Experiences of Girls Participating in STEM Educational Programs in Burkina Faso

Marie Angele Hermine Nintiema

St. Cloud State University

Follow this and additional works at: https://repository.stcloudstate.edu/edad_etds

Recommended Citation
https://repository.stcloudstate.edu/edad_etds/10
Experiences of Girls Participating in STEM Educational Programs

in Burkina Faso

by

Hermine Marie Angele Nintiema

A Dissertation

Submitted to the Graduate Faculty of

St. Cloud State University

in Partial Fulfillment of the Requirements

for the Degree

Doctor of Education in

Educational Administration and Leadership

December, 2015

Dissertation Committee:
John Eller, Chairperson
Mumbi Mwangi
Nicholas Miller
Roger Worner
Abstract

This study documents the narratives of female students’ experiences in STEM (Science, Technology, Engineering, and Mathematics) educational programs in a high school in Burkina Faso. The study examined the successes and challenges of female students who want to improve their academic achievement. The main goal of the study is to inform educational stakeholders about the female students’ experiences in STEM and make recommendations for increasing female students’ enrollment and retention rate in STEM programs.
Acknowledgments

I would like to thank all people who have helped and inspired me during my research and study at Saint Cloud State University.

I especially want to thank my advisor, Dr. John F. Eller, Program Director of the Educational Administration and Leadership at Saint Cloud State University. Since my admission in this program in 2009, you have been my teacher and also my advisor and definitely made me the graduate student with the degree of Doctorate in Educational Administration and Leadership that I earned as of today. I’m so grateful to the challenge you gave me to always improve and perform.

I am greatly indebted to Dr Mumbi Mwangi, Associate Professor of Women and Ethnic Studies at Saint Cloud State University for being incredibly supportive. You have provided so much input this dissertation and in my academic learning process and I will be forever be grateful.

I was delighted to interact with Dr Roger B. Worner and Dr. Nicholas J. Miller, the Educational Administration and Leadership professors and members of my committee. You have dedicated a lot of time throughout this project. I would like to thank you for your help and the important information you have provided.

I especially thank my husband Stanislas Ilboudo, whose unconditional love has been my greatest strength. Thank you for supporting me and giving me the strength and the courage to be the woman I can be. You have provided a wealth of advice, financial support and all kinds of lovely assistance a husband can provide to a wife. I do love you.
I owe my deepest gratitude to my mother and my father; Brigitte and Mathias for proudly raising me with unflagging love and support throughout my life.

Thank you to my siblings Jeanne, Danielle, Esther, Delphine, Late Wendpanga, David, Christophe, and Deo-Gratias for your love, support and prayers.

Lastly, and most importantly, I wish to thank my lovely children, Yvonne Esther, and Yves Junior who are the special gifts of my life. I hope to be a role model for you. To you I dedicate this dissertation.
“One of the things that I really strongly believe in is that we need to have more girls interested in math, science, and engineering. We’ve got half the population that is way underrepresented in those fields and that means that we’ve got a whole bunch of talent...not being encouraged the way they need to.”

-- President Barack Obama, February 2013
# Table of Contents

List of Tables  .................................................................................................................. 9

Chapter

1. Introduction  .................................................................................................................. 10
   Background of the Study  .......................................................................................... 10
   Statement of the Problem  ........................................................................................ 13
   Description and Scope of the Study  ....................................................................... 15
   Purpose of the Study  ................................................................................................ 17
   Significance of the Study  ........................................................................................ 17
   Limitation of the Study  ............................................................................................ 18
   Research Questions  .................................................................................................. 19
   Definition of Terms  .................................................................................................. 20
   Organization of the Study  ........................................................................................ 21
   Ethical Considerations and Confidentiality  .............................................................. 22
   Summary of Chapter  ................................................................................................ 22

2. Literature Review  ...................................................................................................... 23
   Introduction  ............................................................................................................... 23
   Background on Gender Issues  .................................................................................. 24
      Gender/Female Issues  ........................................................................................... 24
      African Feminism Perspectives  .......................................................................... 26
      Social Construction, Gender Roles and Culture  .............................................. 27
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science and Gender Disconnection</td>
<td>29</td>
</tr>
<tr>
<td>Women’s Contribution to Science</td>
<td>32</td>
</tr>
<tr>
<td>Approaches to Promote Female Studies in STEM Education</td>
<td>34</td>
</tr>
<tr>
<td>Burkina Faso’s Educational System and Stem</td>
<td>36</td>
</tr>
<tr>
<td>Summary of the Chapter</td>
<td>39</td>
</tr>
<tr>
<td>3. Methodology</td>
<td>41</td>
</tr>
<tr>
<td>Chapter Overview</td>
<td>42</td>
</tr>
<tr>
<td>Methodology: Feminist Qualitative Case Study</td>
<td>43</td>
</tr>
<tr>
<td>Research Design</td>
<td>44</td>
</tr>
<tr>
<td>Identifying the Respondents</td>
<td>45</td>
</tr>
<tr>
<td>Method of Data Collection</td>
<td>45</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>47</td>
</tr>
<tr>
<td>Summary of the Chapter</td>
<td>48</td>
</tr>
<tr>
<td>4. Narratives of the Girls</td>
<td>49</td>
</tr>
<tr>
<td>First Narrative: Amy</td>
<td>50</td>
</tr>
<tr>
<td>Second Narrative: Fanta</td>
<td>54</td>
</tr>
<tr>
<td>Third Narrative: Sandra</td>
<td>59</td>
</tr>
<tr>
<td>Fourth Narrative: Patty</td>
<td>64</td>
</tr>
<tr>
<td>Narrative Analysis</td>
<td>68</td>
</tr>
<tr>
<td>5. Conclusions and Recommendations</td>
<td>74</td>
</tr>
<tr>
<td>Recommendations for Future Female Students</td>
<td>75</td>
</tr>
<tr>
<td>Chapter</td>
<td>Page</td>
</tr>
<tr>
<td>--------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Recommendations for Parents</td>
<td>76</td>
</tr>
<tr>
<td>Recommendations for Teachers and School Administrators</td>
<td>76</td>
</tr>
<tr>
<td>Recommendations for the Government</td>
<td>79</td>
</tr>
<tr>
<td>Recommendation for Future Studies</td>
<td>81</td>
</tr>
<tr>
<td>References</td>
<td>84</td>
</tr>
<tr>
<td>Appendices</td>
<td></td>
</tr>
<tr>
<td>A. Map of Burkina Faso</td>
<td>97</td>
</tr>
<tr>
<td>B. Institutional Review Board Human Subjects Review Form</td>
<td>98</td>
</tr>
<tr>
<td>C. Interview Questionnaire</td>
<td>99</td>
</tr>
<tr>
<td>D. Consent Forms</td>
<td>100</td>
</tr>
<tr>
<td>E. Research and Interview Questions</td>
<td>102</td>
</tr>
</tbody>
</table>
List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Graduation Rate by Gender with Elementary School Certificate from</td>
<td></td>
</tr>
<tr>
<td>1997/98 to 2006/07</td>
<td>82</td>
</tr>
<tr>
<td>3. Enrollment at the University, Male Versus Female Enrollment</td>
<td>83</td>
</tr>
</tbody>
</table>
Chapter 1: Introduction

Background of the Study

Formerly known as Upper Volta, Burkina Faso, which means “Land of Upright people” is a landlocked country located in the middle of West Africa (see map in Appendix A). In 2013, the United Nations Human Development (UNDP, 2014) ranked the country as one of the poorest countries in Africa with a Gross Domestic Production per Capita of $1527.86 (UNDP, 2014, para.4). The country has a population of 16.5 million people and is growing 3% annually. The fertility rate is 5.8 (UNDP, n.d., p. 197).

Seventy three percent of the population of Burkina Faso is rural, and 44.6% live below the poverty level on less than a $ 1.29 a day (UNDP, n.d.). The economy of the country is largely reliant on agriculture, mainly cotton and gold exports (Food and Agricultural Organization ,FAO, 2015, para. 1).

The literacy rate is low at 28.7 % (UNDP, n.d., p. 173). There is a large gender disparity between females and males in primary school enrolment. Only 3.2% of men and less than 1% of women aged 25 and older have completed secondary school (Table 3).

Despite the low representation of women in the formal education system, women are very active in the economy of the country (Oxford Committee for Famine Relief OXFAM, 2011a). Women are commonly referred to as “les poumons de l’économie” (the lungs of the economy) by leaders in public policy statements and speeches.1 Although these statements would lead one to believe that women play a significant role in the country’s economic development, they are not fully integrated in the development process of the country. Women

1 All uncited information in this dissertation is based on the researcher’s own knowledge as a woman native to Burkina Faso.
also heavily depend on the small businesses in the informal sector of the country’s economy, and their access and control of resources such as land and capital are limited (OXFAM, 2011a).

Many researchers have documented women’s contributions to the economy of Burkina Faso. According to United Nations’ Food and Agricultural Organization (FAO, 1998), approximately 95% of women in Burkina Faso work in subsistence agriculture or the informal sector, using low levels of technology (1998, p. 5). Another study conducted by OXFAM (1998) explained that women’s responsibilities have been expanded and are no longer limited to care giving and domestic tasks. Women are required to provide meals for their families, buy clothes, pay school fees, and buy medicine for their children. In order to accomplish these responsibilities, women in Burkina Faso carry out individual or collective small-scale activities to generate revenue. Specifically, they generate revenue mostly from the agricultural and food processing businesses.

Despite women’s contribution, they often do not own land and, therefore, do not have any control or say over the use of land or the resources that are produced from the agricultural activities (OXFAM, 2011a).

On the local and institutional levels of decision making, women are also underrepresented. For example, in 2011, only 3 out of 29 ministerial positions in the Burkina Faso government were occupied by women (Premier Ministère du Burkina Faso, n.d., p. 2). Today, efforts are being made in many Third World countries, including Burkina Faso, to promote women’s rights. For example, Burkina Faso has signed and ratified international conventions and laws that promote women’s rights, with the belief that upholding women’s
rights is key to building a successful democratic nation. In 2009, the Parliament passed a law (Loi no 010-2009/AN du 16 avril, 2009) that required the implementation of a quota system in allocation of seats in parliament to ensure increased female representation (Loi no 010-2009/AN, 2009).

According to the Quota Project (2013) (a collaborative effort of three organizations including, International Idea, Inter-Parliamentary Union, and Stockholm University), the goal is to increase women’s participation and representation in political life in all countries. This law was implemented for the first time in the 2012 legislative and municipal elections in Burkina Faso. The organization argued that the interpretation of the Law on Quotas by many political parties was that “at least 30 per cent of all candidates nominated by each political party must be women, instead of 30 per cent of women candidates per party list in each electoral constituency” (para. 3).

The female’s lack of participation in decision making is mainly due to their limited access to education, as well as the low enrollment and retention rate of females in school systems. The data from the United States (US) Department of States (2012) show that about 80.3% of children are enrolled each year in school in Burkina Faso (2012, para. 8). Of those enrolled, 41.7% will graduate from primary school. Only a third of these students are female students. Because of the low retention rate, very few progress to higher education (Table 3).

Researchers have found that women’s involvement in the socio-economic development efforts is a key factor that contributes to the success of any country’s development process (United States AID, USAID, 1982). The United Nation Women argued that this might be the reason many programs designed to assist developing countries through
the development process, without involving women, have failed (United Nation Women, UN Women, n.d.). The UN believes that in order to have any meaningful advancement of women’s rights, the reduction of those in poverty, and the promotion of sustainable development, it is important to emphasize the full and equitable partnership between men and women (UN Women, n.d.).

Toward these efforts, an innovative and independent US Foreign Aid Agency, Millennium Challenge Corporation (MCC, 2011) has made it their goal to promote gender equality. While this is an important goal, it is even more vital to promote and encourage female participation in STEM programs (President Obama, 2013).

**Statement of the Problem**

Different factors that contribute to women’s lack of participation in education and in STEM have been well documented by researchers. These factors include a student’s socio-economic status and culture (Hagberg, 2002; Kerman, 2012; McHale, Kim, Dotterer, Crouter, & Booth, 2010); a student’s academic ability (Chapman, n.d.; Kamii, 1991; Kumari, 2009; Shapka & Keating, 2003); the academic quality of the educational institution (Crombie et al., 2005; Litten & Hall, 1989; Shapka & Keating, 2003); gender biases and stereotypes (American Association of University Women, n.d.; Cramaruc, 2010; Crombie et al., 2005; Kumari, 2009; Rydel, Shiffrin, Boucher, Loo, & Rydel, 2010; Sadker & Sadker, 1985, 1994; Shapka & Keating, 2003; Wyer, 2003); written materials and publications in course materials (Crombie et al., 2005, Sadker & Sadker, 1985, 1994; Rydel et al., 2010; Wyer, 2003), and a lack of role models (Shepardson & Pizzini, 1992).
Besides these identified factors that affect female students’ success, other research has been conducted to identify ways to promote female STEM education (Arbuckle, n.d.; De Wise, 2010; Else-Quest, Linn, & Hyde, 2010). As a result, countries such as the United States has invested in STEM programs (US Department of Education, 2010). These efforts have led the United States to close the enrollment and retention gap between male and female students (AAUW, n.d).

