis of existing literature on females' intention to participate in STEM education was conducted and the problem and research gap were identified. Furthermore, the research questions, objectives and scope were determined to have a clear focus of research.

3.6.2 Phase 2

In phase 2, the methodology to answer and achieve the objectives of the research was outlined. Furthermore, sampling, sampling methods and questionnaire was developed to collect data.

3.6.3 Phase 3

In phase 3, the data was collected from female students studying at higher secondary level of education in Pakistan.

3.6.4 Phase 4

Phase 4 constitutes the analysis of the collected data. For this purpose, SPSS 23.0 was utilized and proposed theoretical framework was validated.

3.6.5 Phase 5

In the last phase, the results were reported in the form of the thesis report. Figure 3.5 summarizes all the phases of this research's process.

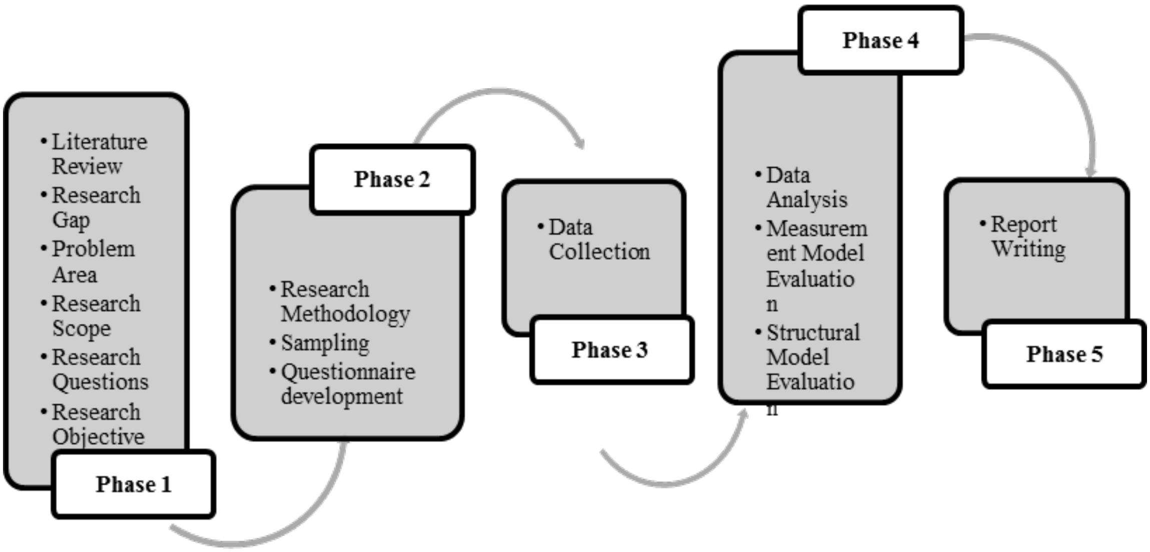

Figure 3.5: The Phases of Research

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Overview

This chapter presents the results and the discussion. The results are based on the quantitative data gathered through survey from the female students studying at secondary level of education in Pakistan. The analysis is the output of quantitative data analysis by using the statistical tool SPSS.

The chapter starts with presenting the descriptive analysis. This includes the demographic information of the respondents and parent's income level. Next to the descriptive analysis, the analysis such as indicator reliability, construct validity as well as convergent and discriminant validity are presented.

Lastly, the results for the hypotheses are presented. This includes the relationships between self-concept, attitude, and career outcome expectancy with self-efficacy as well as intention to pursue STEM education. Lastly, the results for the moderating impact of parental income and parental involvement on the relationship between self-efficacy and intention to pursue STEM education are also presented.

4.2 Descriptive Analysis

4.2.1 Demographic Information of Respondents

Table 4.1 shows the demographic details of the respondents in this research work. Demographic data was collected for age, current city, parent's education, and average monthly income of the parents.

Based on the results presented in Table 4.1, most of the female students are between 15 to 18 years old (85.7%). Moreover, there are only 0.5% students who are 13 years old and 1% who are 20 years old.

As for the city distribution, the data has been gathered from two provinces of Pakistan as well as the federal territory. The data contains an equal percentage of students from the cities of Islamabad, Lahore, and Rawalpindi (18.3% each). Islamabad is a federal territory whereas Lahore and Rawalpindi belong to the Punjab province. Moreover, female students from Peshawar and Kohat make up the majority with 20.8% and 24.3% respectively.

Moving on to the distribution of parental education, the results show that the majority of the parents have undergraduate level of education (37.1%), followed by secondary education (32.7%) and postgraduate education (30.2%) respectively.

As for the parental income, most of the parents earn between Rs. 50,000 and 74,999 (37.1%). Parents earning above Rs. 75,000 make up 35.1% of the total sample. The smallest group belongs to the income less than Rs. 50,000, which is 27.7%.

Table 4.1

Demographic Profile of Respondents

Age		
	Frequency	**Percentage (%)**
13	1	0.5
14	9	4.5
15	23	11.4
16	23	11.4
17	54	26.7
18	47	23.3
19	17	8.4
20	2	1.0
City		
Islamabad (Federal Territory)	37	18.3
Peshawar (Khyber Pakhtunkhwa)	42	20.8
Kohat (Khyber Pakhtunkhwa)	49	24.3
Lahore (Punjab)	37	18.3
Rawalpindi (Punjab)	37	18.3
Parental Education		
Secondary	66	32.7
Undergraduate	75	37.1
Postgraduate	61	30.2
Parental Income		
Less than Rs. 50,000	56	27.7
Rs. 50,000 – 74,999	75	37.1
Rs. 75,000 – 99,999	39	19.3
Rs. Over 100,000	32	15.8
	202	**100%**

4.3 Data Normality

The results for data normality are presented in Appendix B. According to the criteria, all the items achieved an excellent normal distribution. For kurtosis, some of the items obtained values above +1 and -1 and a very few items also had values above +2 and -2. However, most of the values are within the range, it can be ascertained that the data is normally distributed as stated by George and Mallery (2006).

4.4 Reliability Analysis

Table 4.2 reports the Cronbach's Alpha reliability analysis of all the variables. The item-total statistics for each item are provided in Appendix C. According to the results presented in the Table 4.2, all the variables demonstrated a satisfactory Cronbach's alpha of above 0.70. Appendix C highlights the inter-item correlation as well as item-total statistics for each of the variable.

Table 4.2

Reliability Statistics for all variables

Variable	Cronbach's Alpha	Total No of Items
Attitude towards Math	0.928	8
Attitude towards Science	0.910	9
Attitude towards Engineering	0.716	9
Parental Involvement	0.915	11
Self-Concept	0.808	26
Career Outcome Expectancy (COE)	0.936	24
Self-Efficacy	0.939	6
Intention	0.802	4
Overall	0.872	97

4.5 Multicollinearity

Table 4.3

Multicollinearity Results

Variable	VIF Values
Attitude towards Math	7.127
Attitude towards Science	5.075
Attitude towards Engineering	1.536
Parental Involvement	0.915
Self-Concept	5.075
Career Outcome Expectancy (COE)	1.023

Table 4.3 shows the results of multicollinearity analysis. As can be seen, the values have not crossed the threshold of 10 and indicate towards no problems pertaining to collinearity.

4.6 Regression Analysis for Causal Model

The second stage in the presentation of results is testing the relationships between the variables by using regression analysis. Tables 4.4, 4.5 as well as 4.6 presents the regression results for the outer model including the overall model summary, ANOVA as well as path coefficients.

Table 4.4

Overall Model Summary for the Regression Results (1)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.844[a]	.712	.703	.590

The results presented in the Table 4.4 illustrate the overall model summary results for the linear regression analysis. The value of R Square in the above table illustrates the proportion of variance in the dependent variable which can be predicted through independent variables. According to the results, it can be concluded that 71.2% of positive variance in self-efficacy can be predicted by the independent variables including self-concept, career outcome expectancy, parental involvement as well as attitude towards math, science, and engineering. Furthermore, from the value of R, it can also be concluded that there is a strong and positive correlation between the independent and dependent variables.

Table 4.5

ANOVA outcome for the Regression Results (1)

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	168.298	6	28.050	80.451	.000[b]
	Residual	67.988	195	.349		
	Total	236.285	201			

Table 4.5 illustrates the ANOVA outcome for the linear regression analysis. One of the important parts of the ANOVA results is the sig. value. This indicates if the independent variables predict the dependent variables significantly and reliably. As illustrated in Table 4.5, the Sig. value is below 0.05, hence it can be concluded that the independent variables (including self-concept, career outcome expectancy, parental involvement as well as attitude towards math, science, and engineering) significantly and reliably predict the dependent variable (self-efficacy).

Table 4.6

Overall Model Summary for the Regression Results (2)

Coefficients[a]

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model	B	Std. Error	Beta	t	Sig.	Tolerance	IF
1 (Constant)	2.626	510		5.153	000		
Career_Outcome_Exp	092	076	.047	.219	224	.977	.023
Self_Concept	898	206	.377	.351	000	.197	.075
Attitude_Engineering	386	092	.200	.208	000	.651	.536
Attitude_Science	253	119	.185	.133	034	.197	.075
Attitude_Math	293	122	.246	.395	018	.140	.127
Parental_Involvement	.138	071	-.086	1.955	052	.756	.322

** Significant at $p < 0.001$ | ** Significant at $p < 0.05$

Table 4.6 presents the overall model summary of the regression results. The table presents important results for the proposed hypotheses in terms of beta values as well as the significance values. The results in the Table 4.6 shall be interpreted in reference to the proposed hypotheses.

4.6.1 H1: Self-Concept and Self-Efficacy

H1: Self-concept will positively affect the self-efficacy of women to pursue STEM education

For the hypothesis 1 (H1), the results of the present research suggest that self-concept positively affects the self-efficacy of the women to pursue STEM education in Pakistani context. Based on the beta value, the result show that, with every 1 unit increase in self-concept, self-efficacy is increased by 0.377 units. Furthermore, the t-value (4.351) and sig. (0.000) values indicate that the relationship is statistically significant as the t-value is above the threshold of 0.196 and the sig. value is below 0.05.

The results of the present study are in congruence with the existing literature. According to Hoffman (2002), self-concept is one of the most significant predictors of achievement in STEM related subjects. Furthermore, according to Ertl, Luttenberger and Paechter (2017), the STEM related self-concept may affect the level of achievement in STEM related subjects. Moreover, Ferla, Valcke and Cai (2009), in a study conducted on Math related self-concept and efficacy, found that academic self-concept strongly predicts self-efficacy.

In conclusion it can be asserted that hypothesis 1 is supported and self-concept positively and significantly predicts self-efficacy of the women to pursue STEM education in Pakistani context.

4.6.2 H3: Attitude and Self-Efficacy

H3: Attitude towards STEM will positively affect the female's STEM self-efficacy.

For the hypothesis 3 (H3), there are further three categories including attitude towards engineering, attitude towards science and attitude towards math.

Starting with attitude towards engineering, according to the results, it positively effects the female STEM self-efficacy. The beta value for the relationship between attitude towards engineering and self-efficacy is 0.200 which signifies that with each 1 unit increase in attitude towards engineering, female STEM self-efficacy increases by 0.200 units. Furthermore, the t-value (4.208) and sig. (0.000) values indicate that the relationship is statistically significant as both values are within the acceptable range. Hence, the results support the hypothesis 3.

