UNDERSTANDING AFRICAN IMMIGRANT FAMILIES' SUPPORT FOR THEIR
CHILDREN'S MATHEMATICS LEARNING IN CANADA

by

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Abstract

This research investigates African immigrant families' experiences and perspectives of their children’s (10-15-year-old) mathematics learning in the home, community and school settings within the Greater Vancouver area. The study employs the concept of cultural capital framework and Afrocentric worldviews to understand how African immigrant parents support their children’s mathematics learning at the upper elementary and middle grade levels (Grades 4 - 8) in Canada. Specifically, the study addressed the following questions: i) which socio-cultural strategies and understandings do African immigrant families living in a large metropolis draw upon to support their children’s mathematics learning? ii) what are African immigrant families’ experiences and perspectives with respect to their (10–15-year-olds) children’s mathematics learning in the home, community and school settings, within the Greater Vancouver Area? The study’s findings indicate that, African immigrant parents 1) were aware of the gatekeeping function of mathematics and its role in reproducing or disrupting race or class hierarchies and 2) perceived their support for their children’s mathematics fluency as a sure way for securing a status for counterbalancing their social exclusion and positioning themselves as people of education and intellect. The study’s findings also indicate that immigrant families leveraged various forms of capital in support of their children’s mathematics learning: Cultural, linguistic, aspirational, technological/digital and navigational capital. These forms of capital extend the narrowly conceived definitions of capital as accumulated wealth, resources, and experiences of white middle-class families. The results of the study are significant in that they provide much-needed insights into ways to build culturally responsive mathematics education informed by African immigrant students’ and families’ funds of knowledge.
Lay Summary

This research explored African immigrant families’ experiences and perspectives of their children’s mathematics learning in the home, community and school settings within Greater Vancouver. African immigrant parents and their children were interviewed individually and their daily activities in their homes in relation to their children’s mathematics learning were observed. The findings suggest African immigrant parents saw, and valued, their support for their children’s mathematics learning as a way of challenging persistent racial stereotypes that seem to position African/Black students as academically inept in racialised contexts. The study’s findings also indicate that African immigrant parents’ language, culture, aspiration to succeed, their ability to navigate a new system or culture, and technology were resources which offered them strategies to support their children’s mathematics learning in Canada. This research furthers the conversations on how educators could be responsive to African immigrant students and families’ home experiences and cultures in teaching mathematics.
Preface

The study reported in this dissertation was designed, conducted, and analyzed by the author with guidance from the supervisory committee. No part of this research has been published.

This research study has been approved by the University of British Columbia Behavioural Ethics Board (Certificate Number: H17-02767).
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Dedication

I dedicate this dissertation to my wife (Millicent) and children (Mordecai and Gabriella).
Chapter 1: Introduction

1.1 Background and Problem Statement

As immigrants\(^1\), we encounter unique and never-ending “pathways” to navigate our community and across various institutional levels. For instance, as an international student from Ghana, studying in Canada was not just about “the experience of change”, it was also about the process of navigating and overcoming the hurdles of cultural shocks, both major and minor ones. I recall when I first arrived on the UBC campus for my first graduate class. Upon reaching the entrance of the classroom where I was supposed to have my class, I saw tables arranged in a circle, around which about eleven people were seated with their laptops. This confused me a bit, so I double checked my class schedule to make sure I was at the right venue. Indeed, I was. However, I did not enter the classroom, and out of respect for the “people gathered,” I patiently waited outside in order not to interrupt “an ongoing staff or board meeting.” I remained outside for about 15 minutes into the class time. While outside, my research supervisor, with whom I had met a few minutes previously, saw me in the hallway. She became curious and asked why I was outside while class was in session. She quizzed:

   Kwesi, why are you outside?

With shaky voice, I simply responded:

\(^1\) Immigrants: voluntary immigrant minorities, who are supposed to have moved willingly to their host country and involuntary immigrant minorities, such as refugees, migrant/guest workers, undocumented workers, and binationals, including descendants or later generations. (Adapted from Civil, 2012)
There is an ongoing staff meeting in the room where we are supposed to have our class, and I am waiting for them to finish the meeting so I could enter the class.