Despite the fact that in Burkina Faso female enrollment in education is low (see Table 3) and males outnumber females in school enrollment in STEM (Ouedraogo, 2006), little research has been done to document females’ academic success in Burkina Faso. Previous studies done on the topic by Femmes scientifiques du Faso pour la promotion de l’éducation scientifique et technologique des femmes (Association for the Promotion of Women in Science and Technology in Burkina Faso, FESCIFA/PRESCIFA) have provided insights about the issue of low enrollment and retention of female students in STEM education (FESCIFA/PRESCIFA, 2001 & 2004), but there is few studies that specifically examine the narrative experiences of female students. This study explores the experiences of female students in STEM education and seeks to inform the educational stakeholders about female experiences in STEM.

This study is important because recognizing the experiences of female students in STEM education could assist women in fully developing their potential. The study could also reveal how STEM education can contribute to women’s increased confidence in engaging in local and institutional levels of the decision making process, thus closing the perceived gender

**Description and Scope of the Study**

Many scholars have documented the positive correlation between STEM program and critical thinking. Ganiron (2014) defines critical thinking as “the ability to think clearly and rationally that requires reflective and independent thinking” (para. 1). It is a skill that enables students to reflect on the justification of their own beliefs and values, to understand the logical connection between ideas, and to detect inconsistencies. This process systematically engages the person in problem solving (Ganiron, 2014; Kamii, 1991; Lau & Chan, 2004).

Critical thinking also entails personal growth that is necessary for the advancement of the society (Lau & Chan, 2004). Today’s economies are driven by information and technology, and as such, in order to be successful, “one has to be able to deal quickly and effectively with changes using their own flexible intellectual skills from diverse sources of knowledge guided by their critical thinking” (Lau & Chan 2004, para. 1).

Also, Lau and Chan (2004) recognized that thinking critically is essential for the advancement of democracy and social justice in a country. Citizens that are able to understand right from wrong about issues will be able to act responsibly and overcome biases and prejudices that can affect their personal lives and the lives of others.

Today, STEM disciplines have become important and have become a central preoccupation of policy makers across the world (Australian Council of Learned Academies, ACOLA, 2013). Even though it is difficult to measure the impact of STEM in the
development of a country, what is clear is that “science, universal learning, and economic
dynamism and prosperity form a single interdependent system” (2013, p. 14).

“Securing Australia’s Future” a development program launched by the Australian
government is an example of the reality of the “STEM agenda “adopted by many countries. In
2013, Australian’s government sponsored a comparative study including 23 countries. These
countries included Japan, USA, Taiwan, China, South Korea, Finland, Russia, and Germany.
The goal was to,

critically examine existing solutions to the STEM skills shortage in comparable
countries and to ascertain which, if any, of those solutions could be usefully
applied to the formation and maintenance of a STEM skills workforce and propose
a set of options for increasing Australia’s productivity and international
competitiveness. (ACOLA, 2013, p. 10)

One of the key findings of Securing Australia’s Future Program was that for most of
the countries, initiatives targeted at student attitudes and identity were a significant part of
their strategy. This included female students and low income families (2013, p. 21).

The United States government has also recognized the benefits of critical thinking.
They have invested $2.3 million in the Women’s Equity Program with the goal of closing

The American Association of University Women (AAUW, n.d.), one of the America’s
leading voices in promoting equity and education for women and girls, found that their
programs have lasting effects on many levels of women’s lives (para. 2). The organization
further argued that their Trek summer camp program–targeting female students–contributed
in raising girls’ confidence to pursue STEM curricula and future career plans.
It is these and many other personal experiences as a woman growing up in Burkina Faso and pursuing higher education in the United States of America (USA) that led the researcher to examine female STEM education experiences in Burkina Faso. The goal of conducting this research was to contribute to the STEM education discourse in Burkina Faso and to advocate for the sustainable development of that country.

**Purpose of the Study**

This study documents the narratives of female students’ experiences in STEM (Science, Technology, Engineering, and Mathematics) educational programs in one high school in Burkina Faso. The study examined the successes and challenges of female students who are committed to improving their academic achievement. The main goal of the study was to inform educational stakeholders about the female students’ experiences in STEM and report recommendations to educational stakeholders to increase female students’ enrollment and retention rate in STEM programs in Burkina Faso.

**Significance of the Study**

Previous research done on this topic by FESCIFA/PRESCIFA in 2001 and 2004 shows a need to improve female students’ enrollment and retention in schools, specifically in STEM where females were less represented than males. These studies also revealed that female students did not generally show an interest in science and technology (FESCIFA/PRESCIFEF, 2004).

The current study would respond to the need to investigate best strategies to encourage female students’ enrollment and retention in STEM programs. The current study was also an addition to the few studies done on the representation of female education in developing countries.
In addition, many African countries, especially Burkina Faso, governments and policy developers are conscious about the need to involve more women in their development process. Agencies of the United Nations such as UNESCO and UNICEF (n.d.), in connection with local government and NGOs, have combined their efforts for the advancement of women in all aspect of development. Feminist scholars have also focused their attention on how women from different parts of the world experience different struggles that limit their full participation in political, social, and economic development. They are also committed to ensuring that gender subordination and the exclusion of women and girls in development process are addressed around the world. The current study added a voice to the efforts of those who are committed to improving the status of women worldwide and specifically in Burkina Faso.

**Limitation of the Study**

The limitations of the study include the following:

1- The study is geographically limited to students enrolled in a STEM-based (Série C) school in Ouagadougou (Capital city) of Burkina Faso. The number of qualified participants was very limited.

2- The participants were friends and as such had the accessibility to communicate with each other prior to interviews.

3- Participants’ ages were 17, 18, and 19. Perhaps younger students would have produced different results.

4- Lack of previous relevant research on STEM in Burkina Faso was a limitation of this study.
5- The researcher is originally from Burkina Faso and might have pre-conceived judgements about the participants and the educational system.

6- The interviews were conducted in French. Therefore translation was a limitation of this study.

**Research Questions**

The following general research questions guided the study and were used to examine the learning experience of the female students:

1. What are the perceptions of females students enrolled in STEM program about schooling?
2. What impact do the female students report the STEM program has had on their leadership skills?
3. What issues or barriers to program completion did students report encountering during enrollment in STEM program? What strategies did they report using to overcome those barriers? What strategies did they report trying that failed?
4. What suggestions and recommendations did the students report for better retention of female students in STEM programs in Burkina Faso?

The detailed analysis of the study questions provided information that helped in understanding the impact of STEM program on female students in Burkina Faso. It also guided the researcher in formulating recommendations to the future female students, school administrators and teachers, as well as the government in Burkina Faso.
Definition of Terms

Based on studies identified in the literature review, several important concepts are defined in this section to provide the reader with clarity related to the use of these terms:

**Bias:** “Any attitude, belief, or feeling that results in, and helps to justify, unfair treatment of an individual because of his or her identity” (Derman-Sparks, 1989).

**Discrimination:** According to Palumbo (2003) negative treatment based on ones’ social category; distancing behavior toward members of some group; salary inequalities; differential treatment; preferential treatment; and affirmative action (p. 4).

**Gender:** According to the American Psychology Association, (2011), gender refers to “the attitudes, feelings, and behaviors that a given culture associates with a person’s biological sex. Behavior that is compatible with cultural expectations is referred to as gender-normative; behaviors that are viewed as incompatible with these expectations constitute gender non-conformity” (para. 2).

**Gender roles:** gendered behaviors considered appropriate by a given society or group (APA, 2011).

**Social constructionism of gender:** “social differences between women and men are not natural” but are “constructed and maintained in social actions and interactions” (Palimbo, p. 27).

**Stereotype:** The term refers to “an oversimplified generalization about a particular group, race, or sex, which usually carries derogatory implication” (Derman-Sparks, 1989).
Organization of the Study

This dissertation consists of five chapters. Chapter 1 includes an introduction, background of the study, statement of the problem, description and scope of the study, purpose of the study, significance of the study, limitations, research questions, definition of terms, and a summary of the chapter.

Chapter 2 presents a review of related literature and is divided into four sections. The first section provides background information on gender issues. The section provides a description of gender issues, discusses gender issues in the African Feminism perspective, and analyzes the social construction of gender and gender roles, and science and gender disconnections. The second section analyses women’s contributions since those contributions were historically recorded. The third section focuses on present approaches taken by countries to promote females’ education and careers in STEM. In order to provide the reader with a better understanding of the study, a brief review of the educational system of Burkina Faso is provided.

Chapter 3 presents the methodology of the study, including the research methodology, research design, and the method of data collection and analysis.

Chapter 4 presents the narratives of the female students in two sections. The first section consecutively presents the narratives. The last section provides an analysis of the narratives.

Chapter 5 focuses on the conclusions and recommendations of the study and is organized in the following sections: future female students, parents, teachers, and the government.
Ethical Considerations and Confidentiality

This research was conducted according to the recommendations of the Belmont Report. The research proposal was submitted to the IRB commission before the beginning of this project. The three basic ethical principles were observed with respect to persons, beneficence, and justice. The researcher assured that a consent form was signed by each respondent according to their age eligibility (see Appendix D). Pseudonyms have been used in this dissertation to protect the identity of the respondents. At the end of the interview, the participants were thanked for their time and for sharing their stories. Confidentiality of their stories was observed based on the requirements on the IRB.

Summary of Chapter

This study was designed to explore the experiences and perceptions of female students participating in STEM programs in Burkina Faso. Chapter 1 introduces background information about Burkina Faso; the study which identified the problem of low representation of female students in the STEM programs; and provides the scope of the research. The subsequent sections provided the problem statement, the purpose of the study, and definitions of terms, delimitations, and a brief summary of the chapter.

In the next chapter, (Chapter 2), provides information on the related review of literature on background history of gender biases, gender and gender mainstream in African feminism perspective, social constructs and gender roles, science and gender disconnection, women’s contribution to science, approaches to promote female students in STEM and the education in Burkina Faso.
Chapter 2: Literature Review

Introduction

This study documents the narratives of female students’ experiences in STEM (Science, Technology, Engineering, and Mathematics) educational programs in a high school in Burkina Faso. The study examined the successes and challenges of female students who want to improve their academic achievement. The main goal of the study was to inform educational stakeholders about the female students’ experiences in STEM and report recommendations to increase female students’ enrollment and retention rate in STEM programs.

In this review of literature, scholarly journal articles related to the topic were examined as well as variety of policies initiatives implemented in countries designed to promote female students’ education in STEM. The literature review is divided into the following four sections:

The first section focuses on gender issues. It begins with a brief history of the gender biases and reveals that the issue is not specific to the Third World countries. The section describes gender roles as socially constructed (Chapman, n.d). The social construction of gender and gender roles has not only kept girls away from schools, but has also prevented them from pursuing STEM education (De Wise, 2010; Shepardson & Pizzini, 1992).

The second section examines women’s contribution in the field of science. According to Howard (2006), women have contributed to science since time when history started being recorded (para. 1). He argued that ancient civilization gave great value to women healers (para. 1). In contemporary time, valuable contributions have been made by women. For example, Marie Curie has made a valuable contribution in physics and chemistry with her research about radio activity (Chazal, 2006).
The third section analyses approaches taken to promote female education in STEM. As current research documents the benefit of women participation in STEM education (Else-Quest et al., 2010), countries, such as the USA, has declared that STEM education programs is one of their top priorities (Jones, 2015). In 2015, the US government invested $240 million in the Women Equity Program, to increase the participation of underrepresented groups, including women, in STEM fields (Jones, 2015, para. 1). In the light of the importance of STEM education today, understanding the success and challenging of females pursuing STEM education in Burkina Faso was a major focus of this study.

The last section of Chapter 3 analyses the educational system in Burkina Faso, to provide the reader with an overview of the educational system in Burkina Faso and to help understand the context and factors affecting female students’ education and STEM.

**Background on Gender Issues**

**Gender/Female Issues**

Gender subordination is a universal phenomenon and this subordination is evident in how women and girls access resources in society including, education (The National Women History Museum, n.d.). In early modern societies, biased theories about gender and the perception of the role of women as being domestic have kept women away from accessing formal education. Many of these theories and perceptions are determined by customs, traditions, and the patriarchal mindset of the society in which they live (Maathai, 2006; Maerten, 2004; Mohanty, 1988). Prominent theorists of early civilization, such as Rousseau, argued that women are not only intellectually inferior to men, but are also unable to perform
work requiring muscular or intellectual development (The National Women History Museum, n.d; Schwartz, 1984).

This legacy has continued today in most parts of the world, in which women still face challenges of being perceived to be equal to men. This include sexual violences (Campell & Salem, 1999; Hagberg, 2002; Mohanty, 1988), lack of access to resources (Boserup, 1970; FAO, 1998), and lack of access to education (Adeyemi & Adeyinka, 2002; Kouraogo & Dianda, 2008; Maathai, 2006; Maerten, 2004; Medel-Anonuevo, 1995; Mohanty, 1988).

The formal education of females became popular when co-educational advocates started to argue that boys and girls should be educated together (Lucidi, 1994). Lucidi (1994) also argued that this advocacy birthed the initial stages of the feminist movement. Started in Western countries and led by white middle class women, blossoming of the movement during the 1960s created an awareness of sexual discrimination in all areas of society, which led to the enactment of laws to protect women’s rights (Lucidi, 1994).