Moving on to the attitude towards science, the results indicate that with each unit increase in attitude towards science, STEM self-efficacy of females increase by 0.185 units.

This shows that the impact of attitude towards science on self-efficacy is positive. Moreover, the result is also significant with t-value of 2.133 and sig. value of 0.034. Hence, it is safe to assume that the results of the study support hypothesis 3 for science.

Lastly, for the attitude towards math, the results show a positive beta value of 0.246 with t-value of 2.395 and sig. value of .018. This shows that attitude towards math also positively affect female STEM self-efficacy. Furthermore, the result is also reliable as it is statistically significant. Hence, the results support hypothesis 3.

Overall, the results indicate that attitude is a strong predictor of STEM related self-efficacy of females. Moreover, the results also indicate that female's attitude towards math is a stronger predictor of female STEM self-efficacy (beta: 0.246) compared to attitude towards engineering (Beta: 0.200) and attitude towards science (beta: 0.185).

The results of this study related to the relationship between attitude towards STEM and STEM self-efficacy are also in compliance with the existing literature. Overall, according to Farooq and Shah (2008), female in Pakistan have a positive attitude towards STEM subjects in Pakistan compared to males. Prior research has found that, attitude towards science can predict student's interest and participation (Weinburgh, 1995; Greenfield, 1996), performance (Linn, 1992) as well as achievement (Rana, 2002; Papanastasiou & Zembylas, 2004). Furthermore, according to Akin & Kurbanoglu (2011), attitude is positively linked with self-efficacy. Similar result was found about chemistry subjects (Kurbanoglu & Akim, 2010).

Hence, the results of the present research support the proposed hypothesis 3 (H3) and it can be safely assumed that female's overall positive attitude towards STEM can strongly predict their STEM self-efficacy.

4.6.3 H4: Career Outcome Expectancy (COE) and Self-Efficacy

H4: Career Outcome Expectancy (COE) will positively affect female's STEM self-efficacy.

For the hypothesis 4 (H4), the results indicate that career outcome expectancy is not a strong predictor of self-efficacy. The results indicate that the beta value of the relationship between career outcome expectancy and STEM self-efficacy is 0.047, which is very weak. Moreover, the relationship is also statistically insignificant with the t-value 1.219 and sig. value of 0.224. Hence, the results do not support the proposed hypothesis 4 (H4) and indicate towards a weak and insignificant relationship between career outcome expectancy and STEM self-efficacy of female students in Pakistan.

The author believes that the insignificant relationship of career outcome expectancy with self-efficacy is because Pakistan is a patriarchal society (Chaudhry & Rahman, 2009) and woman's primary role is assumed to be limited to their homes. Hence, in this context, it seems plausible to believe that career outcome expectancy does not play any significant role in shaping STEM self-efficacy of females in Pakistan, as they might not be expected to pursue a career in STEM related subjects. Similar results were found by a study conducted by Henry and Stone (1995) whereby they found an insignificant relationship between computer self-efficacy and outcome expectancy.

4.6.4 H6: Parental Involvement and Self-Efficacy

H6: Parental involvement will positively affect female's STEM self-efficacy.

For the hypothesis 6 (H6), the results indicate that parental involvement negatively effects the STEM self-efficacy of females in Pakistan. The beta value of the relationship between parental involvement and self-efficacy is -0.086 which indicates towards the weak but negative impact of parental involvement on STEM self-efficacy. Furthermore, the t and sig. values for the relationship is -1.955 and 0.52 which indicates toward an approximate significant value. Hence, the results do not support the proposed hypothesis 5 (H5) and indicate towards a weak, significant, and negative relationship between parental involvement and STEM self-efficacy of female students in Pakistan.

The authors believe that it could be due to the lack or over involvement of parents in female STEM subjects due to common perception that females are weak in STEM subjects. On one hand, studies like Ruholt, Gore and Dukes (2015) suggest that lack of parental involvement negatively effects academic self-efficacy whereas scholars like Tabaeian (2016) suggest that parent's over-involvement can have negative influence on student's educational attainment. Furthermore, a study conducted by Fan and Williams (2010) found that parental involvement has many facets, and it can affect the motivational aspects, including self-efficacy, differently. The authors found that the educational aspirations of parents positively affect the self-efficacy whereas the parent's contact with the school in relation to their child's problems at school is negatively associated with self-efficacy. Hence, it is possible that the parents of the respondents of this study are negatively involved.

In addition, according to Rittmayer and Beier (2008), parental involvement in terms of positive feedback and encouragement can enhance STEM self-efficacy whereas the opposite can undermine the STEM self-efficacy. In the context of the present research, the authors believe that the parents in Pakistan, due to their patriarchal mindset may discourage or provide negative feedback or remarks on female's participation in STEM education, hence negatively affecting their STEM self-efficacy.

In addition, possibly the parents of the present study did not possess the required knowledge, skills, or communication skills to be involved in the STEM related subjects of their daughters, which can be detrimental (Ogbu, 1987; Milner-Bolotin & Marotto, 2018).

4.6.5 H2 and H5: Self-Efficacy, Career Outcome Expectancy, and Intention

Table 4.7

Overall Model Summary for the Regression Results (3)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.775[a]	.601	.597	.634

Model Summary

a. Predictors: (Constant), Self_Efficacy, Career_Outcome_Exp

The results presented in the Table 4.7 illustrate the overall model summary results for the linear regression analysis for the effect of self-efficacy and career outcome expectancy on female intention to pursue STEM education. The value of R Square in the above table illustrates the proportion of variance in the dependent variable which can be predicted through independent variables. According to the results, it can be concluded that 60.1% of positive variance in intention can be predicted by the independent variables including self-efficacy and career outcome expectancy. Furthermore, from the value of R, it can also be concluded that there is a strong and positive correlation between the independent and dependent variables.

Table 4.8

ANOVA outcome for the Regression Results (2)

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	120.618	2	60.309	149.871	.000[b]
	Residual	80.079	199	.402		
	Total	200.697	201			

a. Dependent Variable: Intention

b. Predictors: (Constant), Self_Efficacy, Career_Outcome_Exp

Table 4.8 illustrates the ANOVA outcome for the linear regression analysis for the impact of self-efficacy and career outcome expectancy on female intention to pursue STEM education. One of the important parts of the ANOVA results is the sig. value. This indicates if the independent variables predict the dependent variables significantly and reliably. As illustrated in Table 4.7, the sig. value is below 0.05, hence it can be concluded that the independent variables (including career outcome expectancy and self-efficacy) significantly and reliably predict the dependent variable (intention).

Table 4.9

Coefficients for the Regression Results

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.804	.344		5.247	.000
	Career_Outcome_Exp	-.175	.080	-.097	-2.174	.031
	Self_Efficacy	.712	.041	.773	17.244	.000

a. Dependent Variable: Intention

Table 4.9 presents the overall model summary for the linear regression for the impact of career outcome expectancy and self-efficacy on intention to pursue STEM education. The results for the Table 4.9 shall be discussed in reference to the proposed hypotheses as follows.

4.6.6 H2: Self-Efficacy and Intention to Pursue STEM Education

For the hypothesis 2 (H2), the results of the present research suggest that self-efficacy positively and strongly effects the female intention to pursue STEM education in Pakistani context. Based on the beta value, the result shows that, with every 1 unit increase in self-efficacy, the intent to pursue STEM education increases by 0.773 units. Furthermore, the t-value (17.244) and sig. (0.000) values indicate that the relationship is statistically significant as the t-value is above the threshold of 0.196 and the sig. value is below 0.05. The results highlight that hypothesis 2 is supported and self-efficacy is a strong and positive predictor of female intention to pursue STEM education in Pakistani context.

These results are in congruence with the existing literature as well. According to Larose et al. (2006), self-efficacy strongly predicts female's vocational choice compared to men. According to Fouad and Santa (2017), the intention to pursue STEM education is affected by the STEM self-efficacy. Furthermore, according to Lin, Lee, and Snyder (2018), self-efficacy plays a critical role in determining the intention, choices, and performance in STEM fields. Lastly, according to SCCT, self-efficacy predicts the choices, goals, and actions (Lent et al., 1994).

4.6.7 H5: Career Outcome Expectancy (COE) and Intention to Pursue STEM Education

H5: COE will positively affect female's intention to pursue STEM education.

For the hypothesis 5 (H5), the results indicate that career outcome expectancy is a weak, negative and a significant predictor of intention to pursue STEM education. The beta value for the relationship between career outcome expectancy and intention to pursue STEM education is -0.97, which is weak. Moreover, the relationship is statistically significant with the t-value -2.174 and sig. value of 0.031.

It can be concluded that the results do not support the proposed hypothesis 5 (H5) and contrary to the proposed hypothesis, indicate towards a weak but significant and negative relationship between career outcome expectancy and female intention to pursue STEM education in Pakistan.

The results are contradictory to most of the existing literature. It is important to notice that according to the results of this study, the impact of COE on self-efficacy was weak, insignificant, and positive. The author believes that the negative impact of COE on Pakistani female's intention to pursue STEM education is due to the same reason that women in Pakistan are discouraged to participate in STEM careers. According to a report by International Telecom Union (ITU) (2016), women in STEM education constantly face stereotypical remarks such as *'Why are you wasting your time and money on engineering? All you'll ever be is a housewife'.* Furthermore, according to Shabib-ul-Hasan and Mustafa (2014), the females in Pakistan face this notion that just by being women they are not capable of fully participate in work and are unable to work on unbalanced work schedules or travel for work. According to Sadaquat (2011), women in Pakistan face discrimination in job market and must take up under-paying and low-status jobs. Coupled with their dual roles at work and home, consequently, most of the women are working in sectors known for reduced levels of productivity, stability in income and security.

This and many such notions about women in Pakistan, deteriorates their career outcome expectations especially in STEM related fields like engineering. In addition, according to a report by World Bank (2019) women in southeast Asian countries lack basic career counselling or participation in career fairs related to STEM careers. Hence, they are not knowledgeable to decide what to expect from a STEM career. The authors believe that this can be another reason behind the negative impact of COE on female's intention to participate in STEM education in Pakistan.

4.7 Regression Analysis for Moderating Models

The present study attempts to examine the impact of two moderators, including parental involvement as well as parental income, on the relationship between STEM self-efficacy and intention to pursue STEM education. Hypotheses 7 and 8 pertains to the moderators.

4.7.1 H7: Parental Involvement as Moderator between Self-Efficacy and Intention

H7: Parental involvement will moderate the relationship between self-efficacy and female's intention to pursue STEM education.

To analyze the moderating impact of parental involvement on the relationship between self-efficacy and intention, interaction variable was created by multiplying and calculating the Z values of the interacting variables.

Table 4.10

Overall Model Summary for moderator model of Parental Involvement

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.784[a]	.615	.611	.62363562
2	.788[b]	.621	.615	.62050465

a. (Constant), Zscore(Parental_Involvement), Zscore(Self_Efficacy)

b. Predictors: (Constant), Zscore(Parental_Involvement), Zscore(Self_Efficacy), ParInvxSelfEff

Table 4.10 illustrates the model summary for the moderator model of the impact of parental involvement on the relationship between STEM self-efficacy and intention to pursue STEM education. The analysis is conducted in two different models. The first model includes the independent variables whereas the second model also includes the interaction term. The value of R square in both models shows a strong variance caused by the independent variables as well as the interaction term (in second model).

