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Cameroonian Immigrants Switching From Non-Stem To Stem-And-Related Fields In The United States

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CAMEROONIAN IMMIGRANTS SWITCHING FROM NON-STEM TO STEM-AND-RELATED FIELDS IN THE UNITED STATES

by

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This dissertation, submitted by Delphine N. Tamukong in partial fulfillment of the requirements for the Degree of Doctor of Philosophy from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

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Dean of the School of Graduate Studies

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PERMISSION

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Delphine N. Tamukong
May 13, 2017

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ABSTRACT

Recent studies on STEM education in the United States (U.S.) have largely focused on such issues as the ever increasing need for more STEM workers, STEM attrition/retention, the gender gap in STEM, encouraging more STEM enrollment both at college and post-graduate levels, and the use of modern technology to facilitate STEM education. Other studies have considered the impact of immigrants on STEM education in the U.S. and on the U.S. economy in terms of either creating or filling STEM jobs. Many of those studies underscore the importance of immigrants in boosting the high skilled, much needed, STEM labor force and thereby increasing the global competitiveness of the U.S.

Despite a large volume of STEM-related research in the U.S., minimal research has focused on immigrants who enter the U.S. without prior STEM backgrounds and choose STEM or related majors while in the U.S. In particular, no prior study has considered Cameroonian immigrants with non-STEM majors and who switch into STEM or related fields upon arrival in the U.S. Such studies could unveil key factors that serve as strong motivators for STEM enrollment.

To fill this gap, the present study investigated why Cameroonian immigrants who came into the U.S. without a prior STEM background switched into STEM or related fields while in the U.S. The study involved 8 Cameroonian immigrants who were majoring in either a STEM or related field who came into the U.S. without a prior STEM

background. Data was obtained through in-depth, semi-structured, face-to-face, individual participant interviews.

Participants attributed their failure to major in STEM while in Cameroon to the following: stereotypes, limited financial and other resources, negative influence from teachers, peers, relatives, and others, and the impact of non-STEM role models. Participants attributed their choice to switch into STEM or related fields while in the U.S. to job discrimination within non-STEM fields, ease of employment within STEM, and the impact of friends and others who directly encouraged them to switch. In comparing STEM education in Cameroon and the U.S., participants felt the U.S. offered many advantages such as increased flexibility, teacher accessibility, and financial and other resources. It was found that although participants had faced challenges upon switching into STEM in the U.S., their determination/resilience had led them to overcome those challenges and persist in their new majors. Overall, gender differences were insignificant in the decision to switch to a STEM or related major in the present study.

CHAPTER I

INTRODUCTION

The world has made significant strides in industrial and technological advancement since the industrial revolution, thanks to contributions from science, technology, engineering, and mathematics (STEM) and related fields. STEM-related refers to any field that is based on STEM education, such as pharmacology, medicine, and nursing. In today's modern society, most top economies owe their success to the emphasis they place on STEM knowledge. In order to keep up with global technological demands, concerted efforts should not only be directed at maintaining personnel serving in STEM fields but also in attracting more students into STEM and related subject areas (Weaver et al., n.d.). Additionally, knowledge and expertise from STEM fields is indispensable in fostering societal development (Standke, 2006). With the understanding of STEM as a cornerstone of economic growth and development, the Obama Administration set a goal to raise the number of STEM undergraduate degrees by at least one million in the next decade (Feder, 2012).

Efforts to attract more people into STEM subjects and subsequently STEM careers have been ongoing, and notable progress has recently been reported. For example, a 2008 survey of 203 higher education institutions in the U.S. signaled a rapid growth in the number of schools and students specializing in STEM education (Means, Confrey, House, & Bhanot, 2008). However, the demand for STEM skills in the U.S. still

supersedes the number of STEM graduates (Holzer, 2011). Of special note is the fact that foreign nationals are contributing immensely to STEM careers in the U.S. For example, in a report from the National Science Foundation (2015), it was stated that temporary visa holders are most predominant in engineering and physical sciences. In 2014, temporary visa holders characterized 55% of doctorate recipients in engineering and 45% of those in the physical sciences. Also, the number of doctorates in science and engineering fields awarded to temporary visa holders raised to 13,739 in 2014, a 45% growth since 2004 and a 2% growth since 2013.

The U.S. has welcomed thousands of immigrants from around the globe annually. In fact, as of 2013, the U.S. was receiving more legal immigrants annually than the rest of the world combined (Kullgren, 2013). Data from the Department of Homeland Security (2013) on immigrants obtaining permanent legal resident status spanning the years 1820 to 2012 shows a steady (but somewhat irregular) increase in immigration rates. Some of the years showing major spikes in immigration include 1905 to 1907 when 1,026,499 (1905); 1,100,735 (1906); and 1,285,349 (1907) immigrants received legal status. More recently, the years 2005 to 2012 had record highs with well over a million immigrants obtaining legal permanent resident status in the U.S. per year. Additionally, the U.S. has been noted as a top destination for foreign students (Verbik & Lasanowski, 2007) including Africans.

The U.S. offers different avenues for immigrants to come into the U.S. through its complex immigration system. Each year, up to 50,000 people immigrate into the U.S. through a special program called the Diversity Visa (DV; U.S. Department of State, n.d). This program grants visas to immigrants from countries that are less-represented among

the total diversity of immigrants in the U.S. To get a visa to come into the U.S. through this lottery program, an applicant must be 21 years of age and must meet certain academic qualifications.

The majority of studies on U.S. immigrants in the STEM fields have tended to focus on their immense contributions to the growth of the U.S. economy (Wadhwa, Saxenian, Rissing, & Gereffi, 2008). The contributions of immigrants to the U.S. economy vary from direct services to innovation and job creation via the opening of thriving companies. For example, the Partnership for a New American Economy (2011) reported that over 40% of the 2010 Fortune 500 companies were founded by immigrants or their children. These companies employed over 3.6 million workers in the U.S. alone and over 10 million worldwide. Moreover, the income generated by these companies exceeded the Gross Domestic Product (GDP) of all countries outside of the U.S., apart from China and Japan, and companies founded by immigrants or their offspring have generated $4.2 trillion annually. Research shows that the economy of the U.S. has often benefitted from foreign talent in diverse ways.

In 2007, immigrant-owned small businesses employed roughly 4.7 million people nationwide and generated over $750 billion in annual revenue (Kallick, 2012). The White House blog featured a 2012 article on 10 ways immigration has helped build and strengthen the U.S. economy (Furman & Gray, 2012). The impact of immigrants was noted to vary from business and job creation to innovation, development of cutting-edge technologies, and an increase in demand for consumer goods, among other things.

While the contributions of immigrants to building the U.S. economy are arguably numerous, there have been contentious suggestions that the influx of immigrants places

Americans at a disadvantage when it comes to getting jobs or making career choices (Hedberg & Tammaru, 2013). A study by Orrenius and Zavodny (2013), however, refutes such claims. After analyzing data on college students from American Community Surveys collected from 2009 to 2011 alongside data on immigrants collected from 1970 to 2000 censuses, the authors did not find significant adverse effects on career choices of U.S. citizens as a result of the influx of immigrants; rather, they concluded that the presence of immigrants in the U.S. is an advantage to the economy. In fact, to encourage more foreign STEM immigrants to the U.S., the federal government recently announced the Skills Visa Act, intended to grant permanent residency status to foreign STEM graduates to encourage them to stay and work in the U.S. (Skills Visa Act, 2014). In fact, the American Immigration Council (2013) stated:

> For the sake of the U.S. economy's recovery and long-term competitiveness, lawmakers should couple new policies to improve STEM training throughout the U.S. educational system with revisions to the antiquated rules that currently govern how many and which scientists and engineers from abroad are allowed to work in the United States. (p. 3)

A plethora of research exists on the importance of STEM fields and the contributions of STEM immigrants to the U.S. economy (Charette, 2013), and the need to attract more people to STEM fields is essential. One way to do this is to encourage new immigrants to the U.S. to study in STEM fields. Little research exists on the career choices immigrants with little prior STEM education make who come to the U.S. This study will focus specifically on immigrants from Cameroon, a country in central Africa.

Recent data from the Integrated Public Use Microdata Series (IPUMS) indicates that a higher percentage of African immigrants in the U.S. major in STEM than in other fields at college and university levels (Ruggles, Genadek, Goeken, Grover, & Sobek, 2015; see Figure 1).

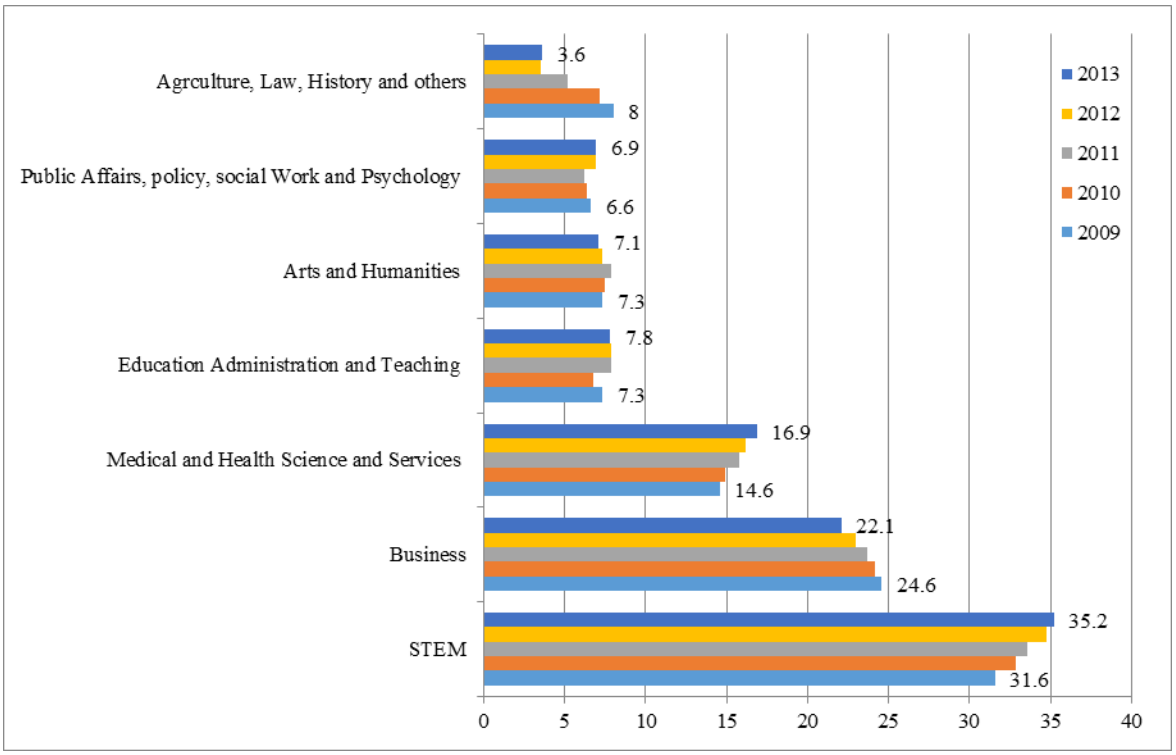

Figure 1. Major Fields of Study of African Immigrants in the U.S.

As shown in Figure 1, a trend for African immigrant college students in the U.S. indicates that increasingly these students are pursuing STEM careers. In 2009, 31.6% of African immigrant college students majored in STEM fields compared to 35.2% in 2013, indicating a 3.6% increase within 5 years. The percentage of students studying in the medical and health science and service fields also increased from 14.6% in 2009 to 16.9% in 2013, indicating a 2.3% increase in these fields. In the business fields, the percentage of African immigrant college students dropped from 24.6% in 2009 to 22.1%

in 2013, indicating a 2.5% decrease. The fields of Education, Arts & Humanities, Social Work, and Psychology did not show any significant increase or decrease, and "Agriculture, Law, History, and Others" majors showed a percentage decrease from 8% in 2009 to 3.6% in 2013, indicating a 4.4% drop. Even though more African immigrants study in the STEM and related fields while in the U.S., some studies have shown that U.S. citizens opt out of STEM fields.

In the U.S., many of those college students who started as STEM majors opted out of STEM by either changing majors or leaving college without completing a degree or certificate. In a U.S. National Center for Education Statistics report, Chen and Soldner (2013) reported that "a total of 48 percent of bachelor's degree students and 69 percent of associate's degree students who entered STEM fields between 2003 and 2009 had left these fields by spring 2009" (p. 6). They added that roughly one-half of these leavers switched their major to a non-STEM field, and the rest of them left STEM fields by leaving college before earning a degree or certificate. The question yet to be answered is: What attracts immigrants into STEM fields when U.S citizens are moving away from these fields? The above analyses provided the impetus for the present study.

In general, education in Africa suffers from the ills of poverty. Teferra and Altbachl (2004) noted that Africa's academic programs including primary, secondary, and post-secondary institutions face obstacles such as funding, language issues, and brain drain in providing the education, research, and services needed for advancement. Brain drain refers to the emigration of highly trained or intelligent people from a country. These obstacles have led to low higher education enrollment with a gross enrollment ratio for ages 18 to 25 of about five percent. In Tanzania, for example, with a population of 32

million, the enrollment in higher education institutions for the year 2000 was under 21,000 (Mkude & Cooksey, 2003). In Ethiopia, with a population of about 65 million, only 50,000 students were enrolled in postsecondary institutions (Wondimu, 2003). In Cameroon with a population of 22,773,014, only 5% of the students ages 15-24 completed post-secondary education (Education Policy and Data Center, 2014).

According to the United Nations Educational, Scientific, and Cultural Organization (UNESCO Office in Dakar, 2012), Africa has the world's highest dropout rate with 42% of African school children leaving school early; about one in six students leave before Grade 2. Teenage pregnancy is a major factor contributing to the high dropout rate among women (Akwetey-Okunor, 2015). Eloundou-Enyegue (2004) found that in Cameroon, early pregnancy is the greatest factor in female students dropping out, which also contributes to an overall high gender gap in educational attainment, particularly at the secondary and tertiary levels.

Due to the above limitations, few Africans (including Cameroonians) enter the U.S. with degrees that can easily fetch them good jobs. Once in the U.S., immigrants, especially from Africa, tend to enroll in school in order to improve their employment opportunities. This is due to the fact that they are generally not conversant with the U.S. employment culture and skills at the time of entry into the U.S., not proficient in English, lack U.S. work experience and professional networks, or simply possess credentials which are not recognized in the U.S. (World Education Services, 2008). Cameroon immigrants in the U.S. are not exempt from these challenges. Studies based on Cameroonian immigrants in the U.S. and their fields of study or career choices are scarce.

As a native of Cameroon, I am especially interested in the career path of Cameroonian immigrants in the U.S.

Cameroon is a nation of 23,927,341 inhabitants (Countrymeters, 2016) situated within the central part of Africa (see Figure 2). As of 2010, there were about 331,711 Cameroon immigrants in the U.S. with a median age of 33.8 years (Njila, 2012). Among these Cameroonians, over 95% of them had at least a high school diploma, and the majority possessed this level of education at the time they entered the U.S. (Njila, 2012).

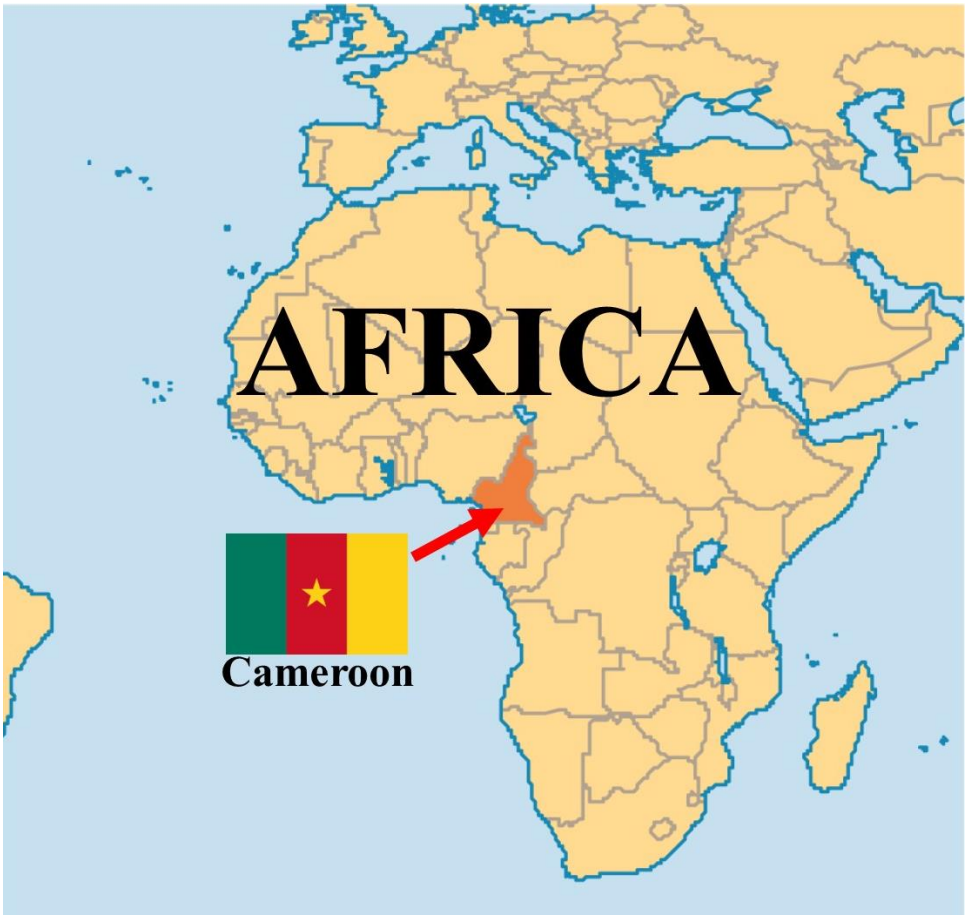

Figure 2. Location of Cameroon in the African Continent. Adapted from "Cameroon," by Operation World, 2016, Operation World [Webpage]. Retrieved from http://www.operationworld.org/came. Copyright 2016 by Operation World.

First annexed by Germany in 1884 and later by Britain and France in 1919 (see Figure 3), Cameroon's educational landscape has been shaped in many ways by these colonial masters (Dupraz, 2015). Footprints of these colonial forces persist within the educational system in Cameroon. In the early 1960s, following the merging of French

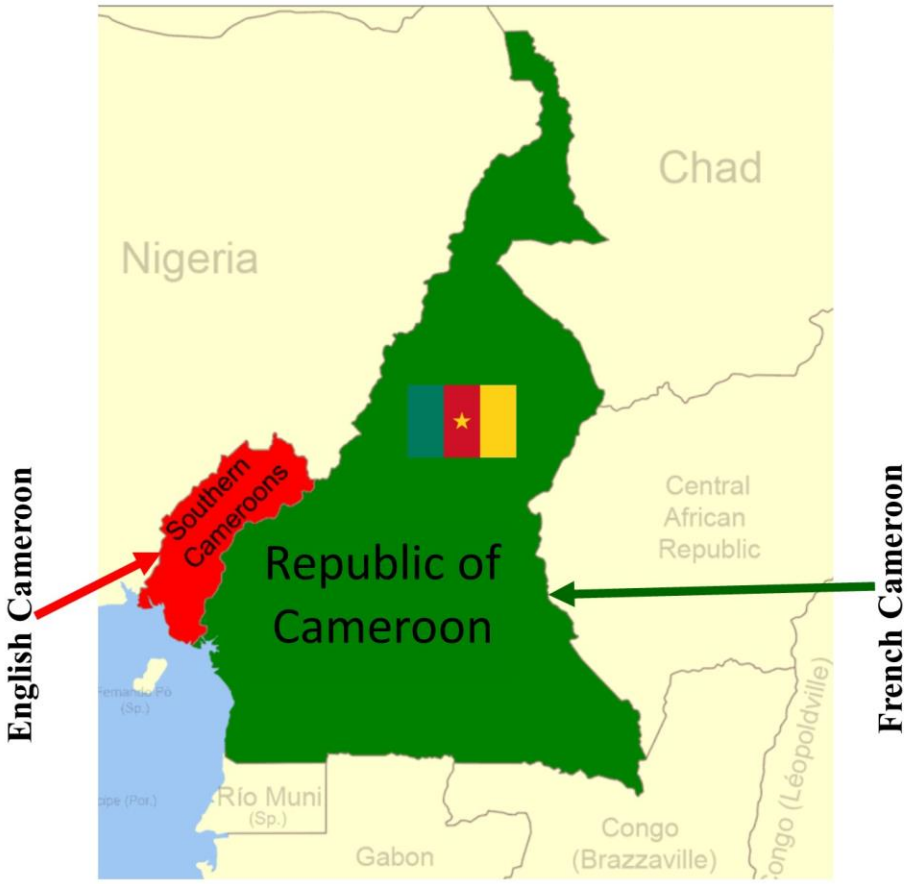

Figure 3. Map of Cameroon Showing English (Red) and French (Green) Speaking Parts. Adapted from "File: Cameroon boundary changes.PNG" by Roke, 2006, Wikimedia Commons [Webpage]. Retrieved from https://commons.wikimedia.org/wiki/File:Cameroon_boundary_changes.PNG. Copyright 2016 by Wikimedia Commons.

and English speaking Cameroons through a plebiscite (Percival, 2008), Cameroon's only university was established in the French sector, which hindered English speaking students from attending due to language barriers since the majority of the teaching was done in the

French language. A number of other post-secondary institutions opened their doors in French Cameroon before similar ones emerged in English Cameroon. All of these had significant repercussions on the foundation of education in English Cameroon in general and STEM in particular. The misappropriation of public funds and overall marginalization of the English speaking sector of Cameroon meant that little was invested in STEM education such as the building of scientific laboratories. The educational systems in these two parts of the country have largely had different structures until recently, and efforts toward uniform education were ongoing in Cameroon at the time of this report.

It is important to distinguish between the two Cameroons because the majority of Cameroonian immigrants in the U.S. have typically originated from the English-speaking part of Cameroon while the French-speaking Cameroonians' lack of English proficiency hindered them from migrating to the U.S. (Takougang, 2014). However, the Diversity Visa Program, which requires Cameroonians to have a high school diploma, has recently brought large numbers of Cameroonians into the U.S., including French-speaking Cameroonians (Takougang, 2014).

The English region of Cameroon has been marginalized in many respects, including the underdevelopment of most institutions of higher education, especially in STEM areas. This marginalization has for its sand and cement (a) widespread nepotism which is mostly from the fact that the country is governed by the majority French-speaking citizens who tend to favor their kind in hiring for key positions in government, and (b) the generally corrupt nature of Cameroon, including English-speaking citizens (Pefok, 2012). For example, most STEM graduate students at the University of Buea in

English Cameroon, the first Anglo-Saxon university in the country, often have to travel to the "University of Yaounde I" in the French part of the country to analyze their research samples due to a lack of adequate laboratory facilities and a lack of other resources to facilitate their studies. At nearly all levels of the educational ladder, STEM education in Cameroon suffers from inadequate resources. For example, for the Cameroon General Certificate of Education (GCE) examination (which is a national examination featuring STEM and other subjects), reports have been made of students who are writing the GCE in rural parts of the country and suffer from insufficient laboratory resources (Mulkeen, 2005). These difficulties adversely impact students' attitudes towards STEM, especially in the English part of the Country.

In Cameroon, many students find it difficult to go to school, let alone pursue STEM education due to increased costs for STEM subjects (Tucker, 2011). For example, the average village child in Africa, intending to attend a STEM-focused high school, has to travel to a city to enroll, which is an additional cost. Other additional costs include procuring a laptop or software for students wishing to pursue computer science. These costs must be borne by most parents who find it difficult to raise the money. Thus, few students end up in STEM fields (Richard Attius & Associates, 2016).

In Cameroon, even though the government has made continued efforts to see that all citizens attend primary school, only a few students finish postsecondary education (Education Policy and Data Center, 2014). Education has been made compulsory and free through the age of 12 since the year 2000, except that families have to pay for uniforms, books, and Parent Teachers Association (PTA) fees (Karugu, Kamere, & Mugo, 2013). Some parents who cannot afford these fees prefer not to send their children to school, and

students who go to school without the PTA fees are barred from attending class (Wiener, 2010).

The government has also improved the quality of education, especially in cities. With the help of the government, recent years have seen improvement in the numbers of students who go to school in Cameroon; enrollment rates have risen at all levels of education with more boys attending school than girls UNESCO Office in Dakar, 2012). UNESCO additionally indicated that 47.7 percent of girls and 56.7 percent of boys attend primary school in Cameroon. Until recently, most parents in Cameroon preferred to educate only their male children, because women would be married and leave their families (Meeker & Meekers, 1997). However, recent years have seen improvements with 81% of adult Cameroonian men being reported as literate in 1999 compared to 69% adult Cameroonian women (State University, 2016).

Even though more students go to school now in Cameroon (especially female children), most of them do not study in the STEM fields after completing a third year of secondary education, which corresponds to eighth grade in the United States (Ossono & Foretia, 2013). STEM education in Cameroon suffers from many roadblocks, from limited resources for setting up laboratories and other STEM-related equipment to various stereotypes prominent in society, especially in regards to female students (Arnot & Phipps, 2003). These stereotypes revolve around the thought that STEM subjects are challenging and unsuitable for women (Beede et al., 2011).

A nation that does not emphasize STEM or related fields in its educational system will find it difficult to compete with most other nations around the world. According to the National Science Board (2007), STEM fields have become increasingly important as

society faces the challenges of globalization and a knowledge-based economy. Despite the importance of these fields, Ossono & Foretia (2013) stated that the Cameroon educational system "does not encourage a STEM-driven curriculum" (p. 5). This hindrance comes from the fact that when students are in Form Three, which is equivalent to eighth grade in the U.S., they have to make a choice of their field of study. Most students choose the non-STEM fields because they are less expensive (Karugu, Kamere, & Mugo, 2013), and such expenses hinder most students from pursuing STEM careers. Developing a STEM-skilled labor force allows a country to make strides toward lifting its population out of poverty and increasing its per capita income; STEM fields affect almost every sector of everyday life. Mureriwa (2014) emphasized the need to educate more African youths in STEM fields, especially because the growing skills shortage in such fields has reached critical levels on the African continent. If institutions of higher learning in Africa, especially in Cameroon, have to increase the population of students in STEM fields, finding ways on how to encourage enrollment in these fields is very important; however, some students have been discouraged by their teachers from pursuing an education in STEM fields.

In Cameroon, teachers lack motivation to teach STEM subjects because of low pay and inadequate scientific equipment to use in their classrooms (Adedeji & Olaniyan, 2011); hence, they demotivate students from going into such fields, especially in rural areas. With the Cameroon government's declaration of free primary education from the year 2000 (Banya & Elu, 2001), more children are able to complete at least primary education and many more proceed to secondary and tertiary levels than previously.

However, smaller proportions of these students pursue STEM fields and this contributes to schools hiring fewer STEM teachers.

Studies have shown that teachers have a significant impact on the students they teach. For example, Paulson (2012) found that children who are taught by good teachers can be identified by their relatively good performance. Especially, teachers at early stages of child development (such as head start or kindergarten) contribute significantly to students' future performances. Moreover, teachers' attitudes towards students strongly mediate their levels of engagement, resolve, and motivation. Eccles (2004) observed that when teachers trust and show respect and concern for their students, this often provides the social-emotional support needed by students to build self-confidence and inner fortitude, leading them in turn to engage and persist on academic learning tasks, and to develop positive achievement-related self-perceptions and values. In general, the quality of student-teacher and student-peer relationships are key determinants in students' academic engagement and achievement (Furrer, Skinner, & Pitzer, 2014). Since teachers impact the students they teach, not only in terms of knowledge discharged, but also psychologically, efforts to attract students to STEM subjects should include more quality training for teachers in those subject areas. The U.S. has reduced beliefs in stereotypes in some students by exposing them to role models, which has helped to encourage more students to enter into STEM fields (Rios, Stewart, & Winter, 2010). However, in Cameroon, there is a tendency in some teachers to focus on students who show interest and understanding in the STEM subjects they teach while ignoring students who are disinterested (Karugu, Kamere, & Mugo, 2013).

It is interesting that IPUMS data (Ruggles et al., 2015), shows that more African immigrants in the U.S. major in STEM and related fields when compared to other fields at college and university levels (see Figure 1). The issue that comes to mind is whether these immigrants were STEM majors in Africa before moving to the U.S. As noted earlier, the Cameroonian educational system does not encourage a STEM driven curriculum. The puzzle that forms the fulcrum of the present study is the need to understand why African immigrants (Cameroonian immigrants in particular) tend to major in STEM fields in the U.S. even when these immigrants had little foundation in such fields at the time they entered the U.S.