In general, feminism focuses on gender inequalities such as right to vote, right to own land and properties, women’s reproductive rights and political representations (Grossman, 2015). At the work place, feminism advocates for work rights including maternity leave, sexual harassment, equal pay and equal career opportunities (Grossman, 2015). Grossman also argued that the movement offers a framework to women to express their perceptions, experiences, frustrations and discuss their ideas. It also allows them to reflect on how they perceive themselves and everything around them (2015, para. 3).

The World First Conference on women was organized in 1975 in Mexico. It was organized by the United Nations Development Funds for Women (UNIFEM) with the aim to
promote women’s rights (UN Women, n.d). Whatever form women have used to express
themselves, their aim and purpose remains the same: to better women’s lives.

African feminism seems also to concern itself with the same grand themes similar to
women in Western countries experiences. Although it has its roots from the western
feminism, the African feminism has embraced multicultural and global perspectives which
acknowledge the impact of the intersection of gender with race, class, colonization and
exploitation of women in Third World countries (Maathai, 2006; Mohanty, 1988; Steady,
2005).

**African Feminism Perspectives**

Women’s studies scholars agree that many forms and ways of expressing feminism
exist. In Third World countries, feminism has been associated with post colonialism heritage.
This is because colonial oppression is believed to have the most significant impact in Third
World women’s lives; politically, socially and economically (Mohanty 1988; Steady, 2005).
Mohanty (1988) and Steady (2005) argued that African feminism is strongly influenced and
shaped by the activism against colonial rule. During the colonial era, women were
discriminated against as colonized people and as females.

In some Third World countries, feminists advocate claimed that Western feminism
failed to examine how African women experiences are different from the Western feminism
experiences (Mohanty, 1988). Mohanty (1988) also argued that women from Third World
countries experience greater inequality at the intersection of racism, homophobia, and
classism. An understanding of this complexity is an important aspect of understanding
African and Third World women’s lives.
As mentioned before, steps have been taken in many countries to promote gender equity. Burkina Faso representatives have signed and ratified international conventions and laws as conditions for building successful democratic nations. Recently for example, the Parliament has passed the law (no 010-2009/AN du 16 avril 2009) requires a quota for women with the aim to increase women’s representation. Despite the new laws to promote gender equity, women’s access to education is still problematic in Burkina Faso (Table 1, Table 2, and Table 3). The females’ achievement in school is still consistently lower than their male counterparts, especially in STEM (Shepardson & Pizzini, 1992).

**Social Construction, Gender Roles and Culture**

Today’s female students have seen women occupy various non-traditional roles such as doctors, lawyers, police officers. However, research shows that most girls still see occupations as gendered in the most stereotypical ways (Burger & Sandi, 2010). From their parents, children learn through the process of socialization how to be male or female (Chapman, n.d.). Socialization process, therefore shapes and reinforces the gender roles in society.

Before children are born, society has already categorized what is acceptable for each gender role. Good parenting involves both nurturing and educating children. In this process, the family’s values and traditions are passed from one generation to the next (Kernan, 2012). As Cramaruc (2010) argued, if a girl has seen her mother only as a wife, cooking, and taking care of the house, that girl will be challenged when considering a change in gender roles for herself, “because her mother’s model has become a symbol of her world” (para. 1). It is
therefore, important to note that socialization into a particular culture may affects school enrollment and retention in some countries (Hagberg, 2002).

In his study of western culture, Hagberg (2002) found that there is a positive relationship between education and identity. He argued that sending children to school in Western countries is not only a question of money and other resources, but it is also a question of opting for a modern way of life. Stevens (2008) supported Hagberg’s claims, as follows: “Privileged parents put their children through schools so that they might acquire official licenses to occupy relatively desirable positions in government ministries, religious organizations, and the myriad bureaucracies of modern capitalist society” (p. 99). In Burkina Faso, for example, the Sahelian north is populated by nomad people for whom schooling is not a tradition. Nomad communities move with herd animals from one place to another, rather than settling down in one location. Their identities are linked to the animals that they worked with.

The lack of emphasis on education is not only seen in Nomad groups. In many regions of Burkina Faso, society devalues education for women or simply prevent them from pursuing a degree in education and specifically in STEM education. There is still a cultural belief that women engaging in "male careers" such as engineering, technology, and architecture are somehow abnormal and will be poor prospects for marriage (Mushibwe, 2013).

These stereotypes do not come naturally (Shepardson & Pizzini, 1992). There is a general consensus that the media plays an important role in gender socialization within societies. Media such as television in Burkina Faso tend to reinforce traditional gender stereotypes and contribute to making such roles look natural (Chapman, n.d.). Not only do
gender stereotypes affect female students’ abilities to learn but, they also impact the females’ interests and areas of study.

**Science and Gender Disconnection**

The disconnection between science and gender is not specific to Third World countries. Many developed countries experience similar challenges. Despite efforts to provide social justice and equity, O’Neil (2000) and Sadker and Sadker (1985), both argued that there is still gender disparity between boys and girls, especially in STEM. The situation has led to more research on the issue.

As previously discussed, scientists have proven that gender roles are not biologically determined, but socially constructed (Chapman, n.d.). Believing that women have less aptitude for science than men is more of a myth than a reality. There is no convincing evidence that women’s representation in science is limited by some innate quality (Belsky & Beaver, 2011). Instead, people learn within their cultural context what sort of behavior and personality are appropriate for males and females (Chandler, 2011). Research on genetics has shed new light on the issue of women’s academic aptitude when compared to men. Belsky and Beaver (2011) argued that there is a mutual interdependence between genes and environment, not the individual gender. The discrepancies between the performances of girls and boys in education have led some critics to argue about the effects of gender bias in education.

Even though the total number of women who graduate from college is continuing to rise in many countries in the West, research shows that women still lag behind men in STEM. According to De Wise (2010), United States’ women now hold a nearly 3-to-2 majority in
undergraduate and graduate education. He found that in 2009, a total of 5,130 women received a doctorate diploma compared to their male counterparts who received 2,488. In health sciences, women earned 4,851 diplomas and men 2,056. Additionally, in behavioral science, women earned 4,271 diplomas and men 2,894. However, De Wise found that in STEM related doctorate programs, women earned only 736 doctorates compared to 2,008 by men. Furthermore, women earned 1,559 engineering degrees, while men earned 5,814. Finally, in physical science, women earned 1,612 doctorates compared to 3,210 men (De Wise, 2010, p. 1). To answer the question regarding why there are fewer women in the science education field, social scientists and feminist advocates have helped to shed light on the issue by examining the educational system.

Sadker and Sadker (1994) asserted that classrooms are “microcosms of society, mirroring its strengths and ills alike” (1994, p. 23). They concluded that “the normal socialization patterns of young children often lead to distorted perceptions of gender roles [that] are reflected in the classroom” (Sadker & Sadker, 1994, p. 23). Upon entering school, girls perform equal to or better than boys on nearly every measure of achievement, but by the time they graduate high school or college, they are trailing behind (Sadker & Sadker, 1985). This can be partly explained by what girls are exposed to in the classroom settings.

According to Chapman (n.d.), gender biases are taught implicitly through the resources chosen for classroom use and in the teachers’ interactions with the students. In order to create a more equitable learning environment for all children, teachers need to be aware of their gender-bias tendencies. They should also be provided with strategies for altering that behavior, as well as having access to gender equitable materials.
A research study conducted by Kiefer, Francisco, and Sekaquaptewa (2010), on young undergraduate women enrolled in an introductory calculus course, found that stereotypes and gender identification may affect female performance in mathematics. They discovered that women who possessed strong implicit gender stereotypes (for example, automatically associating "male" more than "female" with math ability and math professions), were likely to identify themselves as “feminine” and performed worse relative to their female counterparts who did not possess such stereotypes (Kiefer et al., 2010, para. 1). The same study found that underperforming women are less inclined to pursue a STEM career. They are also more than twice as likely as men to drop out once they begin the first year of the program. In this way, women may come to distance themselves from feminine characteristics if they want to maintain a strong identification with their math-related field (Kiefer et al., 2010).

The threat of stereotypes offers one of the most important factors that affect women’s math performance, career choices and career achievement (American Psychological Association, APA, 2010). The study also found that “teachers who believe in the stereotype that girls are not good in math puts them at a disadvantage and undermines their math performance” (APA, 2010, p. 1). According to Rydel et al. (2010), negative stereotypes also affect learning, and not just performance. Over time, the negative stereotypes of women ultimately decrease their cognitive resources. Beside the classroom materials, female students’ aptitudes affect their learning as well as their learning environment.

Additionally, a study conducted by the University of Chicago (2010), consisting of 52 boys and 65 girls, found that female elementary school teachers who are anxious about math pass on to female students the stereotype “that boys, not girls, are good at math” (p. 1).
Researchers concluded that having a highly math anxious female teacher may push girls to confirm to the stereotype that they are not as good as boys at math, which in turn, affects girls’ math achievement (University of Chicago, 2010). When girls internalize these beliefs, they soon lose confidence in themselves and perform badly.

Although girls grow up seeing women in some non-traditional roles, (doctors and lawyers), and men performing what was once considered feminine jobs (elementary school teachers and nurses), research shows that even though girls may be aware of these examples, they still see occupations as gendered in the most stereotypical ways (Burger & Sandi, 2010). This sexist division of labor has confined women to fit within their traditional gender roles (Marinova, 2003). Also, the presence of gender bias, entrenched into policies, has discriminated against women and prevented them from achieving their potential (Burger & Sandi, 2010). Research has shown that when girls are given the proper attention, materials, and encouragement, they can perform as equally well as boys (Else-Quest et al., 2010).

**Women’s Contribution to Science**

The previous section examined the issues and factors that affected female students’ access to STEM education. It is important to also examine participation and contribution to science.

The history of science has taught us that men have made all of the great discoveries: Newton, Einstein, and Maxwell, for example. It seems that there is no female equivalent. The same journey into the history of women in science shows us that women were kept away from school in general, and from science in particular, for ideological, religious, social, and perhaps political reasons. However women have played an active role in science, including human
science and animal science. It is known that ancient civilizations gave great value to women healers and in many African countries, those roles are still highly revered (Howard, 2006).

Human knowledge, including the knowledge of the natural world, has shaped science and supported theories. Women and men together have researched and found solutions to our human needs (Howard, 2006). Howard (2006) documented a 400-year history of women in science and technology. She reported that she hoped women in technical and even non-technical fields would feel a sense of pride as they read about the many achievements that their gender has made throughout history.

Since early times, women in Europe and the United States, as well as many developing countries, have been responsible for the pharmacological knowledge needed to attend to the daily healings in the household. Most mythology and religions have placed beginnings of agriculture, laws, civilization, mathematics, calendars, time keeping and medicine into the hands of women (Howard, 2006).

In this contemporary time, women’s contributions to the advancement of science, as well as in other disciplines is easy to perceive. For example, Trotula of Salerno, a woman who lived in Italy during the 11th century, is considered the world’s first gynecologist. She was known for teaching men about women’s health, and is also well-known for writing the book *The Diseases of Women*, which has contributed to the advancement of research in the medical field (Amt, 1993).

The first well-known woman scientist in the modern world was the European scientist Marie Curie. Known as the mother of modern physics and the pioneer in research about radioactivity (Chazal, 2006), Curie is also the first person to win Nobel Prizes in two different
scientific disciplines: physics and chemistry. She is the only female out of the four people to win a Nobel Prize twice. Another, contribution, the helical structure of DNA, was largely developed by a woman, Rosalind Elsie Franklin (Chazal, 2006).

In many societies, such as regions of Asia and Africa, it would be challenging to provide a timeline of women’s contribution to science. In these regions, women have been responsible for local agriculture and livestock breeding. These activities enabled the women to develop knowledge about their environment (Boserup, 1970). Boserup (1970) also argued that women are continually in touch with the environment where they get most of the resources that affect their social conditions. Following the work of Boserup (1970), on women’s role in the economic development in the Third World countries, the UNDP has established a special Division for Women in Development (DWD), encouraging the involvement of women when establishing policies on industrialization, food and agriculture, science and technology and social development (Abadian, 1996).

Arguably, women have made discoveries through history, but cultural and gender discrimination against women have historically negatively influenced their participation in STEM type fields. When these barriers are removed, history has also shown that women can become leading figures in science. Having more women in scientific careers enlarges the pool of innovative human capital.

**Approaches to Promote Female Students in STEM Education**

According to Darling-Hammond (2006), the 21th century is characterized by the availability of abundant information and advanced technology, which rapidly changes society. Future jobs will require strong skills in the areas of mathematics, technology, and science. In
In order to compete in this global economy, countries will need to educate their program developers to include women. Arguably any development efforts made without taking into account the gender approach have failed (Jacobson, 1992). As a result governments have developed programs and sponsored educational organizations with the goal of attracting more females in STEM related fields. In the United States, the government has recognized the benefits of gender equity and has invested $2.3 million into the Women’s Equity Program with the goal of closing gender gaps in the STEM disciplines (US Department of Education, 2010, para. 57). President Obama also stated,

recognizing the gaps in career prospects and achievement for women in the sciences, the program aims to help women match the gains achieved elsewhere in the professional world in fields of engineering and technology, where the workforce was over 75% male in 2009. (para 58)

President Obama’s argument was supported by Linda Darling-Hammond (2006). She argued that the 21st century is characterized by the availability of abundant information, advanced technology, a rapidly changes society, greater convenience in daily lives, and keener international competition. She also added that in order to respond to the demands of the 21st century, people will need to have strong skills in areas including mathematics, technology and science. In addition, businesses are operating in an open global economy in which employers will be willing to pay twice the price to get the specific skills (Darling-Hammond, 2006).