The sig. value in the ANOVA table for both models (sig.: 0.000) suggests that the models are statistically significant. Hence, from the above two tables it can be safely assumed that the moderator model is significant and strong.

Table 4.11

ANOVA for Moderator Model of Parental Involvement

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	123.605	2	61.802	158.907	.000[b]
	Residual	77.395	199	.389		
	Total	201.000	201			
2	Regression	124.765	3	41.588	108.014	.000[c]
	Residual	76.235	198	.385		
	Total	201.000	201			

a. Dependent Variable: Zscore (Intention)

b.Predictors: (Constant), Zscore(Parental_Involvement), Zscore(Self_Efficacy)

c.Predictors: (Constant), Zscore(Parental_Involvement), Zscore(Self_Efficacy), ParInvxSelfEff

The results presented in the Table 4.12 illustrate the coefficient results for the independent and moderator model of parental involvement. The result show that in the first model, as independent variables, self-efficacy, and parental involvement have a positive and significant impact on intention to pursue STEM education (Self-efficacy: 0.722; 0.000; Parental Involvement: 0.160; 0.001).

Table 4.12

Coefficient results for the Regression Results of Moderator Parental Involvement

Coefficients[a]					
	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta		Sig.
(Constant)	9.438E-16	.044		000	.000
Zscore(Self_Efficacy)	.722	.046	.722	5.666	.000
Zscore(Parental_Involvement)	.160	.046	.160	.480	.001
(Constant)	.022	.045		485	629
Zscore(Self_Efficacy)	.723	.046	.723	5.776	.000
Zscore(Parental_Involvement)	.140	.047	.140	.966	.003
ParInvxSelfEff	-.075	.043	-.078	1.736	.084

a. Dependent Variable: Zscore (Intention)

However, the second model includes the interaction term as well and shows that, although independently the impact of self-efficacy and parental involvement is positive and significant, as a moderator the impact is negative and insignificant (ParInvxSelfEff: -0.78; 0.084). However, the sig. value is slightly above the threshold value and can be considered with caution.

In a nutshell, the result for the moderating impact of parental involvement shows that, as a moderator the impact of parental involvement on female intention to pursue STEM education in Pakistani context, becomes negative and insignificant. Furthermore, the results do not significantly support the proposed hypothesis H7.

The results are two layered. It is interesting to find that parental involvement has a negative impact on self-efficacy, but it positively effects the intention of female students to pursue STEM education. As for the impact of parental involvement on intention of females to pursue STEM education, it has been emphasized in great deal in the literature. It is considered as one of the most significant factors to effect children's attitude towards science (Dewitt et al, 2013; Perera, 2014; Sun et al., 2012). According to Van Voorish (2011), there is a positive relationship between parental involvement in children's homework and children's achievement in subjects like math and science. Moreover, parental involvement positively influences children's motivation towards learning and leads to better academic achievement (Cheung & Pomerantz, 2012). Hence, it is no surprise that parental involvement positively predicted female intention to pursue STEM education.

On the other hand, parental involvement has an insignificant and negative impact on the relationship between self-efficacy and intention to pursue STEM education. According to Boonk et al. (2018), the literature shows that parental involvement can have a positive, negative, and insignificant impact on the student achievement in education. According to Singh et al. (1995), this largely depends on the type of parental involvement whereby more than any other *'involvement'*, parent's aspirations play the strongest positive role in student's achievement. Hence, it is plausible that the type of parental involvement of the respondents of the present research is not positive enough to positively moderate the relationship between STEM self-efficacy and intention to pursue STEM education. Moreover, it could also be due to the insignificant impact of parental involvement on STEM self-efficacy of females in Pakistani context. It has been discussed in detail in earlier section.

4.7.2 H8: Parental Income as Moderator between Self-Efficacy and Intention

H8: Parental income will moderate the relationship between self-efficacy and female's intention to pursue STEM education.

To analyze the moderating impact of parental income on the relationship between STEM self-efficacy and female's intention to pursue STEM education, the result of the relationship between self-efficacy and intention was divided according to the parental income as follows:

4.7.2.1 Parental Income of less than 50,000 Pakistani Rupees (PKR)

Table 4.13

Coefficient values for self-efficacy and intention relationship (less than 50k income)

Coefficients[a,b]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
	(Constant)	.726	.256		2.836	.006
	Self_Efficacy	.809	.071	.841	11.411	.000

a. Parent_Income = Less than 50,000 Rupees; b. Dependent Variable: Intention

The Table 4.13 highlights the impact of self-efficacy on the intention for the parental income of less than 50,000 Pakistani Rupees (PKR). The results indicate that for the female students who have parental income of less than 50,000 PKR, the impact of STEM self-efficacy on intention is strong, positive, and significant. The beta value signifies that for the parental income range of less than 50,000, with every 1 unit increase in self-efficacy, intention increases by 0.841 units. Furthermore, the sig. value is 0.000 which is within the threshold level.

4.7.2.2 Parental Income between 50,001 and 74,999 PKR

Table 4.14

Coefficient Values for self-efficacy and Intention Relationship (50,000-74,999 income)

Coefficients[a,b]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
	(Constant)	1.104	.252		4.373	.000
	Self Efficacy	.721	.072	.759	9.968	.000

a. Parent Income = 50,001 to 74‹999 Rupees

b. Dependent Variable: Intention

The table 4.14 highlights the impact of STEM self-efficacy on female intention to pursue STEM education, for the parental income between 50,001 and 74,999 PKR. The results indicate that for the female students who have parental income between 50,001 and 74,999 PKR, the impact of STEM self-efficacy on intention is strong, positive, and significant. The beta value signifies that for the parental income range between 50,001 and 74,999 PKR, with every 1 unit increase in self-efficacy, intention increases by 0.759 units. Furthermore, the sig. value is 0.000 which is within the threshold level.

4.7.2.3 Parental Income between 75,000 and 99,999 PKR

Table 4.15

Coefficient Values for self-efficacy and Intention Relationship (75,000-99,999 income)

Coefficients[a,b]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
	(Constant)	1.778	.380		4.676	.000
	Self_Efficacy	.557	.099	.679	5.625	.000

a. Parent_Income = 75,000 to 99,999 Rupees;

b. Dependent Variable: Intention

The table 4.15 highlights the impact of STEM self-efficacy on female intention to pursue STEM education, for the parental income between 75,000 and 99,999 PKR. The results indicate that for the female students who have parental income between 75,000 and 99,999 PKR, the impact of STEM self-efficacy on intention is strong, positive, and significant. The beta value signifies that for the parental income range between 75,000 and 99,999 Pakistani Rupees, with every 1 unit increase in self-efficacy, intention increases by 0.679 units. Furthermore, the sig. value is 0.000 which is within the threshold level.

The impact of STEM self-efficacy on female intention to pursue STEM education has decreased with increase in parental income until the parental income of 99,999 PKR.

4.7.2.4 Parental Income above 100,000 PKR

Table 4.16

Coefficient Values for Self-efficacy and Intention Relationship (above 100,000 income)

Coefficients[a,b]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
	(Constant)	1.403	.424		3.311	.002
	Self_Efficacy	.627	.112	.714	5.579	.000

a. Parent_Income = Over 100,000

b. Dependent Variable: Intention

The table 4.16 highlights the impact of STEM self-efficacy on female intention to pursue STEM education, for the parental income above 100,000 PKR. The results indicate that for the female students who have parental income above 100,000 PKR, the impact of STEM self-efficacy on intention is strong, positive, and significant. The beta value signifies that with every 1 unit increase in STEM self-efficacy, intention increases by 0.714 units. Furthermore, the sig. value is 0.000 which is within the threshold level.

In a nutshell, for the moderator parental income, the impact of STEM self-efficacy on female intention to pursue STEM education has decreased with increase in parental income until the parental income of 99,999 PKR. However, it has slightly increased beyond the income level of PKR 100,000. It can be concluded from these results that parental income does play a small moderating role for the relationship between STEM self-efficacy and female's intention to pursue STEM education. The difference between the students of different parental income is very small.

The scientific literature on the impact of parental income on child's education is unclear (Chevalier et al., 2013). It is generally believed that financial limitations significantly influence the educational achievement (Krueger, 2004). On the contrary, scholars like Carneiro and Heckman (2003) believe that the present income level of parents does not influence the child's educational choices. However, it is argued that the impact of parental income is small compared to the educational level of parents (Jenkins & Schluter, 2002). In this way, the results of the present study are like that of Jenkins and Schluter (2002). Furthermore, according to Coleman (1987), factors like parental income do not play a significant role independently; rather their impact is moderated by other factors such as educational opportunities, the location where the family resides, cultural factors etc.

4.8 Summary of the Results

Table 4.17 summarizes the results for the proposed hypotheses. The table shows that from 10 hypotheses, the results of this study have supported 7 hypotheses. This chapter presented the results of this research. The analysis was carried out by using the SPSS version 23. In particular, the chapter presented the descriptive analysis including the demographic profile of the respondent. The analysis was divided into three parts including the reliability and multi-collinearity analysis, causal model analysis and moderator model analysis. Each result was discussed in detail according to each hypothesis. The results indicated that majority of the proposed hypotheses were supported.

Table 4.17

The summary of the hypotheses results

No.	Hypothesis Statement	Result
H1	Self-concept will positively affect the self-efficacy of women to pursue STEM education	Supported
H2	Self-efficacy will positively affect the intention of women to pursue STEM education	Supported
H3a	Attitude towards science will positively affect the female's STEM self-efficacy.	Supported
H3b	Attitude towards engineering will positively affect the female's STEM self-efficacy.	Supported
H3c	Attitude towards math will positively affect the female's STEM self-efficacy.	Supported
H4	Career Outcome Expectancy (COE) will positively affect female's STEM self-efficacy.	Not Supported
H5	COE will positively affect female's intention to pursue STEM education.	Not Supported
H6	Parental involvement will positively affect female's STEM self-efficacy.	Not Supported
H7	Parental involvement will moderate the relationship between self-efficacy and female's intention to pursue STEM education.	Not Supported
H8	Parental income will moderate the relationship between self-efficacy and female's intention to pursue STEM education.	Supported

CHAPTER FIVE

CONCLUSION

5.1 Overview

The present research attempts to examine the impact of personal (self-efficacy, self-concept, career outcome expectancy, attitude) as well as contextual factor (parental involvement and income) on women's intention to pursue STEM education in Pakistani context, which is a largely neglected area of research.

This chapter presents the conclusion including the summary of the results, mapping of results with the objectives of the study, contribution of the work, implications as well as recommendations for the future work.

5.2 Summary of the Results

The present study embarked on achieving four objectives. The summary of the results will be presented based on the objectives of the study.

5.2.1 Objective 1

To achieve the objective 1 (to identify the factors which affect women participation in stem education in Pakistan) four individual factors including academic self-concept, STEM self-efficacy, attitude towards science, math and engineering, and career outcome expectancy, and two contextual factors including parental income and parental involvement were identified. Through the regression model, the factors which prove to be significant factors have been identified and presented in the final proposed variable.