This dissertation focused on the elements that contribute to influencing Cameroonian immigrants in the U.S. who switch to studying in STEM or related subjects. The present study owes its significance to the important role STEM education plays in the technological advancement and global competitiveness of any nation, and consequently, to the ongoing efforts in the U.S. by both federal, state, and private agencies to attract more students into STEM fields. Importantly, the researcher will seek to understand why Cameroonian immigrants switch to STEM and related fields.

Motivation for This Study

Growing up as a village child in Cameroon, I know firsthand that most villagers were not educated, and the most educated ones had completed only elementary school, which was the highest level in my village. I had the opportunity to move to the city to complete my elementary education after the death of my father. I then continued to middle school. While in the city, I saw many more people going to high school and some to college. Usually at age 15, students are expected to make a choice either to study in a

STEM or non-STEM field. At this age, many students make their choices without understanding why they have to make such decisions. In my case, I chose to study the STEM subjects, and I noticed that many teachers discouraged students, especially females, from choosing the STEM fields. Most teachers and even parents felt that the STEM fields were not for female students, and so they discouraged them from choosing such fields.

However, when I moved to the U.S., I saw many Cameroonian immigrants in STEM and related fields, and some of them graduating with Ph.D.s. Recently, I was talking with a woman from my home country who earned her Ph.D. in chemistry in the summer of 2015 from the University of North Dakota (UND). I was shocked to hear that she was the first woman from her village to obtain a Ph.D., not just in science, but also in any field. I wonder if this woman would have had a Ph.D. in chemistry if she was living in Cameroon.

As a Cameroonian student who studied in the STEM fields while in Cameroon, and as someone who was a mathematics teacher before moving to the U.S., I am concerned about the fact that many Cameroonian students, especially females, do not believe in their ability to succeed in STEM fields. Consequently, they do not seek careers in these fields while in Cameroon. However, I have been amazed to see many Cameroonians in STEM and related fields in the U.S. What I still have to understand, is whether these Cameroonian immigrants in STEM and related fields were STEM majors while in Cameroon, or whether they have chosen to study in these fields only after they moved to the U.S. One of the goals of this study is to understand ways and strategies of combating stereotypes, misconceptions, and restrictive attitudes that have hindered some

Cameroonians from studying in the STEM fields while in their country. A particular interest in this study will be to assess social interactions and other environmental forces that influence Cameroonian immigrants to consider STEM and related fields in the U.S., particularly those who were not STEM majors while in Cameroon. This knowledge will be derived from findings on reasons why some Cameroonians without a prior STEM foundation switch into STEM once they start school in the U.S.

Purpose of Study

The purpose of this study was to understand why Cameroonian immigrants who did not major in a STEM field at the time of entering the U.S. switched into STEM or related fields while in the U.S. The issue of attracting more students into STEM-related subjects is a global plea, but the Asian and Western nations seem to be doing much better than most African countries. Cameroonians generally do not study in the STEM fields from high school level while in their country (Karugu, Kamere, & Mugo, 2013). This choice of study is because students are required to choose their majors very early in their academic careers (that is, after the third year of secondary education corresponding to eighth grade in the U.S.), and a good number of those students generally opt out of STEM. Nevertheless, a good proportion of immigrants prefer STEM to other fields after moving to the U.S (Wasem, 2012). This study seeks to understand why Cameroonians without a STEM foundation switch into STEM while in the U.S.

Significance of the Study

The findings from this study will provide useful information to various organizations in the U.S. currently involved in efforts to find new ways of attracting more students into STEM and related fields. Additionally, this study will be useful to

Cameroon's educational sector in identifying important factors that attract Cameroonians into STEM in the U.S. The findings will be helpful for reshaping STEM in Cameroon to attract more enrollment. At large, this study can be adapted for further research on other African countries and go a long way to improve STEM education on the African continent.

Knowledge from this study may help STEM educators and educational planners in sustaining and enhancing Cameroonian immigrant students' motivation to study in STEM and related fields. The motivating factors that influence Cameroonian immigrants to switch into STEM and related fields will shed light on the path to finding new ways of encouraging more STEM enrollment both in the U.S. and in Cameroon. Such findings will be useful also to most other African nations which share commonalities with Cameroon in terms of their educational structures. It should be noted that the footprints of colonial masters still abound in various sectors of societies of African nations. Since the governing strategy of each colonial master (for example, France or Great Britain) was similar in all its colonies, education was set up similarly in those colonies. Since the departure of those colonial masters following independence of the African nations, little has been done to restructure education in most African nations. Overall, when factors influencing Cameroonian immigrant enrollment in STEM and related fields are understood, the effect in the different nations around the world could be a global increase in the number of students graduating from STEM and related fields; and consequently, there might be an economies boom due to the important role STEM plays in economic development.

This study will also be helpful to U.S. policymakers in education who are continually seeking new ways of improving STEM education and drawing more people into these fields. Results from this study would also be a resource to nations around the world whose citizens migrate to the U.S., switch to the much-needed STEM and related fields, and hence shed light on activities that could attract more people to STEM. It is also hoped that this research will lead to a better background understanding of most Cameroonian immigrant students who are in STEM-related fields while in the U.S. With this knowledge, educators can better understand the academic background of their Cameroonian immigrant students.

Theoretical Framework

This study has as its theoretical foundations the Transformative Learning Theory (TLT) and the Social Cognitive Theory (SCT). The TLT assesses changes in behavioral patterns occurring in individuals due to changes in their understanding of their capabilities, their beliefs, and their lifestyles. Such changes result in autonomous critical thinking, analyses, and judgments (Clark & Wilson, 1991; Elias, 1997; Mezirow, 1997). TLT forms the basis for assessing possible change that may eliminate stereotypic tendencies towards STEM, result in self-confidence, and lead non-STEM Cameroonians into pursuing STEM and related fields in the U.S.

The Social Cognitive Theory was developed by Bandura (2001) and extended by others (e.g., Pajares & Schunk, 2001; Pintrich, 2003; Glynn, Brickman, Armstrong, & Taasoobshirazi, 2011). The theory maintains that people learn partly by observing others within their network of social interactions. When a learner observes a model or someone involved in some action, the observer learns by viewing the sequence of events; and this

observation, in turn, shapes the observer's future behavioral patterns (Bandura, 2002; Bandura, 1986). This theoretical thought forms the basis for the possibility that Cameroonian immigrants observe other Cameroonian immigrants pursuing STEM and related fields, which may lead them into choosing similar fields of study. The theory interprets human learning as a sequence of reciprocal exchanges among personal characteristics (e.g., intrinsic motivation, self-determination, self-efficacy, career motivation, and grade motivation), environmental contexts (e.g., immigrants in U.S. universities), and behaviors (e.g., enrolling in STEM or related fields).

Research Questions

1. Why do Cameroonian immigrants who have not majored in a STEM field at the time of entering the U.S. switch into a STEM or related field while in the U.S.?
2. What is different about pursuing a STEM field in Cameroon versus pursuing a STEM field in the U.S.?
3. What differences if any, exist between male and female Cameroonian immigrants' decisions to switch from non-STEM to a STEM or related field in the U.S.?
4. What challenges, if any, do Cameroonian immigrants encounter when switching from a non-STEM to a STEM or related field in the U.S.

Assumptions

1. An assumption inherent in this study was that participants would answer questions fairly and completely.

2. Researcher bias (see below) may have influenced the types of questions that were asked during the interview phase of this study.

Delimitations

1. This study was limited to Cameroonian immigrants in STEM and related fields who were enrolled at U.S. colleges or universities at the time of the study.
2. The study included only individuals who had become permanent residents or citizens of the U.S. International students or illegal immigrants were not included in the study.

Definition of Terms

STEM: STEM is an acronym for Science, Technology, Engineering and Math.

STEM-related: STEM-related refers to any field such as medicine and nursing that uses STEM education.

Foreign nationals: Persons who are not naturalized citizens of the country in which they are living.

Immigrants: An immigrant refers to a person who comes to live permanently in a foreign country. This study does not include international students, because their visa status requires them to go back to their country after graduation. Additionally, this study does not include illegal immigrants.

Switch: Switch is an act of adopting one policy or way of life. This study looks at a shift of Cameroonian immigrants' ideas toward STEM and related fields as a result of arrival to the U.S.

Researcher Bias

I am originally from Cameroon, which means that my experiences might have influenced how I analyzed my qualitative data. I also entered the U.S. after being a female STEM field major in Cameroon. At the time of this study, I had lived in the U.S. for 7 years, and had seen the attitude of Cameroonian immigrants toward education in the U.S., and such experiences might have influenced the responses of the interviewees through my nonverbal language.

I am aware that the experiences and beliefs I brought to my research had the potential to create bias. To minimize such bias, during interviews, I frequently reminded myself to remain focused on my research purpose and questions. I also reflected upon my biases to ensure that they were not influencing my data analysis. During interviews, I needed to be aware of my body language and facial expression to avoid leading answers. When interpreting the qualitative data, I utilized the practice of member checking to ensure that my interpretation of data reflected the meanings of participants' responses and not my own beliefs.

Summary of Chapter I

This chapter provided an introduction to the research problem along with providing a study purpose and rationale. Research questions were identified along with introducing the phenomenological foundations of this qualitative study. Assumptions, delimitations, and researcher bias were also presented. A review of literature will follow in Chapter II.

CHAPTER II

REVIEW OF THE LITERATURE

The importance of science, technology, engineering, and mathematics (STEM) fields cannot be overemphasized in having played a critical role in developing our planet from a primitive society to a modern one. One doesn't need to go far before seeing the impact of knowledge gained through these fields. For example, the existence of electronic gadgets, including more fancy modern ones like the Kindle, iPod, iPhone and sophisticated computers, automobiles, aircrafts, ships, medical equipment, all attest to the significance of STEM fields in our world. Even primitive societies, as is typical of African villages, have felt the impact of STEM fields, at least in their use of textile products such as clothing, cell phones, television (TV), and clocks.

STEM fields have helped the word deal with crises. These include curbing world food crises, providing potable water to many people around the world, combating illnesses or infections and mitigating their effects on human health around the globe. As the world faces challenges with feeding its rapidly growing human population, meeting its energy demands, curbing global warming, and preserving the environment, many eyes are on the STEM fields since these fields are indispensable to the advancement of our world and meeting global challenges.

The Need for STEM Education in Africa

Educating Africans in STEM fields is critical, because such education will help them to be able to compete with the rest of the world. According to Easterly (2009), Africa could not meet up with Millennium Development Goals (MDGs) because of its limited ability in STEM fields. The MDGs consisted of eight international development goals which include:

> (1) Eradicate extreme poverty and hunger; (2) achieve universal primary education; (3) promote gender equality and empower women; (4) reduce child mortality; (5) improve maternal health; (6) combat HIV/AIDS, malaria, and other diseases; (7) ensure environmental sustainability; and (8) develop a global partnership for development. (United Nations, 2016, para. 10)

These goals were established from the Millennium Summit of the United Nations held in New York during the year 2000 and were recorded following the adoption of the United Nations Millennium Declaration. A critical human resource for meeting any of these goals is a strong STEM workforce; the lack of strong STEM education in Africa contributed to them not achieving any of the MDGs.

Easterly (2009) contended that Africa does not meet the MDGs and that even their successes seem like failures to the rest of the world. To him, STEM education is crucial for Africa to be able to meet the MDGs and compete with the rest of the world. To this effect, Africa needs to work hard and be self-sufficient to be able to meet up with the rapidly technologically advancing world. Chandy and Gertz (2011) contend that Africa cannot hope to develop as a continent and be self-sufficient by using other countries' science and technology. Africans need to work at developing STEM expertise

to address their numerous problems. Kola (2013) observed that science and technology education are important to any nation in solving its problems. For Africa to develop, there is an urgent need to motivate all students to get involved in STEM subjects.

Even though Africa is in need of students in the STEM fields, dropout rates in such fields are high, especially for females. For example, in mathematics at the university level, Teferra (2006) noted a dropout rate of 85% in Madagascar, 95% from the Central African Republic, 75% in Niger, and 60% in Uganda. Teferra added that these losses may not be fully representative of dropout rates, but some percentages of those leaving may be due to students switching to less challenging fields of study. While these statistics reflect dropout rates for mathematics, data on dropout rates from other STEM fields is limited in the literature. Such a deficit reveals the need for a more comprehensive understanding of dropout rates in these disciplines. It should be noted in particular that women are underrepresented in the STEM fields in Africa (Araba, 2015), especially because they are less likely than men to enroll in the STEM fields (Hill, Corbett, & St. Rose, 2010), and more likely to drop out (Akwetey-Okunor, 2015; Eloundou-Enyegue, 2004). For example, in Nigeria, the peak of female enrollment in STEM subjects was at an average of 20 percent (Araba, 2015).

The African culture plays a big role in keeping women away from STEM fields; and therefore, limits the overall number of STEM majors the nation has. In the African culture, parents believe that their female children will get married and leave their birth family one day, and that spending money to educate their daughters is wasteful (Meeker, & Meekers, 1997). Also, African parents believe that their highly educated daughters will become unmarriageable (Spencer, Steele, & Quinn, 1999). In order not to waste their

resources and prevent their daughters from becoming unmarriageable, African parents often choose not to educate their daughters Hill and King (1993). Hill and King emphasized that since highly educated females take longer to complete school than less educated females, this reduces their chances of getting married and having children. Johnson-Hanks (2003) noted that highly educated African females not only produced fewer children than their less educated peers, but also were less likely to get married. Johnson-Hanks added that educated women were more likely to abort an unplanned pregnancy than their uneducated counterparts. Jensen, Khasakhala, Odwe, and Wawire (2015) pointed out that education influences the number of children that females wish to bear, and hence, hinders their ability to achieve their societal reproductive expectations.

As noted earlier, African women are expected to spend more time keeping their home and raising their children. Ogunjuyigbe, Ojofeitimi, and Akinlo (2006), found that according to tradition, women's roles have been primarily domestic, and hence, have required little or no education. Such societal beliefs result in women having little or no motivation to choose a STEM field (Amponsah, Mensah, & Mensah, 2014). In addition to low motivation for women in the STEM fields, cultural beliefs are also a hindrance to them, because African women in the STEM fields are perceived differently in society. Such perceptions generally demotivate some African women from enrolling and excelling in the STEM fields (Ogunjuyigbe et al., 2006), and those women who enter a STEM field of study find it difficult to progress at the same rate as their male counterparts. Masanja (2010) noted that females in Sub-Saharan African schools continued to "lag behind" males in performance, particularly in STEM fields. The cultural impact of gender stereotypes in education remains clear with more women

tending to study so-called “women related fields” such as nursing and social work, whereas programs in the so-called “hard sciences” are dominated by males.

When women perform academically at a lower level than men, they risk being judged in ways that maintain gender stereotypes such as women have lower ability than men in STEM fields, and this continues to disrupt the academic performance of women in such fields. Studies have long shown that a gender gap and stereotypes exist among female and male students in STEM fields (Arnot & Phipps, 2003; Beede et al., 2011).

These studies, however, have failed to show what influences female students in their choices of what to study while in their home country, and what might motivate them into STEM or other fields when they study in other countries. According to Epstein’s (1996) theory of overlapping spheres of influence, a child’s growth and development is influenced by three overlapping phases: school, family, and community. This theory emphasizes the importance of schools, families, and communities working together to meet the needs of children. Such a theory indicates the importance and the influence of these three factors in the choices that students make while in school. This means that people in these roles have a great influence in the lives of African and Cameroonian students to either choose to study in the STEM fields or non-STEM fields.

In the last decade, expansions in social theory have provided greater insight into how strong connections between schools, families, and communities enhance children’s academic performance, and social and emotional development and well-being. In a theory on school, family, and community partnerships, Epstein (2001) noted that there is no indication that any of these factors – schools, families, or communities – more strongly influence children’s performance in school. It was commonly thought that there

was a sequential influence of family, school, and community on a child's development and growth. The family was viewed as the primary source for nurturing the child and placing the foundation for his or her entire school life. The school was seen as the mediating agent that prepared the child for his or her role in the larger community (Parsons, 1985). Recent studies, however, show that from infancy, the home, school, and community simultaneously affect children's growth and development (Wasik & Karweit, 1994; Young, Core-Gebhart, & Marx, 1992). These three variables (family, school, and community) stand clear in Epstein's theory on child development, and so, this literature review will continue to examine how these factors influence African students in choosing to study in STEM or non-STEM fields while in their country or in another country.

Motivation of Africans into STEM Fields

Some African governments are making efforts to encourage more STEM education. Since most African women have been known to either not enroll in school at all or drop out too early, often for marriage, encouraging female education in Africa is crucial. Moreover, stereotypical beliefs are prevalent in African girls towards STEM education, and efforts still have to be made at attracting such students into STEM fields. Because these attitudes discourage women from pursing an education in STEM fields, the overall result is that less African and Cameroonian students are involved in these fields. In order to motivate African women to enter into STEM fields, and therefore encourage more overall STEM majors, the combined efforts of parents, teachers, and the society at large are needed.

African Families and Education

Okantey (2008) noted that the family is the main factor influencing the lives and school performance of students. However, African societal norms hinder families from effectively assisting their daughters in school; rather, they prepare their children for marriage, and hence, keep them away from school. Emirie (2005) posited that because of aggravating family poverty in Ethiopia, peasant parents tend to arrange marriages for all of their female children at the same time in order to avoid the problem of preparing wedding feasts for each of them. The ages of these children is not taken into account so long as men are available to get married to them, limiting the education of these girls. Such marriages are accentuated by the desire for a dowry often paid to the girl's family when she is to be married (Goody & Tambiah, 1973). Some parents wait anxiously for when their female children will get married prioritizing this over their education. Such attitudes limit the education of women, which lead to more males in school while neglecting the nation's female population.

In the past, in some African countries, the education of female children was curtailed due to the view that women were *other peoples' property* (Njogu & Orchardson-Mazrui, 2013; Tambiah et al., 1989). The female child was not really viewed as a permanent member of a family since she would be given to her husband someday. Goody and Tambiah (1973) also said that investing in female children in terms of education was considered to be wasteful. Spencer, Steele, and Quinn (1999) noted that early marriages have hindered most African females' education because parents believe their daughters will be unmarriageable if they are highly educated. Some parents continue

to hold onto such beliefs, according to recent studies on child marriage in Ethiopia (Rodgers, 2012) which hinders their children, then, from pursuing education.

According to Okantey (2008) the first set of people to motivate female children into STEM fields should be their parents, who spend more time with them than anyone else. Parents buy toys for children when they are young, and provide the first education to children even before they get to school (Eccles, 2007). In fact, parents influence and make decisions for their children from birth at least to the point when they become more independent; which is to say that parents have a big role to play in the education of their children. For this reason, if parents become aware of how their interactions with their children will affect children's studies, it will be less likely for their children to fall into the pattern of girls playing with dolls and boys playing with scientific equipment such as a microscope, or a doctor's stethoscope (Snow, Jacklin, & Maccoby, 1983). Reynolds (2000) noted that most parents tend to buy more toys relating to science for their sons and buy dolls for their daughters.

The more interest parents show their children toward STEM fields the better parents will build confidence in their children toward STEM fields, but parents can cultivate good habits toward STEM fields only if they understand their role as parents. If children perceive STEM subjects in a positive way, they will be more likely to fall in love with the subjects. Tzur (2000) opined that poor attitudes or anxiety about mathematics or related fields inhibits the performance of children. He stated that such children normally try to avoid such subjects, and many pretend to be sick when it is time for these classes. Children develop negative attitudes because parents portray little to no appreciation for such subjects. Tomasetto, Alparone, and Cadinu (2011) found that the

endorsement of gender stereotypes regarding STEM abilities was lower for mothers than for fathers and this attitude affected female children more. That is, more mothers than fathers felt that their female children would not do well in STEM fields, and such attitudes negatively affected the female students, and contributed to the gender disparity in STEM fields.

The African Community and Stereotypic Beliefs

There is unequal representation and performance in STEM fields within African communities between gender, which is not biological but cultural. Based on a study in Osun State, Southwest Nigeria, Ogunjuyigbe et al. (2006) argued that societal norms are the reason for low involvement of women in STEM fields. For example, the belief that women are likely to get pregnant and have their studies interrupted is common in the African society. Also, marriage and child bearing are key societal expectations of African female children and anything interfering with this is generally considered unacceptable (Bigombe & Khadiagala, 2003).

In most African societies, there is the thought that women are dependents and do not need to be educated in fields such as the *hard sciences*. Men should labor more in school and earn higher degrees since they are expected to become bread winners for their families (Johnson-Hanks, 2003). Although such ideologies are not as strong in modern times, traces can still be seen. For example, Ogunjuyigbe et al. (2006) revealed that 57% of fathers, 45.6% of mothers, and 57.6% of children held the view that boys and girls have equal rights to STEM fields. However, the societal reality in schools and occupations in these areas was not reflective of these views as women were still

underrepresented. They added that science courses often require those who select them to stay longer in schools before they graduate with a profession.

Anamuah-Mensah (1997) reported that highly educated females are believed to be arrogant, sophisticated, discontented, and even sometimes immoral, and, therefore, unmarriageable; he further stated that such women find it difficult to find husbands. He also asserted that science and technology subjects are normally looked at as largely masculine, a secret domain in which females are considered to encroach. Such societal beliefs have caused women to have stereotypes about STEM fields, and hence, they do not desire to pursue them.

Stereotypic beliefs appear to be the dominant factor that explains why women tend to shy away from STEM and related fields. In her study on issues that keep women away from the sciences, Rosser (1989) found that women often think mathematics is cold, local, and void of intuition and creativity. The majority of the females involved in the study thought that mathematics is learned by memorization and by having what they referred to as a "mathematical mind." Rosser noted that such views interfered with girls' understanding in STEM fields and with confidence in their capability to do mathematics.

Simon (2000) also reported on stereotypic beliefs leading to gender disparity in representation and performance, which lead to women's exclusion in mathematics and the sciences in general. Simon reported that such gender beliefs were held even by ancient fathers of mathematics, such as Pythagoras (600 B.C.), who believed that numbers belonged to the psychic domain, which to him was masculine. According to Pythagoras, the female cranium was too small to hold a powerful brain, which could handle numbers, mathematics, or STEM subjects. As late as the 19th century A.D., beliefs

still loomed that women's brains were too weak to sustain rigorous theory. Recently, the president of Harvard University suggested at a scholarly meeting, "One reason fewer women make it to the top in mathematics and science may be because of innate differences of ability from men" (Fogg, 2005, para. 1). Even though studies have shown similarities in gender performance in mathematics (Guiso, Monte, Sapienza, & Zingales, 2008; Valla & Ceci, 2011), such beliefs are still vivid in today's world.

Stereotypic belief is also prevalent in African nations. Stereotypes in education remain clear in such societies with more women tending to study so-called *women related fields*, such as nursing and social work, whereas programs in the so-called *hard sciences* are dominated by males. Findings in modern times have disqualified such stereotypic beliefs (Frenzel, Pekrun, & Goetz, 2007); however, traces of the repercussions of negative beliefs about women and STEM subjects continue to be seen in Africa (Johnson-Hanks, 2003; UNICEF, 2005). For example, Masanja (2010) noted that females in Sub-Saharan African schools lag behind males particularly in STEM fields.

Teachers and the Classroom

Besides parents and communities influencing students towards STEM subjects, teachers also play an important role. Some students, especially female students, come into a classroom with little or no interest to attend school because of all the adverse information they have received from their families and the community (Hill, Corbett, & St. Rose, 2010). It is incumbent upon teachers to help wipe off negative preconceived ideas students have towards any subject area. A good teacher should inspire his or her students and serve as a role model. Some students have continued to pursue certain subjects even to the Ph.D. level as a result of inspiration from their teachers at some point

while studying those subjects. Some authors have shown that one common way to help students be successful in STEM is to expose students to a variety of role models. For example, exposing female students to women teachers who are successful in STEM fields can help the students improve their abilities as they may emulate these successful women (Lockwood & Kunda, 1997; Marx, Stapel, & Muller, 2005).

Bornfreund (2011) contended that teacher-training and licensure requirements at the time of Bornfreund's study left many new teachers of early elementary students poorly prepared. Unfortunately, several STEM field teachers, irrespective of sex, have been reported to discourage girls from studying STEM subjects; and hence, for some of these girls, it is hard to be persuaded into continuing on in STEM subjects, especially at higher levels.

McGlone (2007) found that boys received more attention than girls from their teachers in the form of time and encouragement in mathematics and the sciences. He also noted that teachers tended to praise girls only on grounds of their neatness and cared little about their performance. Eccles (1987) noted earlier that classrooms and schools ought to be used to counteract years of socialization that children receive from television and culture at large prior to attending school. Wai, Cacchio, Putallaz, and Makel (2010) referred to such counteractive endeavors as one of the major causes for the observed reduction in the gender gap between 1980 and 2010 in the USA. Such endeavors should be emulated in the African continent, especially in Cameroon.

Teachers' emotions and psychology have been shown to have repercussions on student performance. In a study by Back et al. (2011), as well as Beilock, Gunderson, Ramirez, and Levine (2010), they found that at the beginning of a school year, there was

no significant relation between teachers' STEM subject anxiety and students' STEM subject achievement. However, by the end of that school year, there was a relationship, which showed that the higher a teacher's STEM field anxiety, the lower the performance of female, but not male, students. Such high anxiety negatively affected female student performance, which henceforth created a gender gap in STEM fields.

In Africa, especially Cameroon, teachers lack motivation to teach because of low pay and lack of scientific equipment to use in their classrooms, which affect students negatively and hence discourage these students from continuing their education (Banya & Elu, 2001). Dladla and Moon (2002) noted that most Africans who manage to receive education would prefer to move to big cities or even overseas where more opportunities and higher paying jobs await them. Thus, this creates large class sizes, with high average numbers of students per ill-equipped teachers in a classroom. They added that the teachers who teach in rural areas are usually those unqualified with few teaching aids and poor textbook provisions, which exacerbates poor teaching in rural learning environments and negatively affects student performance.

Due to the inadequate qualification of teachers in Africa and lack of good learning materials, students' performance in STEM fields greatly drops (Mulkeen, 2005) and poorer results in standardized tests scores occur. Such poor performances henceforth demotivate teachers, which leads to high anxiety among teachers, and poor performance (Murimba, 2005). With such anxieties, teachers in Cameroon find it difficult to motivate students in the subjects they teach, which causes high dropout rates with up to four out of ten children (mostly females) not able to complete primary school, leaving more boys attending school than girls (UNICEF, 2005). If teachers themselves are not motivated to

teach, how will they motivate the students they teach, especially students who are demotivated by their family and the community? This lack of motivation creates a struggle for Cameroonian students who want to further their education.

Considering that STEM education in Africa, especially Cameroon, faces many obstacles, most students who want to further their education in these fields travel overseas (Edokat, 2000), and the U.S. has been found to be the top destination for immigrants (Verbik & Lasanowski, 2007). The U.S provides many different avenues through which immigrants are permitted into the U.S, such as the *Diversity Lottery,* which accepts 50,000 immigrants into the U.S. each year (American Immigration Council, 2016). Reviewing current immigration practices and impacts in the U.S. could better help in understanding the Cameroonian immigrant population as they make academic decisions.

African Immigrants in the U.S.

Even though this study focuses on Cameroonian immigrants, limited literature was found specifically for this population. Therefore, this section will examine literature on African immigrants in general. Millions of immigrants who migrate into the U.S. have had a tremendous impact on U.S. culture and economy. Immigrants boost the U.S. economy through entrepreneurship or the creation of new jobs and through the purchase of goods and services from U.S. businesses (American Immigration Council, 2012). In the Ewing Marion Kauffman Foundation report titled *Kauffman Index of Entrepreneurial Activity 1996-2013* Fairlie observed that within the past 18 years, “Latinos, Asians, and immigrants experienced rising shares of all new entrepreneurs” (Fairlie, 2014, p. 3), and notably that “immigrants were nearly twice as likely to start businesses each month as

were the native-born [Americans] in 2013" (Fairlie, 2014, p. 3). Besides opening new firms, immigrants impact U.S. businesses positively. Generally, U.S. firms have been found to respond to the influx of immigrants by expanding their production activities or the number of their establishments. This is more noticeable with small-sized, relatively mobile, low-skilled intensive industries (Olney, 2013). The rise in immigration increased labor-force participation by about 12.5 million between 1990 and 2006 and resulted in the earnings of U.S. workers increasing by between 0.6 percent and 0.7 percent (Ottaviano, & Peri, 2012). Despite a number of politicians opining that immigrants compete with and take away jobs from natives, research has largely not supported this assertion. Rather, immigrants have been found to complement Americans in the workplace in multiple ways (Kugler, & Oakford, 2013).