As research continues to document the benefit of women participation in STEM education, several countries are making efforts to promote more females into the field (US Department of Education, 2010,) Burkina Faso needs to investigate its educational and cultural systems in order to promote and retain female students in STEM programs.
While several studies have identified the problem of the enrollment of female students in the STEM programs, few studies have examined the success and challenges of female student in STEM programs in Burkina from the perspectives of the female students themselves. This study therefore provides a new ground within which to investigate the problem of low representation of female in STEM education.

The next section provides an insight into the educational system in Burkina Faso. An understanding the educational system is an important aspect of understanding the female students narratives.

**Burkina Faso’s Educational System and Stem**

Prior to 1900, the people of Burkina Faso used oral tradition to teach their children how to live in the world, using cultural and religious rites, storytelling, folktales, dance and arts (Marah, 2006). In this way, the entire community passed on their beliefs and traditions to the next generation. However, this system drastically changed with the arrival of western religions, modifying the focus more on literary and academic work (Adeyemi & Adeyinka, 2002). According to the Ministere de l’Enseignement de Base et de l’Aphabetisation / 
*Ministry of Basic Education* (MEBA. 2004a), the current educational system of Burkina Faso consists of a formal structure, including schools, universities and vocational training, as well as informal systems such as carpentry, mechanics and literacy training. Formal education began in Burkina Faso with the arrival of the French Roman Catholic and Protestant missionaries in 1900 (Kouraogo & Dianda, 2008). This Western type of education was mainly influenced by the educational system of France, which was the colonizer at the time (Marah, 2006). The educational system in Burkina Faso is currently divided into primary, secondary
and higher education levels. School materials, including the teaching curricula, syllabi and exams schedule, are centrally managed by MEBA and the Ministere de l’Enseignement Superieur et de la Recherche Scientifique/Ministry of Higher Education and Scientific Research (MESRS, 2011).

Although attending school is free, according to the law no. 2001-179/PRES/PM/MEBA (MEBA, 2008), students are still required to pay for their school supplies. Schools often operate with the most basic equipment. Officially, class size is limited to 65 students, but in rural areas classes are much larger (OXFAM, 2011b). According to MEBA (2004b), the average enrollment age for first grade is seven years old. At the completion of 6 full years, admission to secondary school is open to those students who have obtained a certificate of completion from an elementary school. The majority of teachers at elementary schools become certified only after having completed secondary school. This is the equivalent of having finished grade 8 in the United States. An additional two years of specialized training certify them to become teachers. At the secondary level, education is divided into two main parts: the junior high school level and the senior high school level. Junior high school education consists of a 4-year program, and is open to students who have passed their primary school national examination and obtained an elementary school certificate. In this program, students study languages (French, German, Arabic, and Spanish), geography, science (biology/geology/zoology, physics, and chemistry), and mathematics. At the end of their 4-year program, students are required to take and pass a nationwide examination that enables them to attend a senior high school for further general studies. Those
who do not pass their examination or decide not to pursue a senior high school education are permitted to compete for entrance in vocational education.

Vocational schools entail two to three years in training programs that enable students to pursue their career as schoolmasters, nurses, midwives, police, customs officers, or public administration clerks (MEBA, 2004b). The senior high school education consists of a 3-year general study program which is completed by taking a baccalaureate examination. Upon obtaining this diploma, the student can enroll in college and university.

Researchers have demonstrated that all the political parties that have ruled Burkina Faso after its independence in 1960 have put a strong emphasis on education, especially basic education (Kouraogo & Dianda, 2008). Kouraogo and Dianda argued that, consistently, education has been a top priority for leaders and they have allocated a sizable part of the federal budget for this sector, up to 25% in 2009 (p. 1). However, despite these efforts, there has been little improvement in the retention rates for female students (Table 2 and Table 3).

The country registered a very slow enrollment rate for most of the past century, growing from 0% in 1900 to 5% in 1960, then to 16.8% in 1983 (p. 23). During the past 25 years, significant improvements have been achieved. The gross enrollment in first grade jumped from 800,000 in 1998 to 1,600,000 in 2007 a 100% gain (Kouraogo & Dianda, 2008, p. 24).

Today, efforts in the educational sector are geared toward the MCC’s goals of universal primary education and access to equitable quality education for all by 2015 (Kourago & Dianda, 2008). The goal has been to emphasize the importance of education for all children. However, there is still disparity in gender enrollment.
Previous research done on this topic by FESCIFA/ PRESCIFA in 2001 and 2004 in Burkina Faso, show a need to improve female students’ enrollment and retention in schools, specifically in STEM where females were less represented than males. These studies also revealed that female students did not generally show an interest in science and technology (FESCIFA/PRESCIFEF, 2004). Therefore, this study analyzes the responses of a selected few females as to their successes and challenges. The study provides information to educational stakeholders about the female experiences. The researcher believes that the study will lead to more investigations for best strategies that would increase female enrollment and retention in STEM educational programs.

**Summary of the Chapter**

Research has proven that any economic development efforts within a country have failed because of the neglect of taking into account gender issues (Jacobson, 1992). It is also recognized that although women comprise half of the world’s population, they perform nearly two-thirds of its work hours, receive one-tenth of the world’s income, and own less than one-hundredth of the world’s property (Dorsey, 2007). So, in order to usher in a greater, more equitable future, it is necessary to educate women in STEM, because these inequalities prevent the world from reaching its full potential. For developing countries such as Burkina Faso, female education in STEM is likely to help the country in many areas. According to the World Bank (2011), “Education for girls is the key to the health and nutrition of populations; to overall improvements in the standard of living; to better agricultural and environmental practices; to higher gross national product; and to greater involvement and gender balance in decision-making at all levels of society” (p. 62).
In the recent past, researchers and educational leaders worldwide have attempted to raise awareness about female underrepresentation in STEM (AAUW, n.d.; Chapman, n.d; De Wise, 2010; FESCIPA/PRESCIFE, 2001). They have developed programs and sponsored educational organizations with the aim to attract more females and to reinforce their capacity in STEM education (AAUW, n.d.; US Department of State, 2012). This is important because today’s economies are driven by science and technology. In order to usher in a greater, more equitable future, it is necessary to educate women in STEM. Inequalities in educational opportunities prevent countries to reach their full potential (Dorsey, 2007).

For generations, boys’ education in Burkina Faso has been nurtured. And, given the opportunity, females have the ability to be just as successful. Promoting females’ education might provide a new perspective on an old problem because an educated woman would be willing to educate her children. This will create a collective group of motivated individuals with knowledge about their country and about what is needed to bring societal change (Burkina Faso Education Profile, n.d.).
Chapter 3: Methodology

This study explored the experiences and perceptions of female students participating in STEM programs in Burkina Faso. The researcher analyzed the meaning of their challenges, and considered how a comprehensive support system would help prevent dropouts among female students and increase the number of female students succeeding in STEM.

By conducting in-depth personal interviews with the girls, the researcher intended to examine the challenges and successes of the females in STEM programs in Burkina Faso. The study also provided insights into the school system in order to formulate recommendations for increasing the enrollment and retention of female students’ in STEM programs.

The following general research questions guided the study:

1. What are the perceptions of females students enrolled in STEM program about schooling?
2. What impact do the female students report the STEM program has had on their leadership skills?
3. What issues or barriers to program completion did students report encountering during their STEM program? What strategies did they report using to overcome these barriers? What strategies did they report trying that did not work?
4. What suggestions and recommendations did the students report for better promotion and retention of female students in STEM programs in Burkina Faso?

The detailed analysis of these questions provides information to help in understanding the experiences of female students in STEM programs in Burkina Faso. It also helped to
inform the educational policy in promoting and increasing the enrollment and retention of female students’ representation in STEM programs.

**Chapter Overview**

Feminist qualitative researchers and scholars have argued that the adequacy of a research method depends on the purpose of the research and the questions asked (Locke, 1989). For example, Harding (1998) stated that methodology is a method or technique of data collection as well as theory and analysis of how research does or should proceed (p. 10). Choosing a methodology requires an understanding of the nature and the goals of the research, as well as the researcher’s position regarding the research as a process or a means of accomplishing those goals (Mwangi, 2009).

The first section of this chapter describes the methodology used in this research. Because this research was designed to capture stories of female students in STEM programs in Burkina Faso, a feminist qualitative narrative methodology was used with the goal of validating their narratives.

The second section presents the research design. The study focused on the experiences of female students’ in STEM education programs; this research used a case study design.

The third section emphasizes the identification of the respondents. Because specific respondents were needed to provide appropriate information and meaningful data were needed to understand the problem and experience of females studying in STEM education, a purposive technique was used to identify the respondents.

The fourth section analyzes the method of data collection, ethical considerations, and analysis of the data. In-depth interviews were used in this research to understand how the
respondents had negotiated obstacles and barriers to successfully achieve outstanding academic standards. The researcher set the parameter of the study with ethical considerations. For this reason, this research was conducted according to the recommendations of the Belmont Report and a research proposal was submitted to the IRB commission before the beginning of this project.

The fifth section focuses on making sense of the data derived from the interview transcriptions, field notes, and observations. The researcher analyzed each respondent’s narrative separately and highlighted the main points that each respondents raised. The last step involved analyzing the collected data in order to connect each participant’s story to the others and to develop the strategy of writing the discussion and recommendations section of the dissertation.

**Methodology: Feminist Qualitative Case Study**

This study was designed to capture the personal stories of female students. The feminist qualitative case study approach, focusing on how individuals or groups make sense of events and actions in their lives, provided the theoretical framework of the study.

Narrative or storytelling is a method to study the life and experiences of women (Riger, 1999). For example, Campbell and Salem (1999) contended the effective way to understand these experiences and attitude of women is through interviews. In the data gathering process through storytelling, women are involved as active participants, active creators, and active interpreters of their knowledge.
Because this study focused on narrative stories that the female students in STEM program in Burkina Faso told about their experiences, a feminist qualitative research was the appropriate methodology to use in order to validate their narratives.

The process of understanding the research nature and goals was framed within feminist theoretical paradigms. Schawndt, stated that a paradigm embodies assumptions about the world that we believe and the value that we hold (as cited by Mwangi, 2009, p. 31).

This research was influenced by feminist qualitative approach which emphasized the fact that knowledge is value-laden, and reality is based on multiple perspectives, and that truth is grounded in everyday life involving social interactions amongst individuals” (Mitchell & Egudo, 2003). In other words, a feminist qualitative research approach relies on the idea that realities are socially constructed and highly contextual and that stories that people tell about their lives are a basis of knowledge construction. Therefore, the stories the participants told about their experience with STEM would be instrumental in understanding not only the nature of the STEM programs in Burkina Faso, but also how best to improve these programs to benefit female students and prepare them to be leaders.

Research Design

Because the focus of this study is on the impact of STEM on female students’ education, this research also took a form of a case study. A case study is an ideal research design when a holistic, in-depth investigation of an issue or phenomena is needed (Feagin, Orum, & Sjoberg, 1991). According to Reinharz (1994), the two major purposes for a feminist case study are to analyze the change in a phenomenon overtime and to analyze the significance of a phenomenon for future event. Given this definition, the case study design is
invaluable in examining the issue of female students’ participation in STEM education in Burkina Faso. By focusing on the sample, the case study also allows to connect this issue to the larger society and societal structure including education and culture. The study emphasizes on the relationship between the piece (the female students experiences) to the whole (the whole is the society as well as the educational system).

**Identifying the Respondents**

The researcher used a purposive technique to identify the respondents. This method enables one to identify specific respondents who will provide appropriate information and the meaningful data needed to understand the problem (Seidman, 2006) in this case, the experience of female students studying STEM education.

The researcher selected four girls, defined as traditional female students studying in STEM education program in Burkina Faso. The respondents were completing their high school education and had achieved a high academic standard. The selection of the key respondents was conducted with the cooperation of their school, and with the respondents’ consent, or her family’s consent if the female student was under 18 years old. The respondents were given the following pseudonyms to ensure their privacy: Amy, Fanta, Sandra, and Patty.

**Method of Data Collection**

In-depth interviews were used in this research to understand how the respondents have negotiated obstacles and barriers to successfully achieve the “A” academic standards. Seidman (2006) stated that “interviewing helps to understand the world outside ourselves, and stories represent a way of knowing” (p. 19). “It provides access to the context of people’s behavior and thereby provides a way for researchers to understand the meaning of that
behavior” (p. 19). This process implies intimacy, self-disclosure and “believing the interviewee” (Oakley, 1981, p. 31). To accomplish the purpose of this interview, the researcher took into account some basic considerations.

First, the researcher was responsible for creating a safe atmosphere in which the participants were comfortable enough to share their stories. For this reason, participants were given the decision to choose the place where they would feel most comfortable to share their stories. The researcher conducted two to three interviews with each respondent. The length of each interview was about one hour. Every interview was transcribed before the next interview was done. Interviews were recorded and participants were notified beforehand. An interview guide form was used which had some open-ended questions and also some closed-ended questions (see Appendix C).