She smiled and responded to me:

The class has already started; you can join them.

What confused me was the seating arrangement and, more shockingly, that every student in the room had a laptop. The circular seating arrangement defied the traditional lecture-style classroom seating I was used to during my undergraduate studies in Ghana, where one will usually have an instructor lecturing in front of a large class and students taking notes. More importantly, every student in the class to have a laptop was a “cultural shock” to me. In my experience in Ghana, students rarely own laptops, at least at the time of my undergraduate studies. Laptops were reserved for lecturers; hence, the atmosphere of the class depicted a typical Ghanaian “staff or board meeting.” This anecdote might be taken as a trivial cultural shock, but its point is to draw attention to the fact that small differences (e.g., classroom seating arrangements) could indeed pose a “cultural shock,” and people might react to these changes differently. The anecdote reflects Gorgorio and Planas’ (2005) notion of immigrant students’ experience of change and of living “discontinuities between cultures; in particular, discontinuities between different school cultures” (p. 93), which many immigrants are likely to encounter in their host countries. The discontinuities provide a premise for studies that seek to better understand how immigrants respond to such cultural differences and how they might leverage their assets and cultural capital to overcome, or compensate for, these discontinuities in the host country. Considering the recent upsurge in international migration and the efforts by host countries and international organizations in supporting immigrants to settle and succeed in
their respective host countries, as well as the growing need to enact measures that counter issues of racism and inequities among immigrant communities, the study of immigrant populations, including African immigrants living in Western Canada, becomes even more pressing. Global statistics indicate that approximately 273 million people have emigrated from countries with emerging economies, primarily from Africa, South and East Asia, Latin America and Eastern Europe, to developed economies such as Europe and North America (McAuliffe & Khadria, 2019). Although the rate of international migration remains low compared to the world’s population (at 3.5%), the figure is already beyond the global forecast made for the year 2050 at 2.6% or 230 million (McAuliffe & Khadria, 2019). In the case of Canada, since the early 1990s the number of landed immigrants has remained relatively high, with an average of approximately 235,000 new immigrants per year (Statistics Canada, 2019), highlighting Canada’s commitment to welcoming people from diverse cultures.

Canada’s population indicates the country’s richness in terms of ethnicity and cultural diversity. According to 2016 Census data, 41.1% of the Canadian population was reported to have more than one ethnic and cultural origin, with over 250 different ethnicities recorded (Statistics Canada, 2019). With regards to new immigrants, their population in Canada keeps growing annually. There was 20.6% increase in the number of immigrants in 2011. The number increased to 21.9% in 2016, with a Black population constituting 3.5% of the total immigrant population. The African population in Canada is concentrated primarily in Ontario, Quebec, British Columbia (BC), and Alberta. In 2016, it was estimated that 94.1% of all those who identified themselves as having African ethnic origins lived in one of the above-mentioned provinces, with BC accounting for 14.5% (Stats Canada, 2019).
I acknowledge that Canada’s infrastructure programs are designed to integrate immigrants into a new setting (e.g., adult language classes set up in many community centres, a language support system for new immigrant students, etc.). Despite such efforts, there appears to be a significant gap between specific provisions in Canadian schools and the strengths that culturally diverse students and communities bring to Canada that can enrich their education and that of other students within Canada (Cummins, 2010). Cummins (2010) cautioned that we risk losing sight of, and squandering, the cultural, linguistic and economic resources that new immigrants represent, especially if we become complacent in interrogating issues and complexities of cultural and linguistic diversity in our general education discourse. More specifically, the growing trend in immigration and its consequent cultural diversity in Canada further places a responsibility on schoolteachers and curriculum developers to address issues of ethnicity, culture, bilingualism and multilingualism in various school subjects, including mathematics. This is important because immigrants from various cultures and linguistic backgrounds bring with them their lived experiences from home countries. Although relevant, in many cases their experiences do not align with the educational or schooling culture of the host country (Anderson, Kim, & McLellan, 2016). Although many studies have documented linguistic and cultural diversity as an asset in multicultural classrooms (Barwell, 2018; de Abreu & Elbers, 2005; González, Moll, & Amanti, 2006; Jorgensen, 2016a; 2016b; Meaney & Lange, 2013; Planas & Setati-Phakeng, 2014), it appears that there is still a research gap in the implications of cultural and linguistic diversity in children’s learning at all levels of the educational system in Canada (Cummins, 2010).
Furthermore, many educators who currently work with culturally and linguistically diverse students within multicultural classrooms, as is the case of Canada, are somewhat uninformed of the implications of cultural diversity in today’s multicultural classrooms and seem to have little or no professional training to equip them to deliver their mandate effectively (Civil, 2012; Crafter, 2012). There is the need for mathematics teachers to know their students beyond their cognitive functioning to include the cultural and linguistic resources they might each bring to classrooms or the dispositions they may hold towards mathematics and how these might influence their mathematics learning in school (Gutiérrez et al, 1999; Yaro, Amoah, & Wagner, 2020). This is important considering that teachers’ knowledge and experiences with different cultures, and shared linguistic and cultural backgrounds with students, can support dispositions that value a range of diverse family and community activities as resources to mathematics learning, including different ways of approaching mathematics (Andrews, Wan, Greenhough, Hughes, & Winter, 2005). However, it appears that classroom teachers are generally unaware of unique, cultural capital, including linguistic experiences African immigrant students may bring to their mathematics learning from home, and the role African immigrant families play in utilizing their home resources in support of their children’s mathematics learning, in a new cultural setting like Canada. Thus, there is the need for mathematics education researchers to address and help us better understand the complexities and possibilities of ethnicity, prior cultural and linguistic experiences of immigrant students, and how these tend to influence African immigrants’ mathematics learning in the host country.