As noted previously, a large proportion of legal immigrants in the U.S.A. persist in the country and eventually secure citizenship through naturalization. This only makes sense since the average person emigrating to the U.S. is in search of greener pastures or a better life. This is so, particularly, for immigrants from poorer nations around the world (Arthur, 2009). Economic difficulties, increased poverty, and political instability coupled with dashed post-colonial hopes are the main causes of exodus from developing countries to the west (Takougang, 2003). Immigrants from these poor nations with worsening economic situations and increasing unemployment rates do all they can to secure U.S. citizenship once in the United States. Takougang (2014) found this to be the case for U.S. immigrants of Cameroonian descent, and his findings would hold true for most African countries with similar socio-political and economic climates as Cameroon. According to Takougang (2014), the number of Cameroonian immigrants in the U.S.A. increased from

3,161 to 30,000 between 1990 and 2009. The majority of these Cameroonian immigrants, he noted, strive to integrate into American society and culture, gain citizenship, and become productive patriots of their newly found country. Overall, the population of African-born U.S. immigrants increased from nearly 200,000 in 1980 to some 1.5 million in 2009 and is continuing to grow (McCabe, 2011). A majority of these immigrants have become naturalized citizens.

What is Naturalization?

In order to understand how this population functions in the U.S., it is better to understand the naturalization process. Naturalization is the process by which a lawful permanent resident (LPR) in the United States who fulfills requirements established by Congress in the Immigration and Nationality Act (INA) gains U.S. citizenship. LPRs need only five years of continuity in the U.S. to qualify for this status, provided they maintain commendable moral rectitude and show proof of knowledge of U.S. history, governmental setup, and general civics (Kandel, 2014). This process usually brings many benefits to the recipient such as voting rights, the right to travel with a U.S. Passport, the right to run for an elective office where citizenship is required, the right to participate on a jury, eligibility for federal and some law enforcement jobs, access to some state and federal benefits unique to citizens, the right to gain citizenship for minor children born abroad, and the right to bring family members to the U.S. much more easily than LPRs (U.S. Department of Homeland Security, 2017). Despite these benefits, millions of LPRs who are eligible for naturalization do not apply, particularly those from neighboring Mexico, according to a recent study (Gonzalez-Barrera, Lopez, Passel, & Taylor, 2013). Gonzalez-Barrera et al. found that whereas Mexicans constitute the largest number of

immigrants in the U.S.A. (and over half of the total number of illegal immigrants), this group was the least likely to seek naturalization.

Contrarily, the majority of African immigrants seek U.S. citizenship. In 2014, nine percent of the immigrant population nationwide was African, making the total number of African immigrants nearly 1.8 million or about twice as high in the year 2000. In fact, from 1970 to 2012, the number of African immigrants in the U.S. virtually doubled every decade (Gambino, Trevelyan, & Fitzwater, 2014). These immigrants often seek citizenship in the U.S. (Sacchetti, 2014). For example, Arthur (2008) found the majority of Ghanian immigrants in the U.S. seek naturalization; however, no information was found for Cameroonian immigrants. This pursuit of citizenship or the "American Dream" by African immigrants is not without challenges.

Sinyan and Lorenzo (2012) outlined some of the challenges faced by African immigrants to the U.S.A. Sinyan and Lorenzo noted that whereas history holds that European immigrants to the U.S.A. easily gained citizenship, accessed jobs, and moved up the economic ladder, African immigrants faced discrimination, inter- and intra-group prejudice, drastic cultural changes, and language barriers, among other challenges. Above all, African immigrants enter the U.S.A. from a wide range of social conditions, some as refugees and with different educational levels, which indirectly defines their placement in U.S. society and the hurdles they face. Kent (2007) wrote on the influx of African immigrants to the U.S. in the last quarter of the 20th century, following changes in the legal system that removed restrictions on Africans and permitted such immigration. Of all black immigrants who entered the U.S. between 2000 and 2005, 40% were from Africa.

Despite the many hurdles African immigrants face in their pursuit of the American Dream, this immigrant group has been found to be resilient, hard-working, and more successful than native-born Americans (Denhart, 2015). Since the majority of them move to the U.S. to seek a better life, they are determined to succeed. Once here in the U.S., their resolve and hard work often pay off in multiple ways, and such resolve is often inculcated in their progeny. Rauh (2014) found that African immigrants' labor market outcomes supersede those of African Americans, and the same trend was seen when comparing their children.

Moreover, African immigrants were found to be more likely than African Americans to be employed, and the children of African immigrants were more likely to go to and complete college than African Americans (and whites) and were less likely to quit high school. Other studies have shown that high school students from African immigrant populations enroll in selective colleges at higher rates than do U.S.-born children (Bennett & Lutz, 2009; Massey, Mooney, Torres, & Charles, 2007). From analyses of data from the "National Longitudinal Survey of Freshmen of 1998," Massey et al. observed that among students at the top 28 universities considered in their study, African immigrant students constituted 27%, more than double the fraction of African American students.

To the contrary, historically black colleges and universities (HBCUs) had a majority of African Americans. Bennett and Lutz (2009) analyzed data from the National Education Longitudinal Study of 1988, which was a study of eighth graders who had been followed continuously for a period of 12 years, and observed that 9.2% of African immigrant students were enrolled in elite colleges compared with 7.3% white and only

2.4% African American students. Moreover, African immigrants recorded the highest college attendance rate (75.1%), slightly higher than white students (72.5%) and considerably higher than African Americans (60.2%).

Despite being disadvantaged in multiple ways, the resilience in African immigrants reveals itself in academic attainment. A recent report on immigrants from Africa noted that the majority of these immigrants attain high levels of education (Gambino et al., 2014). Notably, immigrants from Egypt, Nigeria, and South Africa had record highs of advanced academic degrees (at least a bachelor's degree). Although many studies have shown such trends, no study was found on the career choices of Cameroonian immigrants. The Center for American Progress published five facts about Black immigrants in the U.S., reporting that African immigrants have more college education and higher rates of degree attainment than any other immigrant group in the U.S. (Faris, 2012). The U.S. Department of Commerce announced in its 2010 American Community Survey Briefs that foreign-born residents held 33% of all bachelor's degrees in engineering fields; 27% in computers, mathematics, and statistics; 24% in physical sciences; and 17% in biological, agricultural, and environmental sciences, despite constituting less than one-fifth of the total U.S. population (Gambino & Gryn, 2011). Although 51% of foreign-born students with at least a bachelor's degree were female, only 37% of science and engineering degrees for immigrant students went to females.

How the U.S. Attracts Students into STEM Fields

In the U.S., there has been an increase in the number students taking STEM subjects due to ongoing efforts to attract STEM students at different levels, which have helped in encouraging more students into these areas. In the proportion of the 24-year-old

who earns degrees in STEM fields, the U.S. currently ranks 20th in the world (Kuenzi, 2008). The U.S. has been using different ways to attract students into STEM fields, such as helping parents to motivate adolescents in mathematics and science at all levels of education, especially during the last 2 years of high school (Harackiewicz, Rozek, Hulleman, & Hyde, 2012). Another way the U.S. has tried to overcome obstacles of students pursuing STEM studies and careers is by exposing them to role models. It is generally held that exposing students to exemplars would reduce stereotypes. Rios et al. (2010) contended that introducing student role models into educational curriculum, where they are least anticipated, carries the potency of neutralizing automatic stereotypes in that field, such as educational and occupational choices believed to be attainable to them.

The part role models play in motivating other students to enter and continue on in STEM field education has been emphasized in recent literature. These role models are workers, such as professors or senior students, who are admired by other students as talented and possessing traits worth emulating (Erkut & Mokros, 1984). In general, human beings develop and learn from birth by observing parents and others. In other words, children learn mostly by imitating or following others senior to themselves. In some families, one would find children tending to end up in the same careers as did their parents. In particular, when young adults encounter people they admire, the respect they have for these people influences their psychology immensely and could reduce stereotypes towards certain tasks previously thought to be biased. Marx and Roman (2002) found female students' mathematics test performance in the U.S. to be improved when the test was administered by skilled female role models in the subject. Competent female exemplars administering the test buffered women's test performance and

neutralized stereotypic feelings, such as anxiety and the feeling of not being capable. By providing students with biographies of fictitious female exemplars regarding their past mathematics experiences and abilities, participating students' self-appraised mathematics competence was moderated, resulting in better performance in a difficult math test.

Reading about competent students in STEM fields has been reported to have a positive impact on other students in these subject areas in the U.S. A study with the use of a stereotype inoculation model, based on the premise that contact with same-sex STEM experts (including advanced peers, professionals, or professors) would improve students' self-concept and attitudes towards STEM; lead to greater motivation to pursue STEM careers, where student participants in a calculus class were found to build positive attitudes and stronger implicit identification with STEM (math in this case) after encountering counter-stereotypic student exemplars. This awareness led to more effort and increased self-efficacy in the subject (Stout et al., 2011). By providing students with biographies of some engineers of varying ages and races, Stout et al. found that after reading such information, students appeared to be more poised to pursue a future career in engineering. Studies have found that not only a physical presence of role models positively impacts students, but reading about them likewise creates motivation in STEM students.

Young, Rudman, Buettner, and McLean (2013) found students' STEM career aspirations to be enhanced once they identified with professors to whom they were exposed as role models, irrespective of whether these professors were male or female. Young et al. found STEM students whose professors helped them develop pro-science

implicit attitudes improved academically as long as they viewed these professors as role models. Such students were unlikely to develop stereotypes in science as masculine.

In general, despite the low involvement of African students in STEM fields in their native countries (Karugu, Kamere, & Mugo, 2013), it is clear that immigrants have contributed positively to STEM fields while in the U.S. (Rai, Borah & Ramaprasad, 1996). As the U.S. invests more money and efforts to encourage progress in STEM education, the number of immigrant students and workers in these fields has been increasingly significant (Kuenzi, 2008; National Center for Education Statistics, 2009). However, studies have not specified if African immigrants, especially those from Cameroon, have also contributed positively to STEM fields in the U.S. Additionally, studies have not shown if Cameroonian immigrants go into STEM and related fields while in the U.S., and if those who go into such fields were STEM majors while in Cameroon. These subjects will be considered in this study. This study sought to understand the reasons why Cameroonian immigrants who did not study STEM fields in their country switched into STEM or related fields after migrating into the U.S.

Summary of Chapter II

This chapter presented a comprehensive review of the complex topic of African immigrants, especially those from Cameroon studying and building careers in STEM and related fields while in the U.S. The chapter began with a situation of African immigrants, especially those from Cameroon, the challenges they face concerning STEM fields, and the contribution of immigrants in the U.S. Chapter III will present the quantitative and qualitative methods utilized in this study.

CHAPTER III

METHODOLOGY

Qualitative Methods

The methodology section covers elements that formed the design and manner of this study, which includes the methodology and methods. Methodology relates to strategy for the design of the study, which dictates and justifies selected methods. Methods, on the other hand, deals with actual techniques engaged in data gathering and analysis of the study (Crotty, 2012).

This study sought to understand the reasons why Cameroonian immigrants who did not previously study STEM and related fields in their country switched into such majors after migrating into the U.S. This understanding could help improve the education of students studying STEM in Cameroon. Ultimately, more Cameroonian students might be encouraged to pursue STEM and related fields while in their country and in the U.S. The researcher employed a qualitative method to provide an in-depth investigation of why students switch into STEM and related fields after coming to the U.S. Figure 4 shows a summary of the theoretical framework utilized for this study, the purpose, method, research questions, and how validity and reliability were employed.

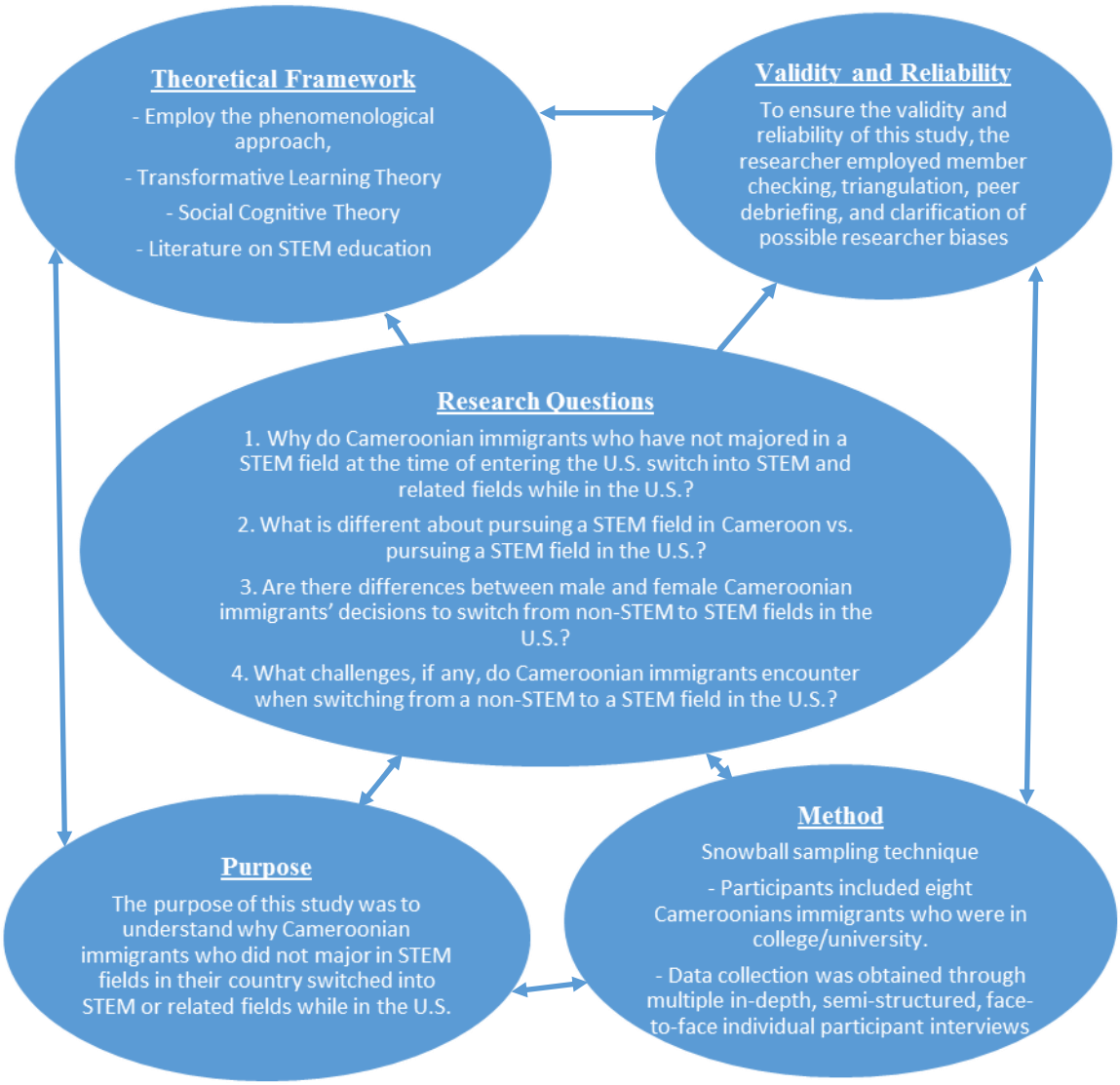

Figure 4. Diagram of Qualitative Study.

Methodology

This study employed qualitative research methods, specifically a phenomenological approach. A phenomenological study explores a common meaning of a life experience (or life experiences) of a phenomenon for several individuals, and what they have in common as they experience this phenomenon (Creswell, 2013; Moustakes,

1994). According to Englander (2012) and Creswell (2013), the initial process of phenomenological research design involves mindful realization with the aim of understanding a phenomenon from the viewpoint of people regarding their life experiences of that phenomenon in such a way that meaning can be made out of these experiences. Englander and Creswell additionally described the aim of phenomenology as to determine in depth what an experience (or experiences) means for the individuals who have undergone a shared phenomenon and are able to provide a comprehensive description of it. In this study, the researcher sought to understand why Cameroonian immigrants chose to study STEM or related fields while in the U.S.

Method

This section describes the procedures that were used for data collection and analysis. This study used a phenomenological qualitative method for data collection to understand why Cameroonian immigrants switched into STEM and related fields that they did not study in their country. By collecting qualitative data from eight Cameroonians, the researcher was able to identify some common themes in their stories according to their experiences in Cameroon and in the U.S. Herein, the researcher also describes the procedure that was used to interview these eight immigrants.

Data Collection

Sites and Locations

This study was conducted in a Midwestern region of the U.S. Respondents were comprised of Cameroonian immigrants who were willing to talk about their experiences as STEM or related field converts. All participants were current students in a regional college or university.

Participants

Participation for this study was based on purposeful sampling. Every participant needed to be a Cameroonian immigrant who switched into a STEM or related field upon arrival in the U.S. This is because a specific group of individuals was required for the study; that is, Cameroonian immigrants who switched their major from a non-STEM to a STEM or related field were needed to satisfy the needs of the research questions of this study. Phenomenology requires returning to personal experiences in order to get authentic information about what it means to be in a situation, and it was only fair that Cameroonian immigrants who switched their majors were selected for this study. In that way, they could have the occasion to express their experiences (Whittemore, Chase, & Mandle, 2001).

Cameroonian immigrants participating in this study included male and female professional and undergraduate students at a Midwestern college or university, who had expressed participatory interest at the time of the study. To contact participants, the researcher used a snowball sampling technique which entails recruiting subjects through acquaintances (Patton, 1990). The principal investigator contacted people, via phone or email, who met the basic criteria and those who desired to be interviewed were accepted for the study.

After individuals agreed to participate in the study, the researcher sent an email communication to participants with the approved Institutional Review Board (IRB) Consent Form attached to the email (See Appendix A). The content of the email also

included the purpose of the study, and requested a voluntary interview with the participant. The email also informed participants that the attached consent form was for their reading, and consent would be required at the time of the interview if they agreed to participate in the study. A total of eight Cameroonian immigrants who had switched their majors from a non-STEM to a STEM or related field were selected as participants for the study (Table 1) because they fulfilled the demographic requirements and could provide useful information to answer the research questions.

As seen in Table 1, it should be mentioned that the educational system in Cameroon is organized into specific series at the high school level. The series that contain science and related subjects begin with the letter "S" (for example, S1, S2, S3…). The series that contain arts and related subjects begin with the letter "A" (for example, A1, A2, A3…). Each series consists of specific subjects; for example, S1 consists of Physics, Chemistry, and Mathematics (students in this series are allowed to add Biology and Further Mathematics which is an advanced form of math), while the series A1 includes the subjects History, English Literature, and French. While each high school series has three subjects, students are generally permitted to add other related subjects to a maximum of five. Students are only allowed to take subjects in one series.

Table 1. Participants' Education in Cameroon and Their Program of Study in the U.S.

Pseudonym	**Gender**	**Age**	**High School Field**	**Highest Level of Education In Cameroon**	**Program of Study in the U.S.**
Shalom Love	Female	26	A1. History, English, Literature, French Language, and Philosophy	Higher Teacher's Training College	Pharmacy*
Princess Brown	Female	28	A2. History, English, Literature, Geography	Law Degree	Biomedical Sciences
Mother Mimi	Female	27	A2. History, English, Literature, Geography	Accountancy Degree	Bio Statistics
Miss A.	Female	32	A1. History, English, Literature, French, Religion	Journalism and Mass Communication Degree	Pharmacy*
Mussa Bless	Male	34	A1. Literature, History Philosophy, French Languages	Degree in Political Science	Medical* School
Thiery Randze	Male	29	A5. History, Religion Geography, Economics Philosophy	Seminary and MBA classes	Nursing*
Job John	Male	35	A3. History, English Literature, Economics	Degree in Human Resources	Medical* School
Rosemary Ambang	Female	44	A3. History, English Literature, Economics	High School	Petroleum Engineering

*Indicates professional degrees

As Creswell (2012) stated, sampling in qualitative research is based on "people that can best help us understand our central phenomenon" (p. 205). The acceptance of a smaller sample permits in-depth data collection that results in a better understanding of each person's unique experience (Patterson & Williams, 2002). In a phenomenological method of investigation, Englander (2012) recommended that a researcher should use at least three participants in a study. In addition, Creswell (2012) discussed sample size to be between "1 or 2 to 30 or 40" in qualitative research (Creswell, 2012, p. 2009).

Participants in the study included three males and five females, who were either professional or undergraduate students (see Table 1). It should be noted that international students were not included in the study because of their visa status, which does not allow for easy switching of fields of study while in the U.S. This study also did not include illegal Cameroonian immigrants.

Procedure

The researcher submitted an Institutional Review Board (IRB) proposal to the University of North Dakota. After approval from the IRB, the qualitative research interviews and data collection took place in the fall of 2016. Participation in the study was based on purposeful and convenient sampling, which is sampling built to satisfy the researchers' specific needs based on the research questions. Via a variety of methods, such as word of mouth, face-to-face, telephone, and/or email correspondence, the principal investigator recruited participants referred by Cameroonian immigrant acquaintances. During the time of contact, the researcher explained the purpose of the study and participation requirements. The researcher then emailed the IRB Consent Form to qualified participants who had consented to participate in the study. Prior to beginning the interview, this researcher obtained informed consent from participants.

Data collection was obtained through in-depth, semi-structured, face-to-face, individual participant interviews (see interview questions, Appendix B). All interviews were conducted at a time and place chosen by participants for their convenience and lasted about 60 minutes. At the beginning of each interview, the principal investigator welcomed the participant and thanked them for their participation in the study. The

researcher also reiterated the purpose of the study, the duration of the interview session, and assured participants of the confidentiality of their responses.

Throughout each interview, the researcher did not follow preplanned interview questions strictly, but kept probing participants for deeper insights depending on responses of participants to preplanned questions. According to Patterson and Williams (2002), it is imperative to ask relevant questions other than preplanned questions in order to gain the most accurate information about each phenomenological experience. According to Patterson and Williams, interviewers should have questions that guide the interview process; however, there should be flexibility during the interview. The interview guide should contain questions to be addressed during the interview, which are based on the purpose of the study and research questions; however, a list of interview questions should only be considered as a guide. This is because interviews in phenomenological research stress that the researcher make use of follow up questions by probing contextual issues that arise from participants' responses during the conversation (Patterson & Williams, 2002), which was the case for this study. Patterson and Williams (2002) discussed that preplanned interview questions have pros and cons. They serve as a guide for the interviewer and the interviewee, making sure pertinent subjects are addressed in the interview. Yet, strictly following a guiding set of interview questions can obstruct free flow of discussion and can hinder the opportunity to ponder on other areas of the phenomenon being studied.

In this study, based on emerging themes during the interviews, additional interview questions were asked to provide clarification on reasons why Cameroonian immigrants who did not study STEM fields in their country switched to study in STEM

or related fields while in the U.S. In addition, the researcher took notes during interviews (Roulston, 2010) to help in posing meaningful questions to participants.

Data Analysis

After data collection, data analysis began in October, 2016. The verbatim method was used to transcribe digitally recorded interviews (Creswell, 2013), in which all interviews were transcribed word-for-word to be able to capture precisely what each participant said. Such transcription helps to ensure credibility of data and trustworthiness of the outcome of the study (Whittemore, Chase, & Mandle, 2001). It should be noted that, according to Milstein and Wetterhall (2000), data collected on a phenomenon cannot express itself; however, meaning is built through cautious and systematic analysis.

There are different methods of data analysis that are applicable in phenomenological studies. However, in this study, I applied an analysis process proposed by Stake (2010). After transcription, Constant Comparison Analysis, Keywords-in-Context, and Conversation Analysis were used in analyzing data collected to generate findings (Stake, 2010). These methods of analyzing data transform raw data into new knowledge. For instance, Constant Comparison Analysis in which positions of new data is compared to other potions, and newly collected data is compared with previous data that was collected in earlier studies. The aims is to reduce data to codes, which eventually develop into common themes (Carspecken, 1996). Keywords-in-Context is a document search method that creates guides of document text or titles which identifies key words by using the surrounding context to understand the meanings of words. Conversation Analysis in which the research sought to embrace both verbal and non-verbal conduct of participants with the aim of understanding reasons why Cameroonian immigrants chose

to study in STEM and related fields while in the U.S. The main reason for these forms of analysis was to capture participants' meaning, which is one of the qualities of conducting qualitative research.

Consent, Confidentiality, and Validity

To follow ethical procedures, prior to this study, the researcher obtained permission from the IRB at the university participating in this study. To protect the confidentiality of participants, no identifiers were used in written transcription notes or data analysis. Participants selected pseudonyms for themselves to further ensure confidentiality.

To ensure the validity and reliability of this study, the researcher employed different techniques to ensure reliability through trustworthiness and credibility. According to Patton (1990), the issue of credibility or trustworthiness in qualitative research can be divided into three different fragments. The first fragment relates to the methods of data collection and analysis, the second looks at a researcher's credibility, including issues like knowledge and experience, and the third fragment is in regard to the philosophical perspective that supports the foundation for the methodological design of the study. These different mechanisms require attention and deliberation. Issues of credibility are also important at every stage of a qualitative study.

Numerous and diverse processes were used to guarantee trustworthiness or credibility of techniques and methods used in this study at different stages of the study design and implementation. The researcher intentionally used a phenomenological approach to design this study so as to be able to explore experiences of Cameroonian immigrants who switched their majors from a non-STEM field to a STEM or related field

while in the U.S., and ensure steadiness in design, since the research design used was suitable for the phenomenon studied. Resolutions concerning sampling are also important as far as credibility of study design is concerned (Whittemore, Chase, & Mandle, 2001). The researcher has clearly described sample procedures and sample size grounded on ideas found in phenomenological research design. Purposeful sampling was demonstrated when the snowballing technique was used to select eight participants who were Cameroonian immigrants who had switched their majors from a non-STEM to a STEM or related field in the U.S. (Lincoln & Guba, 1985).

Interviews were transcribed verbatim (Whittemore, Chase, & Mandle, 2001) to ensure credibility of data and trustworthiness of results of the study. Transcriptions were shown to participants with satisfactory time for member checking to ensure accuracy of data. Concerning data analysis, the researcher has described the technique used to analyze the data and procedure involved.

To implement all of the above, the researcher checked credibility and subjectivity of data by conducting member checking and peer debriefing. Member checking is a process where participants are asked to review a transcription of their interview. Peer debriefing is a way of providing additional perspectives to avoid misinterpretation and overgeneralization of emerging themes. All these methods of checking credibility were employed in this study to ensure participants' stories were analyzed to represent their true voices and to reduce biases. In this study, member checking included sharing interview transcripts with participants so they could give their feedback regarding accuracy of the transcript. Peer review debriefing was also employed, in which the researchers' advisor assisted in reviewing accuracy of data analysis and interpretation.

Researcher Reflexivity

Creswell (2012) defined reflexivity as a researcher's consciousness of his roles. Reflexivity is used as a sign of respect to participants and the site of a study. Once more, as a sign of credibility, a researcher needs to state what they bring with them to the study, including their training and experience as well as viewpoints they possess (Patton, 1990). For instance, according to Glesne (2011), it is important that researchers explain their bias and show how it will be connected.

This researcher has a bachelor's degree, a master's degree, a college teaching certificate, and is now pursuing education at the doctoral level. The researcher has received education and training in qualitative research methods at the graduate level and also has many years of experience teaching at elementary levels of education. The researcher has been a STEM subject teacher in Cameroon and has seen what students experience. The researcher was aware of this previous experience, level of education, and viewpoints regarding the STEM subject of study. However, I put it aside, and focused mainly on the research study process, data collection, and analysis.

Limitations

1. The participants in this study were selected from the same region. This constitutes some form of a bias in the study. It is not clear whether a similar study with immigrants from the different parts of the U.S. will corroborate the present results.
2. The participants in this study had not been STEM majors in Cameroon. They had done STEM subjects only up to form four in Cameroon (equivalent to ninth grade

in the U.S.). Therefore their responses regarding STEM education in Cameroon should be treated with caution.

Summary of Chapter III

This chapter described the methodology utilized in this phenomenological study. The study sought participants who were Cameroonian immigrants in the Midwestern region of the U.S who had switched their major field of study from a non-STEM field to a STEM or related field while in the U.S. Participants responded to questions relating to their experiences in Cameroon and in the U.S. Chapter III also presented how this study maintained validity and reliability throughout the process. Chapter IV presents results.