The researcher used the reciprocity in her relationship with the respondent. She sought the permission of each respondent to tape record all the interviews. The open-ended questions were designed to allow the respondents to decide and talk about the issues that were most important in their educational and life-related experiences.

The structure of the interview established a conversation involving the participatory model. This model laid out a beginning, middle, and end, thereby enabling the participants and the researcher to develop a trusting relationship in the beginning of the interview and to establish an understanding by the end (Vygotsky, 1987). For Schuman (1982), a series of three interviews allows the interviewer and participants to let the relationship and the conversation build through each interview. Each interview will serve a purpose (p. 23). For this reason, an open-ended, in-depth inquiry was the best method to carry out this study. This
method allowed both participant and interviewer to maintain a sense of focus at each interview session. Moreover, each session laid the foundation that helped illuminate to the next. The purpose of each interview was defined and guided the process. This enabled the researcher to better structure the work.

After the first interview, the information gathered was analyzed. During the second round of interviews, more information was revealed and concepts that had not been fully developed were revisited.

Before conducting the interviews with the intended participants, the researcher piloted the interview questions with young girls studying in STEM education in Burkina Faso. The purpose was to identify problematic questions, general flaws, and areas that needed to be expanded.

**Data Analysis**

Making sense of the data derived from the interview transcriptions, field notes, and observations requires a process of analysis that involves disassembling, coding, sorting, and sifting (Mwangi, 2009; Seidel, 1998). Additionally, the researcher used the data analysis system developed by Seidel (1998) which consisted of three steps: noticing, collecting and thinking (p. 11).

The noticing stage is about managing data. First, the researcher examined the preliminary research questions and the related literature in order to provide the grounded theory that enabled her to define critical categories and themes, as well as potential coding methods. In this process, the researcher used the technique of color coding. Demoing was
another technique that the researcher used to record her thoughts and ideas as they evolved throughout the study, including extensive notes and comments during the interviews.

After collecting all the data from the interview the researcher analyzed each respondent’s narratives separately and highlighted the main points that each respondent raised.

The last step involved analyzing the collected data in order to connect each participant’s story to the others and to layout the strategy of writing the discussion and recommendations section of the dissertation (pp. 1-15).

**Summary of the Chapter**

This chapter addressed the method used in this qualitative case study. The research focused on female students’ completing their high school degrees in STEM education in Burkina Faso. The respondents were purposively selected and data were collected through interviews addressing the research questions. The procedure for the collection of data included paper notes and a tape recorder. The data were transcribed and analyzed using color coding techniques, and field notes in order to highlight the main points that each respondent raised.
Chapter 4: Narratives of the Girls

Lagemann (1997) argued that education is a science of people (p. 51). This definition makes it not so different from social science. Both cannot achieve their purpose without having an interest in people’s lives. People’s life is their values, attitudes, beliefs, and relations with themselves, the social systems, institutions, and structures (p. 15). As such, the idea of exploring students’ experiences in an educational research linked all these factors together. Educators have understood this value of students’ experiences and since early 1900s; they have increasingly refrained from logic or speculation toward building knowledge deriving generalizations from empirical data (Jamieson, O’Mara & Warren, 1991).

The purpose of this study was to examine the challenges and successes of female high school students studying in a Burkina Faso in the STEM program. Information was collected through an interview process. As argued feminist advocates, the power of voices is important in research. Voices of the people themselves are the best to inform us about their experiences (Solnit, 2004). The narratives of the girls shed light in their lived experiences while constructing meaning of those particular experiences.

In the following pages of this chapter, the responses of four female students, taken at the end of their high school STEM program, have been analyzed individually. The students were interviewed in the following order: 1-Amy, 2-Fanta, 3-Sandra, and 4-, Patty. This process enabled the researcher to identify patterns in the narratives of the students and to explore emerging complexities of their personal stories.

The narratives of the students expose the continue challenges of girls in high school’s STEM programs in Burkina Faso. As with numerous other female students attending STEM
programs in Burkina Faso, the students in this study identified significant factors including culture, religious, socio-economic and political issues that affected their decisions to embrace and achieve their goals in STEM education. Pseudonyms were assigned to the participants in order to uphold their anonymity.

This chapter presents the narratives which evolved around the experiences of high school female students enrolled in STEM in STEM programs in Burkina Faso. As stated in chapter 1, this study addresses the following research questions: (1) What are the perceptions of females students enrolled in STEM program about schooling? (2) What impact do the female students report the STEM program has had on their leadership skills? (3) What issues or barriers to program completion did students report encountering during their STEM program? What strategies did they report using to overcome these barriers? What strategies did they report trying that did not work? (4) What suggestions and recommendations did the students report for better promotion and retention of female students in STEM programs in Burkina Faso?

**First Narrative: Amy**

Narrative inquiry as a way to understand the experiences of others. This led the researcher to analyze the data from the interviews. The first interviewee was Amy. She was 17 years old and came from a monogamous family. Both parents were well educated and provided a descent standard of living. Amy was the second born child and had two siblings (an older sister and a younger brother). Her older sister was studying in a European country after graduating from a STEM program in Burkina Faso. Her younger brother was also
enrolled in a STEM program. Amy was one of the three girls in her class who were completing their high school program.

In this first narrative, Amy did not see any major obstacles related to her being a female and embracing a STEM education program. She was not challenged at school, in her family or within the community. She had always earned good grades in science and mathematics and loved these subjects compared to language arts subjects. Her goal was to study actuarial science in Germany after graduating from high school. One of Amy’s alternative options after graduation was to continue her study in the United States since she was already a bilingual. Her mother was a native of neighboring English speaking country. Another goal that Amy revealed was to earn a doctorate degree.

Amy rode her own motorbike to school. She always arrived on time for school because she did not need to use public transportation. She admitted that she was blessed that her parents could afford to help her with her transportation. She had a little financial support for gas and other needs from her parents.

Amy spoke about how education had always been valued in her family. She explained that:

. . . Since we are in elementary school, me and all me siblings always had private tutors who came regularly at home to help us with our assignments. . . I know this had helped me a lot. The private tutors helped us with math and chemistry. My mother helped us with our social studies assignments. . .

She reported that this had not always been a fun experience. “We had less time to go outside and play with other kids and our friends in the neighborhood.” Amy also reported that with time, this pattern became a routine and their way of life. . . “Every child in this household knows and obeys the rules.” Amy came from a family where both parents had a busy
schedule. Her father was travelled outside the country. At the time of this interview, both parents were out of the country.

Amy reported that she was very proud to be enrolled in the STEM program. She shared that “you make the headline in the school for being part of the fewer women enrolled in the program…and this made you feel special.” Some of her classmates dropped out of the program at the end of their first year in the 3-year program. She stated that her critical thinking enabled her now to see the challenges the other girls were sharing with her. She understood that one of the main challenges faced by the girls that dropped out of the program was their struggle to maintain good grades consistently. “This gives you hope that the future grade level would be fine.” These obstacles could be avoided with some extra work. This requires access to additional educational resources that many of the girls did not have. For Amy, her parent’s financial support helped her out. In addition to private tutoring lessons, her parents bought her a computer and some extra books that enabled her to complete further readings on lessons she did not fully understand.

Amy also talked about the status of females in Burkina Faso society. This theme was not only about females trying to obtain an education in STEM but also the challenges in their everyday lives. According to her, those families with some very strong patriarchal norms, traditions forced parents to educate their female children differently from males. “Girls are given all the work in the house. They have to cook, clean, take care of their siblings and at the end of the day, they become very tired. How can they do well in school compared to boys?” Amy wanted the girls in these homes to be empowered to change these traditional bounds. They would seek for help if they could share their issues with someone. . . “They is nothing
like being educated . . . it is just like normal.” She recommended that girls who want to pursue their education in STEM have confidence in themselves and not be afraid to break barriers and seek help from others. She also believed that there should be more communication between the school and the parents.

Amy and many other students with the same family background view education as “just like normal”. She did not face the same burden as many other females who dropped out of the program. Her leadership ability gave her the confidence that, with additional resources and hard work, she would meet her goals. Her critical thinking skills led her to understand how families with culturally-rooted traditional thinking limit girls’ opportunities for success by placing on them the burden of household chores instead of sharing them evenly with the boys in the family.

One of the most striking points was Amy’s comment about female students not seeking help when they are in situations of need. This last comment requires more attention. Usually, students’ performance problems become apparent to their teachers when they experience difficulties in their social lives. The signs can be physical, sexual, or emotional. Whatever the issue may be, teacher could gain an understanding of a student’s problems by observing his/her behaviors (Jamieson et al., 1991). Addressing those issues that potentially affect students’ performances is an integral part of the mission of educators in the practice of teaching and learning.
Second Narrative: Fanta

In this narrative, Fanta shared her experiences in the educational setting while providing an understanding of the cultural boundaries in which she lived as dictated by her traditionally-oriented family.

Descriptively, Fanta has somewhat of a large family. Her father is physically handicapped. Her mother operates a small business in the local market. Both parents were uneducated. The family of Fanta includes her grandparents and uncles and relatives from the village who immigrated to the city to seek a better life. The family lived in the same compound and shared the family meal together. Fanta’s family was very religious. They practiced their Muslim faith within their family and within the community setting. When the opportunity was given to contact Fanta for the purpose of conducting this research, her father was the person who answered the researcher’s phone call. Fanta expressed needing to obtain her father’s consent before being recorded in the interview.

Fanta was 18 years old. She was completing a high school education in STEM. She was the most educated person in her household. She was the second child in her family.

Fanta said that she felt lucky her parents invested in her education despite her gender. This is because is Burkina Faso parents are known to invest in their children’s education according to gender, birth order or other characteristics. As a result, when a family was able to afford to send a child to school, it was less likely for the child to be a female.

Throughout her academic tenure, Fanta was reported to be a good student. She had always been among the highest five students in her class academically. Reflecting on this matter, she felt that being the best student did not mean a lot to her or to her parents. She
asserted that being illiterate, she was not sure her parents fully understood the value of education. “If school did not go good for us, I don’t think it would have made any difference in my parents’ lives since this was a long term investment anyways.” The mother was still the bread winner of the family. She provided food, clothing, medicine and tuition fees to Fanta and her siblings. Every issue Fanta had in school or in her life she reported to her mother. She later shared her thoughts about her future needs with her older sister.

Fanta connected her comments about her life and her stories, in general, to her older sister to whom she attributed her educational and life accomplishments. Fanta’s sister cut short her own educational aspirations after graduating from junior high school to enter into the work force as a teacher. By doing so, she and her husband were able to provide financial support for Fanta.

Fanta reported that her most challenging obstacles were coping with all the school assignments and finding the financial support she needed to complete her schooling. “Now, I am more appreciative of those who accomplished their educational goal without having financial support. I wouldn’t be able to accomplish what I did without my mother and now my sister’s help” . Like her sister, Fanta also explored the idea of becoming a school teacher after graduating from her junior high school. Her decision was based on the uncertainty she felt about what the future held for her.

As many young girls, she dreamed about a job that would give her security as well as meet her needs and aspirations. In fact, she passed the national examination to become a teacher but was encouraged by the sister to pursue her high school education instead. Her
sister assisted her with the basic needs including transportation fees, clothing, and other expenses.

Fanta also talked about her struggles and her accomplishments during her participation in the STEM educational program. Fanta described her experiences in very rich, descriptive detail about the factors that contributed to her success.

Fanta reported that at the end of the first year of the program, three out of the six female students in her classroom decided to pursue their education in biology and chemistry instead of pure mathematics and physics. She was among the latter group. The teachers of the school, including the principal, challenged her decision with facts about career opportunities that she needed to take into consideration. According to her, this discussion focused on self-awareness and offered her opportunities for reflection. This process of critical reflection enabled her to understand that she had power to transform her and her family’s socio-economic status. Fanta believed that this was an important epiphany that encouraged her to engage more seriously in her studies.

What was the most striking part of Fanta’s interview was that she believed she was an independent learner. She set up her own goals and monitored her own progress. This was because her parents were both uneducated and did not understand the educational system. Within the classroom, Fanta reported that she was always engaged in regular discussions on a variety of issues. “When the teacher brings a new topic to class, it is about developing an understanding of the new material through questions, class discussions and the bottom line the test score.” Fanta stated that the classroom setting was the best place to ask questions since teachers were rarely available to answer student’s questions after class.
In school systems in Burkina Faso, only one staff-room was provided for all teachers. They all met at this place before and after classes and students were not allowed in this room. As a result it was difficult for teachers to meet with students for afterschool coaching due to lack of meeting space. Fanta spent most of her study time with classmates and often exchanged study materials with other groups of students.

In her neighborhood, Fanta was highly involved in helping students with their mathematics assignments. “They don’t call me Fanta here, my name is «Série C».” This is the designated symbol for mathematics and physics major. Fanta was very happy to help the students because she helped them to gauge their learning potential and provided them with suggestions on areas on which they needed to focus more to become better. As a result, she felt like she had to be much stronger.

Beyond her educational experiences and the subjects that she studied, Fanta’s critical thinking skills and her leadership capacity were demonstrated through her ability to discuss issues that limit women access to and retention in STEM.