5.2.2 Objective 2

To achieve this objective (to examine the impact of individual (i.e., self-concept, attitude, career outcome expectancy and self-efficacy) and contextual factors (i.e., parental income and involvement) on women’s intention to pursue stem education in Pakistan), data was gathered from the females studying at Higher Secondary Level in two provinces of Pakistan namely Punjab (Lahore and Rawalpindi) and Khyber Pakhtunkhwa (Peshawar and Kohat) and a federal territory namely Islamabad. In total 202 valid responses were yield. The data was collected by using pre-validated questionnaire and analyzed using SPSS.

The results indicated that self-concept (beta: 0.377; Sig.: 0.000), attitude towards science (beta: 0.185; Sig.: 0.034), engineering (beta: 0.200; Sig.: 0.000) and math (beta: 0.246; Sig.: 0.018) are positive predictors of STEM self-efficacy of female students in Pakistan. The results have also illustrated that self-efficacy is a strong and positive predictor of female intention to pursue STEM education (beta: 0.773; Sig.: 0.000). Furthermore, parental involvement, when taken as an independent variable, negatively predicts the female STEM self-efficacy with a borderline significance value (beta: -0.086; Sig.: 0.052) and positively and significantly predicts their intention to pursue STEM education (beta: 0.160; Sig.: 0.001).

Moreover, career outcome expectancy did not predict female STEM self-efficacy in a significant manner. However, it significantly and negatively predicted the female intention to pursue STEM education in Pakistani context. This shows the career outcome expectancy of females pursuing STEM education and how it effects their intention to further pursue STEM education in Pakistani context.

5.2.3 Objective 3

As for objective 3 (to ascertain the moderating impact of parental involvement and parental income on the relationship between stem self-efficacy and female intention to pursue stem education in Pakistan) as for the moderating impact of parental income, the results indicate that parental income moderates the relationship between STEM self-efficacy and intention in a way that with the increase in parental income, the self-efficacy decreases whereby after the parental income reaches a certain level, the efficacy starts increasing. However, the difference between different income levels is small. Furthermore, as a moderating variable, parental involvement's impact on the relationship between STEM self-efficacy and intention is insignificant and negative.

5.2.4 Objective 4:

Lastly, for the objective 4 (to statistically validate and propose a framework of women's participation in stem education in Pakistan), the present study proposed a framework of individual and contextual factors effecting female intention to pursue STEM education in Pakistani context. The study applied the Theory of Planned Behavior and Social Cognitive Career Theory to develop the conceptual framework (see Figure 2.1). Based on the results of the present research, the final framework is illustrated in Figure 5.1. The precursors and paths which are positive and significant are shown in green whereas the precursors or paths which are negative and significant are shown in yellow color. The insignificant paths have not been included in the final framework.

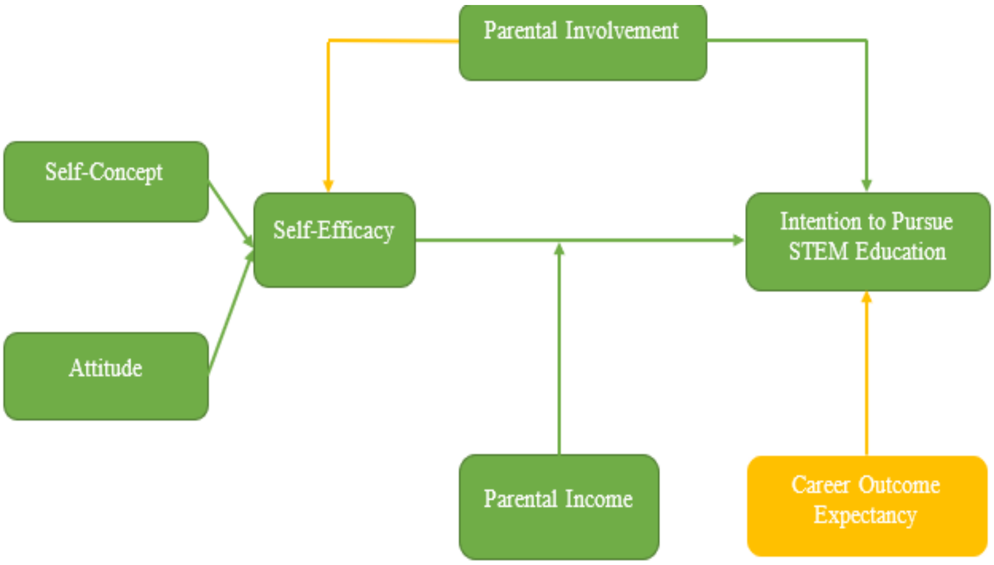

Figure 5.1: The Final Framework

5.3 Contribution, Implications and Recommendations

5.3.1 Contribution

The present study is a humble contribution with the goal to understand the precursors of female intention to participate in STEM education in Pakistan. As mentioned earlier, in Pakistan, which is a global outlier in education and where significant gender disparity persists in STEM education, the research on this topic is scarce. Hence the present research fills the gap by examining the precursors of female intention to participate in STEM education in Pakistan.

Moreover, the study has valuable implications. Understanding of these precursors shall enable the parents, policymakers, and students to achieve the goal of gender parity in STEM education, particularly in Pakistan. It is important that a cohesive and synchronous efforts are made by all the stakeholders to achieve efficient and effective outcomes. The forthcoming sub-sections will list some important recommendations for each of the stakeholders discussed in the present research.

5.3.2 Implications

Theoretically the study has contributed towards the body of knowledge in following ways:

a) The present study confirms that the theory of planned behavior and social cognitive career theory are suitable for educational research and in particular to understand vocational choices.
b) The study confirms the findings of earlier researchers regarding the impact of attitude and self-concept on self-efficacy. Furthermore, the study has also confirmed the findings of prior research about the impact of parental involvement on intention of females to participate in STEM education
c) On the other hand, the results of the study have unique implications for the impact of career outcome expectancy and parental involvement's impact on STEM self-efficacy. Contrary to the existing literature, the study has found that parental involvement does not affect self-efficacy and career outcome expectancy may not be a predictor of female's intention to pursue STEM education in a particular context like Pakistan.
d) Furthermore, the study also proposes implication with respect to the parental income. The results of the study hints towards inversely proportional impact of parental income as a moderator.

5.3.2.1 Implications for Policymakers

The government regulations and policies make a significant and systematic impact on female participation in STEM education. The present study found that in Pakistani context, the career outcome expectancy is negatively affecting the female intent to pursue STEM education in Pakistan. Furthermore, parental income also plays a vital role. Based on the results of the study, following are some of the key recommendations for policymakers:

- The governments should actively monitor the working conditions in STEM related careers to check if the working conditions are conducive for females. The governmental organizations should set a precedence in this regard by allowing flexible working hours, a female friendly working environment and culture in their organizations.
- The governments should make policies for equal employment for females in STEM related careers.
- The policymakers should keep in mind that the initiatives to encourage females to participate in STEM education need to begin as early as secondary level of education. Unless the change comes from earlier school education, the efforts will be fruitless.

5.3.2.2 Implications for Parents

Parents are one of the most critical enablers of female participation in STEM education. The present study has indicated that parental involvement may negatively affect the STEM self-efficacy of females, but it positively effects their intention to pursue STEM education. Following are some of the recommendations for parents:

- Parents, from early years, should actively try to develop a positive attitude towards of their daughters towards STEM subjects. Attitude is one of the precursors of their intent to participate in STEM education.
- It is important that parent's involvement in their daughter's STEM education is well thought out. Too much involvement in school activities may not be effective. It can hamper their self-efficacy to handle STEM subjects on their own.
- However, it is essential that they get involved in STEM education of their daughters by sharing their aspirations for them and engaging with them at the cognitive level.
- At the same time, it is important to actively debug and destroy the stereotypes which are held against women pursuing STEM education.

5.3.2.3 Implications for Female Students

The present study found that attitude, self-concept, and self-efficacy are those personal factors which significantly predict female participation in STEM education. Hence, it is important that females understand these factors and adopt strategies to further their participation in STEM education. Following are some of the recommendations for females based on the results of the present research.

- It is important to develop a positive attitude and self-concept towards STEM education. For this purpose, females can do the following:
  a) Challenge the stereotypes held against female participation in STEM education in their culture.
  b) Look up for the female role models in their family, society, and world at large who have successfully participated in STEM education and careers.

- The females should also work on their self-efficacy towards STEM education. For this they may:
  a) Register for STEM related courses, career and science fairs and competitions as well as volunteer opportunities (Rabenberg, 2013)
  b) Take additional help from parents, peers, and teachers if they find STEM subjects difficult.

5.3.2.4 Implications for Schools and Teachers

Following are some of the recommendations for schools and teachers based on the results of the present research.

a) It is important the teachers actively try to uplift the attitude, self-concept, and self-efficacy of female students to pursue STEM education.
b) Furthermore, the teachers can be one of the major sources to augment or diminish the impact of stereotypes against women in STEM education and career.
c) Schools should provide suitable infrastructure and support to the teachers for effective teaching of STEM subjects to female students.
d) Schools should also organize science fairs and competitions.

5.3.3 Recommendations

The present study is one of the few studies to investigate the precursors of female participation in STEM education in Pakistani context. The research aims to encourage the research community of Pakistan to conduct research on this important untapped area to dig important insights.

Future research should encompass a wide range of geographical areas as well as social class. Furthermore, the future research should attempt to further understand the optimal degree of parental involvement in female STEM education. Furthermore, the predictors of male participation in STEM education should also be studied in Pakistani context to examine if there are similarities between male and female precursors of female participation in STEM education. In future, research should encompass the respondents from private schools and upper class of society to have a better and holistic understanding of the phenomenon.

The present research suggests further investigation of the impact of parental involvement on female's STEM self-efficacy. Furthermore, in future different type of parental involvement and the involvement from both parents can be examined in relation to female's intention to pursue STEM education. Lastly, the parental education should also be examined with respect to the female's intention to pursue STEM education and STEM self-efficacy.

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APPENDIX A: SURVEY QUESTIONNAIRE

FACULTY OF ARTS AND SOCIAL SCIENCES

Universiti Tunku Abdul Rahman

Jalan Universiti, Bandar Barat,

31900 Kampar, Perak.

Malaysia

Survey Questionnaire

FACTORS INFLUENCING FEMALE PARTICIPATION IN SCIENCE TECHNOLOGY ENGINEERING MATHEMATICS (STEM) EDUCATION IN PAKISTAN

The purpose of the survey is to fulfill the requirement for master's degree research. This survey covers the issues of Factors Influencing Women Participation in Science Technology Engineering Mathematics (STEM) Education in Pakistan. Participation in this survey is voluntary; however, we hope that you will complete this questionnaire since your views are very important to complete this research. We would very much appreciate your participation in this illustrated survey. Your responses will be kept in the strictest confidence and will not be shared with any third party.

Thank you very much for your co-operation.