CHAPTER IV

RESULTS

As described in the methods section, this work was a qualitative study based on the beliefs and experiences of selected Cameroonian immigrants in the U.S. who came into the U.S. without a prior STEM background and switched into a STEM or related field. The intent of this investigation was to ascertain reasons why such students chose a STEM or related field in lieu of their previous field of study in Cameroon. Such findings can inform educators and policy makers who have been seeking ways of increasing STEM enrollment due to the limited number of STEM graduates in comparison to available STEM jobs. To arrive at this goal, my inquiry was guided by the following research questions:

1. Why do Cameroonian immigrants who have not majored in a STEM field at the time of entering the U.S. switch into a STEM or related field while in the U.S.?
2. What is different about pursuing a STEM field in Cameroon versus pursuing a STEM field in the U.S.?
3. What differences if any, exist between male and female Cameroonian immigrants' decisions to switch from non-STEM to a STEM or related field in the U.S.?

4. What challenges, if any, do Cameroonian immigrants encounter when switching from a non-STEM to a STEM or related field in the U.S.?

This chapter reports the responses of eight Cameroonian immigrants who participated in oral interviews. As mentioned in the methods section, these participants chose their own pseudonyms. The results have been organized by themes that emerged when coding the data in relationship to research questions. Data was analyzed through the lens of Transformative Learning Theory and Social Cognitive Theory

Research Question #1

Why do Cameroonian immigrants who have not majored in a STEM field at the time of entering the U.S. switch into a STEM or related field while in the U.S.?

This question seeks to understand why Cameroonian immigrants switch into the STEM or related fields in the U.S. To be able to comprehend the switch, this equation will first of all look at why Cameroonian immigrants did not study STEM in their country.

Reasons Participants Did Not Major in STEM While in Cameroon

In general, participants indicated that they found STEM subjects to be more difficult, more costly, and dependent on additional resources compared to other subjects. Students tended to avoid STEM or STEM-related subjects, especially when they got into high school. Their responses have been grouped into themes presented in following sections.

Math and science are difficult subjects.

Participants stated that they lacked interest in mathematics and avoided any major relating to it due to it being a difficult subject. It should be noted that although

mathematics is only one subject in the STEM areas, its principles are used in virtually all other STEM fields. Therefore, students with negative stereotypes towards mathematics tended to opt out of other STEM subjects. Princess Brown said:

> I think I chose A3 because I didn't want to have anything to do with math. . . . When I looked at the next series, which was A2, it had geography, economics, and math. I could do economics, geography, but I could not do math. Because I did so well in the ordinary level geography. But when it came to mathematics, I was not really very good at it because it was difficult for me. Then for A3, when I looked at the three courses, English, literature, and history. Those classes did not really have much to do with a lot of calculations and math, in particular, because I had not really been a good student for mathematics. Maybe for some reasons, I had not really loved doing mathematics from primary school. I was trying to look through the classes that I would break through without having to do any difficult subject. . . . I think that A3 was the best series that I thought I could actually go through for my high school studies.

Princess did not like math, consequently, she chose A3 to avoid math-based subjects. Shalom Love's experience was similar to that of Princess Brown. She described her experiences as follows:

> I did not choose those science subjects because I didn't really like mathematics. . . Math was difficult to follow, especially if you miss to understand [misunderstood] a concept. . . . When I decided to divert from science, I decided to divert from anything that had to do with calculations. So, I didn't really concentrate on any subject that had to do with calculations. So A1, which is History, English

> literature, and French language is [was] the only field that I could study without any calculation.

Other participants seemed to have had attitudes similar to those of Brown and Shalom regarding the difficulty of math and the avoidance of STEM subjects, and especially mathematics, while in Cameroon. For example, Rosemary Ambang had difficulties understanding the STEM subjects. She said: “I never actually did math which involved calculations in secondary school. . . . I did not like the STEM subjects because I could not understand math. . . . hence, I did not choose the STEM subjects in high school.” Again, Mother Mimi expressed her dislike for science-related subjects as follows:

> When we were in secondary school, subjects with numbers like math, physics, and biology seemed to be the hardest subjects compared to subjects like history, English, literature, and economics. So for most students, when they get to that secondary level and notice that physics is kind of hard, they don’t want to concentrate on the physics and math because they think it’s so hard. They tend to run away from numbers and figures and turn to subjects like literature which is just about notes. This was what happened with me, so I chose A2 because I thought mathematics, physics, biology, and chemistry were really so hard.

It can be seen that Mother Mimi’s difficulties towards STEM were quite similar to those of the others. Mother Mimi had an inherent belief in subjects involving numbers being difficult to study. This notion contributed to discouraging her from pursuing STEM subjects while in Cameroon. Miss A., another participant, said, “I didn’t like the science subjects because I wanted to avoid math. . . . I didn’t like all the mathematics, chemistry, and the calculations, and the stuff."

Manipulation of numbers or performing calculations was largely reported by participants as one of the things that turned them away from STEM subjects while they were in Cameroon. Participants also believed that science subjects were difficult to understand, and many, like Miss A. says in the following quote, did not want to spend that much effort when they could study easier subjects. Miss A. said:

> I was just being lazy, and I wanted easy going stuff. I did not want to study the sciences subjects because they were difficult for me. I just wanted to do my stuff in an easy way. And in science, you need time; you need to know. With Arts, you can just say anything, and it's correct, yeah. You don't read a lot in Arts like in science. So I just wanted an easy career.

Another participant, Thiery Randze, also talked about the extra time it took to study and understand the sciences:

> Science was something very difficult for me. . . . So by the third year in secondary school, I thought that science wasn't something I was really good at. I hated math because of the calculations and figures. That's why I chose the arts. . . . Not that I couldn't do it. I could manage it. It's just that . . . I didn't want something that I was going to spend more time understanding. So I went to the arts.

Even though Thiery felt he was capable of learning science, he didn't want to invest the extra effort it required.

Most participants did not like mathematics because they considered it to be a difficult subject, and such dislike for mathematics started early before had the chance to decide on what to study. This was because of an intrinsic belief in subjects that involved numbers being difficult to understand, and so students decided to choose a series in high

school that did not have mathematics in them. Participants chose what they considered to be a much easier area of study.

STEM studies are more expensive.

Regarding higher financial demands for STEM subjects in Cameroon, Mother Mimi said, “Most textbooks for the STEM studies are always so expensive and most students cannot afford them.” Another participant, Rosemary Ambang, likewise blamed her inability to study in a STEM field party on limited finances while in Cameroon. She said:

> Actually, I never considered studying in STEM fields because I knew that there was no opportunity for me to study in those fields because of the cost. That’s why I never even considered to study in those fields. I look at it like considering the technology, science. I thought studying in those fields was somehow expensive, and I was not having money that I could actually study in those fields. . . . I knew I was creative, but for the fact that financially I could not make it, that’s why I never made up my mind to go into those fields.

Whereas Rosemary felt she was creative, she didn’t feel she had sufficient financial resources to be able to get into those subjects, the STEM subjects, since the arts subjects were relatively cheaper for her. Princess Brown also believed that “the STEM subjects were mostly for the students who had the big financial sponsors.”

Another theme that made some students avoid STEM fields while in Cameroon was because schools did not have resources for STEM classes.

Inadequate STEM resources in local schools.

Regarding choosing STEM subjects at the high school level, Princess Brown stated, "The school you attend also influences your field. In my school, some of the facilities that were available, were mostly suited for arts." Another participant Shalom Love expressed that one of the reasons for her interest in non-STEM fields was:

> Some of my arts teachers encouraged me to do the arts in secondary school because I could have all the material needed. They advised me that with the arts, I will easily have all the material that I need to study since there are available facilities, but with the sciences, I had to go to another school to be able to have access for lab facilities.

It could be very stressful for STEM students whose schools lack facilities to have to go to other schools to gain access to those resources. Regarding shortage of facilities, Thiery Randze said:

> Our institution never had good facilities; I mean good science facilities. So the focus was more on arts subjects . . . most students did arts subjects and not the sciences . . . Students who did sciences like physics or chemistry had to go to another school for the laboratory work. So the process was really stressful, and I had to avoid all the stress.

Mussa Bless emphasized that Cameroon lacks most facilities essential to the study of STEM. He expressed this as follows:

> We lack facilities that can really encourage STEM education in Cameroon. This is one of our main struggles. We have very few training sites, and therefore, very

few students, too. Our ways there are still very primitive. . . . We have a lot to do. We are still really backward. Schools need equipment for the science subjects.

Another participant, Princess Brown, also said, "The STEM subjects were mostly for the students who had the possibility to go to big schools that had science labs and stuff like that." The lack of adequate infrastructure or resources favoring studies in the STEM subjects was another roadblock. As noted above, finances and limited resources are contributing factors to some participants not studying in the STEM fields.

Study environment.

One participant, Job John, blamed his choice not to major in STEM while in Cameroon partly on the environment where he studied. He explained it in the following way:

> While in primary school, I really did well in the sciences. But in secondary school, I became more of an arts student. I think one of the things that contributed to that switch from a science to an arts student was because of where I attended school. Which secondary school you actually go to is very important . . . many students faced [more] difficulties being in public (government) [schools] than private schools. Private schools were more equipped with facilities like dormitories. I have a twin brother . . . our parents couldn't afford to send both of us to a dormitory school. So they ended up sending me to a government school while my twin brother went to a private school . . . . So because of that, I was staying home while he lived at a school dormitory. I was exposed to more distractions than him. . . . I was more of an art student in secondary school because I couldn't focus enough to do the sciences. My brother who went to a

> private school did science. It was because of where we were actually living and where we actually went to school. He was a little bit more focused than me.

Job John faced more distractions than his brother who lived in a confined school dormitory and could focus more on his studies. The end result was that his twin brother ended up majoring in STEM while he (Job John) majored in the arts subjects.

Thiery Randze also indicated that the environment where he studied was one of the factors that influenced him into choosing non-STEM subjects. He said:

> The school or environment where you study matters. The school maps your path to your academic career, which is why I went to a seminary. In the seminary, they teach you only how to become a priest, and they don't offer other classes like STEM subjects, which is why I could not do science. The passion of going to the seminary came because I went to a Catholic School when I was five and developed interest in priesthood.

The environment can have significant impact on career choices of some students. Randze's decision to enroll at a Catholic seminary had been motivated by his attending a Catholic school, and hence he could not study in the STEM fields because the STEM subjects were not offered.

Personal stereotypes.

Personal negative beliefs towards STEM were reasons expressed by some participants on why they could not major in STEM while in Cameroon. For example, Princess Brown stated:

> I just had a belief that science was for extra-ordinary students. To succeed in anything that has to do with science, one had to work very hard. It was maybe for

> extra-ordinary students and . . . and I was not one of them. For some reasons, I have always developed a passion for arts. And I have been performing well, and I didn't really have much to do with STEM subjects.

Princess Brown chose non-STEM in lieu of STEM fields because she felt STEM subjects were difficult to learn and were for a special breed of students. Other participants similarly expressed having faced difficulties with science-related subjects while in Cameroon. Mother Mimi stated as follows:

> When it came to chemistry and physics, they were a little hard for me. . . . I'm sure it was just a mindset at that time because we were ignorant; we didn't have like people to encourage us that if we concentrated on STEM subjects, we could succeed. We were made to believe that the STEM subjects were for particular set of people. . . . So that was just the reason why I had to do something else.

Mother Mimi reported difficulties with some STEM subjects. If someone had given her a little push or counseled her on making more of an effort when studying STEM, she might have majored in STEM. As she expressed, lack of such support led to her opt out of STEM studies. Responding to why she did not major in STEM while in Cameroon, Miss A. expressed one of her reasons as follows:

> Well, I love telling stories. I just love history. . . . I also love novels. I like reading literature. It's all about novels. So, I just loved it. . . . So it was just all about what I liked. It was also all about what was easy for me. I like what is easy for me to do. Arts was easier for me to do than doing science, like all the math and all the chemistry. . . . I was made to believe that science was not for all. I thought science subjects were strange and were for specific students, not me.

What a person likes may tend to blind that person from other similar things. Miss A. was biased towards the arts subjects due to her passion for storytelling and reading of novels, and also because of the belief she had that science was not for her. This led to her losing interest in STEM-related subjects.

Miss A.'s bias towards arts subjects was also reported by Mussa Bless. He did not explicitly indicate lack of interest for STEM subjects while in Cameroon, but did highlight his passion for politics. He said:

> I wanted to become a politician, and this is why I chose political science as a university major in Cameroon. I did literature, philosophy, languages, and introductory political science while in high school. . . . Since I wanted to become a constitutionalist, I also did basic public law. . . . But I never thought I wanted to be a medical doctor or do anything in the STEM fields. Those kinds of stuff, no. I believed it was for others.

Mussa Bless was more interested in becoming a politician; and to him, the STEM subjects were for others. Apart from the fact that some participants felt math and science were difficult subjects, STEM fields had limited resources. Also, stereotypes existed for STEM fields, and social interactions influenced participants to avoid STEM subjects.

Influence from social interactions.

Social interactions usually shape human behavior. Most participants in the present study reported that they were discouraged from majoring in a STEM area by either their family or teachers while in Cameroon. Some participants reported having been influenced by role models around them who were in non-STEM areas or who did not have much

education, but nevertheless impacted them. The different societal forces are presented in subsections below.

Non-STEM role models.

Relatives were found to have had significant influence on some participants regarding their choice of majors. For example, Princess Brown said the following about her grandmother and uncle who raised her and influenced her decision to major in law:

> When I was growing up, I always admired being a lawyer because I knew they were very disciplined people. This is because the environment where I grew up was such a disciplined one. I grew up with my grandma, and she was so disciplined and taught us discipline. . . . I really loved the way she brought us up.

Princess Brown's choice of law was further influenced when she later lived with her uncle who was a magistrate. She said, "And along the line when I got into high school, I started living with one of my uncles who is a magistrate by profession. So, I started developing a lot of interest in becoming a lawyer." Future interactions with people in the law profession increased Princess Brown's desire to choose a law major. She said:

> My passion for law didn't end there. . . . My uncle had a girlfriend who had been his classmate when he was in the school of magistracy. . . . I had to stay with my uncle's girlfriend for a period of time because she was close to where I needed to attend school. . . . I really admired this woman. She worked at a nearby state council as a state councilor. She had previously served at a high court in Bamenda. And I really used to just admire her much more because she was almost as tall as I was. . . . I used to look at her like my role model. . . . So that is where I got my impression and inspiration for becoming a lawyer.

From Princess Brown's response, it is seen that role models significantly impacted her educational choice in Cameroon. To some children, professions they really know of or admire are those their parents or relatives are employed in.

Another participant, Shalom Love, indicated her Dad's influence as a role model in her choosing a non-STEM career. Shalom Love spoke as follows:

> When I was really little, I always admired my Dad because my Dad was in the military, and he eventually retired as a captain. So I always said to myself that because my dad retired as a captain, I would want to go higher than him in that profession. I wanted to become an army general. So that was my passion and my desire to be a general in the Air Force because my Dad was in the Air Force. And, I admired his attire each time he dressed up for work. He was always so neat and cute. And when they came out on our National Day celebrations, it was often just so beautiful. . . . I just wanted to be in the military and to be like my father because I saw my father succeeding in it so well, and we had a comfortable life. So I knew that if I went through that route, I would be the same, and maybe even more. That's what I wanted to do, so I chose the subject that will [*sic*] enable me to be able to write the military exams.

Shalom Love was influenced by her father's success in the Air Force. She was encouraged by her literature teacher to study at the Teacher's Training College as a means to enter the military after graduation; however, she emigrated to the United States before writing the Cameroonian military board exam.

Lack of support from STEM teachers.

Interactions with teachers also played a significant role in career choice. Several participants discussed how they received encouragement from non-STEM teachers as opposed to STEM teachers who did not support them – made them feel they were not capable in science. For example, Shalom Love explained:

> I remember when I was in High School, the teacher that taught us literature actually encouraged me to write the comparative exams to get into the Higher Teacher's Training College and he told me that from what he saw me do, he knew that if I wrote it I'll succeed. And he really encouraged me that I should make sure I write and teach literature. That if I succeed, then I will know that what he is saying is true. And when I did, I succeeded; and until today, all the time I think about that encouragement, . . . even though, . . . this did not stop my interest to go into the military, it was just a path for me. . . . But, I had never had any science teacher encourage me that way when I was doing sciences. So I think that was a plus for the art teachers. . . . Instead, our STEM instructors made us felt [*sic*] that those subject were for a chosen few.

Similar to Shalom's encouragement of a teacher to study literature, Mussa Bless, another participant, explained that while he received no encouragement from teachers to study STEM, one of the reasons he decided to pursue politics was because of teacher encouragement. He said:

> Yeah, first of all, as our system is, our teachers easily assess the capabilities of their students and tell them what subjects they would excel in: "You are good in this or that, you would excel in this or that." Yes, from when I was still in primary

> school, my teachers would tell me that I was good to become a politician, you would be our first minister, you are good . . . but no one encouraged me in the sciences. . . . They influenced me into arts.

In Shalom and Mussa's cases, no teacher encouraged them to study STEM. Another participant, Rosemary Ambang, said that instead of providing support when she needed it to complete her homework, her teacher made learning the math even more difficult. She expressed her challenges as follows:

> Sometimes, our math teacher would send us out of the class because we did not do the homework he had given. Due to this, I often missed math lessons and couldn't understand other concepts that built on those I had missed. This is why math became so difficult to follow. So, I hated math and hence could not do any of the science subjects.

Rosemary's experience is common in Cameroon where practices in teaching math and science often discourage students rather than encourage them.

Another participant Thiery Randze, explained that in a school system where there were few STEM teachers, those teachers concentrated only on students who readily grasped science concepts. He reported:

> There were more Arts teachers than science teachers. And the few science teachers weren't really capable in getting people to understand what the whole concept was all about. So they just hardly went over the concepts. Then those of us who were really slow in picking up science concepts never ended up understanding the material.

> When teachers are teaching in class, they know each student's capabilities. They know what each student can do. . . . They just single out those who were really good at their subjects and can excel in those subjects, and they paid attention to those students most. I never caught the attention of my science teachers . . . so, I could not do any of the STEM subjects. Instead, I chose art because the teachers paid more attention to me and also encouraged me in that area.

A lack of STEM teachers, and the inability of the few STEM teachers there were to explain scientific concepts comprehensibly enough so all students could understand, was a major factor in Thiery's choice to study the arts. John echoed a similar experience, saying:

> In the sciences, you need to know, you need to be focused . . . and there were few teachers or no teachers to encourage us. Everything else I had to just figure out by myself. So, because of that, you get yourself more interested in the arts subjects where you have more teachers.

Job John also explained that support was not available because of limited school counselors. He testifies:

> Our whole school had only one counseling madam. I don't even know if she was conscious of her job. It was very difficult for us to see her, and when you meet with her, she will tell you that the students are too many for her to counsel alone, and her advice to every student is that they should do what is easy for them, which is what she told me.

Job John chose to study in the arts because it was easy for him. Some students chose arts without understanding why; however, if they would have had counselors to educate them, their story might have turned out differently. Mother Mimi said:

> I just feel like it is ignorance that made me to study arts, and back in Cameroon we don't have people like counselors or school advisors to counsel students on pursuing their career dreams. . . . We don't really have those opportunities. I did not really understand the importance of science . . . and was discouraged especially with school work. . . . I lacked psychological support, too.

In the same light, Princess Brown said:

> Back in Cameroon, one of the things that we didn't really have was the opportunity to get orientation as students. Very few students got orientation or counseling in our school; and usually, it was not about choosing a career. Counseling was needed more when one had a problem.

Considering that students did not have good opportunities in their schools regarding counseling, it might have been better if their parents had been able to give them advice at home. However, Miss A. mentioned:

> You know, back home, your parents don't really advise you on particular things. They just want you to pass. They just want to hear that you have passed your exams. And for you to pass your exams, you choose the lesser and less stressful things. Things that you know you will pass in, and this is why I preferred arts. You don't go out of your domain, and parents don't really want to know if you are good in this and really make you work on that. They don't really care.

Miss A. stated that parents in Cameroon are not so concerned with what subjects their children study in school. They are more concerned with their academic success as opposed to what their children will develop into. Teachers and parents have a huge influence on career paths of students in Cameroon.

Mussa Bless expressed:

> Also, if your father is a lawyer, he can orient you toward that field. Parents have great influence on their children, and teachers, too. Most of them motivate students to pursue certain fields, and too many of them cannot motivate students to study in STEM fields because they are arts people.

From the above, we notice that parents, teachers, and school staffs have played a part in motivating students toward art fields and these motivators do not choose the STEM fields for their students/children.

Summary – Why participants did not major in STEM fields in Cameroon.

Participants views raised these issues: Students have personal stereotypic viewpoints toward STEM subjects; also, STEM subjects are more expensive, and schools have inadequate STEM resources. As noted, parents have great influence on the career path of their children; however, parents tend to be more concerned with the academic success of their children than their children's career. Also, since schools have more arts teachers, students are motivated to move more toward art fields. Many students do not understand the important of STEM fields and seldom receive help from school counselors. As a result, students tend to choose non-STEM subjects. Even though participants did not study STEM subjects in higher school while in Cameroon, they were able to switch into such fields in the U.S. The question that comes to mind is, "How was

this possible?" The next section will show why Cameroonian immigrants who did not major in STEM while in Cameroon were able to convert into such fields after entering the U.S.

Why Cameroonian Immigrants With No Prior STEM Background Switch Into STEM While in the U.S.

Results of this study showed that Cameroonian immigrants who did not study STEM subjects while in Cameroon sometimes became STEM or STEM-related majors once they arrived in the U.S. As noted previously, the present study focused only on immigrants who switched from non-STEM fields into STEM or STEM-related fields while in the U.S. This subsection reports on themes that emerged from responses of participants and outlines their reasons for choosing STEM careers once they moved to the U.S. These themes center around participants not being able to get jobs in their previous fields of study largely due to cultural and racial discrimination in the United States.

Job discrimination in the United States.

Most participants switched into STEM or related fields once in the U.S. because of the nature of the U.S. job market. They either found it difficult to obtain employment in the fields they had been educated for in Cameroon, or fearing they wouldn't find employment, decided to return to college to study in a different field. The reasons for not finding employment largely centered around discrimination.

Thiery Randze, who studied both seminary studies and business in Cameroon, decided to continue his business studies in the United States. However, after graduating from a U.S. university with a masters degree in Business Administration, he could not find a job. He explained:

> I continued with MBA in the U.S. even though I was advised by some friends to switch. . . . After graduation, I tried to get a job and applied to more than 40 jobs. I was called for three interviews, but not given the job. I became so frustrated. . . . I wished I had not done the MBA. I just wasted my time and money for an MBA. . . . Jobs in such a field are mostly for the white people.

The issues of particular jobs not being easily available for participants in particular fields was a common thing. For example, Princess Brown said:

> One of the things that made me . . . switch to STEM was the fear of continuing in my field and not getting immediate employment upon graduation . . . the anticipated difficulty of getting a job that a professor I consulted at the University of North Dakota openly made me to understand. And so getting into an expensive graduate program and at the same time not sure to have a job right after graduation was quite discouraging. . . . I had to change to STEM. Another point was the nature of the law in the U.S. I realized . . . there are 50 states in the U.S. And I found out that if I studied law in North Dakota and happen to move to another state, I may have to do some training in the new state before I can practice law there. I mean that I may have to get acquainted with the law of that state before I can start practicing like a lawyer.

It may be seen that Princess Brown was influenced to switch from law to the STEM fields (Biomedical Sciences) due to a desire to gain employment upon graduation. Moreover, she noticed that U.S. law was quite complex with slight variations from state to state. Therefore, if one studied law in one state, one may not be licensed to practice

just anywhere else in the U.S. This apparent lack of flexibility in her previous field precipitated her switch into STEM.

Likewise, Mussa Bless stated that he could not continue with his politics field from Cameroon because as he learned, no African could be successful in politics here in the U.S. He understood that STEM fields had greater flexibility and career opportunities. These contributed to making him switch from political science to a STEM-related field. In this regard, Mussa said:

> Oh, in the years I have been here, I found out that no African person can be successful in politics here. Our color is one obstacle. The STEM fields are more open, and I realized I could easily switch to another field. Politicians tend to do much empty talking. . . . Yeah, the fact that there is a growing demand for people from STEM fields. They are more opening and people graduating from there are always having jobs everywhere.

Another participant, Miss A., who was trained as an English teacher in Cameroon took advice from relatives and Cameroonians who warned her about difficulty obtaining employment. She testified:

> My relatives told me that my major from Cameroon (that is, modern letters) would not help me in the U.S. They were talking in terms of finding a job. But they didn't know they were actually pushing me to the right field. . . . They ask, "What would you do with English, modern letters? Teach? Who will hire you?" You know, they kept saying to me that the kids here in the U.S. would not understand me if I were to teach. Which is maybe true.

For fear that she might not gain employment in modern letters in the U.S., Miss A. switched her major into pharmacy. Similarly, Mother Mimi said:

> I was told that most jobs in the business field are given to white people, and if you are a black person and going into that field of studies, you need to excel or you need to prove otherwise to occupy a job. The jobs are not open to black people, especially when you go for interviews. They just think you are not good enough for that position, and they think only white people [are] qualified for that position. So, it tends to discourage black people.

Mother Mimi listened to the advice from friends and relatives and switched into Bio Statistics.

Social influence toward lucrative fields.

Participants indicated that their decisions to switch into a STEM or related field were partly motivated by advice they received from friends and relatives once they arrived the U.S. Some participants stated they still loved their majors obtained in Cameroon and wished to continue with them when they got into the U.S.; however, their perspectives changed when they listened to friends and other relations around them. Shalom Love, expressed her desire to study pharmacy was energized by counsel from her friends and relatives who had been in the U.S. before her. She said:

> When we came over to the U.S., it took time to think of what I wanted to do. And from the advice of friends and family members that have been here, I saw that education in the U.S. is affordable in such a way that you have everything at your reach. Many of my friends advised me to look at the medical or the science fields

> because that is where the money is. I am now in the school of pharmacy, thanks to the advice from my friends.

Similarly, Mother Mimi, stated that she came to the U.S. with the intent to continue in her field of study and earn an MBA (Masters of Business Administration) degree. However, she was influenced by friends to switch into a STEM-related field. She explained in the following words:

> Well, I didn't want to switch before I came to America. I came to America to do MBA since my base was already a business-related field. But when I came here, people helped me to change my mind. . . . Those who talked to me even gave me examples of some people who had gone through that same field of study and didn't even have jobs and were trying to switch majors after earning business degrees.

Mother Mimi was influenced by other people to switch from her MBA track because of fear that she would not easily gain employment upon graduation. The fear of future unemployment made her elect to change her career to bio statistics where she was studying at the time of her interview.

Whereas Mimi was advised to not pursue an MBA degree once she got to the U.S., Thiery did not receive such advice early. Thiery actually studied and earned an MBA within the first few years of entering the U.S. However, after struggling in vain to procure a job, he was influenced to change. Thiery said:

> I first of all did an MBA when I came to the U.S. . . . but could not get a job after graduation. I felt so sorry for myself because many people had advised me not to continue with my MBA, but I did not listen. Friends encouraged me that it was

> not too late to change. So, I decided to choose nursing. It's not just about graduating from school after spending so much money. It's about, okay, how available are the jobs there? . . . In nursing, one will always have a jobs. . . . The openings are there; the chances are there . . . anybody who is coming in to do science will always have a job. Doesn't matter if they want to be a doctor, an engineer, or whatever the case may be. I think the jobs are there.

There is a direct correlation between the advice Mother Mimi received and Thiery's experience. There is a notion that MBA jobs are for the "white people" or for the Americans. Moreover, Thiery's choice to switch into a STEM-related field in the U.S. was much motivated by friends considering that he would gain employment upon graduating.

Miss A. was similarly influenced by her relatives in her choice of career path and field of study. The motives of her persuaders were somewhat similar to those of the friends who influenced Mother Mimi. Miss A. described her experience as follows:

> My sisters advised me to switch. . . . "You're not born here, so you don't know how the people function, yet." So, it would be hard for you to be a teacher in the U.S., and stuff like that. They praised the health or medical field majors. At least, these would be easier for you, and you would work with people [more] easily than going to teach. This made me switch to do pharmacy.

As seen, Miss A.'s persuaders marginalized her in her previous field of study. The argument of these persuaders minimized her previous field and painted a mental picture of a bleak future. They talked Miss A. out of her major and into a STEM related field.

Ambang also received very similar counsel from friends and family members to switch to a STEM field. She stated, "I received advice from my sister, from my nephew, and from friends who encouraged me to do a science field in the U.S. because the arts fields would not pay." Thus, Ambang moved away from her field and decided to study Petroleum Engineering.