Generally, the discourse on immigrant children’s mathematics learning has drawn on quantitative test-taking data that show the disparities or achievement gaps between Latino/African
immigrants and their white counterparts (Barajas-Lopez, 2014). As Nasir (2002) noted, the everyday stories of students and their school and community experiences are unaccounted for in such studies. In addition, available studies appear silent on the distinction between the various cultures, languages, nationalities, and immigration statuses of immigrant students (Barajas-Lopez, 2014). Furthermore, the unique educational experiences of African immigrant children and their families in the host countries are usually absorbed into categories of other minority groups. Leaving such important cultural differences, perspectives, experiences, and learning contexts unarticulated may well hinder educators and researchers in mathematics education from gaining a deeper insight into how African immigrant families’ cultural capital plays out differently for different groups of families in supporting mathematics learning of their children.

Within mathematics education research, there is a growing body of literature on immigrant families and children’s mathematics learning in general (Anderson, Kim & McLellan, 2016; Civil, 2012; Civil, 2014; Crafter, 2012), but mostly on how families support their children’s early years or early elementary (K-3) children’s mathematics learning (see Anderson et al., 2016; Crafter, 2012). Studies in the field of mathematics learning, especially in the Canadian context, have paid minimal attention to how immigrant families support their children’s learning in the upper elementary and middle school level (e.g., Grades 4-8). With regards to research on an African immigrant population, studies on African immigrant families and their children’s (10–15-year-olds) mathematics learning is underrepresented. In fact, available studies on immigrant families and children’s mathematics learning have mostly either focused on dominant immigrant populations in Canada or immigrants in general (e.g., Barwell, 2012; Barwell, 2018; Barwell, Barton, & Setati, 2007), with African immigrant experiences being subsumed into other
immigrant population. Hence, research with a special focus on African immigrants or Black people in Greater Vancouver could provide insights into the uniqueness of what researchers, educators and policy makers could learn from this visible minority group. The growing immigrant population, more specifically African immigrants, including refugees, makes Vancouver an appropriate context to investigate what culturally situated strategies (if any) African immigrant families from different socio-cultural contexts within Africa employ in support of their children’s mathematics in Vancouver, Canada.

Recent mathematics educational reform documents such as the National Council of Teachers of Mathematics (2020) and the New British Columbia Curriculum (2016) have called for increased parental involvement through school and community collaboration as an important step in enhancing children’s education at all grade levels and across disciplines. With specific reference to the New BC curriculum and the role of all parents in the child’s education, it is written that:

> parents or guardians and others in the community may bring expertise and perspectives from their lives and experiences to enhance students’ learning. Teachers are encouraged to incorporate such experiences when possible and applicable to the goals of the curriculum or subject content (BC Ministry of Education, 2016, Curriculum Overview para. 18).