اس سروے کے ذریع ہم یہ جاننا چاہتے ہیں کے خواتین پر وہ کون سے عوامل اثر انداز ہوتے ہیں جن کی وجہ سے وہ سائنس، انجینرنگ، میتھمیٹکس، اور ٹیکنالوجی کے میدان میں تعلیم حاصل کرنے کے قابل بنتی ہیں یا نہیں کر پاتیں. آپ کے جوابات مکمل طور پر تعلیمی مقصد کے لئے استعمال ہونگے اور ان کو کسی سے بھی شیر نہیں کیا جائے گا
آپ کی شرکت کا شکریہ

Sadia Sajid
Supervisor: Dr. Sultana Alam
Faculty of Arts and Social Science (FAS)
Universiti Tunku Abdul Rahman, Kampar, Malaysia

SECTION A:

Demographic Profile of the Respondents

1. What is your age? (آپ کی عمر)

____

2. You are currently live in? (شہر)

a. Islamabad
b. Peshawar
c. Kohat
d. Lahore
e. Rawalpindi

3. What is the maximum level of your parent's education? (آپ کے والدین کی تعلیم)

a. Secondary
b. Undergraduate
c. Postgraduate

4. What is the average monthly income level of your parents? (آپ کے والدین کی اوسط انکم)

a. Less than 50,000 Rupees
b. 50,000 to 74,999 Rupees
c. 75,000 to 99,999 Rupees
d. Over 100,000 Rupees

SECTION B:

Attitudes towards STEM Education

(سائنس ٹیکنالوجی انجینرنگ میتھمیٹکس کی تعلیم کی طرف آپ کا رویہ)

Directions:

There are lists of statements on the following pages. Please mark your answer sheets by marking

how you feel about each statement. For example:

Example 1:	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I like engineering.	○	○	○	○	○

Example 1:

As you read the sentence, you will know whether you agree or disagree. Fill in the circle that describes how much you agree or disagree.

Item No	Statement	1	2	3	4	5
		Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree
MATH						
1.	Math has been my worst subject.					
2.	I would consider choosing a career that uses math.					
3.	Math is hard for me.					
4.	I am the type of student to do well in math.					
5.	I can handle most subjects well, but I cannot do a good job with math.					

6.	I am sure I could do advanced work in math.					
7.	I can get good grades in math.					
8.	I am good at math.					
SCIENCE						
9.	I am sure of myself when I do science.					
10.	I would consider a career in science.					
11	I expect to use science when I get out of school.					
12	Knowing science will help me earn a living.					
13	I will need science for my future work.					
14	I know I can do well in science.					
15	Science will be important to me in my life's work.					
16	I can handle most subjects well, but I cannot do a good job with science.					
17	I am sure I could do advanced work in science.					

ENGINEERING AND TECHNOLOGY

Engineers use math, science, and creativity to research and solve problems that improve everyone's life and to invent new products. There are many different types of engineering, such as chemical, electrical, computer, mechanical, civil, environmental, and biomedical. Engineer's design and improve things like bridges, cars, fabrics, foods, and virtual reality amusement parks. **Technologists** implement the designs that engineers develop; they build, test, and maintain products and processes.

انجینرنگ سائنس ، ریاضی اور تخلیقی صلاحیت کو استعمال میں لا کر تحقیق اور پروبلمز کو حل کرتی ہے جس سے سب کی زندگی میں بہتری آتی ہے. دنیا میں بہت سی اقسام کی انجینرنگ موجود ہے. جیسے کیمکل، الیکٹریکل، کمپیوٹر، مکینیکل، سول، ماحولیاتی اور بائیو میڈیکل انجینرنگ. انجینئرز پل، گاڑی، کپڑے، کھانے جیسی چیزوں کو ڈیزائن کرتے اور بناتے ہیں. جبکے ٹیکنولاجسٹ ان ڈیزائنز کو استعمال کر کے انہیں بناتے، ٹیسٹ کرتے اور ٹھیک رکھتے ہیں .						
18	I like to imagine creating new products.					
19	If I learn engineering, then I can improve things that people use every day.					
20	I am good at building and fixing things.					
21	I am interested in what makes machines work.					
22	Designing products or structures will be important for my future work.					
23	I am curious about how electronics work.					
24	I would like to use creativity and innovation in my future work.					
25	Knowing how to use math and science together will allow me to invent useful things.					
26	I believe I can be successful in a career in engineering.					

SECTION C:

Perception of Parental Involvement

(آپ کی سائنس، ٹیکنالوجی، انجینرنگ اور میتھمیٹکس کی تعلیم میں والدین کا کردار)

Strongly Disagree : 1
Disagree : 2
Neither Disagree nor Agree : 3
Agree : 4
Strongly Agree : 5

Item No	Statement	1	2	3	4	5
		Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree
1.	My parents ask the STEM subject teacher about my progress					
2.	My parents support the teacher's decision about STEM education.					
3.	My parents help me in STEM subject learning at home.					
4.	My parents know what I am learning in STEM subjects.					
5.	My parents do not know how to help my learning in STEM subject					
6.	My parents can improve my performance in STEM subjects					

7.	My parents have enough information about my learning in STEM subjects					
8.	My parents can help me in some of my STEM subject's homework.					
9.	My parents can explain STEM subjects to me					
10.	My parents can find resources to help my learning in STEM subjects. (i.e. books, videos, practical examples)					
11	My parents do not know how to explain STEM subjects to me using real life examples.					

SECTION D:

STEM Self-Concept

(سائنس ٹیکنالوجی انجینرنگ میتھ کی تعلیم سے متعلق آپ کا اپنے بارے میں کیا خیال ہے)

Strongly Disagree : 1
Disagree : 2
Neither Disagree nor Agree : 3
Agree : 4
Strongly Agree : 5

Item No	Statement	1 Strongly Disagree	2 Disagree	3 Neither Disagree or Agree	4 Agree	5 Strongly Agree
1.	I am a good student in STEM subjects.					
2	I am learning in STEM subjects					
3	I feel comfortable in the classes of STEM subject's					
4	I take part in STEM subject's class discussions					
5	I try to solve the STEM subject's problems without giving up					
6	I remember what I learn in STEM subjects					
7	I volunteer in STEM subject's class					
8	I care about learning STEM subjects					

9	I do well in STEM subject's quizzes.					
10	I ask questions when I don't understand anything in STEM subject class					
11	I do STEM subject's assignments on time					
12	I keep up with STEM subject assignments					
13	I am interested in STEM subjects					
14	I am confident that I can learn STEM subjects					
15	I feel calm when I am called on in STEM subject class					
16	I get STEM subject homework problems done correctly					
17	I'm able to apply what I learn in STEM subject classes					
18	I understand things in STEM classes.					
19	I try to solve STEM subject problems on my own					
20	I pay attention in STEM subject classes					
21	I like STEM Subjects					
22	I enjoy myself in STEM subject class					
23	I'm able to concentrate well on STEM subjects					
24	I have good ideas during STEM subject's class					

25	I'm doing well compared to others in STEM subject's class					
26	I worry little about STEM subject tests					

SECTION E:

Career Outcome Expectancy

(سائنس ٹیکنالوجی انجینرنگ میتھمیٹکس کی تعلیم کے بعد آپ اپنے کیریئر کے بارے کیا توقعات رکھتی ہیں)

Strongly Disagree : 1
Disagree : 2
Neither Disagree nor Agree : 3
Agree : 4
Strongly Agree : 5

Item No	Statement	1	2	3	4	5
		Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree
1	If I work in STEM related career I will get a feeling of accomplishment. (سٹیم سے متعلق کیریئر میں کام کرنے سے مجھے کامیابی کا احساس ہوگا)					
2	If I work in STEM related career I will be somebody special in the job. (اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو میں اپنی جاب میں اہم ہونگی)					
3	If I work in STEM related career people at my place of employment will be easy to make friends with					

Item No	Statement	1 Strongly Disagree	2 Disagree	3 Neither Disagree or Agree	4 Agree	5 Strongly Agree
	(اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو میری کام کی جگہ پر لوگوں کے ساتھ آسانی سے دوستی ہو جائے گی)					
4	If I work in STEM related career I will get recognition/praise for the things I do. (اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو مجھے میرے کام پر حوصلہ افزائی / شناخت ملے گی)					
5	If I work in STEM related career I will do something that makes use of my abilities. (اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو میری صلاحیتوں کا صحیح استعمال ہوگا)					
6	If I work in STEM related career my supervisor will communicate expectations well. (اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو میرا سپروائزر مجھے کام سے متعلق توقعات واضح طور پر بتائے گا)					

Item No	Statement	1 Strongly Disagree	2 Disagree	3 Neither Disagree or Agree	4 Agree	5 Strongly Agree
7	If I work in STEM related career I will have good working conditions. (اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو مجھے کام کرنے کا اچھا ماحول ملے گا)					
8	If I work in STEM related career I will have an opportunity for self-advancement. (اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو اپنے آپ کو آگے لے کر جانے کے مواقع میسر ہونگے)					
9	If I work in STEM related career I will try out my own ideas. (اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو میں اپنے آئیڈیاز کو استعمال کر سکون گی)					
10	If I work in STEM related career I will make decisions on my own. (اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو میں فیصلے خود کر سکوں گی)					

Item No	Statement	1 Strongly Disagree	2 Disagree	3 Neither Disagree or Agree	4 Agree	5 Strongly Agree
11	If I work in STEM related career, the employer will provide for my continuing employment. (اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو میری کمپنی مجھے مسلسل نوکری دے گی.)					
12	If I work in STEM related career my supervisor/boss will back me up. (اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو میرا سپروائزر / باس میرا ساتھ دے گا)					
13	If I work in STEM related career people of my ethnic origin will be accepted and will have good job possibilities. (اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو میرے صوبے / ذات کے لوگوں کو تسلیم کیا جائے گا اور اچھی جاب کے مواقع ملیں گے)					
14	If I work in STEM related career I will do something different every day.					

Item No	Statement	1 Strongly Disagree	2 Disagree	3 Neither Disagree or Agree	4 Agree	5 Strongly Agree
	(اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو میں ہر دن کچھ نیا کروں گی)					
15	If I work in STEM related career I will do things for other people (اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو میں دوسرے لوگوں کے لئے کچھ کر سکوں گی)					
16	If I work in STEM related career my salary will be comparatively better compared to others. (اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو میری تنخواہ دوسروں سے بہتر ہوگی)					
17	If I work in STEM related career I will not be bored. (اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو مجھے بوریت نہیں ہوگی)					
18	If I work in STEM related career my work hours will be flexible to meet the needs of the family.					