Similar to Miss A., Mussa Bless was influenced by his persuaders to feel small in his field of study; and consequently, he switched. To show how his persuaders downplayed the possibility of flourishing in his field, Mussa said, "Many friends advised me not to continue with political sciences. They said that I could not succeed in political science here in the U.S. because the Americans are so good in talking while I am not so good at this."

Another participant, Princess Brown, received some advice from a law professor, advice which was confirmed by friends. She said:

> When I got here, I wanted to continue with my career in law. I tried to get information concerning getting into the law department or law school in the U.S. I booked an appointment with a law professor at the University of North Dakota for counsel. . . . But one thing he openly made me to understand (and I appreciate this so much) was the fact that earning a master's degree in law will not necessarily mean that I will just jump out there and pick a job . . . once I graduate. . . . It took me awhile to finally decide on a switch to STEM after talking to many friends who encouraged me that it was the right thing to do.

Although Princess Brown had a passion for the field of law, even after entering the U.S., she finally switched for fear of not having immediate employment upon graduation.

While she pondered her decision, she was advised by friends to consider a switch in her field of studies into a more lucrative field.

Job security.

In the course of talking with participants, one thing resonated frequently, the desire for a better life which directly relates to job expectation. Some were encouraged that doing STEM guaranteed a future job much more easily than for other fields of study. The desire for future employment seemed to be a far more paramount motivation for switching to STEM than self-actualization or the personal fulfillment of the participants. Referring to the new STEM-related field she had switched into, Shalom Love said:

> Looking at the job market, it's a field that really pays well. That was one reason why I decided to do it. . . . And when I search through all the different fields of study, getting information on the admission process and requirements, I found out that I could still be able study something in the medical field if I wanted to, because I saw that there are so many openings and so many opportunities here in the U.S. And I decided to give it a try. And when I started going to school, I truly enjoyed the classes that I have taken. I feel happy and most especially because I will have a good job after graduation.

To Shalom Love, it was about potential monetary gain. She went for the pharmacist field because she foresaw many opportunities upon graduation.

Likewise, Mother Mimi stated:

> One of the reasons why I switched is because I was looking for another field that has like a job security. I decided to choose bio statistics because, whenever I finish, I can easily get a job wherever I am in the United States and out of the

> United States; because it deals with data, and data is everywhere. So, I chose to do what I'm doing right now because I feel like it pays well, and it has a good job security since you can always find a job anywhere anytime.

Mother Mimi felt that bio statistics had good job security because she could find a data job anywhere. Another participant, Miss A., switched into pharmacy because she was certain to get employment in that field upon graduation. Miss A. said:

> The medical field is where most African people do better in . . . and that is the field where most African people can easily find a job. Nobody wants to stay in a foreign place and not have a job. We all have bills to pay; and without a good job, it can be so hard. . . . So, everybody's going to a field where you know you will be able to pay your house rent and other things; where you can feed your family . . . a field where you come out, and you are guaranteed at least a 90% chance to have a job. Yes, it is better than a field where you are just at a 50% chance of having a job.

Similar to Miss A., another participant, Rosemary Ambang, asserted that job expectation led her to switching into a STEM field after searching information on well paid jobs. She said:

> I search information on the type of jobs that are well paid in America. And I know that the sciences are the well paid fields. And in those fields, you will hardly lack a job because they are always looking for employees, so I chose Petroleum Engineering.

The participants emphasized the importance of social interactions in their decision to switch to STEM fields in the U.S. When they first came to the U.S., they relied heavily

on advice from friends and family who were familiar with the U.S. job market, both in terms of job discrimination and what fields offered job security and financial reward.

> While we're here in the U.S., we try to get information on the best thing to study. . . . So, we're trying to do what we think is going to help us in the long run. What is going to help us take care of our families back home because they are looking up to us. You know, we are looking at life here differently than how we looked at it back home. . . . Yes, this is something that I have to try to do no matter what. I realized that not being a science student doesn't mean one can't do it. And that's how things are changing now for me, and I have joined science. This is because science pays more in the United States; and in it, job[s] are really available.

Participants believed that they could easily gain secured employment in the STEM and related fields upon graduation; hence, they switched into STEM or related careers.

Research Question #2

What is different about pursuing a STEM field in Cameroon versus pursuing a STEM field in the U.S.?

One of the things that made changing career fields an option, was that the U.S. system of education offered much more flexibility than the Cameroonian educational system. Participants expressed more satisfaction with the system of education here in the U.S. than the system in Cameroon. Many felt, in the U.S., the education system was more student-friendly in terms of financial aid, access to resources, testing and exams, and access to teachers.

Flexibility Within the U.S. Educational System

Participants directly or indirectly indicated that the system of education in the U.S. offers more flexibility than does the Cameroon system of education. This flexibility relates to the ease with which one can change his or her major and the ease of being allowed to get into a major one desires. For example, Princess Brown expressed the difficulty she faced in Cameroon in pursuing her academic dream of building a career in law after graduating with a law degree in the following words:

> The Cameroon educational system is very rigid. Even though I had been a law student, it was difficult for me to still get into ENAM . . . even though it needed just advanced level, and I already had a degree. I didn't get into it. I wrote the entrance exam and did not succeed. . . . How then could it be possible for me to get into a STEM fields. That would have been an impossibility. It is not possible to switch from arts to science in Cameroon.

While in Cameroon, Princess Brown tried in vain to get into Ecole Nationale D'Administration et de Magistrature (ENAM), which translates into English as National School of Administration and Magistracy, even though she had been a law major. The requirement for getting into this school was a high school diploma. Brown had earned a bachelor's degree, but still could not get in. There is a lack of flexibility in terms of admitting new students in professional schools in Cameroon, because only one criteria is used to determine who gets accepted, that is, the entrance exam. However, in the U.S., professional schools such as medical schools often consider much more criteria such as prerequisites, references, and work experience for admitting students, not just the MCAT (Medical College Admission Test) exam. To Princess Brown, if she could not be

admitted into ENAM, which she had been working toward since high school, it would have been impossible for her to go into a science field in Cameroon because the system does not allow for a switch.

Lack of flexibility in the system in Cameroon was also expressed by Job John who desired to major in STEM, but was forced into a non-STEM major by the system. John stated that he always wished to become a medical doctor but at about 10th grade, he had to major in arts subjects because he had not performed so well in STEM subjects. Although he liked STEM subjects, the education system warranted that students major only in subjects where they perform well. In John's words:

> I've always dreamed of becoming a medical doctor. I used to admire doctors a lot whenever I was taken to the hospital as a child. They are the most important people when it comes to individual people's life and health. . . . So my dream was to become a doctor, . . . but after the Ordinary Level, looking at my performance, I could not continue with science . . . and from my results, I did well in most of the arts subjects, so most of the time, that determines which of the high schools you go to and whether you would be either a science or an arts student. So, in high school, I did history, literature, economics. . . . So right in high school, I already knew that I cannot be a medical doctor any more. . . . I was now focusing more on anything of the arts subjects. And that's why when I went to the University in Cameroon . . . I did human resources because it was more of an arts field.

It is quite interesting that growing up, Job John desired to become a medical doctor, but could not pursue his dream after performing relatively poorly in STEM subjects at the

Ordinary Level which compares to 10th grade in the U.S. He explained that the arts subjects he subsequently undertook at the high school level constrained him to continue in the arts. He could not dream of getting into the medical school field while in Cameroon. John continued:

> When I moved over to the U.S., I studied the educational system over here, and I realized that I could become anything I want to become. After looking at the way the system function[ed], I knew it would be possible for me to go back to my earlier dream and fulfil it. Because, I saw that it doesn't matter, your background, . . . it doesn't matter if you're an arts student or science, you can still become a medical doctor here in the U.S.

Job John switched into medical school while in the U.S., which he could not do in Cameroon. The Cameroon education system has lacked flexibility, and has been unable to provide good alternatives to struggling students without taking them out of their academic passions. The fact that Job John could not major in STEM in Cameroon, but could easily switch into a STEM-related field here in the U.S. suggests that the U.S. educational system allows for more flexibility in career choices so students can move from one major to another with relative ease.

Shalom Love cited limited flexibility within the educational system in Cameroon by stating that while she desired majoring in STEM, she had to continue in the arts because of her performance at the Ordinary Level (equivalent to 10th grade in the U.S.). She expressed this as follows:

> During the Advanced Level, I choose history, English literature, French language, and philosophy. It's all as a result of the way the educational system in Cameroon

> is. . . . When going to the Advanced Level, you need to succeed in the Ordinary Level. And what you have in the Ordinary Level is what determines what you continue with at the Advanced Level. So, I failed the STEM subjects in Form 4 and so could not continue with science. I wish students were able to take some prerequisite that could help them makeup if they want to go into the STEM fields like here in the U.S.

Shalom Love could not study in STEM subjects in Cameroon at the Advanced Level (comparable to 11th and 12th grades in the U.S.) due to poor performance at the Ordinary Level. Comparing this with the fact that she got to the U.S. and was able to pursue a STEM-related field underscores the fact of greater flexibility in the system of education here in the U.S. Whereas the U.S. school system provides prerequisites for students desiring to enroll in certain programs, mindful of the fact that some students have little prior background in fields they wish to major in, such opportunities are limited in the system in Cameroon. In Cameroon, it is rare to find prerequisites meant to prepare students for fields they are interested in – wherein they lack a sufficient prior educational foundation. Another participant Mussa Bless explained the flexibility in the U.S. educational system as follows:

> I think the difference between education in the U.S. and in Cameroon is just the way the educational system works. Back in Cameroon, the system is not flexible at all, your results from . . . your Ordinary Level results already determine where you find yourself in high school. And while in high school, what you major in determines where you end up at the university level. For example, if you have three papers in the Advanced Level (say history, literature, and economics, as I

had), there's no way I can write an exam to get into a medical school in Cameroon. They won't even allow you to do it because you don't meet those requirements. . . . Here in the U.S., they don't really do that. Because, actually if they were doing it that way, I wouldn't find myself in med school right now because my high school subjects were all arts. . . . There was no chemistry, no math, no biology, no physics. But I still got accepted into the med school in the U.S. . . . Back home, they look more of what you achieved in the past. Here in the U.S., they look more of what you intend to achieve, they look more at your future, which is good. So, that's what I think creates that difference in the two situations concerning academics.

In the Cameroon educational system, students must continue to study only what they succeed in, which means their education, in part, is determined by their success and not passion. However, the U.S. system allows for students to be able to study what they want. Mother Mimi compared the educational systems in Cameroon and the U.S., and also noted that the U.S. system was quite flexible, allowing students to choose anything they might wish to major in at any time, which is difficult with the Cameroon system. Mother Mimi said:

> One thing about the U.S. is that U.S. education is very flexible, like they have a flexible system compared to back at home where if you do something like economic, history, geography in high school, and you want to go to the university and apply to do like bio statistic or medicine, they will never accept you. Unlike in the U.S., regardless of what you do in your base, they give you the opportunity

> to do whatever field you want. You can easily switch your major because it's so flexible which is an encouragement to me.

To Mimi, the U.S. system has been quite flexible, allowing students to choose nearly any major of their choice at any time. Therefore, she switched easily into STEM once she arrived in the U.S.

Finance

Some participants in the present study highlighted finances as an area where differences exist between studying STEM (and other fields) here in the U.S., and studying in Cameroon. In general, while costs are higher in the U.S. than in Cameroon, there are far more opportunities in the U.S. for funding one's education such as obtaining financial aid, student loans, or on-campus (or other) employment.

To Princess Brown, education in Cameroon is expensive when studying STEM subjects. Although comparatively, U.S. education is more expensive, there are very limited opportunities for funding one's education in Cameroon. For example, on-campus student employment is almost unheard of. Princess Brown said the following:

> It is more expensive to be a STEM field major in Cameroon. I mean at the level of Cameroon, it is expensive. Because to go through the sciences like primary, high school, you need to pay for your lab stuff. And we might look at that right now to be like that's no money. But back home, it's a lot of money paying for lab stuff when studying the sciences, and it is very hard if your parents are not working. . . Some students are not able to pay their lab practical because they do not have the money, and they [there] are no financial aids. . . . I remember when I got admitted into school here in the U.S., the admissions department had to present to us

> financial aid that you could sign up to get some financial assistance . . . and even up to now, we still have the financial assistance except for summer classes for which we pay from our pockets.

In the above, Princess Brown compared the systems of education in Cameroon and the U.S. and noted that it is hard to pay for education in Cameroon, especially STEM due to extra costs related to laboratory and field work; whereas the U.S. system offers financial aid, which facilitates the studies of STEM and enables them to easily pick majors of their choice.

Shalom Love likewise expressed difficulties obtaining any form of financial aid while studying in Cameroon. She said:

> Just the fact that you're able to get financial aid from the government here in the U.S. makes a big difference. That was a great encouragement [to] me to do pharmacy. . . . In Cameroon, there's nothing like financial aid. There's nothing like, you know, loans that you can take to go to school. You have to pay for your schooling out of pocket. Sometimes, it's not all the time that you have money for school fees or for textbooks. And for exam papers, because we were being asked to pay for our exam papers. And we were being made to pay so many other things. For extra classes, we had to pay . . . and if you didn't have money to buy the textbooks at that time, you would be driven out of class for not having a textbook. Otherwise, you could be driven out of school for not paying school fees. All of these caused some students not to write exams or to miss classes and perform poorly. But in the U.S., it is a completely different thing. If you don't have a lot of money to pay out of pocket, the system is able to help you by you

> applying for financial aid. And if you are eligible, then you get some money from the state that will help you pay for your tuition or your school fees. And if possible for your books, and you'll never be driven out of class for not paying a paper or not paying somethings. . . . If you apply for financial aid, and you are not eligible, you are encouraged to take a loan, which will also help you to be able to cover all of your expenses. But these opportunities, we were not having in Cameroon.

According to Shalom Love, students who could not afford textbooks or pay tuition, fees, and other things like exam papers were sent away from school, which led to students either failing exams or dropping out of school. Here in the U.S., however, students have the opportunity of receiving financial aid or student loans to fund their education. Therefore, it is rare to have students sent away from class for not paying tuition and required fees.

Rosemary Ambang also highlighted the issue of finances. She stated that although she was creative and could have excelled in STEM while in Cameroon, she was limited financially and could not do STEM. She said:

> I know I was creative, but for the fact that financially, I could not make it, that's why I never made up my mind to go in science fields. . . . But here in the U.S., I got financial aid, and then I also took [a] loan for me to make it in school.

On how education in the U.S. offers funding opportunities, Miss A. stated that well:

> I didn't really have any financial issue when I switched to pharmacy because of the way I got into the U.S. With my status, the government is paying nearly all my fees. So I didn't really have to pay anything out of pocket. I have all the Pell

> Grant. They pay all my fees which makes it very encouraging for me to study. . . . You don't find such financial support in Cameroon.

Miss A. enjoyed studying in the U.S. because she felt free of the stress of financial demands relating to her schooling; however, such support was not available while she was in Cameroon.

To Mussa, although STEM education has been expensive in the U.S., he has been able to obtain student loans to enable him to attend schools. He said:

> I took loans to pay for my tuition and fees here. . . . When I was taking prerequisites, I had some financial aids, and I also worked two jobs to meet my school needs. Now, I rely on student loan. I had to drop one of my jobs due to school demands.

To another participant, Job John, the U.S. has offered a portfolio of opportunities for students. He stated these as follows:

> Actually, the U.S. has a lot of opportunities and ways that, you know, encourage people to study. One of it is the financial aid, which many people are in school today because they have that opportunity to have that financial assistance. . . . Back in Cameroon, we don't really have it. . . . Back home, they won't give a loan for you to go to school if you are not working or your parents are not working. Back home, one needs a strong collateral to get a loan. Maybe you need to have a house or something that you use to prove that you will repay the loan. . . Back home, if you are not going to school, most of the time, it's not really your choice not to go but because you don't have the financial means.

According to John, some students in Cameroon have not gone to school because they have lacked needed financing; however, in the U.S., it is easy to obtain loans or financial aid to study in STEM or any major one wishes to pursue. Therefore, Job John believed whoever fails to attend school in the U.S. has chosen not to, because lack of finances is not an obstacle.

Material Resources

Besides finances, some participants compared and contrasted availability of materials and other resources for studying in Cameroon and in the U.S. Resources included things like school libraries, access to the internet, computers, and laboratory equipment. In general, the U.S. offers most of these resources to facilitate studies much more than does Cameroon.

Shalom Love highlighted the following:

> Here in the U.S., we have all the instruments we need to use in [class] or study. The resources are available and even text books. We have a very big library full with books. But in Cameroon, instruments are not available even at some universities, which limit the number of students in those fields. I am always wondering how those who do Masters and Ph.D. in the STEM fields succeed in Cameroon.

To Shalom Love, the STEM education in Cameroon suffers from lack of sufficient laboratory instrumentation compared to the U.S. These demotivate students and cause some of them to major in non-STEM fields.

To Rosemary Ambang, studying STEM fields in Cameroon is expensive due to extra fees demanded from students to cover laboratory needs. She expressed this as follows:

> STEM field students have to pay extra for lab, yet they don't have good labs to study in those fields. . . . Here in the U.S., I have everything I need to study with, good labs, access to internet, all kind of textbooks which makes study easier.

A lack of sufficient resources for STEM education in Cameroon was widely expressed by participants. Mother Mimi spoke similarly to Rosemary, about the lack of adequate human and material capital favoring STEM in Cameroon. She said:

> Students going into STEM fields in Cameroon don't have that availability of materials like computers, all these microscopes, and other lab equipment because they are limited compared to the number of students going in and sometimes . . . if you want to get access like going into those labs or use some of those lab equipment, it entails money, too, like you have to pay this sum for you to get into the lab, which is really discouraging, too. So, one thing that the government can do regarding that is to, like, improve on their supply of these equipment and try to stock schools and make the labs of those schools have enough equipment that can encourage the learning of science.

On the poor schooling conditions in Cameroon, Miss A. mentioned that, in her years at a university in Cameroon, it was common to attend a lecture in a large hall with over 500 students seated. Sadly, these large halls did not have projector screens to display slides of the lectures. She spoke as follows:

> When I was in the university in Cameroon, we had a very big Amphi or hall. . . . Almost a thousand students used to sit in there. Imagine one thousand students in a class; yeah one thousand, can you believe? In a very big Amphi, and the lecturer would just hold a microphone and talk . . . students at the back of the hall would barely follow the lesson. . . . Also, with such large number of students back home in a single class, the STEM classes are more difficult because students will not be able to have access to the few lab resources and computers.

The above quote indicates how crowded lecture halls can be at some school campuses in Cameroon. This results from limited infrastructure and/or an insufficient number of teachers. The situation would be worst with those STEM subjects requiring laboratory work given the lack of laboratory equipment.

Thiery Randze praised the educational system here in the U.S., and the fact that there are many facilities around to motivate people into studying in the STEM fields.

> The facilities are there, and the opportunities are there. You have all the means of succeeding. All the facilities and all the help you can use to succeed, so that's what I mean. Whereas in Cameroon, one barely could have some of those things. And sometimes, we get discouraged even by the way the system in Cameroon works. Over there, you have to be a fighter and use money . . . but here in the U.S., every facility is available. So, it is different.

Access to Teachers

Accessibility to professors or instructors is one area where participants felt differences exist between studying in Cameroon and in the U.S. Some participants felt that teachers are more accessible to students in the U.S. than in Cameroon. In the U.S.,

teachers have office hours to attend to students' needs at a personal level. This is very uncommon in Cameroon.

Shalom Love felt that her teachers in Cameroon were somewhat lazy and were not open to students. By openness, she meant being accessible to students like providing office hours to attend to their needs. She expressed her experiences while studying in Cameroon in the following way:

> I think that the teachers in Cameroon were not taking enough time to go through what they had to teach. Like, to go through the syllabus very well. And other things that I think is that the teachers were not open enough. The teacher-student relationship was just really like a master-slave kind of relationship that I could not walk up to my teacher freely to explain to them that I'm not understanding this because I was so scared that the first thing that would come out would probably be that I would be insulted or maybe just slapped in the face. But here in the U.S., I can call my instructors and tell them that there is this thing that I don't understand. And they are always willing to have the time that we can sit down and go through it. In class here in the U.S., I am able to ask a question a [in] class and the teacher will take time to explain. Even if the other students understand, he will take the time to explain to me. But in Cameroon, it was different. I will even be scared of putting my hand up to ask a question because if I have to ask a question, the question is a dumb question in the first place to the teacher. And they will say that I can always go and learn it at home, I should go and try, because there is no time. If others in class understood, then I should be able to understand. In the U.S., I found out that teachers consider every question, and they actually say that

> no question is a dumb question. Every question is important, so we should always ask. And that already gives you an open mind and a free mind to be able to express any doubt that you have to the instructor, and they would be able to help you.

Shalom Love expressed the liberty she enjoyed at the time of her interview in dealing with her teachers in the U.S., which she never had while in Cameroon. She recounted a recent scenario with one of her U.S. teachers in the following words:

> I remember recently, something occurred. I was in class and throughout the course, I was not able to really understand. And I asked the teacher a question and he explained it so well. But the thing is, I did not really understand it again even after his explanation. And after the class, I met the teacher, and I said, "I know you went through this thing, and I do not really get it. I don't know if you have time that you can meet for us to sit down and you explain this to me again." And the teacher was so willing, he gave me time. We sat down, and when he went through everything, I understood it so well. And it was the same thing that came in the exam. I succeeded so well in that exam; I had 100% in the exam. And I was so proud of myself, and I really thanked the teacher, too. In Cameroon, I could not have such freedom with my teachers.

Besides teachers in Cameroon being comparatively inaccessible, Shalom Love also mentioned that her math teacher in Cameroon would actually send students who were slow in understanding out of his lectures. This forced some of those students to leave math studies and major in non-STEM fields. Her words were the following:

> Our math teacher in Cameroon will come to class and send students out because they are not understanding. And I just started developing hatred for the sciences as I found out I was failing. . . . I think that my science teachers caused it, too. . . . He use to tell us that "if you fail, you are just as a stupid student who cannot succeed." Their goal is to finish the syllabus. It's like they teach just those students who are succeeding, and all of those failing in exams or tests just have [to] look for something else, and do, and you cannot even approach them when you don't understand because they believe you cannot know anything.

Shalom Love believed her teachers in Cameroon paid little attention to the personal needs of students. Moreover, they cared little as to whether students understood the concepts they taught or not. They moved fast with the course material they taught and were more interested in completing their syllabus, so to speak, than to truly inculcate the concepts they taught into the students. To Shalom Love, the situation in the U.S. is much different, with teachers showing much concern for students and making time to help students on a personal level. The implication of this on Shalom Love was that she could understand her U.S. professors much better than those who taught her in Cameroon. She mentioned having taken similar courses in the U.S. as those she had done in Cameroon and how her understanding of the content for those courses was much superior in the U.S. to when she was in Cameroon. She expressed this as follows:

> Some of the courses that I have taken here in the U.S. were almost the same as some of the things that I studied back in Cameroon, which I could not understand at all when I was there. But when I did it here, it was like an entirely new thing to me. And I succeeded so well, and I was so proud of myself. And also the fact that

> my instructors were willing and open at any time to help me where I did not understand. And I realized that it is not really because I was not concentrating in Cameroon. I concentrate so well; and whenever I get it, that is it. So that has really encouraged me going to the Community College that I've been going to. The teachers are really good, they explain so deeply. They take every student to be the same. They don't show any bias, and they don't consider another person to be higher than the other. Everyone is the same. And they make sure that everyone understands what they have come to learn in that classroom. And that has really helped me because I have been succeeding so well in the classes that I didn't even expect I would ever succeed in, knowing that I did arts in Cameroon. It's been really wonderful, and it's really encouraging.

Shalom Love explained how she was excelling in STEM classes she never believed she could ever succeed at given that she had majored in a non-STEM area in Cameroon. She suggested that her teachers in Cameroon showed partiality in dealing with students, tending to pay attention only to the bright students in class and ignoring slow learners. Her experience at a Community College in the U.S. was much different. Compared to Cameroon teachers, the teachers in the U.S. were very caring and explained things deeply to ensure students grasp concepts.

Princess Brown likewise mentioned that she lacked the freedom of approaching her teachers easily while in Cameroon, but that the situation was much different in the U.S. In this regard, she said:

> Unlike in Cameroon that I could not approach my teachers easily, I went to my teachers here in the U.S. from day one. . . . So to help me out of some of my

challenges, I had to talk with my instructor, especially my microbiology instructor. I met with my instructors, and I explained to them my situation. I told them, "I am very new in this system. I am purely an arts student, but I have made up my mind, and I am determined to go through these courses. I just need the help. Just have in mind, I will always come to you at each level I don't understand things. So you just have to know. So when I'm coming to you, you should not be surprised. There are things you might be saying in class, just believe everybody is understanding." . . . Because I did this, all my instructors have been available for me.

To Mother Mimi, STEM teachers in Cameroon need to change their teaching approaches, mindful of prevailing negative stereotypes among some students towards STEM subjects. She said:

> Those who teach sciences in Cameroon should know that students already have a negative mindset about these subjects, so they should try to, like, change their teaching approach in these subjects; try to change the way they set the exams in the subjects because most students even when they try their best to study these subjects, when it comes to the exams, they still fail. So, . . . teachers should . . . focus on students individually. Like if they see that this student is weak and discouraged about the subject, don't give up on them, because teachers like to give up on students. So, they should try as much as possible not to give up on students. Try to encourage and make the students feel free to meet them [teachers] anytime with questions, especially because some teachers are so terrible when you ask them questions, especially the STEM teachers. They'd be like, "You are so

> dumb, how can you ask that kind of question?" . . . and they try to compare with other students, meanwhile that student asking the question that they think is dumb actually doesn't know anything, but they don't understand that way. They are just like, "Oh, you don't love math, that's why you are asking that question." . . . So, teachers should be a little lenient with students, try to listen and understand the students by trying to teach them from a lower level.

While Mother Mimi felt STEM teachers in Cameroon needed to treat students equally and leniently, she also noted that U.S. classrooms were less crowded that those in Cameroon. This permitted teachers in the U.S. to get to know students personally and facilitate their learning. She expressed this as follows:

> I think teachers in the U.S. are respectful. . . . It's not only about the teachers, but the way the classrooms are set in the U.S. The classrooms have very few students for a teacher. The teacher has the opportunity to know the students individually, which is good; because in class, the teacher knows that this student is a weak student, this student is a bright student, and this student is a neutral student. So, they know how to deal with those students in the U.S., which makes the approach way easier compared to back in Cameroon where you have a class of over a hundred students for just one teacher. It is very difficult for the teacher to have a close contact with or knowledge of most of the students. So, they can hardly differentiate between those neutral, weak, or strong students.

Another participant, Rosemary Ambang, described teacher-student relationships in Cameroon as teacher-centered as opposed to student-centered. To her, teachers in Cameroon tended to undermine students and make assumptions when they teach. Her

math teacher in Cameroon would send students he considered to be too dull to cope with math out of the classroom. But here in the U.S., teacher-student relationships are more student-centered with teachers devoted to helping students learn. Rosemary explained:

> The relationship between teachers and students in Cameroon is teacher-centered. You might ask a teacher a question, and he will tell you that you are too dull and cannot understand that small problem. . . . Sometimes, our math teacher would send us out of the class because we did not do the homework, and when I missed one concept, it became difficult to follow the others. But here in U.S., teachers are different and considerate. For example, I never understood a homework; and I went back to the teacher and explained to the teacher that I never understood that we had a homework. Not that I deliberately refused to do the homework. The teacher gave me another opportunity to do it.

Thiery Randze likewise highlighted the ease with which he would meet and talk to his professors and colleagues in the U.S. unlike while he was a student in Cameroon. He expressed this as follows:

> I'm able, now, to be more open to talk to the professors here in the U.S. I'll be like okay, this is the concept I need, I didn't understand this concept. So, I meet the professor, and he breaks it down with me . . . and I meet a classmate . . . and I study in a group . . . and I'm able to watch online tutorials, and maybe videos that can help break a concept down. It does help more. These facilities were not back in Cameroon, back in the days I was there. You know . . . when I put all these together and my personal effort, I succeed very well here in the U.S. And the main thing you must put is working with professors. And that's something we

> weren't just doing back in Cameroon. Where sometimes the professors were just telling you that "Okay, you are not good at this thing." . . . But here in the U.S., things are different . . . teachers are willing to help . . . you know now that this is actually what your life is going to be like. And you have to fight and put in every effort. So, like I said, life is different here in the U.S. And you are looking at it from a different perspective.