I claim that underlying these calls is a normative notion of Western middle-class parents as all parents. I make this claim knowing that extant mathematics education research, with a few notable exceptions, has failed to present sufficiently detailed characterizations of the
mathematical beliefs, experiences, home practices of African immigrant parents and how they draw on their cultural understandings in supporting their children’s mathematics learning. What are African immigrant families’ beliefs, experiences of mathematics, and how do these relate to their participation in or support for the children’s mathematics learning in the host country? In my view, it would be incorrect to suggest that the Western middle-class parents’ beliefs, experiences, desires or wants and participation in children’s mathematics learning are congruent with that of their African immigrant counterparts.

I further argue that non-Western families may have different experiences, beliefs and means of supporting their children’s learning in an out-of-school setting which may not necessarily parallel what educators or researchers may assume (based on normative middle-class parents). And, while different, these out-of-school experiences likely contribute to the overall mathematics learning of the children from these non-Western families. Furthermore, considering the socio-cultural nature of students’ learning and the significant role families play, it is important to find meaningful ways of building home-school relations to increase family/community participation in children’s mathematics learning and education in general. I argue that such a relationship could be built through schools’ and teachers’ deeper insight into families’ cultural capital, experiences and beliefs about mathematics and the ways they participate in their children’s mathematics learning. Understanding how families are involved in their children’s mathematics learning could provide a mechanism for schools and teachers to increase parental involvement among African immigrants and other culturally marginalized families. Thus, this study is guided by the following research questions:
1. What are African immigrant families’ experiences and perspectives with respect to their (10-15 year old) children’s mathematics learning in the home, community and school settings within the Greater Vancouver Area?

2. What socio-cultural strategies and ways of understandings (if any) do African immigrant families, now living in Greater Vancouver, draw upon to support their children’s mathematics learning?

1.2 Contributions and Significance of the Study

While the findings of this study would have direct implications on the future of mathematics learning for young African immigrants, this study will also broaden current understandings of family involvement in African immigrants’ education in general in a Western context. Most studies have focused broadly on family involvement in children’s mathematics learning with no specific reference to African immigrants, as they are usually absorbed into other minority groups such as African-Americans, Latinx and Asian immigrants (e.g. Civil, 2007; Civil, 2012, Dei, 2012; Stinson, 2006; Xenofontos, 2015). As a result, it seems that little or no attention has been given to the experiences of African immigrant families and how they support their children’s mathematics learning. As a result, educators and researchers have not been aware of the unique cultural capital African immigrant families bring with them and how they utilize their experiences in contributing to their children’s mathematics learning in a new cultural context such as Canada. In other words, the study will contribute to our understanding of African immigrant families support for their children’s mathematics learning and also extends on notions of capital.
Hence, this study, focusing on African immigrants, makes an important contribution to the literature on family involvement and children’s mathematics learning especially considering differences in their culture, perspectives, and prior understandings. Moreover, most existing literature has focused on family involvement in their children’s maths learning in early years (e.g. Anderson, 1997; Anderson et al., 2016; Anderson et al. 2005; Anderson et al., 2010) and few on adolescent children (e.g. Civil, 2012; Goldman & Bookman, 2009; Knapp, Landers, Liang & Jefferson, 2016). With few notable exceptions such as Civil (2012; 2007) and Civil et al (2005), it appears that relatively little is known about family involvement in children’s mathematics learning in the age group of 10-15 years old, who are mostly in the upper elementary and middle school grade levels, and especially with families with various immigrant backgrounds. Thus, given the heightened awareness of the need for culturally responsive education, this study comes at an opportune time to contribute to the literature on immigrant family involvement in their children’s mathematics learning in the age group described above.