Fanta believed that the STEM program did not offer rewarding careers for women and girls in Burkina Faso. Despite the hardship and the amount of work that it takes to complete the program goals “the only career opportunity you have is to become a high school teacher or a university professor”. She argued that this was because all STEM education program participants compete for the same scholarships for studying abroad where students have a broader range of fields of specialization from which to choose than what was available in Burkina Faso. The system of distributing those scholarships was completed according to a student’s school performance which was translated into test scores. For her, students in
mathematics and physics majors did not have a fair opportunity to compete for those scholarships. For that reason, Fanta believed that this is one of the major reasons many students with poor family backgrounds changed their educational goals after their first year in the STEM program.

Apart from the career opportunities, Fanta argued that there was a need to break down stereotypes surrounding the idea that her field of study was a male-dominated field and to teach girls that intellectual skill can be grown overtime regardless of gender.” Hard-work and commitment are key parts to success”. Fanta hoped the government would create programs to help girls enroll and retain them in STEM programs. She recommended that these programs create opportunities for hands-on activities while exposing students to multitude professional options.

Fanta’s message to female students who wanted to pursue a career in STEM education identified that a lack of access to resources was a major hindrance. She believed that the majority of the students in STEM came from wealthier families and were accordingly prepared since their early years in school to understand mathematics. However, she believed that making connections with classmates and teachers can be helpful for students coming from poor families in getting the assistance they need to succeed.

What we can conclude from Fanta’s experiences was that preparing students for life outside the classroom should also be the focus of educational leaders. There is a need for a strong support system outside of classroom where female students can be mentored and empowered to make correct career choices for themselves. As Nelson Mandela said during
one of his speech, “Education is the most powerful weapon we can use to change the world” (2003).

Likewise, education is the most powerful weapon to elevate the lives of girls and women in Burkina Faso. Fanta was able to think critically and has used that knowledge to make rational decision for herself and for her community. Fanta engaged in transformative practices with the students living in her neighborhood and created a learning community through her self-confidence, sense of social responsibility and humanizing interactions.

**Third Narrative: Sandra**

This narrative story was provided by Sandra. Sandra believed that women were not doing well economically in Burkina Faso, but that education should help them do better. She viewed STEM education as a great opportunity for women to earn more money and participate in decision making processes that would help other women.

Sandra was 18 years old at the time of the interview. She grew up in a family in which she was the only child and under the care of her father. Her parents divorced when she was six. Her father did not remarried. Sandra and her father lived in a large compound shared by other relatives. Her father dropped out of school when he was in junior high. He operated a family business. Sandra wished to further her education by earning a master degree and possible a Ph.D. in the United States.

Sandra said that she did not want to stay in Burkina Faso and waste her academic potential. Sandra’s father motivated and inspired her. In her opinion, he wanted her to be “somebody”, but Sandra also believed that if a woman did not have the means to achieve
higher education, she could still learn to do something in which she was interested and could achieve something to help her life.

Sandra revealed factors that contributed to her academic success and how she challenged the barriers and obstacles she experienced in school, in her family and her community.

Sandra mentioned the culture of the Yoruba tribe (originally from Nigeria) in which women had acquired reputations for participating in aggressive economic activity in trade and marketing of products or services. In Burkina Faso, the roles of women vary according to their kinship and ethnic groups. Traditional cultural rules applicable to particular communities regulate the lives of the vast majority of both men and women; interpersonal qualities and practices contribute to their success. Because of that, Sandra explained that their culture made them unique, and she felt that the women of her tribe were respected in the community.

Sandra described herself as an easy going and open-minded person. She said that when she sets her goals, she “goes for it”. When complications arose, she tried to solve them by herself before she sought out others for help. “I try to solve the problem jointly with someone”.

Sandra believed there was a difference between male and female student participation in the classroom. She believed that male students talk much longer and tend to dominate classroom conversations more than females. She said this occurred in both the classroom and outside of the classroom. She speculated that the reason for this is possibly because most of her classes were taught by male teachers. Another explanation she gave was that girls were shy, and those who had the opportunity to talk were often interrupted by male students. Once
interrupted, female students often stayed out of the discussion for the remaining of the class. She completed her statement with an anecdote that men tend not to accept contradiction and “raise their voices… maybe to establish a dominant role.”

Sandra was also reflective about her religious faith and the influence it had in her educational accomplishments. She felt that living without her mother brought her closer to God. She spoke from her heart about growing up. She experienced difficulties and sometimes she felt as an “outcast” because she was not able to dress properly like her age group. She believed that these internal struggles affected her confidence at the beginning of her teenage years. However, with time, she believed it made her stronger. Sandra reported that she experienced sleepless nights because she was not feeling attractive to any boy. Even though she believed she was integrated into the school and neighborhood community, she reported that she was frustrated because she thought she was only respected for being intelligent. She condemned female students who slept with older men for with the purpose of earning money.

Sandra believed that by being a STEM major in high school and earning good grades she achieved a sense of autonomy. She became part of a group of girls with whom everyone wanted to become friends. She reported that the principal of the school, as well as her teachers, showed a great deal of interest in her learning experience. They helped her with assignments whenever she asked for it. She also challenged herself to seek help from classmates who understood the class material better than she did.

One striking comment from her was her perception about some of her classmates. She reported that students who have had better life than she has had seemed to have less difficulties in the STEM program. “They have books, computers and other educational
materials given to them by their parents who often travel abroad. If I know where to get them, my dad would probably give me the money to buy them.”

Sandra was given the opportunity to voice her opinion on what recommendations she might have for educational leaders about promoting female participation in the STEM program. Sandra believed that the government should develop sound policies to help females in the STEM program. She reported that she was aware of an association of women who were pursuing careers in STEM that existed in Ouagadougou, the capital, where she was taking her class, but she did not believe that the association had programs that included STEM in high school. She added that many nonprofit organizations were operating in Burkina Faso that were promoting female education such as Plan International, Oxfam-Burkina. She thought their work was primarily to enroll females in school. “They need to implicate themselves more in the higher level too”.

Sandra believed that increasing female students’ presence in STEM programs could be accomplished by preparing them during an early age, prior to high school. She suggested mentorship and tutoring programs with emphasis in mathematics and science with the hope that would build a strong foundation for any STEM discipline. “When students are confident, it breaks the stereotypes that they can do it and be successful as men.”

Sandra also recommended that the government attract more female students in STEM programs by contributing financially to their education through scholarships. “Scholarship should be given to all students who major in pure science and chemistry for example.” She argued that nationwide, less than 20 female students graduate each year from pure math and physics programs. She believed that the hard work of female students should be rewarded.
Sandra’s interview illustrated the struggles of girls in STEM programs and the lack of existence of a support system to help the female students achieve their goals. As she pointed out, the ability of female students to succeed depends in part on the degree of their readiness. The readiness for girls to enroll in STEM education is not embraced fully in Burkina Faso. This is verified by the presence of few female students in STEM programs (see Sandra interview). Educational researchers reported that three key factors contributed to student success across all groups: student engagement, motivation, and exposure to STEM subjects. Students who are engaged in class discussions are more likely to increase their critical thinking skills. This is highly related to the teacher’s instructional method. Because of this, the government and non-profit organizations should support teachers with the appropriate training to better assure appropriate teaching methods. Early exposure to STEM subjects throughout the grades and hands-on experiences have been proven to be effective strategies to improve students’ presence in STEM (AAUW, n.d.)

Sandra stated that female students’ participation in class discussions is sometimes limited due to the interruption by male students. This situation could be changed with the implementation of classroom rules and expectations encouraging female participation. Increasing female presence in STEM programs could lead to increased participation in the classroom. Students may thrive in a setting in which ideas from both female and male students are encouraged.
Fourth Narrative: Patty

Patty believed female students did not need to be academically excellent in order to complete a STEM program. She commented being able to make a life for yourself and a change in your own generation are the most powerful accomplishments.

Patty was 18 years old at the time of the interview and came from a family that could be described as aristocratic. Her father was an official of the government, and her mother was a very successful business woman. Patty was the oldest child in a family of four. She reported that she wanted to be an engineer since elementary school. She said that she believed that if “you are the biggest person and everybody else is under you”, this may have an effect on one’s thinking. She stated that, for her, this was the belief that motivated her to change and study more in mathematics, hopefully to be able to make her dream come true. Her motivations and caused her to want to become a financial expert. Her dream was to pursue her future education in the United States or Canada.

The challenge Patty encountered in pursuing her education in the STEM program was adjusting her social life to the pressures of education. This was a challenge because she described herself as someone who loved to be outside every weekend with friends. “I love having a good time in night clubs with friends… as long as this way of living is not making me failing my classes, I am good.” Patty was a girl who could be described as “beautiful” and who loved to take care of herself. She responded to the comment that “beauty is in the eye of the person who sees it”. She would love to marry after she completes her studies. However, she would like to have a life with someone who is very “smart”.
In a similar manner as other respondents, Patty spoke about her experiences in the school and her socio-environment. She understood the challenges for female students in STEM programs and suggested that the government and the students put ideas together to overcome the issues and challenges.

Patty began the interview by explaining how important the STEM program was to her. She stated that “it is difficult to make a decision when you don’t know if it will be the right or the wrong”. Patty said that she was appreciative of what she could do with her education. She commented that education was absolutely essential for women in Burkina Faso. She believed that more work was needed in rural areas than in cities to encourage females to pursue STEM programs. She stated that people grew up seeing things done in certain ways and, therefore, they believed that, “this is the only way it should be done…they won’t even try something else.” This statement led her to discuss early marriage issues in Burkina Faso. She discussed early marriage and arranged marriages in the village of her mother.

Patty believed that cultural obstacles were still present in the lives of women and in the female students’ experiences in STEM. Female students were not aware of their opportunities in education. She stated that girls still believed they held “a second class status” in classrooms. Many of the female students were shy, and they let their challenges discourage them. She explained that this was a state of mind problem.

Patty reported that one of the challenges she encountered in her junior high school was rejection from her female classmates. She believed that she was viewed as a “bad girl” with low moral values. This was because she wore low cut dresses. “I wore what I want and what I like and I use to hang out with who I want. . . This doesn’t mean I am a bad person.” Now
that she was in STEM, completing her degree, Patty felt that the program caused people to treat her differently. She is treated with more respect.

One of the striking comments Patty made was losing her father confidence that she could succeed in pure a mathematics and physics program. This was because her grades were average and her father was discouraging her not to waste time and money. “My dad thought I was not serious about my future life. Despite the money he spent buying me a computer, books and getting me private tutors, I was not obtaining grades that met his expectations”. Patty reported that when she looked back in the past, she saw that whatever challenge came her way was surmountable. This made her felt very proud.

Patty admitted that sometimes stress took a toll on her, especially when the end of school year came closer, and she was not on top of her schedule. Like the other study respondents stated during their interviews, Patty sought help from teachers, friends and mostly from her private tutors. She reported that the smartest decision she made during that difficult time was to put everything aside and study harder.

She believed her female classmates worked hard at school, but some of them still had to do household work for their family. Patty reported that some of the questions in the interview enabled her to have a better understanding on how a family setting can affect female student success in STEM education programs. She believed that losing focus, even for a short time period in a STEM program, could affect a student’s success if she/he did not have a proper back up support plan. She advised future female students, just like any other students, to be consistent with their study schedule.
In her interview, Patty discussed the importance of the STEM program in students’ lives especially in how it prepared women for future leadership roles. She asserted that everybody could experience difficulties in problem-solving skills since problems are encountered on a daily basis in interpersonal relationships or in business decision. However, she believed that “there are problems that are more severe or complex than others, and it would be wonderful to solve all problems efficiently”. According to her, this requires “analytical skills” that she found in STEM courses.

The narratives of the study participants touched on their perceptions of the STEM program based on their experiences. They provided insight about how they achieved success using their personal motivation to find outside resources and support. They also described how their classrooms are managed. The majority of the respondents noted that girls are shy and feel like “second class” citizens in the classroom. When discussions occurred, male students tended to dominate the conversations while female students tended to withdraw. This issue is related to the cultural challenges that female students face in a STEM major as well as for many other women in Burkina Faso.

Despite their challenges, the respondents were able to pursue their studies to graduation. They used their critical thinking skills to overcome some of their challenges. They actively participated in the learning process through hard work and support from their classmates, parents and their teachers.

The next section summarizes the main points highlighted in the narratives of each respondent.
Narratives Analysis

Earning a high school diploma in a STEM programs is important in Burkina Faso. There is a myth that only smarter students attend these programs. The myth is reinforced by how highly competitive is the access to this field of study. In Burkina Faso, only three schools (two in the capital city and one in the second largest city) offer STEM centered in pure mathematics and physics programs. This limited access makes the program both competitive and viewed as the one of the most prestigious programs in the country.

An analysis of the educational data revealed that fewer than 20 female students were enrolled in these programs each year (INSD, n.d.). Only half of the females graduated by the end of high school. Even though the backgrounds and values of the respondents attending these programs were not addressed in the research questions, the data revealed that the research participants were from different socio-economic levels and religious backgrounds.