Responding to a question on how he interacted with his teachers in Cameroon and the U.S. and whether they often encouraged him, Job John said the following:

> Well, um . . . I will say my teachers in Cameroon didn't really encourage because back home, it's more about you the student and yourself. It's not like here in the U.S. where, you know, the teacher always looks at your grade and comes back to you and asks where you need help. Do you need any extra resources? Do you need more time? Do you need to come to my office during my visiting hours? . . . All those things don't exist back home; and you do, I will say, 90% of the work by yourself. The teacher is just there. He comes, teaches, and leaves you to yourself, then comes to give exams. So, most of the time, you have to actually study on your own. . . . There's no evaluation on the teacher's performance. They focus more on the students' performance.

John further elaborated on the nonchalant attitude of his teachers in Cameroon by pointing to the fact of limited resources for these teachers. He explained how students receive little pedagogical support in Cameroon and blames this in part on the limited resources available to teachers. His words in this regard were as follows:

> Back in Cameroon, education is all about student orientated. . . . It's being considered that you pretty much do I'll say 75-80% of the work on your own. . . . You know, we don't really want to put all the blame on the teachers because more often, they also lack the resources. Most of the time, you will not hear a teacher tell you, "Okay, I'm done with my class for today. I'll be in my office tomorrow from 5-6 PM if you have any questions or if you don't understand anything. If you want any review, you can come and see me." We don't have things like that in Cameroon. Once the teacher is done with the class of today, you only see the teacher the next day. You don't see the teacher anywhere for help. Teachers believe they have little pay, and most of them go to do business. . . . It's crazy, because instead, most of the time you see them in the bars or drinking places. There's nothing in the bar that you discuss that has anything to do with schooling. Yet, in the U. S., teachers have extra teaching hours. You can go meet them. The resources are there. The library is there. You have a lot of good online resources. Teacher in the U.S., when they do most of their lectures, they do recording and put it online. You can access it. You can also email a teacher if you have questions. He/she will reply to you. So, you have a lot of support from the teachers here than back in Cameroon.

From the responses of most of the participants, it was seen that, in general, teachers in the U.S. maintained more cordial relationships with students than did teachers in Cameroon. The effect was that students tended to be more free in their dealings with their teachers in the U.S., being more open to asking questions when in need of clarity. For example, to illustrate this liberty, Miss A. said, "Here in the U.S., I can stay back

after class and ask my teacher questions if I didn't understand something even if it is not office hours, but back in Cameroon, that had never happened."

Organization or Structure of Testing and Exams

Participants indicated that there was a difference in their experiences with writing quizzes, tests, and examinations while studying in Cameroon compared to being students in the U.S. In general, testing in the U.S. was reported to be more frequent, taking the form of quizzes after each chapter or unit of knowledge taught as opposed to the system in Cameroon where most teachers tested close to the end of a semester or term. Moreover, the U.S. education system was reported as being better organized than that of Cameroon, allowing students to know precisely when tests or exams would be administered. This better U.S. school system was noted to mediate the readiness of participants to learn, resulting in them scoring higher in their tests and exams than used to be the case when they studied in Cameroon.

Princes Brown compared her education in Cameroon to the U.S. in the following words:

> Here in the U.S., you know the days that you have quizzes . . . You know the days that you have exams. So, it helps you get a kind of organized. And the instructors here test students' knowledge at the end of every chapter which makes students to always be reading. And this helps students to actually know what they study. In Cameroon, students study to pass exams and not to know. . . . Yes, in Cameroon, the way education is structured, they don't have many quizzes, sometimes we will have only one test and one exam at the end of the semester. So students read only

> when the test or exam day approaches because they want to pass their exams, not because they want to learn the material.

As expressed here, it seems that a school system where students are frequently tested on the material taught to them helps keep students alert and studious. Brown's comparison above indicates that testing students only after large blocks of knowledge have been taught may lead to students being idle, and consequently performing poorly.

Mother Mimi also highlighted the fact that the U.S. system of education was quite organized, facilitating studies. She said:

> In the U.S., the way they organize the things are not as hard as they do it back in Cameroon. For example, the teachers in Cameroon try as much as possible to teach fast and cover the syllabus, not caring much whether students understand. Here in the U.S., teachers care about student learning and development. They try as much as possible to test students after every chapter to see the grades of the students and see where the students are weak in and see how to improve . . . unlike back in Cameroon where teachers only have to test you at the end of the semester.

To Miss A., teachers in the U.S. are more likely to give students a second chance than their Cameroon counterparts. Similar to observations made by Mother Mimi above, Miss A. felt that teachers in Cameroon did not care as much about whether students truly understood the concepts taught. Teachers in Cameroon tended to be more concerned with students' grades. They would use those grades to classify the students into intelligent and dull students. Miss A.'s words regarding this were:

> Here in the U.S., if you fail an exam, the teacher will say that there must be something wrong somewhere, and he or she will give you another chance to prove yourself otherwise. . . . But back in Cameroon, they don't really care to know if you are understanding the concepts; they want to see your marks or grades. The intelligent student is what is on the paper. What they see, that's what they consider as intelligent. That is, the person with a high score is the intelligent student. If you pass, then you are intelligent. If you fail, then you are dull.

The critical goal in the teaching/learning process should be to ensure that learners or students actually learn (and possibly practice) what they are taught. Miss A.'s comments indicated a feel that her U.S. teachers upheld such a goal much more than their Cameroon counterparts.

Thiery Randze mentioned that he experienced difficulties in Cameroon while schooling. He described school life in Cameroon as very tough contrary to the U.S. To him, course work in the U.S. appeared well organized into parts that facilitate understanding and success. His words were as follows:

> Cameroon is very tough . . . when it comes to education. . . . But the learning system back there in Cameroon is different from the learning system here in the U.S. Why? Because back home, they get to combine so much material that you are to know and prepare for an exam. But here in the U.S., it's kind of broken into parts. Which makes success more possible for us Cameroonians. Here in the U.S., students can easily grab a concept and are able to understand it better. Whereas, back in Cameroon, students accumulate so many concepts and easily get confused. . . . I believe that's why Cameroonians succeed here in the U.S. more.

Research Question #3

What differences if any, exist between male and female Cameroonian immigrants' decisions to switch from a non-STEM to a STEM or related field in the U.S.?

A few of the participants reported that gender differences existed in the pursuit of STEM education in Cameroon compared to the U.S. Stereotypes among female students relating to STEM appeared to be more common in Cameroon than in the U.S. For example, expressing her perception of STEM while in Cameroon, Shalom Love, who currently majors in a STEM-related field in the U.S., said:

> As I studied, I realized that medicines was also something that I could really engage in, and I would really love it. So I started thinking of being a medical doctor. But everyone kept saying it would be tough . . . because such fields are mostly for male. . . . It would be difficult. But, I said I would try and try to do sciences. . . . I kept thinking about the fact that people will say sciences was for specific students. . . . So, maybe if I continue with this, I might just get shipwrecked. So, I decided to better just choose something that will be comfortable doing.

Stereotypes are revealed in Shalom Love's response above. People made her feel that the sciences were for a particular set of students. These negative feelings and external influences led to her major in a non-STEM field. Interesting, however, was the fact that Shalom Love majored in a STEM-related field in the U.S. at the time of her interview. Her perception had transformed from the time she entered the U.S. to the time this study was conducted.

Another participant, Job John, expressed similar views to those of Shalom Love regarding attitudes towards STEM in Cameroon. He felt female students were more inclined to major in non-STEM areas while their male colleagues generally majored in STEM in Cameroon. Comparing gender attitudes among Cameroonian students in Cameroon and the U.S., John said:

> Back in Cameroon, many boys tend to do science, and many girls tend to do arts. And one of the reasons for this is because of the nature of the subjects themselves. If you look at it so well . . . you have many teachers who are women than men teaching arts subjects. Same like you have many doctors who are male than female in Cameroon. Here in the U.S., it's different because they give everyone equal opportunity; there is a lot of gender equality. Here in the U.S., they give the same opportunities to everybody irrespective of their gender. But back in Cameroon, they try to make it as if they are giving the same opportunity to both boys and girls irrespective of their gender to choose whichever field they want to choose, being arts or science. But technically, they don't really do it.

To illustrate how the educational system in Cameroon favors gender differences through same sex schools, Job John continued as follows:

> Back in Cameroon, we have single sex schools. Here in the U.S., that is not common . . . for example, Sacred Heart College in Cameroon is all boys . . . most often, when they are reading the GCE results, Sacred Heart is always one of those schools that will have 100% in Ordinary Level and Advanced Level GCE exams . . . if you look at entrance exam into the CUSS medical school in Cameroon, most of the students that will get accepted are those that have 100% in the

> Advanced Level, and often, many of the students have five papers. . . . This means many students will leave from Sacred Heart to go to CUSS . . . gender-mixed schools like G.B.H.S Bamenda will definitely come out with let's say 85% in the GCE. And now if G.B.H.S. is having 85% and among these, girls might be 40% and boys might be 60%. So now, among these 40% girls, maybe four of them have five Advanced Level papers. This will reduce the number of girls who can get into CUSS. That already tells you that the system was making such a way that more boys are in the science field.

Here, GCE represents the General Certificate of Education examination written at two levels in Cameroon (Form 5 or the equivalence of 10^{th} grade and Upper 6^{th} or the equivalence of 12^{th} grade in the U.S.). G.B.H.S. (Government Bilingual High School) is an example of a public school which admits students of both sexes. Job John mentioned that same sex schools (that is, all male or all female) tend to perform better at the GCE national examination; and therefore, have more students entering professional schools such as CUSS (Centre Universitaire des Sciences de la Santé) which literally translates into English as University Center for Health Sciences. It should be noted, however, that girls are less likely to major in STEM than their male counterparts even in same sex school.

Miss A., likewise, mentioned there are stereotypical beliefs in Cameroon that lead to gender disparities in career choices, especially relating to STEM. Like Job John, she asserted that a generally held belief in Cameroon is that arts subjects are largely for women. Contrarily, the U.S. educational system encourages both male and female

students to pursue STEM or related subjects (or arts, for that matter). Her words were as follows:

> In Cameroon, they know that science is for the guys. . . . Back in Cameroon, arts is for the ladies, and fewer men do arts. Here in the U.S., it's like STEM fields are open for everybody. But back in Cameroon, arts for a man is a little bit frustrating. They know that men should be doctors, and women should be journalists. That's just the way people grew up. . . . They believe that the man is the head while the woman follows behind. That is the way the African culture is. So, they believe that all the superior things should be for men . . . there is a lot of gender differences; the men are always the head. . . . But here in the U.S., people have the freedom to do whatever they want.

Gender differences were not found to be limited to STEM-related stereotypes in the present study. Gender disparities were likewise reported in relation to the values upheld by Cameroonian male and female immigrants in the U.S. Mussa Bless felt that gender differences existed in career choices among Cameroonians in the U.S. He believed the men were more preoccupied with seeking careers that can offer sufficient money to raise a family, whereas women were generally not in search of high paying jobs. He believed that the men generally aimed higher than the women when it concerned career choice. This perception was quite similar to that of Miss A. who noted, above, that men tended to be viewed as the head or leaders within African culture (and hence, the main bread winners of their families) unlike here in the U.S. His words were as follows:

> I always think that gender matters, you know. Men are building the family, you know, so they are looking for something that will be big financially for the family.

> But women are not so much into that; women do not want to get involved in big things for the family. Many of us men are thinking of becoming pharmacists and so on, and that is many years of schooling. . . . Back in Cameroon, I noticed that so many women wanted to be what we call here "certified nursing assistants" but very few continued to be full-fledged nurses and to earn degrees and so on. . . . When they come here, they want to follow the same thing. They easily choose what fits with them. But us men, we aim higher.

One of the participants, however, felt that there were few or no gender differences at all relating to Cameroonians attitudes towards STEM in Cameroon and the U.S. To Thiery Randze, the choice of a major was largely determined by capabilities or mental faculties of students and this was independent of sex. In other words, Thiery believed that students determined what they majored in based on how well they performed in those subjects, and this was the same for male and female students, even though he saw most men in the STEM subjects. Here in the U.S., he said, more opportunities abound for students (male or female) to dive into any STEM major of their choice. His words in this regard were as follows:

> I think anybody in Cameroon (either a girl or a boy) choosing their field basing on their capabilities, even though I saw many male boys in the sciences compared to female. It was actually dependent upon what they were good at. . . . Some of them know already what they like to do. For example, some would say, "I don't like history. I don't like writing long things. I don't like stories and so on." . . . So gender doesn't really matter to me. It doesn't matter because every student will realize their capabilities and choose what they like, especially in the U.S.

Research Question #4

What challenges, if any, do Cameroonian immigrants encounter when switching from a non-STEM to a STEM or related field in the U.S.?

Most participants reported having faced challenges in switching to STEM careers from prior non-STEM backgrounds once they got to the U.S. These challenges ranged from fear of the unknown, inferiority complexes, language-related issues, to financial difficulties. Problems faced by participants when switching from non-STEM careers to STEM fields are organized here by theme.

Switching Fields is a Big Decision

Coming to the U.S., participants reported they were flooded with information and confused at first about which career path to follow. In the midst of this confusion, most of them took the initiative to make inquiries about their options through multiple sources such as visiting and speaking to a school official, and listening to counsel from peers. In all, zeroing in on what to study was pretty tough for some of the participants; It required boldness and an inner resolve to succeed in plunging into "the deep challenging waters of STEM" without a prior solid STEM foundation.

To Princess Brown, the utmost challenge was that of deciding what to take as a major once she got to the U.S. She had many questions on her mind, and above all, needed a field wherein she had a passion. She eventually developed a passion for biomedical science where she was majoring at the time of her interview. Her words were as follows:

> The main challenge was the challenge of getting settled in the mind on what to study in the U.S. That was a very huge challenge, being settled in the mind; what

> to pick up as a major, and why. And the self-conviction that you feel . . . . At the beginning I was like, "Oh, am I doing this thing because I need the money or...?" But along the line, I realized I started developing passion for biomedical science. . . . So, one of the first challenges that I had switching from being a law student to being a biomedical major was the challenge of settling down. Picking up, to actually accept the fact that I am switching from this field to the next field.

Deciding on what to study in the U.S. was also difficult for Mother Mimi. She expressed her difficulties relating to choice of major as follows:

> It was hard for me to decide, especially because I experienced some difficulties from people and with myself, too . . . some people tended to discourage me from switching. They would say, "How can you switch your major? Are you ok? . . . How can you leave accounting?" . . . So, whenever I heard that, it disturbed me mentally. I felt like I was making a mistake. So switching majors was kind of like a rope that I was pulling, because at some point, I felt like, "Okay, I will not take such a decision. I'm just going to continue with whatever I was doing in Cameroon." . . . It was so challenging to switch.

Although it was challenging for Mother Mimi, she eventually switched into Bio Statistics the field she was majoring in at the time of her interview.

Lack of a STEM Foundation

One of the challenges faced by virtually all participants was the fact that they entered STEM fields in the U.S. without prior STEM backgrounds. Most of them had to go back to the beginning, so to speak, and learn the very basics of each of the STEM subjects they had to take.

Princess Brown reported having difficulties understanding course work and had to work doubly hard to succeed. She expressed these difficulties as follows:

> The second challenge that I had during my very first semester was related to the fact that the system of studies here in the U.S. is really way different from back in Cameroon. So, being introduced to the new system was a big challenge. My very first class, that I can never forget, was microbiology. When the teacher came into class, he was talking like . . . he knew he was talking to students who had some basic information about biology. Just talking and going . . . just talking; so I was really so lost. I just felt like for the 50 minutes that I had in class, it was just like I had wasted time. And I usually feel bad to be in class and be that lost. . . . So with these challenges, I made up my mind. . . . Though the challenges were real, I resolved not to give up; and although it took a while, I am understanding well now.

Although she faced challenges, Princess Brown was resilient. She resolved to succeed in every course she undertook despite the obstacles. Regarding a chemistry class she had taken, she said:

> When I started taking chemistry, it was very difficult . . . some chemistry terms were hard to learn. I just made up my mind. . . . I realized I had to go back to the beginning to learn many things. I could not say I was "in the university" because I found myself studying basic science like defining an atom. . . . I had to start going from the foundation . . . not just picking up from wherever a teacher wanted us to start in class. . . . I had to do some extra work. And that is just how I think I have been succeeding.

Since each body of knowledge generally builds on prior knowledge, it was very hard from the beginning for Princess Brown to understand the concepts taught in biology, chemistry, and other STEM-related subjects she took. She found herself returning to study those subjects from the foundational stages and having to do extra work to catch up with understanding her classes.

Mother Mimi expressed her difficulties relating to lack of a prior STEM background after she switched her major to a STEM-related one in the U.S. as follows:

> When I started studying in STEM in the U.S., it was really difficult for me because the subjects that I had to start with were subjects that I had done like since when I was in secondary school in Cameroon. Now, I had to do it in more detail, since at this level, we are preparing for the career already. So, it was not easy for me since I did not have the background for the subjects. I had to take my mind backwards, trying to read as if the concepts were things I had never heard of . . . so it was very challenging.

To Rosemary Ambang, studying in STEM in the U.S. was likewise challenging due to lack of a prior STEM background. Her greatest challenges seemed to have been in the area of math or performing calculations. She said:

> The difficulties that I faced when I made the switch into STEM in the U.S. were many . . . most of the calculations were very difficult for me since I had never been a science student in the past. Those are some of the difficulties I faced because I never actually really did math which involves calculations in secondary school. So that's what I faced.

Resilience was generally expressed by most participants amidst the challenges they faced during and after switching into STEM majors in the U.S. Miss A. mentioned that she had many challenges, in switching into a STEM-related major in the U.S., mostly relating to her lack of a prior STEM background. She expressed these difficulties, and her determination to succeed, as follows:

> I've been through a lot of difficulties. First, as I told you earlier, science was not my thing . . . just imagine you have been doing arts and then just all of a sudden, you change to science, where you don't even know the basics. . . . Like you know, your other classmates will be far ahead of you . . . you don't even have a good foundation of science. And then you go to a field where, boom, everything is science. That's a big challenge. Behold, I failed all my courses the first semester.

The issue of lack of a prior STEM foundation as a roadblock in switching from non-STEM to STEM or related majors in the U.S. was reported by most participants. For example, Job John also expressed such difficulties as follows:

> One of the difficulties which I faced, and I will say I'm still facing now, is that of background knowledge. . . . I am missing a lot when it comes to the background knowledge which most of the teachers assume, . . . So, for example, a teacher will say, okay, "We all know . . ., today we will be talking about cardiovascular diseases"; and before we even go there, "Let's recall [this or that] definition because you already know it from your biology class." Somebody who didn't do biology would now be lost. But the teacher assumes that there's no way you can be in the program without having a background knowledge of what cardiovascular diseases are. . . . But that is something which somebody who has a

science background would probably have learned it in biology in high school, and will find easy.

Language Barrier and Accents

Language barrier was another area of difficulty for participants. All participants were fluent in English, but they spoke Cameroonian English, which is based on British English and has a different accent than American English and slightly different grammar patterns.

Mother Mimi experienced difficulties relating to language while studying in a STEM-related major in the U.S. These difficulties concerned not her understanding and ability to use English, but rather her accent and inability to follow professors who often spoke too fast in class. She expressed some of these hurdles as follows:

> I had a lot of challenges communicating with people, not only in school, but in different places. Like the way you talk, they really don't understand what you are saying; and because they don't understand what you are saying, it seems like you are speaking wrong English, and those were the challenges I had at first because sometimes when you are trying to talk, they don't understand you, and that makes me feel like the way I'm wording it is different, and I need to change it. So those were the challenges I faced, and I'm still facing them till today. English affected me in school because at some point, like when you're in class and the teacher is teaching and you really have a question that you want to ask, at first I'll be thinking like how do I word it, how do I say because even the teachers sometimes really don't get it. Also, you just feel like "I'll not ask the question," and you just stay without asking the question not because you don't want to ask the question,

but because you are thinking of your accent; you're thinking of maybe your English.

Besides the inability to express herself clearly in class, Mother Mimi had difficulties following her U.S. teachers in the course of delivering lectures. She felt some of them often spoke too fast for her to follow. Her words were the following:

> I also had a little difficulty with some professors because some professors tend to speak so fast, and I don't know why. I don't know if it's natural or it's just the way they teach . . . like, I had this one professor in a biology class I was taking. I was the only black person in class, and every other person was white. So the way he spoke was really fast. . . . Sometimes, he would speak like for two minutes, and I could barely hear what he was saying.

The feel of having an accent can often lead foreign students into developing a complex, so to speak. Some of them tend to shut down in their lectures and speak little. Like Mother Mimi, Rosemary Ambang faced difficulties relating to her accent, as well as following her professors when they spoke during lectures. She expressed these challenges as follows:

> I speak British English [Cameroonian British English] which is a little different from American English. So when it came to my accent, I had a lot of challenges. From the beginning, it was not easy with me. I could not understand my classmates. . . . I could not understand the teacher very well. To study STEM and not easily understand your teacher makes it really hard to understand the material. I would take my time to listen well before I would understand what actually they are trying to talk. . . . Some of my teachers used to ask us to discuss the concepts

> at our tables. I would not easily understand my colleagues and would be quiet most of the times. When I spoke, they too could not easily understand me. . . . And because of that, I failed to do a homework because I could not understand my teacher.

Miss A. mentioned that she, too, came to the U.S. from the English-speaking or Anglophone part of Cameroon. Therefore, she did not face immense problems with the English language here in the U.S. However, American English has slight differences from the British English spoken in Cameroon, especially relating to spellings of certain words, and phonetics. She expressed her challenges in this regard as follows:

> In Cameroon, I spoke English. . . . The main problem when I came here was my accent. People here always say they don't understand you. . . . There are certain things you will say, and they will be like, what? And when you say it again, I don't know if it's their behavior problem or . . ., but some say they don't understand you. There are words in British English like "pardon" which I found that are not common here in the U.S. In Cameroon, we were fun of saying "pardon me…" when you missed hearing something. But people here in the U.S. will not understand, and there are certain other things that are common in British English which they will not understand. Just imagine like washroom and restroom.

Although Mussa Bless had studied some English, French, and German prior to coming to the U.S., he faced difficulties relating to a language barrier when he decided to switch into a STEM-related field in the U.S. His words in this regard were as follows:

> Language, too, is another issue, yeah. I still struggle with English. I also think I found so many differences between the ways we spoke English in Cameroon and how it is here. . . . I find the English here in the U.S. really hard. I've also found that there are so many synonyms in the English here which further complicates learning for me. There are also differences in vocabulary between the English here and what we spoke in Cameroon. For example, in Cameroon we would say "chair," but maybe here in the U.S., there is a specific noun for calling it. This has made me at times to confuse myself with the same thing . . . when I started studying here, most of the times, I would tend to translate many things into French in order to understand and sometimes I got confused.

Thiery Randze also reported a language barrier as a roadblock in the pursuit of his dream of a STEM-related career. His said:

> The American English is different; very, very different from British English. Sometimes, it's the same concept, but then the wordings, the way they frame phrases or sentences, are different. The way they put the whole structure of it with a particular concept together is different. . . . The difficulty is that sometimes you read something, and it's not like you don't know what the concept is, but the wordings, the wordings could make a difference especially studying in a new field.

Thiery believed everyone (including Americans) has an accent. To him, the issue with communication is how to communicate effectively and not the accent with which one speaks. He expressed his difficulties with communicating as follows:

> People say they don't understand me . . . some think that the English I speak is okay . . . but they talk about accent anyway, people talk about accent all the time. Everybody does have an accent. That's what people fail to understand; everybody has an accent . . . someone will think I don't really speak fluently, or they don't understand me, but if I were to tell them that I don't understand them, too. So the accent thing comes from the basic question, "How can somebody understand you when you talk?" I don't think it's about the way you talk.

Job John shared similar views with Thiery Randze with regards to the problem of accent as expressed in the following words:

> The area where I find a little bit of challenge . . . is more with the accent issue. Which, you know, sometimes when you speak, the accent alone already tells where exactly you are coming from. It also tells the person you are talking to that you were not born in the U.S. So most of the time, one of the challenges is you have to try to speak in a way that the person listening to you would understand . . . To say I don't know how to speak well just because I have an accent is wrong. It's just because you can't understand what I'm saying. This means I can also say you have an accent because I don't also understand what you are saying. But most of the times, we find ourselves in the situation where we are the ones to try to speak clearly for the Americans to understand. Whereas it can also be the other way around.

Moreover, Job John mentioned that Americans tend to speak much faster than he can follow. Coupling this with a lack of a prior STEM background compounded the challenges on his path to learning STEM subjects in the U.S. He said:

> Most Americans speak English fast, and it is hard to follow. . . . I need to speak maybe slowly and to take my time and try to pronounce my words well. . . . First, before you even say anything, there's already the idea in mind that they might not understand you. So that now makes you feel a little bit stereotypic. You feel a little bit of inferiority complex and timidity. So when you want to talk, you don't talk naturally, you try to change your voice and talk like the Americans. You don't talk according to your pace; you talk differently so as to make them understand you. And because of this, you even miss some important points in the statements or message that you are trying to pass across because you feel that if you use the actual words you know, it might change the entire conversation. So you end up eliminating certain key words in your message and just go with what you think the person will understand. And that's why most of the times, you find that often, you have to maybe speak twice.

Large Volume of Material

Participants mentioned that one of their areas of difficulties was the fact that the volume of material for the STEM classes they had to take seemed much larger than what they had hitherto been used to. The text books looked a lot bigger, and the course content seemed more voluminous compared to non-STEM classes they had taken prior to coming to the U.S.

Princess Brown stated that the volume of work she found herself faced with once switching to a STEM-related field in the U.S. intimidated her. She would look at the work before her and feel a sense of defeat. But, she had resolved to succeed. She expressed this challenge in the following words:

> One thing that really scared me was the sizes of the text books. Because back in Cameroon, we hardly used text books. We relied more on our teachers' notes. I studied literature in Cameroon. The literature textbooks we used were very small compared to the textbooks I have been using here. Even when I used big textbooks, they were never as huge as the microbiology text book I have here in the U.S. On the first day I signed up for the classes here in the U.S., I went to get my text books. The text book that I saw for microbiology, oh my goodness, I was so scared. I was like "Oh God, how am I going to read this book?" But I didn't know, until when the instructor came to class, and he showed us how to study. He said, "If you feel you are so scared, just go to the review part and read it from there. Then you have a general view of the course."

Shalom Love likewise felt intimated by the bulk of the course work once she switched into a STEM-related major in the U.S. Her perception was much similar to that of Princess Brown. In this regard, Shalom Love said:

> The bulk of the work in STEM is too much, and the text books are too big. It is more than it was with the arts subjects I took in Cameroon. Because you have so much material in the STEM here in the U.S . . . so much to do . . . It's okay so far because the study here is not like back in Cameroon where you have so much to do at once. You can go gradually here in the U.S. That's the main difference between studying in the U.S. and studying in Cameroon. In Cameroon, you will have to probably study like 10 classes at once. And you are expected to succeed in all of those classes to be able to go to the next class . . . and the teachers help little. But in the U.S., you can take at least 2, 3, or 4 courses that you are

> comfortable with and concentrate on them. So even though the text books are large and look frightful, the teachers teach us how to study them, and that makes it easy.

Although course work in STEM subjects here in the U.S. looks voluminous as Shalom Love observed, studies here in the U.S. are much better than in Cameroon due to the flexibility of choosing the number of courses to take, unlike in Cameroon where the system compels students to take a certain number of classes at once. Moreover, teachers here in the U.S. are more helpful, and teach students on how to study using their large textbooks.

Mother Mimi also felt that the bulk of academic work she faced once switching to a STEM field in the U.S. was overwhelming. She expressed this as follows:

> I'm used to accounting figures and not used to reading so much notes to prepare for an exam. . . . I'm not used to reading big books and stuff. But now, when I started the biomedical program, it entails a lot of reading especially the biology part of it. You need to know . . . like you need to read a lot, which is something I'm not really used to. So, it's a little bit challenging to me because I don't like reading. And especially the fact that the text books are really huge.

The view of the bulk of STEM (and related) work being a challenge is a concern that was shared by most participants. Miss A. observed that doing STEM entailed putting in many hours to read and study. She expressed this as follows:

> When I started with the sciences here in the U.S., I noticed that I needed more time to study; I needed to understand and not just memorize. With the arts subjects, you can just say nearly anything, and it's correct, yeah. You don't read a

> lot in arts like in science. . . . I'm not used to when people go out of class during exams and leave you alone, because you are taking your time to answer questions. And just of a sudden everybody's out of the exam hall because they are already used to the system. So they know how to like answer questions fast . . . and they are out of class, and you are alone. And you start being nervous, looking around. . . . It was so challenging for me. I did not know the system, and [I am] always the last to leave an exam hall. All these challenges made me to study extremely hard and with the fact that I now have very large text books. And again the science field is hard.