In addition, descriptive cases of how African immigrant families support their children’s mathematics will contribute significant baseline data needed to inform interventions and support for family involvement in children’s mathematics learning in countries such as Canada, with diverse populations of immigrants. Although educators are aware of the need to involve parents, and a few success stories are inspiring (Epstein et al. 2002), most schools have not found meaningful ways to involve parents or involve them in ways that “counteract racial or socioeconomic inequities and lead to parent enfranchisement or achievement gains” (Goldman & Booker, 2009, p. 371). Hence, this study provides insights to guide more culturally responsive ways of engaging immigrant families in their children’s mathematics learning. The more
teachers become aware of the mathematical support and interactions with which culturally diverse families engage their children at home, the more they can build relationships with families (Lynch et al. 2006) that will foster students’ mathematics learning.

1.3 The Researcher’s Identity and Positionality

Drawing on “standpoint” epistemology (Toole, 2019), I discuss my positionality to explicate my awareness of my contributions and roles (both explicit and implicit) to the construction of meaning throughout the research process. I conceptualize positionality as ever shifting and permeable social locations that are differentially experienced and expressed in relation to the researched community or participants (Naples, 1996). This shifting of social locations and multiple identities of researchers inform my positionality as a researcher working with African immigrant families. I draw on Merton’s (1972) notion of “status sets” (researcher’s multiple identities). I position myself as both a member of the African community in Western Canada and an immigrant parent who takes a keen interest in ways of supporting my children’s mathematics learning in Canada. In fact, my positioning as a researcher in this study rejects what Sen termed as a “solitarist” approach to human identity, which views humans as belonging to exactly and exclusively one group – white, black, immigrant, non-immigrant, disabled, non-disabled, parent, non-parent and so on. In contrast, to a “solitarist” notion of identity, my positionality could be more described as belonging to multiple or collective identities as Sen (2006) explains:

…in our normal lives, we see ourselves as members of a variety of groups – we belong to all of them. The same person can be, without any contradiction, an American citizen, of Caribbean origin, with African ancestry, a Christian, a liberal, a woman, a vegetarian, long distance runner, a historian, a schoolteacher, a novelist, a feminist…All of these collectivities, to all of which this person simultaneously belongs, give her a particular identity. None of them can be taken to be the person’s only identity or singular
Indeed, such a multi-facet view of personal and community identity challenges the simplistic categorization of researchers as possessing singular identity. For instance, within the African community, we speak different languages, come from diverse cultural backgrounds, have different socio-economic statuses in Canada, and belong to different religious faiths, including Christianity, Islam, and so on. However, we share a common identity of being African immigrants in Canada who aspire for success for their children’s education, including mathematics learning. Merton’s (1972) idea of “status sets,” as opposed to “status”, of a researcher denotes our multiple identities at different locations and times. For example, I am a male Ghanaian doctoral student and belong to the Christian faith. In an Afrocentric sense, my identity would also include my language and tribe – “Kasim” (one of the ethnic groups in Ghana). This view of identity, which Merton calls “status sets,” parallels African ways of knowing, which sees people as having a “collective identity” (Nashon, Anderson, & Wright, 2007). In other words, these multiple identities cannot be taken in isolation and as researchers we embody and perform this collective identity in our work through our data collection, analysis and reporting.

My closeness to the African community offered some advantages in expediting access to participants “away from home” due to shared racial and ethnic backgrounds (Merriam et al., 2001; Chavez, 2008; Creswell, 2013). However, questions of power regarding relationships between participants and myself (researcher) seemed obvious, especially in the situation where with exception of one mother, my level of education is higher than that of my research participants. In most African cultures, higher education is highly revered, and many in the
African community see my status as a doctoral student in a renowned institution in Canada as prestigious. I was mindful of the multi-dimensional nature of our power relationships (myself and the participants), my own gender (an adult male), and age differences between my participants (children (10-15 years old and their parents). I was also aware of how my multiple identities might influence (either overtly or covertly) the data collection from family to family and from participant to participant due to differences in age, gender and religion of family participants (Labaree, 2002). For me, the process of dealing with my multiple and shifting identities was a learning process, which required “a constant process of negotiation and state of becoming,” which transformed me in many ways as a researcher (Nicol, 2006, p. 33).