Item No	Statement	1 Strongly Disagree	2 Disagree	3 Neither Disagree or Agree	4 Agree	5 Strongly Agree
	(اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو میرے کام کرنے کے اوقات نرم ہونگے تاکے میں اپنی فیملی کی ضروریات بھی پوری کر سکوں)					
19	If I work in STEM related career I will direct other people's activities. (اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو میں دوسرے لوگوں کے کاموں کو ڈائریکٹ کروں گی)					
20	If I work in STEM related career I will work independently. (اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو مجھے کام میں آزادی حاصل ہوگی)					
21	If I work in STEM related career I will not be required to act in ways that are morally wrong. (اگر میں سٹیم سے متعلق کیریئر میں کام کروں گی تو مجھے اپنے کام کے لئے غیر اخلاقی سرگرمیوں میں ملوث نہیں ہونا پڑے گا (جیسے رشوت))					

Item No	Statement	1 Strongly Disagree	2 Disagree	3 Neither Disagree or Agree	4 Agree	5 Strongly Agree
22	Careers in STEM are not family friendly. (سٹیم کیریئر فیملی کے لئے اچھے نہیں)					
23	Careers in STEM are not in line with the traditional role of women. (سٹیم کیریئر عورت کے معاشرے میں روایتی کردار سے مطابقت نہیں رکھتے)					
24	Workplaces in STEM are not very woman friendly. (سٹیم کیریئر سے متعلق جابز میں کام کرنے کی جگہیں عورتوں کے لئے مناسب نہیں)					

SECTION F:

Self-Efficacy

(سائنس ٹیکنالوجی انجینرنگ میتھمیٹکس کی تعلیم کے کے متعلق آپ کا اپنے اوپر اعتماد)

Very Confident : 1

Confident : 2

Not sure : 3

Not confident : 4

Not at all confident : 5

	1	2	3	4	5
1. How confident are you that you can get good grades in your STEM courses this semester?					
2. How confident are you that you can get good grades in your STEM courses this semester?					
3. How confident are you that you can get needed accommodations necessary for full participation in courses? (i.e. hostel)					
4. How confident are you that you can do as well in your STEM classes as other students?					
5. How confident are you that you can persist in your STEM courses even when faced with criticism?					
6. How confident are you that you can remain calm and relaxed during tests?					
7. How confident are you that you can remain calm and relaxed when expected to complete a challenging assignment?					

SECTION G: INTENTION TO PURSUE STEM EDUCATION

(سائنس ٹیکنالوجی انجینرنگ میتھمیٹکس کی تعلیم کو جاری رکھنے سے متعلق آپ کا ارادہ)

Strongly Disagree : 1
Disagree : 2
Neither Disagree nor Agree : 3
Agree : 4
Strongly Agree : 5

	1	2	3	4	5
1. I intend to take up STEM related subjects in future.					
2. I intend to learn STEM subjects to get a job in future					
3. I intend to learn STEM subjects to gain more scientific knowledge.					
4. I intend to learn STEM subjects if I get good grades in science examination.					

APPENDIX B: Skewness and Kurtosis

Descriptive Statistics – Attitude towards Math

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Att_Math 1	202	1	5	3.69	1.170	-.907	.171	-.060	.341
Att_Math 2	202	1	5	3.51	1.160	-.720	.171	-.409	.341
Att_Math 3	202	1	5	3.83	1.039	-1.233	.171	1.201	.341
Att_Math 4	202	1	5	3.80	1.085	-1.098	.171	.709	.341
Att_Math 5	202	1	5	3.67	1.057	-1.001	.171	.445	.341
Att_Math 6	202	1	5	3.53	1.089	-.824	.171	-.061	.341
Att_Math 7	202	1	5	3.74	1.169	-.883	.171	.011	.341
Att_Math 8	202	1	5	3.69	1.152	-.933	.171	.059	.341
Valid N (listwise)	202								

Descriptive Statistics – Attitude towards Science

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis

	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Att_Sci1	202	1	5	3.39	.946	-.344	.171	-.190	.341
Att_Sci2	202	1	5	3.56	1.016	-.535	.171	-.052	.341
Att_Sci3	202	1	5	3.48	1.047	-.840	.171	.271	.341
Att_Sci4	202	1	5	3.62	1.040	-.937	.171	.501	.341
Att_Sci5	202	1	5	3.63	1.035	-.622	.171	-.139	.341
Att_Sci6	202	1	5	3.63	.906	-.652	.171	.637	.341
Att_Sci7	202	1	5	3.75	1.142	-1.030	.171	.311	.341
Att_Sci8	202	1	5	3.58	1.140	-.882	.171	-.071	.341
Att_Sci9	202	1	5	3.83	1.039	-1.233	.171	1.201	.341
Valid N (listwise)	202								

Descriptive Statistics – Attitude towards Engineering

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Att_Eng 1	202	1	5	2.75	1.138	.264	.171	-.735	.341
Att_Eng 2	202	1	5	3.21	1.027	-.048	.171	-.703	.341
Att_Eng 3	202	1	5	3.23	.907	-.144	.171	.216	.341
Att_Eng 4	202	1	5	3.42	1.059	-.171	.171	-.795	.341
Att_Eng 5	202	1	5	3.21	.934	-.205	.171	-.634	.341
Att_Eng 6	202	1	5	3.26	.937	-.243	.171	-.231	.341
Att_Eng 7	202	1	5	2.95	1.033	.164	.171	-.545	.341
Att_Eng 8	202	1	5	3.38	1.220	-.372	.171	-.947	.341
Att_Eng 9	202	1	5	3.51	1.243	-.553	.171	-.770	.341
Valid N (listwise)	202								

Descriptive Statistics – Parental Involvement

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis

	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Par_Inv1	202	1	5	3.71	.868	-.283	.171	-.103	.341
Par_Inv2	202	1	5	3.97	.919	-.678	.171	.061	.341
Par_Inv3	202	1	5	3.50	.830	-.701	.171	1.038	.341
Par_Inv4	202	1	5	3.44	.840	-.676	.171	1.206	.341
Par_Inv5	202	1	5	3.34	.771	-.740	.171	1.380	.341
Par_Inv6	202	1	5	3.63	.975	-.577	.171	.233	.341
Par_Inv7	202	1	5	3.71	.965	-1.004	.171	1.058	.341
Par_Inv8	202	1	5	3.63	.917	-.639	.171	.713	.341
Par_Inv9	202	1	5	3.88	.985	-.767	.171	.304	.341
Par_Inv10	202	1	5	4.05	1.018	-1.309	.171	1.538	.341
Par_Inv11	202	1	5	4.03	1.041	-1.209	.171	1.027	.341
Valid N (listwise)	202								

Descriptive Statistics – Self Concept

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Self_Con1	202	1	5	2.87	1.237	.145	.171	-.925	.341
Self_Con2	202	1	5	2.96	.845	.076	.171	-.878	.341
Self_Con3	202	1	5	3.08	1.076	-.256	.171	-1.006	.341
Self_Con4	202	1	5	3.32	1.065	-.374	.171	-.351	.341
Self_Con5	202	1	5	2.85	.863	-.225	.171	.150	.341
Self_Con6	202	1	5	3.40	.728	-.627	.171	.683	.341
Self_Con7	202	1	5	3.25	.983	-.367	.171	-.551	.341
Self_Con8	202	1	5	3.13	.964	-.396	.171	-.242	.341
Self_Con9	202	1	5	3.33	1.014	-.068	.171	-.658	.341
Self_Con10	202	1	5	3.01	1.051	.214	.171	-.558	.341
Self_Con11	202	1	5	2.75	1.138	.264	.171	-.735	.341
Self_Con12	202	1	5	3.21	1.027	-.048	.171	-.703	.341
Self_Con13	202	1	5	3.23	.907	-.144	.171	.216	.341
Self_Con14	202	1	5	3.45	1.258	-.326	.171	-1.021	.341
Self_Con15	202	1	5	3.50	1.259	-.469	.171	-.917	.341
Self_Con16	202	1	5	3.38	1.220	-.372	.171	-.947	.341
Self_Con17	202	1	5	3.79	1.174	-1.058	.171	.289	.341

Self_Con18	202	1	5	3.73	1.171	-1.062	.171	.326	.341
Self_Con19	202	1	5	3.81	1.196	-1.031	.171	.161	.341
Self_Con20	202	1	5	3.62	1.171	-.828	.171	-.184	.341
Self_Con21	202	1	5	3.85	1.151	-1.021	.171	.271	.341
Self_Con22	202	1	5	3.53	1.089	-.824	.171	-.061	.341
Self_Con23	202	1	5	3.74	1.169	-.883	.171	.011	.341
Self_Con24	202	1	5	3.69	1.152	-.933	.171	.059	.341
Self_Con25	202	1	5	2.48	1.235	.510	.171	-.780	.341
Self_Con26	202	1	5	3.70	1.121	-.901	.171	.012	.341
Valid N (listwise)	202								

Descriptive Statistics – Career Outcome Expectancy

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
COE_1	202	1	5	3.95	.774	-1.011	.171	2.305	.341
COE_2	202	1	5	3.94	.841	-.841	.171	1.441	.341
COE_3	202	1	5	3.95	.862	-.609	.171	.294	.341
COE_4	202	1	5	3.92	.857	-.700	.171	.998	.341
COE_5	202	1	5	4.02	.914	-1.145	.171	1.812	.341
COE_6	202	1	5	3.75	.839	-.576	.171	.900	.341
COE_7	202	1	5	3.96	.894	-1.052	.171	1.776	.341
COE_8	202	1	5	4.01	.825	-.778	.171	.907	.341
COE_9	202	1	5	3.99	.911	-.887	.171	1.077	.341
COE_10	202	1	5	3.97	.886	-.722	.171	.557	.341
COE_11	202	1	5	3.78	.926	-.577	.171	.584	.341
COE_12	202	1	5	3.80	.831	-.446	.171	.304	.341
COE_13	202	1	5	3.90	.883	-.626	.171	.434	.341
COE_14	202	1	5	3.93	.834	-.327	.171	-.324	.341
COE_15	202	1	5	4.07	.901	-.880	.171	.716	.341
COE_16	202	1	5	3.86	.829	-.318	.171	-.201	.341
COE_17	202	1	5	3.89	.824	-.594	.171	.854	.341
COE_18	202	1	5	3.88	.822	-.363	.171	-.101	.341
COE_19	202	1	5	3.84	.940	-.466	.171	-.156	.341
COE_20	202	1	5	3.97	.834	-.672	.171	.620	.341
COE_21	202	1	5	4.05	.929	-1.076	.171	1.340	.341
COE_22	202	1	5	3.78	.922	-.272	.171	-.610	.341
COE_23	202	1	5	3.82	.935	-.412	.171	-.193	.341
COE_24	202	1	5	3.89	.935	-.593	.171	.041	.341

Valid N (listwise)	202									

Descriptive Statistics – Self-Efficacy.