Even though Miss A. faced challenges with large textbooks and her classmates leaving exam halls much earlier than she did, she adapted as time went on, and these challenges made her study harder. In other words, she grew resilient; being resolved to pursue her dreams.

Multiple Choice Exams

Coming from a non-STEM background, some participants faced challenges regarding the exams system. They mentioned that the nature of exams in STEM subjects was quite different from the non-STEM subjects they had taken in the past. Mussa Bless testified:

> I had many difficulties when it came to writing test and exams. In the past, my exams were mostly arguments where I presented my view points on diverse issues. Now, I have to write multiple choice exams in STEM where you are required to choose the right answer. This means I have to know all the material I am taught, and it is very challenging for me.

Mussa had been used to writing exams where he presented his view points on different subjects. Now doing STEM subjects in the U.S., he had to recall, and apply scientific facts. To him, this was very challenging. Similarly, Miss A. said:

> In arts, you can memorize; but in science, you have to understand. And in the arts, we don't have too much multiple choice exams. When I switched to STEM, I noticed many multiple choice exams. They are difficult because you have to understand everything, which was different, and that was challenging to me.

Responding to multiple choice questions was something new to participants. Thiery Randze explained:

> Answering multiple choice questions was completely new to me. You have to read within the lines in order to success. Also, the multiple choice exams are challenging due to wording. You could miss or fail a question not because you do not actually know it, but because the wording is confusing. . . . I had to read very hard.

Even though participants faced many challenges as a result of their conversion from a non-STEM to a STEM-or-related field such as a large volume of material, language difficulties, and even the lack of a basic foundation in these fields, they were able to brace through these challenges and still succeed through determination and hard work, and help from teachers.

Help From Instructors and Friends

The results discussed above may seem contradictory. For example, Miss A., who claimed she did not study STEM in Cameroon in part because she was lazy, succeeded in studying STEM in the U.S. despite it being a challenge, and despite her having to

persevere. On the surface, this appears contradictory. Rosemary, who also struggled with math in Cameroon and claimed she hated it, went on to study Petroleum Engineering in the U.S., which required taking math courses. In fact, all participants in the study ended up having to take math courses in the U.S. as part of their requirements. What then made them successful in the U.S. when they had been unsuccessful in Cameroon?

Even though faced with many challenges, participants were able to overcome their problems, because they worked hard, were resilient, and had help from friends and teachers. For example, Miss A. said; "I'm somebody who don't give up easily. I always strive to get to the end. So, I worked hard in order to succeed." Participants also received help from teachers both in and out of class contrary to their Cameroonian counterparts. For example, Princess Brown reported having benefitted in many ways from help directly offered by her teachers in the U.S. She spoke of one of her teachers (and also her spouse who had previously majored in a STEM area) as follows:

> I met with my instructor, and I explained to him my situation. I am very new in this system. I am purely an arts student, but I have made up my mind, and I am determined to go through these courses. I just need the help. Just have in mind, I will always come to you at each level I don't understand things. Also, my husband is a science student. He helps me a lot at home. He was one of the persons who actually encouraged me to switch to STEM.

Miss A. received help from friends. She said:

> I met other students when I started school. Like, they really encouraged me in the field. "Oh, it's a good thing. It's a good field." I know . . . we started forming

> study groups and stuff like that, which really helped. It was really helpful to me to going into the field and stay there.

Thiery Randze also sought social support and advice from different avenues regarding the different challenges he faced as expressed here:

> Yeah, I had help from lots of people. Lots of advices from so many people who told me that this is something doable. And sometimes, when you are trying to do something you have to . . . it's not like you're copying from another person, but you say, "I must do this. . . ." I believe the advice from brothers and friends telling me that this is something I can do helped me a lot. . . . It's something I thought about pretty good; good advice from so many people.

Such help and support made the transition of students going from non-STEM majors to STEM-or-related majors easier.

CHAPTER V

DISCUSSION

The purpose of this study was to investigate why Cameroonian immigrants who did not major in a STEM field at the time of entering the U.S. switched into STEM or related fields while in the U.S. The previous chapter presented the results of the study following the research questions which guided the study:

1. Why do Cameroonian immigrants who have not majored in a STEM field at the time of entering the U.S. switch into a STEM or related field while in the U.S.?
2. What is different about pursuing a STEM field in Cameroon versus pursuing a STEM field in the U.S.?
3. What differences if any, exist between male and female Cameroonian immigrants' decisions to switch from non-STEM to a STEM or related field in the U.S.?
4. What challenges, if any, do Cameroonian immigrants encounter when switching from a non-STEM to a STEM or related field in the U.S.?

This chapter will synthesize and analyze results presented in the previous chapter. Key areas of significant overlaps and correlations between participants' responses will be identified and discussed. The results of the present study will be discussed in light of the

theoretical foundations on which the study was formulated. Moreover, any correlations or anti-correlations with previous similar studies will be identified and discussed.

The theoretical framework for this study consisted of two (somewhat related) theories of learning, namely: The Transformative Learning Theory and the Social Cognitive Theory (Bandura, 2001). The former theory emphasizes how self-discovery **(**psychological changes or changes in understanding oneself) leads to a shift in one's convictions or belief system, and eventually behavioral changes or a change in one's lifestyle. The latter theory emphasizes the importance of social interactions in the learning process; that individuals learn (a) by observing others in their locality or elsewhere (that is, through the media or internet, for example), and (b) by gaining experiences. Such observations and experiences lead to a sequence of reciprocal exchanges relating to a learner's traits such as intrinsic motivation, self-determination, self-efficacy, grade, and career motivation. Behavioral changes result in knowledge acquisition. The two theories are interrelated in the sense that social interactions can lead one to discovering different intrinsic potentials in oneself, which would lead to lifestyle changes. This assertion provides the basis for acculturation wherein individuals of a foreign culture get assimilated or absorbed into a new (usually dominant) culture. Such assimilated or lifestyle changes would be impossible without social interactions.

The findings of the present study fit quite well into the context of these two theories. Participants reported that while in Cameroon, their social interactions in part encouraged them to study in the arts fields, hence they did not discover their true potentials vis-à-vis STEM subjects. Contrarily, after emigrating to the U.S., the social interactions within their new environment led to a change in perspective, convictions, and

behaviors that favored a switch into STEM and related fields. Participants also reported on the important role played by family and friends within their social networks in influencing their decisions to opt into STEM fields in the U.S. Such influence fits into the Social Cognitive Theory as most of those who influenced the participants were themselves majoring in STEM areas. Figure 5 shows the four research questions in this study, themes that arose during analysis of data that addressed each question, interconnections between research questions, and how these questions were built on the theories that form the theoretical foundation of the study.

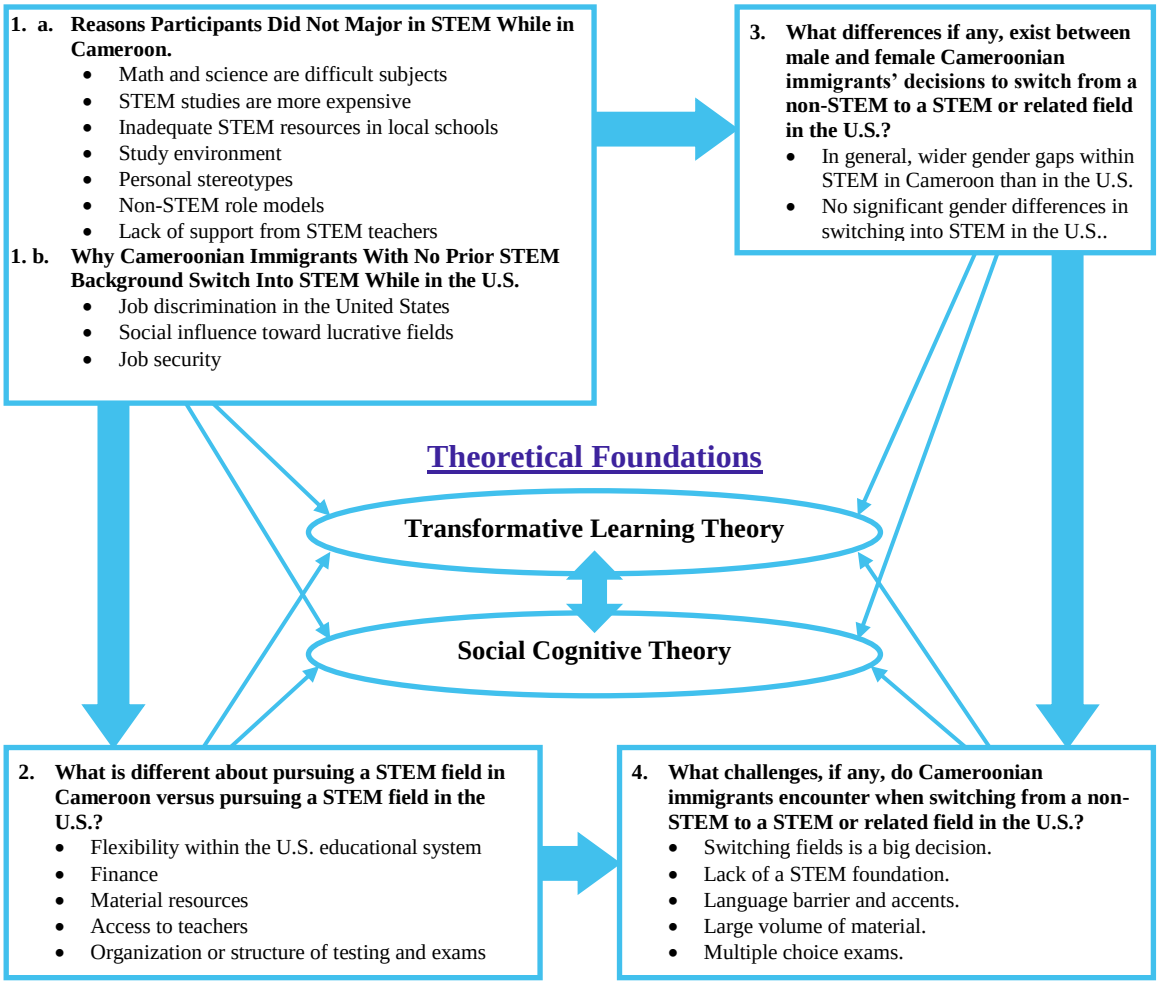

Figure 5. Factors Influencing Each Research Question, Their Interconnectedness, and Their Interactions With the Two Theories That Constitute the Theoretical Framework for This Study.

The top left box in Figure 5 shows the two parts of Research Question #1, contracted. This question investigated why participants did not major in STEM while in Cameroon and why they switched into STEM once they emigrated into the U.S. As shown in this box, participants attributed their inability to major in STEM while in Cameroon to the dislike they had for calculations, in general, or math, in particular; negative influences from parents, peers, or teachers; limited material and other resources disfavoring their study of STEM; personal stereotypes against STEM; the influence of non-STEM role models; and the lack of support from STEM teachers. As to why they chose to switch into STEM and related majors once in the U.S., participants mostly stated that they were influenced by friends, other people, and the job market or the wish to gain immediate employment upon completion of their studies.

The box on the lower left corner of Figure 5 summarizes results on Research Question #2, on what differences, if any, exist with regards to studying in STEM in Cameroon compared to the U.S. Participants noted that differences indeed exist between the two systems. These differences are related to flexibility (or the lack thereof); the presence (or absence) of financial and material resources; accessibility (or inaccessibility) to teachers/professors; as well as the frequency (or infrequency) in administering quizzes/tests and exams.

The upper right box of Figure 5 summarizes the results on Research Question #3 on whether any gender differences existed in the decisions of Cameroonian immigrants in the U.S. to switch from non-STEM to STEM-or-related fields. Participants largely noted that gender disparities relating to attitudes towards STEM are more prominent in

Cameroon than in the U.S. Therefore, significant differences in gender were not reported with regards to choices participants made to switch into STEM while in the U.S.

The lower right box of Figure 5 summarizes the results on Research Question #4 on what challenges participants faced upon switching from a non-STEM to a STEM-or-related field once in the U.S. Participants expressed a range of challenges which could be summarized into: difficulties relating to zeroing in on what to study within STEM (the decision-making process); difficulties relating to lack of a prior STEM foundation; language-related challenges; the large volume of STEM material within the disciplines participants had switched into, and multiple choice exams.

At the center of Figure 5 are the two theories that combined to form the theoretical foundation for this study. As shown in Figure 5, these two theories are interconnected. The Transformative Learning Theory highlights the importance of self-discovery or psychological changes leading to changes in one's belief systems, and hence, behavioral patterns, which result in learning. The Social Cognitive Theory contends that learning occurs through social interactions, which result in reciprocal exchanges that stimulate the learner in many facets as the learner observes other people and gains inspiration, changes his or her behavior, and learns in the process. On the one hand, Transformative Theory mentions psychological changes as triggering the learning process. On the other hand, it fails to provide the avenues through which such changes are initiated.

It is true that human beings are social creatures who live and function within social structures. Therefore, psychological changes most likely occur following the exposure of an individual to some stimuli within a social context. These stimuli may

involve observing a role model who inspires the said individual and changes his or her perspective, or a negative experience such as being discouraged by a teacher or parent, resulting in a dislike of that subject. This provides a foundation for the overlap or interconnectedness between the two theories chosen as the theoretical basis for the present study. Although humans may learn in isolation, most learning occurs through social interactions and the exchanges that occur therewith. It is these exchanges that trigger changes in perspective, convictions, and behavior.

In the present study, it was seen that Cameroonian immigrants in the U.S., who switched into STEM from non-STEM fields, were influenced in part by peers and other members of their communities. Through social interactions, their perspectives towards STEM changed. Negative stereotypes were mitigated. Courage or self-determination was built, leading these individuals to elect to switch into STEM fields they had not hitherto dreamt of studying. Although participants faced a number of challenges upon switching into STEM (and related) fields in the U.S., they proved resilient and persisted in their newly chosen STEM or STEM-related field, and they also had support in the U.S. to keep them going.

Also shown in Figure 5 are arrows connecting the boxes at the four corners of the figure. Such arrows indicate the connections between research questions. As shown, the question of why participants did not do STEM in Cameroon but switched into STEM in the U.S. (Research Question #1) immediately leads to two other questions. First, what is different about STEM in Cameroon from STEM in the U.S. (that is, Research Question #2)? Second, what gender differences exist in the attitudes of the immigrants (that is, Research Question #3)? These next two questions lead to a fourth question, that is, what

challenges did participants face upon switching into STEM in the U.S. (Research Question #4)?

From each box at the corners of Figure 5 are two arrows connecting each box to the two central theories. These arrows show that participants' responses to each of the research questions posed show a connection with the theories forming the theoretical framework for the study. For example, participants' responses to Research Question #1 indicated that their decisions to switch into STEM fields in the U.S. were influenced by job discrimination, family members, peers, and job security. This clearly shows the effect of social interaction on triggering psychological changes, changes in convictions, inspiration, and hence the learning process. Similar analyses will be made for the remaining three research questions to show that participants' responses to those questions correlate with the two central theories.

Comparing responses to Research Question #1 (first part) and Research Question #2, it may be deduced that social interactions can have positive and negative effects. Whereas in Cameroon, the interactions of participants with their parents, peers, and instructors had negative repercussions on the participants with regards to choosing to major in a STEM field, similar social interactions in the U.S. influenced the participants to switch into STEM or related fields. This implies that in discussing the effects of social interactions on learners, it is important to consider what kinds of interactions are productive in what respect. Social exposures can be counterproductive, especially as seen in the participants' discussions of why they did not study STEM in Cameroon.

As to why participants avoided STEM fields while in Cameroon, the reasons given revolved around a dislike for math or calculations; negative influences from

parents, peers, and teachers; personal stereotypes; and limited resources as shown in the upper left box in Figure 5. Some of these responses reflect previous research findings. For example, Ossono and Foretia (2013) observed that the Cameroon educational system did not encourage a STEM-driven curriculum. Arnot and Phipps (2003) attributed the weak nature of STEM education in Cameroon to limited resources for setting up laboratories, other STEM-related equipment, and to stereotypical beliefs prominent among female students. (Karugu et al. (2013) as well as Tucker (2011) found that many students in Cameroon prefer to major in non-STEM subjects because they are relatively cheaper.

In particular, Tucker (2011) noted that STEM subjects tend to be more costly due to extra unavoidable expenses related to laboratory and other experimental work, typical of most STEM subjects. Wiener (2010) highlighted the financial burdens of parents in Cameroon, including parents-teachers' association (PTA) fees often requested at most schools in Cameroon. Mulkeen (2005) also noted the fact that there are often insufficient resources for STEM, and also STEM students writing the national exam (General Certificate of Education or GCE) in rural parts of Cameroon often suffer from inadequate supplies of laboratory resources. Due to these factors, many students in Africa, in general, prefer to migrate from rural areas into the cities or even overseas to pursue education (Dladla & Moon, 2002; Edokat, 2000). These previous studies underscore the fact that limited resources plague the Cameroon educational system, especially STEM subjects. These limitations demotivate students and push some of them to major in non-STEM fields as exemplified through the participants in the present study.

The fact that teachers discouraged some participants from pursuing STEM subjects in Cameroon corroborates previous research. For example, Adedeji & Olaniyan (2011) found that teachers in Cameroon lack motivation to teach STEM subjects due to low pay coupled with an insufficient supply of equipment to facilitate STEM education. A similar conclusion had been arrived at by Banya & Elu (2001). McGlone (2007) observed that some STEM teachers tend to pay more attention to male than female students. Back et al. (2011) contended that teachers' psychology and overall emotional life directly impact their students. Meanwhile, Beilock et al. (2010) found that STEM teachers' anxiety level mediated student performance (especially female students). Mulkeen (2005) noted that poorly trained teachers and inadequate material resources account for poor STEM performance in Africa. These difficulties relating to STEM teachers in Africa, and Cameroon, in particular, often lead to some students being demotivated and opting out of STEM careers.

Stereotypical beliefs and adverse parental influence as highlighted by participants is well documented in the literature as roadblocks to the study of STEM in Africa, in general. Beliefs abound on the African continent which discourage education, especially of female children. Although, this has largely changed in recent years, in most parts of Africa, the same is not true of most rural parts of the continent. Anamuah-Mensah (1997) asserted that highly educated women are likely to be arrogant, sophisticated, immoral, and unmarriageable. It is common in Africa to view men as bread winners who need more education, and women as dependent, needing little education (Johnson-Hanks, 2003). Masanja (2010) observed that female students lag behind their male counterparts in STEM education in Sub-Saharan Africa. In the present study, one of the participants

(Shalom Love) reported that she liked science while in secondary school; but when she failed at a national exam, her father encouraged her to switch into a non-STEM field, and she did so. Such encouragement might have been motivated by a negative stereotype relating to her desire to do STEM, being a female. The effects of parental influence and stereotypes towards STEM education in Cameroon are illustrated in the schematic cartoon diagram shown in Figure 6.

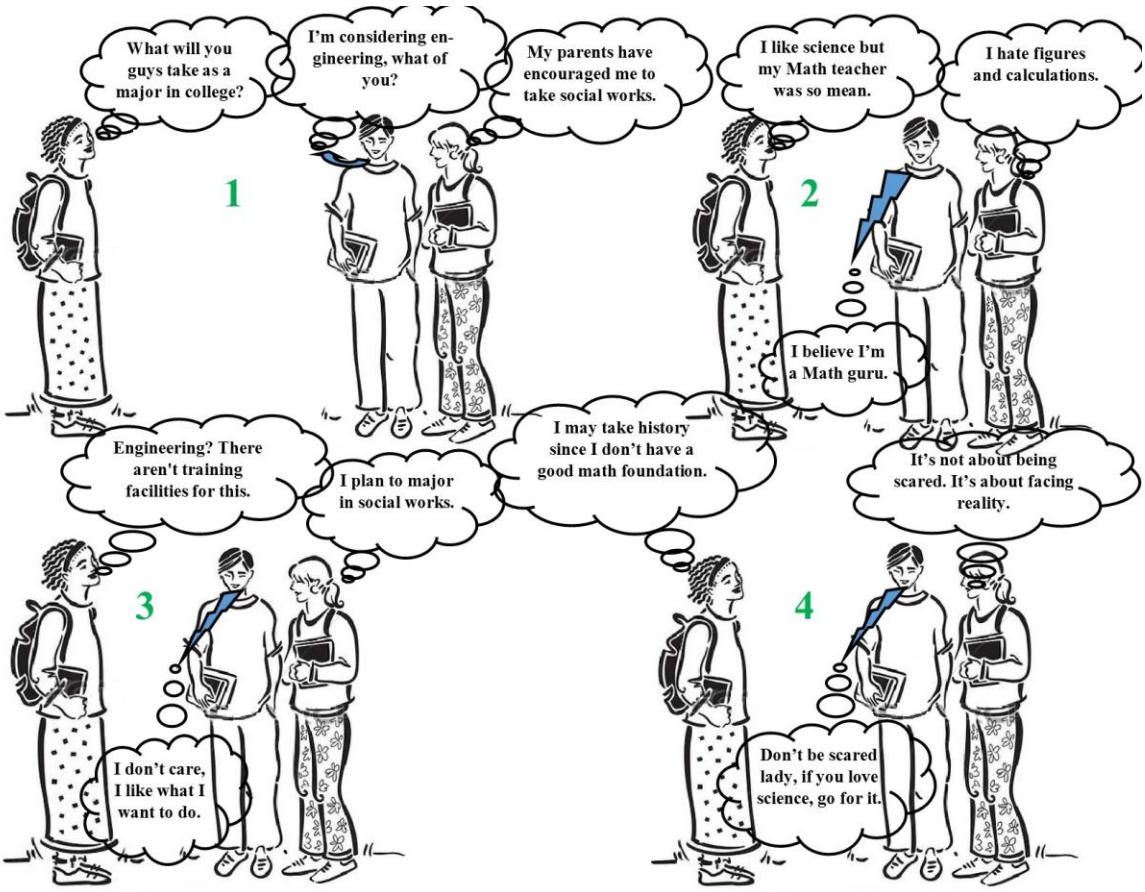

Figure 6**.** Conversation Between High School Students in Cameroon on What They Want to Major In at College.

In Figure 6, a female approaches a male and another female student asking what each of them would want to do in college. The boy states that he wishes to major in

engineering. Next, he shows indirectly that his love for engineering is connected to the fact that he considers himself a "math guru." This boy did not state emphatically that "I am a math guru." Rather, he said, "I believe I'm a math guru." These two statements are very different. The second statement points to intrinsic motivation as revealed in the Social Cognitive Theory. His belief in his ability to excel in math leads him to want to major in engineering in college. Although the student who initiates the conversion attempts to discourage him by stating that training facilities for engineering students are limited, he remains adamant and encourages the said student to pursue science if that has been her initial passion in high school. The female student who initiates the conversion wants to major in history due to a poor math foundation, which could be blamed on her previous math professor who is reported to have been too mean. Here, the negative impact of STEM teachers' attitudes towards some students is illustrated.

The other female student involved in the conversation thinks she will major in social works following advice from her parents, coupled with her dislike for math. This character illustrates the effects of stereotypical tendencies and parental influence on students' choices on what to take as a major. This fictitious scenario illustrates real life situations in Cameroon when it comes to STEM education. Participants in the present study mentioned different factors as illustrated in Figure 6 as their reasons for staying away from STEM while in Cameroon.

On what differences exist between STEM in Cameroon and the U.S., the responses given could be summarized as: greater flexibility in the U.S. school system, availability of financial and other resources, ease of access to and support from teachers, and flexibility in relation to testing and exams. These factors were noted as either present

in Cameroon in small amounts or absent. For example, participants largely stated that the educational system in the U.S. offers far more flexibility than does the Cameroon system. This flexibility implies that students can choose nearly any field of study once they get to college, irrespective of what their inclinations were while in high school. Contrarily, in Cameroon, switching majors is nearly impossible. If a student majors in a non-STEM field in high school in Cameroon, this student cannot switch into a STEM field in college. For example, a participant (Job John) reported that whereas he had grown up in Cameroon desiring to become a medical doctor, his dreams had been chattered at the Ordinary Level (equivalent to 10^{th} grade in the U.S.) when he performed poorly in STEM, but not in non-STEM subjects. In the U.S., most medical schools accept applicants from nearly any background of study. In Cameroon, only students who have majored in STEM can apply to attend a medical college. This points to the flexibility present in the U.S. school system, which is absent in Cameroon.

A key aspect favoring STEM education in the U.S. over Cameroon is the ease of access students have to financial and material resources. Although education in the U.S., in general, is a lot more expensive than in Cameroon, opportunities abound in the U.S. for financing one's education. The U.S. offers a portfolio of scholarships, grants, and student loans for financing education, a rarity in Cameroon. Relating to these financial opportunities in the U.S., it was noted in the previous chapter that Miss A. had reported on how she has financed her education through a Pell Grant offered for undergraduate education.

Besides grants, fellowships, and student loans, jobs are also readily available to students (both on and off campus). In Cameroon, it is very uncommon for students to be

employed. Though some students in Cameroon do get temporary employment during a three months' vacation within the academic year, it is rare to find students employed and working during months when schools are in full operation. Therefore, most students in Cameroon tend to depend largely on their parents (most of whom are poor) or other relatives for financial support towards their education. The U.S. system also has many resources favoring STEM education. Whereas at a typical university or college campus in the U.S., there are tens of desktop computers, only a handful (or even one) would be found on Cameroon's high school and university campuses. Most of those computers are either too old to use or refurbished.

Another thing readily available here in the U.S., which is less common in Cameroon, is the availability of the internet or Wi-Fi. The internet is an excellent tool for facilitating education. For example, without it, students in the U.S. would be unable to access their schools' websites and sites like campus connection and blackboard. The internet helps in research and many other things. Internet in Cameroon is too expensive and limited. Most students in Cameroon are ignorant of the basics of internet browsing and computer use, in general. These limitations have constituted some of the challenges faced by participants in the present study.

In this study, attitudes of STEM teachers towards students was compared for teachers in Cameroon and in the U.S. It was noted by most participants that teachers in Cameroon discourage students in different ways and are generally inaccessible to students, appearing during lectures (or exams) and disappearing thereafter. On the contrary, U.S. teachers are accessible to students, get evaluated periodically by students (a rarity in Cameroon), have specific office hours devoted to attending to students' needs

at a personal level (another rarity in Cameroon), and generally, are inclined to be willing to assist students with challenges they face relating to courses the teachers teach.

In Cameroon, teachers make their students feel they are weak and unable to cope in the subjects the teachers teach. Also, teachers turn away students needing their assistance reasoning that they (the teachers) are either too busy to help or that their responsibility ends in the classroom. On the other hand, participants reported having enjoyed excellent relationships with their STEM professors in the U.S. and having received much help and encouragement from some of them. Such encouragement was noted to have contributed to enabling participants to persist in their pursuit of their newly found STEM majors or STEM-related majors.

Participants mentioned the manner quizzes, tests, and exams are administered in the U.S. as one area they felt the U.S. system has an edge over the system in Cameroon. In the U.S., professors administer quizzes or tests often after each unit is completely taught. They also frequently give course-related assignments to be completed individually or in small groups in class or at home. Assignments are common with most teachers in Cameroon, but tests and quizzes are less common. Most teachers in Cameroon generally tend to teach many units of knowledge within their courses before administering a test. Most teachers administer, at most, two tests during a trimester and one final exam during the last trimester. End of year averages of students' performances are used to determine whether they get promoted to the next educational level or not. The "No Child Left Behind" (McGuinn, 2006) policy in the U.S. school system is foreign to the school system in Cameroon. In Cameroon, only students with certain minimum overall averages at the end of an academic year get promoted to higher levels. Students

who perform below minimum averages are asked to repeat their classes irrespective of their ages (some students actually repeat multiple times).

Figure 7 illustrates peer influence on participants in determining their decision to switch into STEM once in the U.S. As shown in the cartoons in Figure 7, Cameroonian (and other poor) immigrants generally leave their countries with much excitement for greener pastures as they travel to the U.S (Arthur, 2009). However, as they get to the U.S. port of entry, they are often hit by cultural shock waves. In Figure 7, the immigrant lady shown exclaims that everything appears different in the U.S. Yes, indeed, there are many cultural variations between Cameroon and the U.S. As she embraces these challenges and settles in her new environment, she contemplates what to study. Her passion is to continue majoring in law as she had done in Cameroon. But first, she decides to seek counsel from some friends.