This process of negotiation, according to scholars (e.g. Bourdieu & Wacquant 1992; Couture, Zaidi, and Maticka-Tyndale, 2012; Cui, 2015; Kerstetter, 2012), requires critical self-reflection or awareness (reflexivity). Porter (1993) defined reflexivity as “a process of self-examination that is informed primarily by the thoughts and actions of the researchers” (p. 141). As researchers, being part of the social setting complicates our effort to detach ourselves from the society or communities we study since we bring into our studies our individual experiences, personal background, and pre-existing understanding (Cui, 2015). As indicated earlier, as an African immigrant parent, raised in Ghana, in Sub-Saharan Africa, I share similar characteristics with my participants. More so, just like my participants, I also have an interest in how I might better support my children’s mathematics learning in a new socio-cultural context, such as in Canada. Therefore, instead of engaging in futile efforts to eradicate any potential bias in my roles as a researcher, being reflexive allowed me to constantly reflect on these roles to better understand their effects on my study. These constant critical reflections on my activities (data
collection and analysis) during the research shed more light on the day-to-day problems I encountered during the study, and I quickly found ways to mitigate them (Porter, 1993).

Following an Afrocentric method of inquiry, I adapted Asante’s (1990) two processes of a researcher’s reflexivity in researching with African communities: introspection and retrospection. According to Asante, introspection means a researcher’s ability to question his/her own pre-assumptions (prior cultural understandings, etc.) about the research problem and noting what may impinge on the research processes with Africans (e.g., age differences, gender, cultural norms and so on).

On the other hand, during the retrospection, I questioned my personal hindrances that might have interfered with fair data interpretation. For instance, I engaged in retrospective reflection through critical questioning of the data and its interpretation; how does the data challenge my prior assumptions and understanding about the study? In what ways do the data advance my understanding of the study and the knowledge in the field of mathematics education? This ongoing process allows proper interrogation of emotions and positionality and becomes an important data source (Takeda, 2012) and forces us, the researchers, to see beyond the unthinkable (Bourdieu & Wacquant, 1992).

1.4 Organisation of the Dissertation

This dissertation is organized into five chapters. Chapter 1, the introduction, consists of brief background and problem statement of the study, the research questions, contributions and
significance of the study, and researcher identity and positionality, which I have conceptualized as being fluid.

Chapter 2 comprises a comprehensive literature review on thematic relevance in this study; race, culture and children’s mathematics learning, different understanding and approaches of doing mathematics (cultural models of mathematics education). The chapter closes with a synthesized discussion of theoretical concepts from both Afrocentric worldviews and cultural capital theories on which I ground the study.

Chapter 3 details the research methodology, research questions and design, description of the study context, sampling and recruitment, background of participants, data collection procedures, data analysis, and an Afrocentric assessment of the quality of the study.

In Chapter 4, I present the results in the form of key themes constructed from the data in relation to the study’s research questions.

The final chapter, Chapter 5, provides a discussion of the findings by comparing and contrasting my findings with available literature in the field as well as offering interpretations and meanings in light of the study’s theoretical framework. Chapter 5 ends with conclusions and implications for theory, research, and practice in the field of mathematics education.
Chapter 2: Literature Review and Theoretical Framework

In this chapter, I examine the extant literature on immigrant parents’ involvement in their children’s mathematics learning in its broader sense by critically examining issues of ethnicity, race, culture and bilingualism/multilingualism in mathematics. Specifically, I begin this review by first examining various scholarship and policy frameworks for both national and international contexts, to ascertaining how research has reported (i) the genesis of mathematics as a gatekeeping subject and (ii) how immigrant families perceive their children’s mathematics learning. Secondly, I discuss research on intersectionalities of race, culture, language, cultural models of mathematics education, and how these might influence children’s mathematics learning in the host country. Throughout the chapter, I argue that for mathematics education research in Canadian contexts to speak for all people from diverse cultures, it has to address and help us better understand the complexities and possibilities of ethnicity, prior cultural experiences and immigrant students’ mathematics learning in the host country. Within this chapter, I will also discuss the theoretical frameworks and accompanying concepts upon which this study is grounded, namely, Afrocentricity and Bourdieu’s concepts of cultural capital, field, habitus. Closely related to Bourdieu’s concepts of capital, I review Yosso’s (2017; 2005) concepts of community cultural wealth which explains the various forms of capital students of colour brings with them from their homes into classroom settings. I end the chapter by illustrating how a synthesized perspective on the aforementioned theoretical perspectives shapes my understanding and interpretation of my work with African immigrant families and their support for their children’s mathematics learning in the host country.
2.1 The Role of Mathematics in Immigrants and Refugees’ Aspirations