Three of the four girls confessed their Muslim beliefs. The fourth was Catholic. Their family socio-economic levels included the upper class, the middle class, and the lower class. The major themes that were central to understanding the respondents’ successes and challenges were as followed:

Parental support: The degrees of involvement of the parents in the respondent’s academics seem to correlate with their socio-economic levels. The upper class and middle class parents provided additional resources for their children. Their support began for their female children in the early years of school. For example, Amy believed that she was prepared for the STEM program through private tutoring in elementary school. She did not feel anxious enrolling in the program because she was aware of the ability of her parents to
provide her with private tutoring, additional learning materials, and resources when needed. This parental involvement had a positive effect on this student’s learning.

Researchers have gathered evidence of the positive effects of parent involvement on children’s learning and development, especially in mathematics (Kumari, 2009). For Henderson and Berla (1994), the most accurate predictor of a student’s achievement in school is not income or social status but the extent to which that student’s family is able to provide encouragement and support. This family involvement affects the student’s learning and development in three areas: (1-) It creates a home environment that encourages learning, (2-) It expresses high (but not unrealistic) expectations for their children’s achievement and future careers, (3-) Parents become more involved at school and in the community (p. 160).

The narratives reveal that the parents of all the respondents were somehow involved in their children’s learning and development. Sandra reported that her father would buy her all support learning materials if he knew where to obtain them. Amy’s sister provided her with financial support and encouragement that helped her to endure the difficulties she encountered in her life. Like her sister, Amy wanted to participate in STEM in order to embrace a career as an actuarial in Germany. Both Fanta and Amy viewed their sisters as role models who demonstrated what they could do and what they could be. However, other factors contributed to the respondents’ successes, including personal motivation and determination.

Positive learning attitude and environment: The respondents shared how proud they were to be enrolled in the STEM program. As stated in Amy’s narrative, “You make the headline for being part of the few girls attending the program . . . and this makes you feel special.” These “feelings factors” are highly predictive of the level of students’ emotional
states while studying in STEM disciplines. Students’ emotional state is one of the most important factors that predict gender performance differences in mathematics (Frenzel, Pekrun, & Goetz, 2007).

The research participants demonstrated positive attitudes toward their learning by sharing their goals and dreams. They understood the value of a STEM degree and the critical thinking skills that STEM provided to them.

Judging the quality of critical thinking as an outcome within a specific educational context may be the responsibility of educational professionals; however, the narratives of the respondent suggested a strong cognitive presence. They provided very descriptive approaches about the implications of their learnings in relation to women’s issues in Burkina Faso.

As Fanta stated in her narrative, “It is difficult to make a decision when you don’t know if it will be the right or the wrong” one. She felt empowered by the STEM program to make rational decisions for herself, compared to other girls around her. Fanta condemned girls who slept with older men to get money in order to fit in within the society. Sandra confessed that she found peace and harmony in prayers during her difficult times. The majority of the respondents believed that education in STEM was important to strengthen the participation of women in the economic development of the country.

Striking comments that emerged from the narratives were about the myth that STEM education is hard and therefore is not meant for girls. The respondents states their belief that only one third of the female students who enrolled in the program graduated every year. Their female classmates dropped out of the program for less demanding mathematical
disciplines. These classmates also believed that they could use their “mathematics advantages” to earn better grades and win national scholarships.

The respondents recognized the program as a generally male-dominated program. However, they believed that girls can perform as well as boys in STEM. The fact that there was even doubt (culturally) about whether or not female students might not be successful in the STEM program made them doubt themselves.

The topic of potential gender differences, notably in mathematics, has been an area of extensive research in which anxiety was found to be a strong factor in the success or failure of females (Kumari, 2009). Depending on the level of their anxiety, students exhibit pride after success and shame after failure. A positive attitude is an important aspect of the affective domain that has a profound effect on learning. Environments that create a sense of belonging, encourage risk taking, and provide opportunities for success help students to develop and maintain positive attitudes and self-confidence.

The narratives show that the respondents used a bold approach to negotiate their path to success. As Patty mentioned in her interview, her parents discouraged her to enroll in STEM, thinking that she was not good enough, especially in mathematics, to perform well academically. Thinking they are not good at mathematics, even if they really are, can depress female students and their mathematic performances (Crombie et al., 2005). Many of female students changed their minds about pursuing STEM education program after their first year in the program. Those who remained in the program did so based in their actual grades. This was the case of Fanta, who was encouraged by the principal and some professors because of her good grades. Patty had a different attitude toward STEM: “You don’t need to be super
intelligent to achieve what you want.” This positive attitude helped her to embrace the program. She was confident that through hard work and collaboration with her peers, she could successfully meet her goals.

**Self-organized and hard work:** Patty admitted that she liked to go outside almost every weekend to have fun with friends. She recognized that her way of life and her clothing style made her peers judge her in negative ways. She knew about it, but did not try to conform to other’s beliefs. Sandra reported that she was frustrated to see girls sleeping around with old men for cash in order to fit into the mainstream of the outside world.

The narratives also pointed out cultural ideologies about raising boys versus girls. The girls felt more overloaded compared to their male counterparts. They came to school tired and less prepared for class. This culturally-rooted tradition poses some threats to girls’ overall success. African traditions, in general, do not allow women to talk in public or to share their personal problems. Despite the fact that women are more literate than in previous years, very few are represented in decision-making processes in their communities or work.

**Need for greater support from government:** Overall, the respondents expressed their wishes to have the government become more assertive in designing programs that will create incentives for girls to pursue STEM high school programs. This would aid in overcoming the cultural ideation from past generations that a STEM career is important only for boys. Sandra formulated some recommendations that included the sponsorship of programs and government scholarships and grants for all female students enrolled in STEM programs.
The respondents’ experiences in the STEM program were successful but also included many challenges. This explains the pride most of respondents expressed in their interviews. As such, they demonstrated emotional feelings that correlated with their significant achievements. However, the majority of the respondents were not pleased with the low representation of females in STEM programs. Despite the awareness of stereotypes related to females low performance compared to the males enrolled in STEM education, the respondents did not let those stereotypes affect their decisions to enroll in the programs. As Patty stated, “We don’t need to be exceptionally smart to be successful” in STEM.

The narratives reveal some of the obstacles that challenged the respondents in the program. This included gender a bias that limited the full participation of girls in classroom discussions, the lack of access to STEM educational resources, and some insecurity about the respondents’ future careers. All the respondents believed that the government should initiate more programs to encourage girls’ enrollment and retention in STEM high school programs.
Chapter 5: Conclusions and Recommendations

The goal of this study was to document the experiences of four twelfth grade, female students, involved in STEM programs in Burkina Faso. A special focus was placed on identifying the challenges that affected the respondents learning processes. The students were from different socio-economic statuses. The researcher conducted in-depth interviews with the respondents and encouraged them to relate their perceptions of their experiences in STEM. The researcher focused on identifying how the respondents negotiated their paths to success and recommendations they offered to improve and promote female students’ education in STEM.

When analyzing study data, the researcher identified themes that emerged from the respondents. The main themes that were identified included parental support, positive learning attitude toward STEM, self-organized and hard work, the need for more governmental support. Other challenges were revealed throughout the narratives, and they were the same as affected female students throughout the world. Those issues included family influence on young children’s interests depending on their gender (McHale et al., 2010), lack of role models in media, classroom settings which discourage female student involvement (Kitzinger, Haran, Chimba, & Boyce, 2008), female students’ perceptions of their ability in STEM (Crombie et al., 2005), and classroom and workplace bias which cause females to drop out of school or not enroll in STEM (Wyer, 2003). The recommendations prepared for this study were influenced by the experiences of the female students in Burkina Faso and based on strategies that have proven to be successful in closing the gender gap in STEM education.
Many countries around the world have taken action to promote female students’ enrollment in STEM education. The United States is one of the best-known countries that has closed the gender gap in STEM education. The country proved that gender biases toward girls were inappropriate and that boys and girls have the similar abilities to perform well in STEM. Data collected by the AAUW (n.d.) revealed that girls enroll in as many high school science courses as boys and perform as well (p. 20). A study conducted by Northwestern University found that the “bachelor’s to Ph.D pipeline in science and engineering fields no longer leaks more women than men” (Hurd, 2015, p. 1). Hurd used data from two, large, nationally-representative, research samples to reconstruct a 30-year portrait of how bachelor’s-to-Ph.D. persistence rates for men and women have changed in the United States since the 1970s. She was particularly surprised that:

The gender persistence gap completely closed in pSTEM fields (physical science, technology, engineering and mathematics)—the fields in which women are most underrepresented. Among students earning pSTEM bachelor’s degrees in the 1970s, men were 1.6 to 1.7 times as likely as women to later earn a pSTEM Ph.D. However, this gap completely closed by the 1990s. (Hurd, 2015, p. 1)

From these observations, the following recommendations are offered to future female students, parents, teachers, school administrators, and the government of Burkina Faso.

**Recommendations for Future Female Students**

As one respondent stated, “You don’t need to be exceptionally smart or a gifted student to pursue your education in STEM discipline”. The program could be demanding. However, female students need to have confidence in themselves and remain on time with their assignments. They should not be afraid to break barriers and seek help from other students, teachers and school administrators.
Recommendations for Parents

As children age, they become aware of their gender and social or cultural expectations influencing them to adopt more masculine or more feminine behaviors which affect their interests in their adolescence years. These interests include mathematics, sports and even some art activities. Parents can influence the development of their daughters’ interests by involving them in activities that have traditionally displayed masculine traits. Parental involvement should be a continuous process, especially during adolescence when their thoughts about their career plans can change because of social pressures and discriminatory experiences.

Parental involvement at home can lead to greater involvement in school. When parents, teachers, and students work together, this increases parents’ involvement and also their support of their daughters’ learning experiences such as STEM. Unfortunately, working parents, language differences, and economic and cultural divisions have built walls between parents and the school system in Burkina Faso. Teachers and school administrators should understand that the school’s best ally in the task of nurturing a student to learn is the parents. Establishing communication between the school and parents is key to maintaining parental involvement.

Recommendations for Teachers and School Administrators

A student’s learning experiences occur in schools and specifically in the classroom. The classroom environment and culture influence the effectiveness of instruction and learning. The learning environment is both physical and emotional in addition to educational.
In order to help students thrive in the classroom, safety measures are essential to insure that students feel safe in the learning environment.

Key elements in the development of the classroom culture and environment are summarized as follows:

**Promote safe and caring learning environment in which girls in STEM can feel as important as their male counterparts:** Students should feel free from the fear of physical and emotional harm when they are in the school learning environment. It is the role of the teacher to ensure that each student in his/her classroom is provided with a safe and caring environment that fosters and maintains respectful and responsible behaviors, and that students are engaged and motivated to learn. Students should be encouraged to ask questions and participate in classroom discussions in a manner that is respectful of the teacher and the other students.

A culture of respect promotes a learning community in which students, teachers, school administrators, parents, and community leaders work together and emphasize student learning for both males and females.

**Write classroom policies, rules, and procedures to promote female students’ engagement in the classroom:** In classrooms where students must guess what is expected of them by teachers, effective classroom practices do not exist.

School administrators and teachers are responsible for establishing policies, procedures, and rules regarding expectations for students’ behaviors in the classrooms and their academic expectations. This can be done together at the beginning of the school year where teachers and the students work together to produce a list. Each student should receive
a signed copy that would be posted in the classroom. Another copy should be sent home for parental signature and returned to the school.

It is important to take the time to establish a well-functioning classroom. The more time spent elaborating and establishing routines and procedures with students, the more time can be devoted to learning.

**Handle misbehavior with fairness and with respect to the students’ dignity:** Behavior such as interrupting other students’ communications in the classroom reduces students’ participation, lowers self-esteem, and reduces instructional time. Teachers and administrators need to address student behavior issues with fairness and respect to students.

**Encourage students’ collaboration:** Collaborative activities increase students’ interactions with one another. This can be an effective instructional method enabling students to achieve more by learning from each other. In the process of collaboration, students also learn to be respectful of one another, and learn to accept or tolerate differences (racial, socio-economic status, gender, ethnic, and sexual orientation).

**Build strong parental involvement:** According to Henderson and Berla (1994), the most accurate predictor of a student's achievement in school is not income or social status but the extent to which that student’s family is able to (1) create a home environment that encourages learning, (2) expect high (but not unrealistic) expectations for their children’s achievement and their future careers, and (3) become involved in their education at school and in their community. School administrators need to develop a common culture by empowering teachers to create individual links between themselves and students’ parents, especially for females in STEM education.

As said Poole, Sky-McIlvain, and Evan (2007), “the school’s best ally in the task of nurturing a student’s innate urge to learn is, first and foremost, the parents” (p. 1). This open communication helps school administrators, teachers, parents, and students discuss household
chore burdens, the issue of supportive learning materials, and many other issues that the interaction might produce.

**Recommendations for the Government**

If educational policies are aimed at impacting student learning, growth, and development, attention must be given to the growth and development of teachers. There is a direct relationship between student learning and teacher growth (Broad & Evans, 2006; Henrikson, 2013). Consequently, if the government intends to promote student learning in schools, it must invest time, money, and energy into the training and development of its teachers.