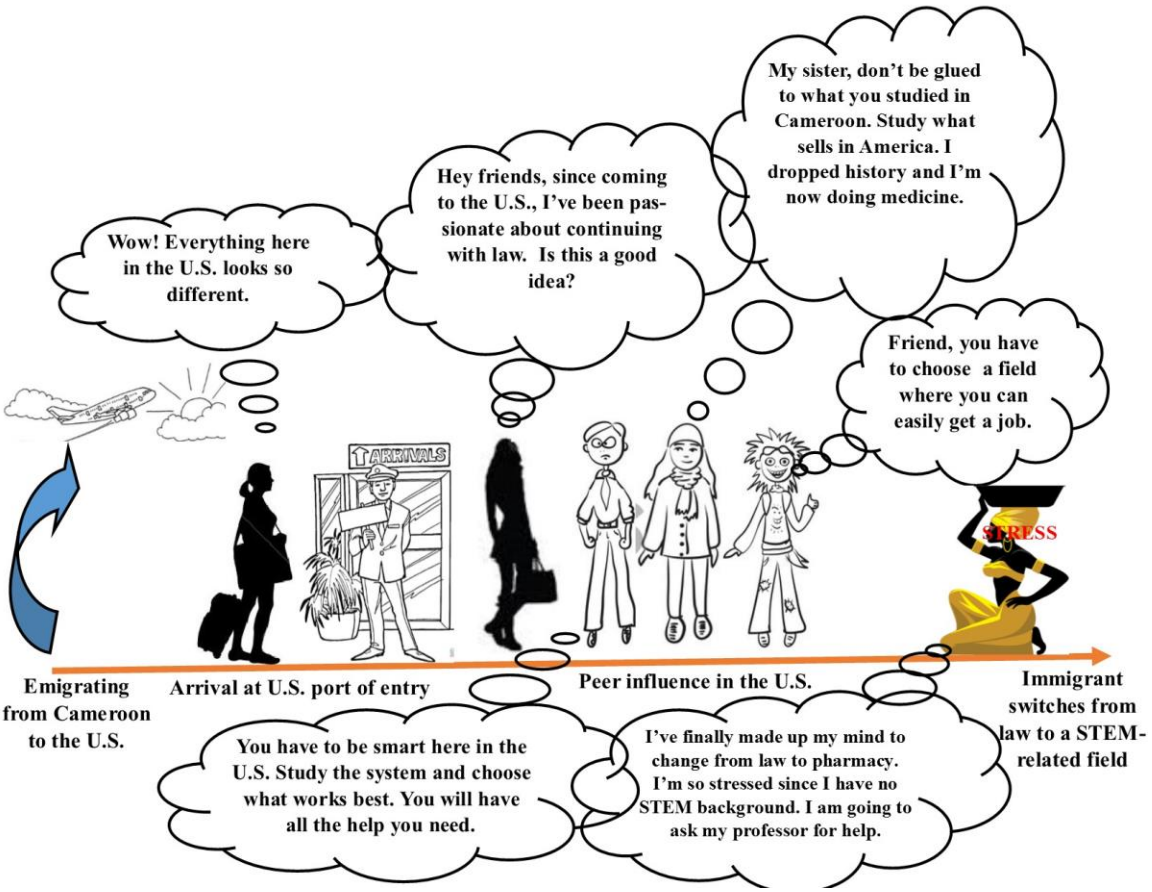

Figure 7. Changes That Often Occur in a Cameroonian Immigrant Arriving in the U.S. and want to Study.

During her conversations with those friends, she is told not to stay glued to her previous major; instead, she is advised to be smart in America (which means, she should seek what pays, not just what she is used to, and to seek a major field of study that can easily fetch her a good job. One of her "peer counselors" mentions that she (the peer) switched from history (her major in Cameroon) to medical school in the U.S. The social interactions in Figure 7 illustrate the results of interviews with participants in this study.

Most participants reported that they were advised by their family and friends to choose majors here in the U.S. where they could easily find employment and also have

job security. Those social interactions are also in the congruence with the Social Cognitive Theory (Bandura, 2001). As participants interacted with friends in the U.S., they observed those friends (some of whom had switched from a non-STEM major to a STEM-or-related field). Participants were inspired in different ways, learned from friends, and moved on to change their behavior pattern. Additionally, such interaction changed participants psychologically and led them to review and change their convictions and build inner motivation to switch into a STEM or related field in support of the Transformative Theory (Clark & Wilson, 1991).

Responses to Research Question #3 suggested, in general, a wider gender gap within STEM education in Cameroon than in the U.S. As illustrated in Figure 6, stereotypes towards STEM (Ogunjuyigbe et al., 2006) and negative influences from parents (Rodgers, 2012) and teachers (Banya & Elu, 2001) are among the factors accounting for the low presence of women in STEM in Cameroon. On the other hand, the present study did not find significant difference in the attitudes of male and female Cameroonian immigrants in the U.S. In relation to switching from a non-STEM to a STEM-or-related field, it should be recalled that the present study involved a total number of eight participants, five females and three males. All participants expressed somewhat similar reasons for switching into STEM and similar challenges faced upon switching. Both genders expressed similar passion to persist within their newly found STEM or related field in the U.S. No participant indicated that they wished to opt out of STEM in the future.

The responses of participants indicated that social interactions in the U.S. resulted in similar reciprocal exchanges (such as intrinsic motivation self-determination, self-

efficacy, grade and career motivation), and consequently, similar behavioral changes among male and female participants in support of the social Cognitive Theory (Bandura, 2001). Moreover, it may be deduced that participants, irrespective of gender, were transformed upon exposure and interaction with U.S. society. Their perspective and conviction changed as suggested by the Transformative Theory of Learning (Clark & Wilson, 1991). Some participants marveled that they found themselves doing STEM and succeeding very well in the U.S., something they would never have dreamed of doing in Cameroon.

Responses to Research Question #4 showed that the major areas of difficulty faced by participants related to: the decision to switch majors, the lack of prior STEM knowledge, language barriers, and the large volume of STEM material required to study STEM in the U.S. While language barrier is not specific to STEM as was the focus of this study, its relevance in the responses of participants was related to the fact that participants found difficulties with vocabulary or terminology related to the particular STEM subjects they had to undertake. The point of making major decisions is usually a confused junction, and can be quite challenging for most individuals. Such complications could be further compounded by fear based on the lack of a STEM foundation. Fears of uncertainly as to how success would be guaranteed was obviously something virtually all participants faced as they narrowed down to a decision to switch their major into STEM or related fields.

The lack of a STEM foundation meant that participants were lost most of the times during early lectures. Since the teachers learning process is similar to building a house, teachers tend to assume foundational knowledge at least a college level and build

upon such presupposed knowledge. When such knowledge is absent, as was the case of participants in this study, the result is that the students get confused. Learning often occurs partly by association meaning that people generally learn by relating new knowledge to what they already know. When correlations cannot be found between knowledge and what the learner already knows, the new knowledge is seen as abstract and difficult to grasp.

Participants in this study also indicated that they enjoyed enormous support from their professors and peers as they went through their challenges. Such support led participants to achieving success and making good progress in their studies even though they had little foundational knowledge of their chosen topics of study. Some participants indicated that they performed poorly immediately after converting into STEM or related fields; but at the time interviews for this study were conducted, all participants were excelling in their academic work. Such success again points to the important exchanges that occur within social structures, exchanges that mediate the learning process as suggested by the Social Cognitive Theory (Bandura, 2001). The more exposure participants had with STEM fields in the U.S., the more their psychological thinking was transformed as well as their inner convictions about STEM or related fields. These changes are related to the Transformative Theory.

Lastly, the large volume of STEM material was a concern expressed by participants. Whereas the previous non-STEM courses they had taken in Cameroon involved relatively small-sized textbooks, most STEM courses they took in the U.S. at the time of their interviews had thick textbooks with many pages. Moreover, some participants indicated that while in Cameroon, they seldom read textbooks, but rather,

relied predominantly on lecture notes of their professors. Contrarily, participants' stated that, in the U.S. professors would tend to travel through the textbooks together with their students and frequently would give assignments from those textbooks. Therefore, participants were forced to read their textbooks closely.

Conclusion

This study investigated the reasons why selected Cameroonian immigrants in the U.S. who majored in non-STEM subjects in their home country decided to switch into STEM or related fields once they emigrated to the U.S. Furthermore, the study sought to understand differences that exist in studying STEM in Cameroon versus the U.S. Moreover, this study investigated whether gender differences exist in relation to the decision of participants to switch from non-STEM to STEM-or-related majors in the U.S. and the challenges participants faced both in the process of switching and since beginning to take STEM courses. The study was designed based on two theories that formed the theoretical framework. Those theories are the Transformative Learning Theory, which is based on the idea that self-discovery alters a learner's personal beliefs, and hence, behavior; and the Social Cognitive Theory, which asserts that learning occurs through reciprocal exchanges within a social network of interactions, and that learners learn by observing others, forming convictions, and changing behavioral patterns.

It was shown through the responses of the participants that the theoretical design for this study was much supported by the findings. That is, the selected theories were most suited for explaining the behavioral patterns of the participants. The importance of social interactions was revealed in this study. It was noted that social interactions can produce both positive and negative ripple effects. While social interactions in Cameroon

contributed to discouraging participants from pursuing STEM subjects, social interactions in the U.S. produced an opposite effect. Participants observed that differences exist in STEM education in Cameroon and the U.S. in the following areas:

1. *flexibility* – the Cameroon system is rigid such that a biology major, for example, cannot easily switch into engineering, whereas here in the U.S., a student with any background can study in virtually any other area of their choice by basically completing required prerequisite course work;

2. *finances*– STEM education in Cameroon is more expensive than its non-STEM counterpart and most poor students cannot afford the income whereas U.S. society provides more job opportunities, student loans, and scholarships, which combined, enable students to pursue nearly any field of their choice;

3. *material resources* – STEM education in Cameroon (especially in rural areas) suffers significantly from lack of needed resources compared to the U.S. where equipment and other resources like furnished libraries and internet are readily available;

4. *teachers* – U.S. teaching is more student-centered and teachers provide maximal support to students by offering office hours, which is far less common in the Cameroon system;

5. *testing and examinations* – the U.S. system involves more frequent tests/quizzes and exams in the course of a semester compared to its Cameroon counterpart.

While no significant gender differences were reported on the choice to switch into STEM (and related) majors, participants, irrespective of gender, faced challenges upon switching into STEM. These challenges involved: *choice* where participants reported

facing difficulties with deciding on what to study; *foundation* where participants reported that the lack of a prior STEM foundation left them wanting in several of the STEM subjects they initially enrolled in; *language* where participants reported difficulties in communicating their thoughts to peers and professors due to English language lapses; and *course load* where participants reported facing much more work load within the STEM subjects they had taken (or were taking at the time of the interview) in comparison to non-STEM subjects they had previously done. Despite these challenges, participants demonstrated resilience; a determination to continue in their newly found majors. Moreover, some participants reported having received substantial assistance from their teachers and friends which enabled them succeed in STEM.

The decision to switch into a STEM career from a non-STEM field is a much welcomed action within U.S. society, where STEM education is upheld as a key cornerstone of the country's technological advancement. School officials and organizations directly involved in encouraging STEM education in the U.S. may benefit from this study. This study unveils some factors attracting students to enroll in STEM courses among Cameroonian immigrants which could also be the same factors encouraging immigrants from other countries. It should be noted that more African immigrants in the U.S. major in STEM and related fields when compared to other fields at college and university levels (Ruggles et al., 2015). The present findings likewise have implications on STEM education in Cameroon, and by extension, other parts of Africa. Results of the present study may be helpful in reshaping STEM education in Cameroon to mitigate attrition of STEM enrolled students, combat STEM-related stereotypes, and attract more STEM enrollment.

Assertions

Based on the results presented herein, the following assertions or deductions are in order:

First, social interactions and environmental factors shape human behavior. The choices we make are a product of our innate qualities or potentials and our interactions with the environment. In this study, negative environmental factors in Cameroon discouraged participants from the STEM fields while positive factors in the U.S. encouraged the same students into the STEM and related fields.

Second, potentials in humans can lie latent until favorable conditions become available. Humans may have certain qualities or inbuilt potentials, but they need favorable conditions to stimulate these abilities. This study found that while in Cameroon, participants did not study in the STEM fields because the conditions were not favorable. This did not necessarily imply that they were unfit for STEM subjects. While in the U.S., favorable conditions led to their switching into STEM or related subject areas. It may be said that these favorable conditions served as stimulants, activating their potentials (which had been dormant prior to their coming to the U.S.) for STEM subjects. Their reported success in their newly found STEM or related majors is a testament to these inner potentials.

Third, people's ultimate motives in all they do is to survive and live a better and fulfilling life. The fields of study that Cameroonian immigrants chose to pursue when they were in Cameroon were motivated by the fact that they just wanted to survive, and so they studied in fields in which they could easily succeed. While in the U.S., these students were motivated by the desire for a better future. They wanted fields where

secured well-paid jobs were guaranteed. This was more likely for STEM or related subjects than for other fields where they had majored prior to coming to the U.S. Therefore, they switched into more promising STEM or related fields.

Recommendations for Practice

Based on the above conclusions, with regards to STEM education in the U.S., the author recommends as follows:

1. Considering that STEM enrollment in the U.S. has historically been known to lag behind the demand for STEM skills in the job market, the U.S. should probably target and motivate, especially, new Cameroonian and other African immigrants to consider STEM majors. To accomplish this, a program, similar to the Right Track Program of the North Dakota State Government (wherein, Right Track Consultants visit parents who recently had babies to provide free developmental screenings and other services), could be established specifically for encouraging new immigrants towards considering STEM majors. Information about new immigrants could be obtained from government agencies such as the Social Security Administration. With this, consultants could visit immigrants and educate them on the wide range of opportunities in the U.S. for STEM graduates. This can have much positive impact given that most new immigrants in the U.S. are very likely to be ignorant of the society and somewhat confused on choice of career path.
2. Considering that participants in this study said teachers were very approachable and always ready to assist students, it is recommended that

students who need help in understanding a concept should take the initiative to ask their instructors for help. However, the instructors should be aware that students expressed difficulties to approach their instructors at the initial stage.

3. Given that participants in this study expressed difficulties with communication, especially when they first began taking courses, it is recommended that professors in the U.S. intentionally speak at a slower pace when they notice foreign students taking their class. Most teachers have a habit of asking students to introduce themselves at the beginning of the semester when they go to their first lecture. This can be a good way of identifying new foreign students in general.
4. Given that some of the Cameroonian immigrants majoring in STEM and related fields in the U.S. have had no prior education in STEM topics, it is recommended that teachers deliberately seek to identify any such students in their classes to better assist them.
5. Considering that some participants in this study struggled with the volume of work in their STEM courses, it is recommended that professors be aware of this situation and intentionally use motivating words when giving reading and other assignments in their lectures. STEM teachers could probably assist students taking their classes by providing them with good reading/study strategies or what portions of the usually voluminous textbooks to focus on.

Based on the difficulties with STEM education in Cameroon as expressed by the participants, some of which prevented them from choosing STEM majors, the author recommendations with regards to STEM education in Cameroon as follows:

1. Considering that some participants were adversely impacted by parents and teachers with respect to choosing a STEM major in Cameroon, it is recommended that teachers and parents be sensitized on the important role of STEM in a modern world and shown the portfolio of opportunities for STEM graduates. Such sensitized parents and teachers should in turn motivate their children or students towards STEM majors and help combat stereotypic beliefs in their children and society.
2. Considering that limited finances and material resources pushed some participants into non-STEM majors in Cameroon, it is recommended that the government of Cameroon doubles her efforts in funding or directly supporting STEM education in a manner comparable to what the U.S. federal government does. Moreover, scholarships could be put in place to support STEM students with excellent academic performance. There are many more such opportunities currently in the U.S. that could be copied and implemented in Cameroon.
3. Considering that participants expressed that STEM education in Cameroon is slightly more expensive that other fields of study, it is recommended that the government works to make the cost of education comparable for most fields except in special STEM-related professional programs such as medicine.

4. Considering that participants observed that the U.S. school system offers more flexibility than its Cameroon counterpart, it is recommended that the Cameroon educational sector works on adopting or creating programs such as *prerequisites* which would allow students from any field to easily switch into another field of their choice simply by undertaking the required prerequisites.
5. To combat stereotypes towards STEM in Cameroon, it is recommended that female role models in particular be exposed and promoted in the sense of mentioning them in text books, during class lectures, or having their photos displayed on billboards on high ways or public places. Such actions are likely to positively impact the average Cameroonian girl's psychology with regards to STEM education.
6. It is also recommended that schools in Cameroon work on providing extra support (perhaps through tutoring) to students wishing to study STEM but who are slow learners or need an extra push.
7. It is recommended that organizations be encouraged on school campuses in Cameroon which involve students and/or teachers with the goal of promoting STEM education. An example of this is the Women in STEM group at the University of North Dakota.
8. It is recommended that the government and school bodies in Cameroon work on creating a support system for teen pregnancies to help female students with unwanted pregnancies to continue education.

It should be noted that findings, conclusions, and recommendations from this research are specific to the context of this study with respect to experiences of Cameroonian immigrants who did not study STEM subjects in Cameroon, but were studying STEM or related fields here in the U.S. at the time of this research, which was the focus of this study. The purpose of the study was not to generalize the outcome to the experiences of all Cameroonian immigrants in the U.S. studying in STEM or related fields. The results of the study is valuable and can be transferred to other comparable conditions, but special surroundings of each situation needs to be considered. Likewise, the procedure of this study can inform other studies in similar situations, but the special conditions of those situations would need to be taken into account. These considerations are vital since situations differ from immigrant to immigrant; and ideas, perceptions, and understanding of experiences also differ.

Future Research

Future research should look at the attitude of STEM and non-STEM teachers toward students in Cameroon. Also, research should be carried out to determine if Cameroonian immigrants from different regions (France and English), also switch fields alike while in the U.S. A comparative study should be conducted among Cameroonian STEM immigrants who continued with STEM fields here in the U.S. looking at the differences in the two educational systems. Future studies should also consider more regions in the U.S. to ensure that the results would not be region-specific and void of diversity from a variety of regions. A mixed-method study could also be considered, which would present an opportunity to explore both quantitative and qualitative data,

allowing for a more in-depth discovery of patterns which was beyond the scope of this study.

Future Steps With This Research

This study is important to me because I have a dream of finding ways to encourage STEM education in Cameroon. How to contextualize this is something I have to still face. It would require a lot of planning, advocacy, and mobilization. I would like to work with the Ministry of Education, universities, and colleges in Cameroon and present to them the findings of this study. I also plan to print two extra copies of my dissertation and keep it in the libraries of the two main teacher training colleges in Cameroon. Again, I would like to get this study published and extend the study and its findings about non-STEM Cameroonian immigrants switching to STEM fields to a wider audience.

APPENDICES

APPENDIX A
Approved Institutional Review Board Consent Form

UNIVERSITY OF NORTH DAKOTA

UND.edu

DIVISION OF RESEARCH & ECONOMIC DEVELOPMENT

Institutional Review Board
Twamley Hall, Room 106
264 Centennial Dr Stop 7134
Grand Forks, ND 58202-7134
Phone: 701.777.4279
Fax: 701.777.6708

September 27, 2016

Principal Investigator:	Delphine N. Banjong
Project Title:	Cameroonian Immigrants in STEM and Related Fields in the United States
IRB Project Number:	IRB-201609-071
Project Review Level:	Expedited 6, 7
Date of IRB Approval:	09/23/2016
Expiration Date of This Approval:	09/22/2017
Consent Form Approval Date:	09/23/2016

The application form and all included documentation for the above-referenced project have been reviewed and approved via the procedures of the University of North Dakota Institutional Review Board.

Attached is your original consent form that has been stamped with the UND IRB approval and expiration dates. Please maintain this original on file. ***You must use this original, stamped consent form to make copies for participant enrollment. No other consent form should be used.*** It must be signed by each participant prior to initiation of any research procedures. In addition, each participant must be given a copy of the consent form.

Prior to implementation, submit any changes to or departures from the protocol or consent form to the IRB for approval. No changes to approved research may take place without prior IRB approval.

You have approval for this project through the above-listed expiration date. When this research is completed, please submit a termination form to the IRB. If the research will last longer than one year, an annual review and progress report must be submitted to the IRB prior to the submission deadline to ensure adequate time for IRB review.

The forms to assist you in filing your project termination, annual review and progress report, adverse event/unanticipated problem, protocol change, etc. may be accessed on the IRB website: http://und.edu/research/resources/human-subjects/

Sincerely,

Michelle L. Bowles, M.P.A., CIP
IRB Coordinator

MLB/sb
Enclosures

Cc: Anne Walker, Ph.D.

THE UNIVERSITY OF NORTH DAKOTA
CONSENT TO PARTICIPATE IN RESEARCH

TITLE: Cameroonian Immigrants in STEM-Related Fields in the United States
PROJECT DIRECTOR: Delphine N. Banjong
PHONE # 701-885-9236
DEPARTMENT: Teaching and Learning
STATEMENT OF RESEARCH

A person who is to participate in the research must give his or her informed consent to such participation. This consent must be based on an understanding of the nature and risks of the research. This document provides information that is important for this understanding. Research projects include only subjects who choose to take part. Please take your time in making your decision as to whether to participate. If you have questions at any time, please ask.

WHAT IS THE PURPOSE OF THIS STUDY?

You are invited to be in a research study about Cameroonian immigrants in the Science Technology Engineering and Mathematics (STEM) and related fields because you are a STEM or related field immigrant who is from Cameroon.

The purpose of this research study is to understand why Cameroonian immigrants who did not major in a STEM field at the time of entering the U.S. switched into STEM or related fields while in the U.S.

HOW MANY PEOPLE WILL PARTICIPATE?

Approximately eight to ten people will take part in this study at the University of North Dakota, and those who have graduated within the past five years and who live in the Midwestern region in the U.S.

HOW LONG WILL I BE IN THIS STUDY?

Your participation in this study will be a onetime interview, which will last for about 45-60 minutes. You will select your convenient location for the interview.

WHAT WILL HAPPEN DURING THIS STUDY?

Prior to beginning the interview, I will explain this consent form to you and we will both sign two copies which I will keep one and you will also keep one. After signing the consent form, the interview will begin. The interview will last no longer than 45 to 60 minutes. At the time of the

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Expiration Date: SEP 22 2017
University of North Dakota IRB

Date: _____
Subject Initials: _____

interview, you may choose not to answer any questions to which you are not comfortable, and you can discontinue at any time without consequences.

WHAT ARE THE RISKS OF THE STUDY?

There will be no more than minimal risks to your participantion in the study. There might be a small risk of you becoming emotionally upset in answering questions involving the reasons why you did not study STEM in Cameroon, which you are now studing in the to U.S. Should you become upset at any point in the study, you may stop at any time or choose not to answer any questions. If you would like to talk to someone about your feelings concerning the study, you may contact UND's Counseling Center at 777-2127 or the Immigration Services at 701-235-7341 if you are not a UND student.

WHAT ARE THE BENEFITS OF THIS STUDY?

You may not benefit personally from being in this study. However, we hope that, in the future, other people might benefit from this study because findings from this study will provide useful information to various organizations in the U.S. currently involved in efforts to find new ways of attracting more students into STEM and related fields. Additionally, this study will be useful to Cameroon's educational sector in providing important factors that attract Cameroonians into STEM in the U.S. The findings will be resourceful in helping reshape STEM in Cameroon to attract more enrollment. At large, this study can be adopted for further research on other African countries and go a long way to improve STEM education on the African continent.

ALTERNATIVES TO PARTICIPATING IN THIS STUDY

There are two alternative to participating in this study including: Declining or accepting to participate.

WILL IT COST ME ANYTHING TO BE IN THIS STUDY?

You will not have any costs for being in this research study.

WILL I BE PAID FOR PARTICIPATING?

You will not be paid for being in this research study.

WHO IS FUNDING THE STUDY?

The University of North Dakota and the research team are receiving no payments from other agencies, organizations, or companies to conduct this research study.

Approval Date: SEP 23 2016
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University of North Dakota IRB

Date: _____
Subject Initials: _____

CONFIDENTIALITY

The records of this study will be kept private to the extent permitted by law. In any report about this study that might be published, you will not be identified. Your study record may be reviewed by the people who audit IRB procedures at the university of North Dakota.

Any information that is obtained in this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of avoiding use of personal description in the transcription. Transcription of interview will be sent to participants for member checking of facts. The actual names of the participants will be known only to the principal investigator. Participants will select pseudonyms for themselves to further ensure confidentiality. All records, including consent forms, tape recordings, and transcriptions, will be kept in separate locked drawers in the principal investigator's office. They will not be used for any other purpose than this study and will be destroyed after three years.

If we write a report or article about this study, we will describe the study results in a summarized manner so that you cannot be identified.

IS THIS STUDY VOLUNTARY?

Your participation is voluntary. You may choose not to participate or you may discontinue your participation at any time without penalty or loss of benefits to which you are otherwise entitled. Your decision whether or not to participate will not affect your current or future relations with the University of North Dakota or you're your involvement in the community.

If you decide to leave the study early, we ask that you inform the researcher through either a call or email.

CONTACTS AND QUESTIONS?

The researchers conducting this study Delphine N. Banjong. You may ask any questions you have now. If you later have questions, concerns, or complaints about the research please contact Delphine N. Banjong at 701-885-9236. You may also contact my advisor, Dr. Anne Walker at 701-777-2862.
If you have questions regarding your rights as a research subject, you may contact The University of North Dakota Institutional Review Board at **(701) 777-4279** or **UND.irb@research.UND.edu.**

- You may also call this number about any problems, complaints, or concerns you have about this research study.

Approval Date: SEP 23 2016
Expiration Date: SEP 22 2017
University of North Dakota IRB

Date: _____
Subject Initials: _____

- You may also call this number if you cannot reach research staff, or you wish to talk with someone who is independent of the research team.
- General information about being a research subject can be found by clicking "Information for Research Participants" on the web site: http://und.edu/research/resources/human-subjects/research-participants.cfm

I give consent to be audiotaped during this study.

Please initial: ____ **Yes** ____ **No**

I give consent for my quotes to be used in the research; however I will not be identified.

Please initial: ____ **Yes** ____ **No**

Your signature indicates that this research study has been explained to you, that your questions have been answered, and that you agree to take part in this study. You will receive a copy of this form.

Subjects Name: _____

_____ _____
Signature of Subject Date

I have discussed the above points with the subject or, where appropriate, with the subject's legally authorized representative.

_____ _____
Signature of Person Who Obtained Consent Date

Approval Date: SEP 23 2016
Expiration Date: SEP 22 2017
University of North Dakota IRB

Date: _____
Subject Initials: _____

APPENDIX B
Interview Questions

Project: Cameroonian Immigrants in STEM and Related Fields in the United States.
Time of interview: _____
Date: _____
Place of interview: _____
Interviewee: _____
Interviewee Gender: Female ☐ Male ☐ Other ☐ _____
Field of study in Cameroon: STEM ☐ Non STEM ☐
I was born in the English ☐ French ☐ part of Cameroon
Interviewee Age: _____
Interviewee pseudonym: _____
Interviewee's number of years in the U.S:_____
Field of study in the U.S.: _____
Email address: _____
Phone Number: _____

1. What motivated your migration from Cameroon to the U.S.?
2. Tell me about your education in Cameroon?
3. When you were a young child, what did you want to be when you grew up?
4. What did you study while in Cameroon at the O Level or BAC level? Why did you choose this field?
5. Did you ever consider studying in the STEM field in Cameroon? If yes, why didn't you pursue a STEM field? If not, why didn't you consider STEM?
6. If you could be anything in the world or have any job, what would it be?
7. What are your reasons for choosing to switch to a STEM major while in the U.S.?
8. Did you experience difficulties in the course of switching to a STEM major? If yes, what were these difficulties and what did you do about them?

9. Were there any financial considerations in your switch to a STEM field? (i.e. loss of salary while going back to school, paying for college)
10. What role did language play, if any, in your career decisions in Cameroon and here in the United States?
11. What do your friends or family, in Cameroon and in the United States, think of your switch in fields?
12. Did you receive any assistance or support in making a decision to switch to a STEM field? If yes, explain.
13. What job do you see yourself doing in five years?
14. What advice would you give to a new Cameroon immigrant in the United States about choosing a field of study? Would you recommend STEM? Why or why not?
15. What, if anything, would you do differently in choosing a field of study, if you could do it all over again?
16. What do you think Cameroon should do to attract more people into STEM fields?

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