In general terms, literature shows that families, especially low-income families, including refugees and immigrants, have high educational aspirations and support their children’s academic attainment throughout their school years. For instance, Johnson et al. (2016) investigated low-income Hispanic mothers’ perceptions of their roles in their first-grade children’s education. Despite the Hispanic mothers’ low socio-economic status, coupled with their lack of English proficiency, they expressed interest in their children’s education and viewed education as an important factor in changing their economic circumstances. Similar perceptions about education was reported in Kumi-Yeboah’s (2018) study with Ghanaian-born immigrant youth (Grades 1-11) living in the United States. Likewise, Li’s (2018) study with refugee families and their children indicate families' effort to re-establish themselves in the US. The author concluded that although refugee families came to the US because of war in their home countries, they also share “similar expectations for the value of what Western education might bring to their future, with ‘copious aspirations for post-secondary education and prestigious careers’ in order to better themselves, their families, and those left-behind in their societies of origin” (p. 473). Thus, among immigrants and refugee families, education is seen as an avenue to better employment opportunities and higher social status.

Mathematics is perceived as a gatekeeping subject needed to build a strong national economy and a means for children to brighten their future career prospects in the Science, Technology and Engineering (STEM) job market. This perceived role of mathematics is further evidenced in both national and international mathematics education policies. The following excerpts exemplify the positioning of mathematics as a “gateway” subject:
• In the United States today, mastering mathematics has become more important than ever. Students with a strong grasp of mathematics have an advantage in academics and the job market. The 8th grade is a critical point in mathematics education. Achievement at that stage clears the way [for] students [to] take rigorous high school mathematics and science courses that are keys to college entrance and success in the labour force. However, most eighth and 9th graders lag so far behind in their course taking that getting on the road to college is a long way off (US Department of Education, 1997, p.1)

• There is a growing recognition that countries in Sub-Saharan Africa will need to boost performance in the Science Technology, Engineering and Mathematics (STEM) subjects if they are to realise their full potential in a competitive global market increasingly shaped by the use of new technologies. ...In particular, poor performance in mathematics in primary and secondary schools is seen as a significant barrier to improved economic and social outcomes both at the level of the individual and of the nation (Bethell, 2016, p. 13)

• In this changing world, those who understand and are competent in mathematics will have significantly enhanced opportunities and options for shaping their futures. Mathematical competence opens doors to productive futures. A lack of mathematical competence keeps those doors closed” (National Council of Teachers of Mathematics, (NCTM), 2020, p. 1)

From the above excerpts, it is evident that mathematics teaching and learning is a major priority in almost every country’s educational reform and global educational policies, in effect shaping political discussions, expert reports, and even parental perceptions on why their children should
study mathematics (Valero, 2017). For instance, Black parents’ recognition of the gatekeeping role of mathematics has been reported in studies investigating the counter-narratives of parents and their agency in supporting their children’s mathematics learning in the United States (Martin, 2006; McGee, 2015; McGee & Spencer, 2015). Thus, it resonates with the general public that mathematics is an engine of economic transformation and an avenue for unlocking economic opportunities for individuals and a means of upward social mobility among working-class students and the marginalized. While I acknowledge the privileged position “mathematics” enjoys in our society as a gatekeeping subject, I argue that such “privilege” has often been unproblematized. For instance, who gets access to the “gate,” and who is excluded from accessing this gate? Furthermore, who determines who studies which mathematics content? Whose interest is mathematics serving?