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Self_Eff 1	202	1	5	3.45	1.258	-.326	.171	-1.021	.341
Self_Eff 3	202	1	5	3.50	1.259	-.469	.171	-.917	.341
Self_Eff 4	202	1	5	3.38	1.220	-.372	.171	-.947	.341
Self_Eff 5	202	1	5	3.51	1.243	-.553	.171	-.770	.341
Self_Eff 6	202	1	5	3.47	1.222	-.483	.171	-.861	.341
Self_Eff 7	202	1	5	3.52	1.235	-.510	.171	-.780	.341
Valid N (listwise)	202								

Descriptive Statistics – Intention

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Int_1	202	1	5	3.63	1.260	-.716	.171	-.525	.341
Int_2	202	1	5	3.76	1.177	-.914	.171	.020	.341
Int_3	202	1	5	3.34	1.322	-.601	.171	-.887	.341

Int_4	202	1	5	3.64	1.282	-.910	.171	-.288	.341
Valid N (listwise)	202								

APPENDIX C: Inter-Item Correlations

Inter-Item Correlation Matrix – Attitude towards Math

	Att_Math1	Att_Math2	Att_Math3	Att_Math4	Att_Math5	Att_Math6	Att_Math7	Att_Math8
Att_Math1	**1.000**	.501	.701	.742	.635	.535	.608	.668
Att_Math2	.501	**1.000**	.524	.569	.583	.431	.607	.494
Att_Math3	.701	.524	**1.000**	.754	.633	.561	.631	.616
Att_Math4	.742	.569	.754	**1.000**	.706	.643	.684	.698
Att_Math5	.635	.583	.633	.706	**1.000**	.575	.653	.608
Att_Math6	.535	.431	.561	.643	.575	**1.000**	.671	.630
Att_Math7	.608	.607	.631	.684	.653	.671	**1.000**	.687
Att_Math8	.668	.494	.616	.698	.608	.630	.687	**1.000**

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Att_Math1	25.77	40.316	.764	.634	.918
Att_Math2	25.96	42.142	.633	.448	.928
Att_Math3	25.64	41.615	.771	.633	.917
Att_Math4	25.67	40.213	.845	.736	.912
Att_Math5	25.79	41.489	.766	.595	.918
Att_Math6	25.94	41.991	.698	.540	.923
Att_Math7	25.72	39.913	.795	.656	.915

Att_Math8	25.77	40.445	.768	.614	.917

Inter-Item Correlation Matrix - Attitude towards Science

	Att_Sci 1	Att_Sci 2	Att_Sci 3	Att_Sci 4	Att_Sci 5	Att_Sci 6	Att_Sci 7	Att_Sci 8	Att_Sci 9
Att_Sci 1	1.000	.564	.527	.548	.523	.476	.514	.445	.468
Att_Sci 2	.564	1.000	.583	.592	.565	.515	.565	.427	.522
Att_Sci 3	.527	.583	1.000	.741	.637	.554	.559	.408	.511
Att_Sci 4	.548	.592	.741	1.000	.669	.585	.611	.468	.543
Att_Sci 5	.523	.565	.637	.669	1.000	.547	.480	.383	.449
Att_Sci 6	.476	.515	.554	.585	.547	1.000	.471	.433	.391
Att_Sci 7	.514	.565	.559	.611	.480	.471	1.000	.527	.739
Att_Sci 8	.445	.427	.408	.468	.383	.433	.527	1.000	.552
Att_Sci 9	.468	.522	.511	.543	.449	.391	.739	.552	1.000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Att_Sci1	29.08	41.626	.658	.444	.902
Att_Sci2	28.90	40.408	.706	.511	.898
Att_Sci3	28.99	39.711	.739	.616	.896
Att_Sci4	28.84	39.258	.784	.669	.893
Att_Sci5	28.84	40.426	.689	.539	.899
Att_Sci6	28.84	42.187	.641	.444	.903
Att_Sci7	28.72	38.811	.734	.633	.896

Att_Sci8	28.88	40.752	.585	.389	.908
Att_Sci9	28.64	40.411	.687	.599	.900

Inter-Item Correlation Matrix - Attitude towards Engineering

	Att_Eng1	Att_Eng2	Att_Eng3	Att_Eng4	Att_Eng5	Att_Eng6	Att_Eng7	Att_Eng8	Att_Eng9
Att_Eng1	1.000	.212	.157	.303	.218	.150	.327	.083	.061
Att_Eng2	.212	1.000	.711	.087	.561	.527	.227	.218	.230
Att_Eng3	.157	.711	1.000	.117	.331	.270	.252	.178	.178
Att_Eng4	.303	.087	.117	1.000	.097	-.135	.344	.015	.065
Att_Eng5	.218	.561	.331	.097	1.000	.598	.094	.197	.250
Att_Eng6	.150	.527	.270	-.135	.598	1.000	.051	.332	.300
Att_Eng7	.327	.227	.252	.344	.094	.051	1.000	-.011	-.090
Att_Eng8	.083	.218	.178	.015	.197	.332	-.011	1.000	.679
Att_Eng9	.061	.230	.178	.065	.250	.300	-.090	.679	1.000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Att_Eng1	26.16	23.083	.321	.187	.705
Att_Eng2	25.70	21.117	.605	.663	.651
Att_Eng3	25.68	22.894	.480	.534	.678
Att_Eng4	25.49	24.729	.193	.235	.726
Att_Eng5	25.70	22.459	.514	.469	.671
Att_Eng6	25.65	22.874	.461	.501	.680
Att_Eng7	25.97	24.322	.245	.241	.716

Att_Eng8	25.53	21.942	.389	.486	.692
Att_Eng9	25.40	21.902	.381	.493	.694

Inter-Item Correlation Matrix – Parental Involvement

	Par_Inv1	Par_Inv2	Par_Inv3	Par_Inv4	Par_Inv5	Par_Inv6	Par_Inv7	Par_Inv8	Par_Inv9	Par_Inv10	Par_Inv11
Par_Inv1	1.000	.663	.637	.475	.452	.404	.400	.303	.396	.502	.500
Par_Inv2	.663	1.000	.620	.449	.506	.365	.388	.311	.359	.454	.422
Par_Inv3	.637	.620	1.000	.643	.561	.451	.511	.332	.396	.503	.489
Par_Inv4	.475	.449	.643	1.000	.612	.557	.549	.420	.370	.524	.554
Par_Inv5	.452	.506	.561	.612	1.000	.492	.507	.384	.407	.509	.502
Par_Inv6	.404	.365	.451	.557	.492	1.000	.617	.621	.431	.491	.540
Par_Inv7	.400	.388	.511	.549	.507	.617	1.000	.609	.471	.588	.622
Par_Inv8	.303	.311	.332	.420	.384	.621	.609	1.000	.380	.469	.480
Par_Inv9	.396	.359	.396	.370	.407	.431	.471	.380	1.000	.646	.663
Par_Inv10	.502	.454	.503	.524	.509	.491	.588	.469	.646	1.000	.754
Par_Inv11	.500	.422	.489	.554	.502	.540	.622	.480	.663	.754	1.000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Par_Inv1	37.20	47.463	.634	.555	.909
Par_Inv2	36.94	47.360	.600	.530	.910
Par_Inv3	37.41	47.227	.690	.610	.906

Par_Inv4	37.47	47.086	.694	.575	.906
Par_Inv5	37.57	48.107	.663	.489	.908
Par_Inv6	37.28	45.953	.673	.544	.907
Par_Inv7	37.20	45.493	.719	.584	.904
Par_Inv8	37.28	47.577	.583	.480	.911
Par_Inv9	37.03	46.546	.616	.501	.910
Par_Inv10	36.86	44.571	.749	.647	.903
Par_Inv11	36.88	44.155	.763	.679	.902

Inter-Item Correlation Matrix – Self-Concept

	Self_Con1	Self_Con2	Self_Con3	Self_Con4	Self_Con5	Self_Con6	Self_Con7	Self_Con8	Self_Con9	Self_Con10	Self_Con11	Self_Con12	Self_Con13	Self_Con14	Self_Con15	Self_Con16	Self_Con17	Self_Con18	Self_Con19	Self_Con20	Self_Con21	Self_Con22	Self_Con23	Self_Con24	Self_Con25	Self_Con26
Self_Con1	1.000	-.357	.356	.422	-.364	-.239	-.463	-.336	.353	.414	.326	.077	.107	.001	-.088	.017	-.006	.010	.009	.085	.129	.075	.107	.041	.075	-.040
Self_Con2	-.357	1.000	-.467	-.312	.306	.357	.395	.281	-.234	-.268	-.290	-.242	-.189	-.067	-.023	-.072	-.053	-.016	-.008	-.080	-.037	.017	-.081	.003	.004	-.007
Self_Con3	.356	-.467	1.000	.546	-.261	-.314	-.245	-.264	.176	.360	.236	.115	.094	.018	-.011	-.011	.045	-.070	-.011	.040	.042	-.074	.091	-.008	.050	-.017
Self_Con4	.422	-.312	.546	1.000	-.208	-.238	-.230	-.230	.140	.259	.322	.142	.052	.040	-.006	-.032	-.101	-.102	-.056	-.038	-.012	-.092	.043	-.057	.037	-.172
Self_Con5	-.364	.306	-.261	-.208	1.000	.563	.631	.610	-.228	-.267	-.251	-.206	-.141	.044	.105	.039	.117	.074	.117	.028	.102	.068	.006	-.026	-.101	.133

Self_Con6	-.239	.357	-.314	-.238	.563	1.000	.595	.564	-.053	-.077	-.304	.005	.012	.008	.008	-.047	-.030	-.008	-.008	-.085	-.033	.082	-.048	-.066	-.027	.033
Self_Con7	-.463	.395	-.245	-.230	.631	.595	1.000	.633	-.229	-.238	-.299	-.123	-.082	.028	.058	-.042	.020	.020	.042	-.073	.008	.074	.027	-.010	-.043	.047
Self_Con8	-.336	.281	-.264	-.230	.610	.564	.633	1.000	-.192	-.154	-.329	-.113	-.034	.026	.021	-.024	.019	.039	.013	-.032	.040	.067	-.023	-.014	-.010	.091
Self_Con9	.353	-.234	.176	.140	-.228	-.053	-.229	-.192	1.000	.758	.189	.266	.209	.112	.080	.072	.100	.058	.119	.114	.121	.043	.131	.011	-.096	.032
Self_Con10	.414	-.268	.360	.259	-.267	-.077	-.238	-.154	.758	1.000	.210	.233	.248	.057	-.011	-.003	.054	-.054	.021	.027	.030	-.070	.067	-.030	.004	-.019
Self_Con11	.326	-.290	.236	.322	-.251	-.304	-.299	-.329	.189	.210	1.000	.212	.157	.108	.096	.083	.031	.069	.044	.040	.183	-.060	.086	.028	-.076	-.048
Self_Con12	.077	-.242	.115	.142	-.206	.005	-.123	-.113	.266	.233	.212	1.000	.711	.318	.191	.218	.053	.060	.005	.059	-.027	-.008	.104	.022	-.191	.060

Self_Con13	.107	-.189	.094	.052	-.141	.012	-.082	-.034	.209	.248	.157	.711	1.000	.223	.113	.178	.129	.109	.054	.119	.048	.064	.149	.134	-.129	.112
Self_Con14	.001	-.067	.018	.040	.044	.008	.028	.026	.112	.057	.108	.318	.223	1.000	.702	.686	.582	.511	.531	.538	.491	.548	.834	.521	-.710	.549
Self_Con15	-.088	-.023	-.011	-.006	.105	.008	.058	.021	.080	-.011	.096	.191	.113	.702	1.000	.712	.549	.601	.831	.581	.489	.539	.568	.470	-.959	.527
Self_Con16	.017	-.072	-.011	-.032	.039	-.047	-.042	-.024	.072	-.003	.083	.218	.178	.686	.712	1.000	.541	.579	.575	.852	.491	.504	.584	.510	-.711	.553
Self_Con17	-.006	-.053	.045	-.101	.117	-.030	.020	.019	.100	.054	.031	.053	.129	.582	.549	.541	1.000	.759	.680	.645	.676	.538	.704	.688	-.565	.719
Self_Con18	.010	-.016	-.070	-.102	.074	-.008	.020	.039	.058	-.054	.069	.060	.109	.511	.601	.579	.759	1.000	.762	.703	.678	.627	.666	.706	-.609	.662
Self_Con19	.009	-.008	-.011	-.056	.117	-.008	.042	.013	.119	.021	.044	.005	.054	.531	.831	.575	.680	.762	1.000	.691	.629	.637	.658	.596	-.843	.635