Creative ways need to be sought to promote and retain more girls in STEM education in Burkina Faso. This needs to be encouraged among girls at a very young age. Positive early experiences in mathematics are as critical to child development as are early literacy experiences. These interactions occur or need to occur at home, in daycares, preschools, schools, and the community. Mathematics learning is embedded in everyday activities, such as playing, reading, storytelling, and helping around the home. Curiosity about mathematics is fostered when children are engaged in activities such as comparing quantities, searching for patterns, sorting objects, ordering objects, creating designs, building with blocks, and talking about these activities.

The AAUW organization found that the best way to promote girls in STEM programs is through the implementation of a pipeline that will place girls on a path toward success from primary school onward.
Since 1998, AAUW has helped to change girls’ lives through “Tech Trek,” an experiential summer camp. The camp was designed to make STEM programs exciting for girls. The AAUW has found these summer camp sessions fostered girls’ curiosities and placed them on paths toward success (p. 1). During the camp, girls worked alongside women scientists and mathematicians. As a result of participating in this camp, many alumnae reported they were less susceptible to negative stereotypes about women in STEM and more determined to achieve in whatever career interested them.

The data from AAUW website (n.d.) revealed that Tech Trek alumnae surpassed the national average in most advanced mathematics and science courses. Seventy-seven percent of those girls who completed pre-calculus in 2009 had participated in Tech Trek compared to 37% who had not.

One of the respondents in this study stated, “the government and its partners in education seem to focus on getting girls enrolled in school, but they do not involve themselves enough in helping them in higher grade levels.” Girls in STEM education need more encouragement and support from the government. This implies the development of governmental policies such as making scholarships automatically available to female students seeking a STEM major. Moreover, a policy that provides as a priority international scholarships for girls could attract and retain even more female students into the discipline.

All of the partners in education should work together. For example, teachers can write grants to buy computers. Career fairs in STEM can be organized by educational leaders.
Further studies should be conducted to promote gender-free school curricula, identify teacher development needs, and determine how educational partners can complement each other to attract and retain more female students in STEM disciplines.

**Recommendation for Further Studies**

Since this study is limited by its sample size and occurred during a single school year, it is suggested that further research be undertaken in order that its findings can be generalized. Such research may be conducted using multiple sites and with time periods of varied lengths.
Table 1

Elementary School Enrollment by Gender from 1997-1998 to 2006 to 2007

<table>
<thead>
<tr>
<th>Year</th>
<th>Gross Enrollment Rate</th>
<th>Net Enrollment Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Fem.</td>
</tr>
<tr>
<td>1997-1998</td>
<td>46.9</td>
<td>32.3</td>
</tr>
<tr>
<td>1998-1999</td>
<td>47.1</td>
<td>32.9</td>
</tr>
<tr>
<td>1999-2000</td>
<td>47.5</td>
<td>33.4</td>
</tr>
<tr>
<td>2000-2001</td>
<td>48.6</td>
<td>34.8</td>
</tr>
<tr>
<td>2001-2002</td>
<td>49.2</td>
<td>36.0</td>
</tr>
<tr>
<td>2002-2003</td>
<td>51.9</td>
<td>38.6</td>
</tr>
<tr>
<td>2003-2004</td>
<td>56.4</td>
<td>43.8</td>
</tr>
<tr>
<td>2004-2005</td>
<td>61.3</td>
<td>48.7</td>
</tr>
<tr>
<td>2005-2006</td>
<td>65.1</td>
<td>52.9</td>
</tr>
<tr>
<td>2006-2007</td>
<td>70.7</td>
<td>58.9</td>
</tr>
</tbody>
</table>

Source: DEP/ MEBA /Summary 2005-2006

Table 2

Graduation Rate by Gender with Elementary School Certificate from 1997/98 to 2006/2007

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>27.0</td>
<td>25.7</td>
<td>27.3</td>
<td>28.4</td>
<td>28.4</td>
<td>29.5</td>
<td>31.0</td>
<td>32.7</td>
<td>34.1</td>
<td>36.9</td>
</tr>
<tr>
<td>Fem.</td>
<td>18.7</td>
<td>18.4</td>
<td>19.3</td>
<td>19.4</td>
<td>20.0</td>
<td>21.6</td>
<td>23.1</td>
<td>24.7</td>
<td>26.6</td>
<td>28.7</td>
</tr>
<tr>
<td>Total</td>
<td>23.0</td>
<td>22.1</td>
<td>23.4</td>
<td>24.0</td>
<td>24.3</td>
<td>25.6</td>
<td>27.1</td>
<td>28.7</td>
<td>30.4</td>
<td>32.8</td>
</tr>
<tr>
<td>Ratio</td>
<td>0.69</td>
<td>0.72</td>
<td>0.71</td>
<td>0.68</td>
<td>0.71</td>
<td>0.73</td>
<td>0.75</td>
<td>0.75</td>
<td>0.78</td>
<td>0.78</td>
</tr>
</tbody>
</table>

Source: DEP/ MEBA/Summary 19975-2006; Demographics projection, RESEN
Table 3

*Enrollment at the University, Male Versus Female Enrollment*

<table>
<thead>
<tr>
<th>Year</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Ratio F/M</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995/1996</td>
<td>6 529</td>
<td>2 078</td>
<td>8 607</td>
<td>0.32</td>
</tr>
<tr>
<td>1996/1997</td>
<td>6 155</td>
<td>1 800</td>
<td>7 955</td>
<td>0.29</td>
</tr>
<tr>
<td>1997/1998</td>
<td>6 294</td>
<td>1 820</td>
<td>8 114</td>
<td>0.29</td>
</tr>
<tr>
<td>1998/1999</td>
<td>7 048</td>
<td>2 055</td>
<td>9 103</td>
<td>0.29</td>
</tr>
<tr>
<td>1999/2000</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>2000/2001</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>2001/2002</td>
<td>11 716</td>
<td>3 960</td>
<td>15 676</td>
<td>0.34</td>
</tr>
<tr>
<td>2002/2003</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>2003/2004</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>2004/2005</td>
<td>18 813</td>
<td>8 249</td>
<td>27 062</td>
<td>0.44</td>
</tr>
<tr>
<td>2005/2006</td>
<td>20 381</td>
<td>9 116</td>
<td>29 497</td>
<td>0.44</td>
</tr>
<tr>
<td>2006/2007</td>
<td>22 418</td>
<td>9 994</td>
<td>32 412</td>
<td>0.45</td>
</tr>
<tr>
<td>2007/2008</td>
<td>27 553</td>
<td>13 334</td>
<td>40 887</td>
<td>0.48</td>
</tr>
</tbody>
</table>

Source: DEP/MEBA/Summary 2005-2006; Demographics projection, RESEN
References


Mandela, N. Former president of South Africa.Strategie 1993 Nobel Peace Prize laureate.


Appendix A: Map of Burkina Faso
Appendix B: Institutional Review Board Human Subjects Review Form

Institutional Review Board (IRB)

Name: Marie Angele Hermine Nintiema
Address: 1540 East Saint Germain Street
St. Cloud, MN 56301
Email: nima0601@stcloudstate.edu

Co-Investigator:

Project Title: Girls studies in Science Technology, Engineering, and Mathematics: How did they make it?
Advisor: John Eller

The Institutional Review Board has reviewed your application to conduct research involving human subjects. Your project has been: APPROVED

--IRB approval of a project expires upon the date shown at the bottom of this letter. The researcher must submit a Continuing Review/Final Report form in advance of the expiration date to report conclusion of the research or to request an extension.

--Informed consent documents must display the IRB's official stamp which shows approval and expiration dates. A stamped copy of the informed consent documents will be provided to the researcher upon IRB approval of the study.

--The researcher must seek approval for any changes in the study (its design, the consent process, funding sources, etc.).

--Adverse events (research related injuries or other harmful outcomes) must be reported to the IRB as soon as possible.

--The IRB reserves the right to review the research while it is in progress or when it is completed.

Good luck on your research. If we can be of further assistance, please contact the Office of Sponsored Programs at 320-308-4932 or email lidonnay@stcloudstate.edu. Please use the SCSU IRB number listed on any of the forms submitted which relate to this project, or on any correspondence with the IRB.

For the Institutional Review Board:

Linda Donnay
IRB Administrator
Office of Sponsored Programs

For St. Cloud State University:

Patricia Hughes,
Interim Associate Provost for Research
Dean of Graduate Studies

SCSU IRB# 1287 - 1554
Type of Review: Expedited

OFFICE USE ONLY

Today's Date: 3/6/2014
APPROVED: 3/6/2014
Expiration Date: 3/5/2015
Appendix C: Interview Questionnaire

1) How would you introduce yourself? (Grade level and school. No name in order to respect confidentiality)

2) How long have been studying STEM and what are your perceptions in relation to your experiences?

3) What factors do you think contributed to your success in STEM?

   ➢ Extra follow-up questions using expressions such as "Think about", "how did" in the following categories:
     • Family/Home
     • Friends
     • Community
     • School

4) What issues or barriers did you face or have to overcome in order to be successful in STEM?

   ➢ Extra follow-up questions using expressions such as "Think about", "how did" in the following categories:
     • Family/Home
     • Friends
     • Community
     • School

5) What would you recommend for other female students, teachers and school administrators in order to increase female opportunity for success in STEM?
Appendix D: Consent Forms

Interview Consent Form

I am a student at Saint Cloud State University in Minnesota, United States and my e-mail address is riima0691@atelovestate.edu. I am conducting interviews for my doctorate dissertation assignment. I am studying the challenges and successes of females completing their high school degrees in STEM (Science, Technology, Engineering and Mathematics) education in Burkina Faso. The purpose is to document their experiences. The information obtained from these interviews will be analyzed to identify major themes that will assist educators and policy makers in creating successful programs for female students.

During this study, you will ask some questions as to what issues or barriers did the female students encounter in their programs and who they overcome them. However please feel free to expand on the topic or talk about related ideas. Also, if there are any questions you would rather not answer or that you do not feel comfortable answering, please say so and we will stop the interview or move to the next question, whichever you prefer.

Participant’s agreement

1. The purpose and the nature of the interview have been explained to me, and I have read this information sheet as provided by the researcher.

2. I understand that the interview will be taped recorded and the interview will last approximately 90 minutes.

3. I understand that the researcher will not identify me by name in any reports using information obtained from this interview, and that my confidentiality as a participant in this study will remain secure.

4. I understand that if I feel uncomfortable in any way during the interview session, I have the right to decline to answer any question or to end the interview.

5. My participation in this project is voluntary. I understand that I will not be paid for my participation. I may withdraw and discontinue participation at any time without penalty.

6. Any questions that I asked about the purpose and nature of the interview have been answered to my satisfaction.

7. I understand that this research study has been reviewed and approved by the Institutional Review Board (IRB) for Studies Involving Human Subjects.

Participants Printed Name and Signature ___________________________ Date ________

Researcher Printed Name and signature________________________ Date_______
Oral Interview Consent Form

I am a student at Saint Cloud State University in Minnesota, United States and I am conducting interviews for my doctorate dissertation assignment. I am studying the challenges and successes of females completing their high school degrees in STEM (Science, Technology, Engineering and Mathematics) education in Burkina Faso. The purpose is to document their experiences. The information obtained from these interviews will be analyzed to identify major themes that will assist educators and policy makers in creating successful programs for female students.

During this study, you will ask some questions as to what issues or barriers did the female students encounter in their programs and who they overcome them. However please feel free to expand on the topic or talk about related ideas. Also, if there are any questions you would rather not answer or that you do not feel comfortable answering, please say so and we will stop the interview or move to the next question, whichever you prefer.

Participant’s agreement

1. The purpose and the nature of the interview have been explained to me, and I have read this information sheet as provided by the researcher.

2. I understand that the interview will be taped recorded and the interview will last approximately 90 minutes.

3. I understand that the researcher will not identify me by name in any reports using information obtained from this interview, and that my confidentiality as a participant in this study will remain secure.

4. I understand that if I feel uncomfortable in any way during the interview session, I have the right to decline to answer any question or to end the interview.

5. My participation in this project is voluntary. I understand that I will not be paid for my participation. I may withdraw and discontinue participation at any time without penalty.

6. Any questions that I asked about the purpose and nature of the interview have been answered to my satisfaction.

7. I understand that this research study has been reviewed and approved by the institutional Review Board (IRB) for Studies Involving Human Subjects.

8. At your request, I am happy to provide a summary of the research results when the study is completed

9. If you have questions right now, please ask. If you have additional questions later, you may contact me at the email number nima0601@stcloudstate.edu

Participants Printed Name and Signature __________________________ Date_______

Researcher Printed Name and Signature __________________________ Date_______

Interpreter Printed Name and Signature __________________________ Date_______
Appendix E: Research and Interview Questions

Research Questions

The following general research questions will guide and also help define the scope of the study.

1) What are the perceptions of female STEM students with regard to their success in school?
2) What role does STEM play in preparing female students for leadership?
3) What issues or barriers did these students encounter? How did they overcome them in order to be successful in their education in STEM-related programs?
4) What impact does the STEM program have on improving educational policy for females in Burkina Faso?

Interview Questions

1) How would you introduce yourself?
2) How long have you been studying STEM and what are your perceptions in relation to your grades?
3) What successful experiences would you like to report? In the family, in school, and in the community? What factors have contributed to your success?
4) What issues or barriers did you face in the family, in school, and in the community? How did you overcome these challenges?
5) What would you recommend for other female students, teachers, and school administrators in order to increase female opportunity for success?