Self_Con20	.085	-.080	.040	-.038	.028	-.085	-.073	-.032	.114	.027	.040	.059	.119	.538	.581	.852	.645	.703	.691	1.000	.607	.583	.652	.618	-.590	.671
Self_Con21	.129	-.037	.042	-.012	.102	-.033	.008	.040	.121	.030	.183	-.027	.048	.491	.489	.491	.676	.678	.629	.607	1.000	.494	.625	.546	-.505	.581
Self_Con22	.075	.017	-.074	-.092	.068	.082	.074	.067	.043	-.070	-.060	-.008	.064	.548	.539	.504	.538	.627	.637	.583	.494	1.000	.671	.630	-.571	.645
Self_Con23	.107	-.081	.091	.043	.006	-.048	.027	-.023	.131	.067	.086	.104	.149	.834	.568	.584	.704	.666	.658	.652	.625	.671	1.000	.687	-.583	.673
Self_Con24	.041	.003	-.008	-.057	-.026	-.066	-.010	-.014	.011	-.030	.028	.022	.134	.521	.470	.510	.688	.706	.596	.618	.546	.630	.687	1.000	-.497	.625
Self_Con25	.075	.004	.050	.037	-.101	-.027	-.043	-.010	-.096	.004	-.076	-.191	-.129	-.710	-.959	-.711	-.565	-.609	-.843	-.590	-.505	-.571	-.583	-.497	1.000	-.527
Self_Con26	-.040	-.007	-.017	-.172	.133	.033	.047	.091	.032	-.019	-.048	.060	.112	.549	.527	.553	.719	.662	.635	.671	.581	.645	.673	.625	-.527	1.000

Item-Total Statistics – Self-Concept

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Self_Con1	83.80	135.635	.093	.494	.814
Self_Con2	83.70	142.279	-.157	.367	.818
Self_Con3	83.58	136.931	.069	.499	.813
Self_Con4	83.34	137.858	.034	.443	.814
Self_Con5	83.81	138.034	.052	.588	.812
Self_Con6	83.26	138.871	.025	.535	.812
Self_Con7	83.41	138.880	.000	.627	.815
Self_Con8	83.53	138.489	.018	.551	.814
Self_Con9	83.33	133.805	.213	.643	.807
Self_Con10	83.65	134.844	.159	.682	.809
Self_Con11	83.92	135.849	.102	.312	.812
Self_Con12	83.45	134.229	.191	.669	.808
Self_Con13	83.44	133.879	.244	.562	.805
Self_Con14	83.21	118.954	.703	.924	.782
Self_Con15	83.16	120.525	.641	.943	.786
Self_Con16	83.29	120.574	.663	.913	.785
Self_Con17	82.87	119.675	.731	.746	.782
Self_Con18	82.93	119.856	.726	.771	.782

Self_Con19	82.86	119.775	.712	.943	.783
Self_Con20	83.04	119.869	.726	.910	.782
Self_Con21	82.82	121.344	.677	.609	.785
Self_Con22	83.13	123.350	.633	.636	.788
Self_Con23	82.92	118.282	.794	.919	.779
Self_Con24	82.97	121.939	.651	.653	.786
Self_Con25	84.18	161.912	-.751	.947	.851
Self_Con26	82.97	121.636	.685	.682	.785

Inter-Item Correlation Matrix – Career Outcome Expectancy

	COE_1	COE_2	COE_3	COE_4	COE_5	COE_6	COE_7	COE_8	COE_9	COE_10	COE_11	COE_12	COE_13	COE_14	COE_15	COE_16	COE_17	COE_18	COE_19	COE_20	COE_21	COE_22	COE_23	COE_24
COE_1	1.000	.560	.331	.391	.402	.377	.478	.422	.352	.404	.393	.300	.356	.248	.362	.422	.388	.333	.350	.367	.426	.324	.296	.370
COE_2	.560	1.000	.325	.448	.487	.464	.499	.353	.388	.471	.455	.380	.480	.369	.413	.472	.370	.269	.408	.402	.412	.251	.226	.371
COE_3	.331	.325	1.000	.378	.456	.471	.462	.406	.461	.317	.360	.312	.405	.334	.350	.317	.356	.342	.358	.461	.444	.349	.304	.283
COE_4	.391	.448	.378	1.000	.466	.358	.515	.445	.413	.423	.309	.353	.587	.284	.401	.425	.282	.416	.347	.435	.430	.152	.217	.231
COE_5	.402	.487	.456	.466	1.000	.460	.616	.481	.496	.406	.417	.425	.594	.354	.440	.437	.433	.374	.398	.510	.491	.342	.237	.311
COE_6	.377	.464	.471	.358	.460	1.000	.403	.400	.424	.452	.513	.413	.462	.393	.372	.501	.376	.330	.440	.458	.399	.295	.248	.225
COE_7	.478	.499	.462	.515	.616	.403	1.000	.513	.427	.419	.421	.524	.580	.376	.467	.488	.398	.514	.477	.532	.560	.338	.294	.381

COE_8	.422	.353	.406	.445	.481	.400	.513	1.000	.324	.470	.408	.404	.459	.348	.367	.410	.317	.362	.311	.470	.414	.266	.203	.260
COE_9	.352	.388	.461	.413	.496	.424	.427	.324	1.000	.369	.403	.384	.418	.339	.456	.419	.342	.310	.468	.444	.512	.416	.347	.372
COE_10	.404	.471	.317	.423	.406	.452	.419	.470	.369	1.000	.386	.343	.409	.381	.345	.475	.295	.330	.364	.457	.389	.211	.276	.302
COE_11	.393	.455	.360	.309	.417	.513	.421	.408	.403	.386	1.000	.427	.392	.417	.304	.388	.378	.304	.456	.500	.440	.281	.242	.243
COE_12	.300	.380	.312	.353	.425	.413	.524	.404	.384	.343	.427	1.000	.419	.316	.325	.443	.271	.451	.429	.422	.432	.194	.293	.343
COE_13	.356	.480	.405	.587	.594	.462	.580	.459	.418	.409	.392	.419	1.000	.327	.434	.476	.449	.441	.495	.428	.534	.240	.219	.318
COE_14	.248	.369	.334	.284	.354	.393	.376	.348	.339	.381	.417	.316	.327	1.000	.298	.316	.299	.153	.429	.390	.409	.218	.264	.187

COE_15	.362	.413	.350	.401	.440	.372	.467	.367	.456	.345	.304	.325	.434	.298	1.000	.393	.359	.287	.425	.374	.448	.366	.298	.352
COE_16	.422	.472	.317	.425	.437	.501	.488	.410	.419	.475	.388	.443	.476	.316	.393	1.000	.276	.405	.501	.483	.416	.246	.173	.301
COE_17	.388	.370	.356	.282	.433	.376	.398	.317	.342	.295	.378	.271	.449	.299	.359	.276	1.000	.214	.426	.430	.547	.392	.245	.236
COE_18	.333	.269	.342	.416	.374	.330	.514	.362	.310	.330	.304	.451	.441	.153	.287	.405	.214	1.000	.366	.423	.379	.160	.211	.287
COE_19	.350	.408	.358	.347	.398	.440	.477	.311	.468	.364	.456	.429	.495	.429	.425	.501	.426	.366	1.000	.463	.585	.239	.335	.308
COE_20	.367	.402	.461	.435	.510	.458	.532	.470	.444	.457	.500	.422	.428	.390	.374	.483	.430	.423	.463	1.000	.496	.347	.255	.264
COE_21	.426	.412	.444	.430	.491	.399	.560	.414	.512	.389	.440	.432	.534	.409	.448	.416	.547	.379	.585	.496	1.000	.303	.434	.344

COE_22	.324	.251	.349	.152	.342	.295	.338	.266	.416	.211	.281	.194	.240	.218	.366	.246	.392	.160	.239	.347	.303	1.000	.404	.393
COE_23	.296	.226	.304	.217	.237	.248	.294	.203	.347	.276	.242	.293	.219	.264	.298	.173	.245	.211	.335	.255	.434	.404	1.000	.524
COE_24	.370	.371	.283	.231	.311	.225	.381	.260	.372	.302	.243	.343	.318	.187	.352	.301	.236	.287	.308	.264	.344	.393	.524	1.000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
COE_1	89.94	166.136	.589	.461	.934
COE_2	89.95	164.167	.631	.524	.933
COE_3	89.94	164.797	.584	.409	.934
COE_4	89.97	164.755	.591	.484	.934
COE_5	89.87	161.698	.686	.547	.932
COE_6	90.13	164.246	.629	.491	.933
COE_7	89.93	161.060	.733	.614	.932
COE_8	89.87	165.108	.598	.447	.934
COE_9	89.90	162.856	.636	.477	.933
COE_10	89.92	164.306	.589	.424	.934
COE_11	90.10	163.417	.600	.444	.934
COE_12	90.09	165.286	.585	.426	.934
COE_13	89.99	162.428	.678	.585	.932
COE_14	89.96	166.894	.505	.343	.935
COE_15	89.82	164.081	.589	.384	.934
COE_16	90.02	164.502	.625	.491	.933
COE_17	90.00	166.119	.550	.441	.934
COE_18	90.01	166.796	.518	.401	.935
COE_19	90.05	162.256	.641	.515	.933
COE_20	89.92	163.480	.671	.512	.933
COE_21	89.84	161.033	.703	.589	.932
COE_22	90.11	166.774	.456	.397	.936
COE_23	90.06	166.866	.445	.427	.936
COE_24	90.00	165.826	.489	.423	.935

Inter-Item Correlation Matrix – Self-Efficacy

	Self_Eff 1	Self_Eff 3	Self_Eff 4	Self_Eff 5	Self_Eff 6	Self_Eff 7
Self_Eff 1	1.000	.702	.686	.739	.667	.710
Self_Eff 3	.702	1.000	.712	.693	.736	.959
Self_Eff 4	.686	.712	1.000	.679	.638	.711
Self_Eff 5	.739	.693	.679	1.000	.698	.687
Self_Eff 6	.667	.736	.638	.698	1.000	.750
Self_Eff 7	.710	.959	.711	.687	.750	1.000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Self_Eff 1	17.38	29.839	.793	.647	.930
Self_Eff 3	17.33	28.909	.874	.922	.920
Self_Eff 4	17.46	30.428	.773	.602	.932
Self_Eff 5	17.32	30.009	.791	.651	.930
Self_Eff 6	17.36	30.222	.789	.634	.930
Self_Eff 7	17.31	29.091	.879	.925	.919

Inter-Item Correlation Matrix – Intention

	Int_1	Int_2	Int_3	Int_4
Int_1	1.000	.581	.473	.518
Int_2	.581	1.000	.499	.553
Int_3	.473	.499	1.000	.418
Int_4	.518	.553	.418	1.000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Int_1	10.74	9.416	.643	.421	.739
Int_2	10.61	9.642	.677	.462	.726
Int_3	11.03	9.685	.552	.312	.785
Int_4	10.73	9.572	.600	.376	.760