2.2 Mathematics Learning, Participation and Family Involvement as a Racialized/Class Project

The positioning of mathematics literacy in the school curriculum as a gatekeeping subject or “critical filter” for higher education and enhanced economic access has also led to questions of equity and access to mathematics based on race (Stinson, 2004). In referencing race, I follow other critical race theorists (e.g., Bonilla-Silva, 2001; Martin, 2009 etc.) to engage with the concept of race as “a social construction that is created and re-created through both institutional structures and everyday interactions and experiences and is not a biological characteristic of an individual” (Morton & Riegel-Crumb, 2019, p. 532).
I am also aware that issues of race cannot be essentialized. As such, it is important not to assume that the educational experiences of African immigrants’/Afro-Canadian children are the same or comparable to one another or constant across the school or home contexts. Martin (2009), when theorizing how race is implicated in mathematics learning, conceptualized mathematics learning as *racialized forms of experience*, claiming that mathematics “experiences are shaped and structured by the meanings and representations of race and racial groups that exist in the larger society” (p. 32). Martin’s (2009) work is relevant in understanding the complexities of Afro-Canadian and African immigrant students’ mathematics learning and participation and their families’ involvement practices. The very nature of mathematics as a gatekeeper and how teachers perceive Afro-Canadians and African immigrant families as agents of their children’s mathematics learning are ways in which racialized forms of math experiences manifest in education.

Anyon’s (1997;1981) works on “Ghetto Schooling” reports unequal educational experiences in two school districts in New Jersey. She investigated the school knowledge and pedagogical practices of teachers in five elementary schools within a contrasting social class setting (working and middle class). While all schools in the district used the same mathematics textbooks, Anyon (1997;1981) concluded that mathematics teaching in working-class schools, with predominately Black and Hispanic students, was reduced to procedures and steps to be followed in adding, subtracting multiplication or division. She noted that teachers concentrated only on “the basics” and rarely used pages of the math textbooks that contained tasks for mathematical reasoning, inferences and identification of patterns. Anyon (1997;1981) contrasted these findings with data she collected from middle-class schools and concluded that,
when teachers explained how to do math or what to do next, there was usually a recognition that a cognitive process of some sort was involved rather than simply leading the children through a series of steps, the [teacher] usually gave several ways to do a problem, and …often asked a child to say how he "did" a problem. (1981, p. 14).

The social class differences in secondary and post-secondary educational experiences provide a fertile ground for a vicious cycle of production and reproduction of unequal class structures in our society. Similarly, there is mounting evidence that people of colour, especially Black students and students from lower social classes and bilingual and multilingual backgrounds, are often subjected to low expectations and “skewed” assessments of their mathematics ability and performance from their teachers and school authorities (McGee, & Martin, 2011; McGee, 2013; McGee, 2016). Lowering expectations and underestimating the mathematics capability of minority groups is referred to as an indicator of implicit soft bigotry2 (Dumenden, 2012; Rubel & McCloskey, 2019) that further reinforces racial stereotypes. Indeed, Moschkovich (2013) argued for the need to engage ELLs in mathematical discussions and cognitively demanding tasks like their peers in order to deepen their mathematical reasoning, and conceptual understanding. With regards to African immigrant children, it is unclear how their social status as immigrants and emerging bilinguals/multilinguals is implicated in their experiences of mathematics learning in Canada.

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2 The phrase “soft-bigotry of low expectation” was first coined by President George W. Bush in 2000 in a speech that marked the launching of No Child Left Behind (NCLB), an Education Act aimed to ensure equal access and close the racial academic achievement gap.
Another means by which mathematics education and participation of immigrants’ families act as a racialized/class project could be seen in the deficit perspective that some teachers and school administrators have for minority families regarding their support for their children’s mathematics learning. Research shown that despite Black and African parents’ engagement in their children’s mathematics education, schoolteachers and administrators attribute academic underachievement of Black and African American students to inconsistency between school and home culture mores of students, and a lack of parental commitment and value for education (Lynn, Bacon, Totten, Bridges, & Jennings, 2010; McGee & Spencer, 2015). Similar perceptions were reported about minority immigrant families by Stagg-Peterson & Heywood (2007) in a study that investigated minority families’ social and cultural capital contributions to their children’s literacy development and overall academic success in Ontario. Teachers and school principals in the study described their experience as “hitting a hard rock” in attempts to get minority families to support their children’s literacy learning. The teachers misinterpreted minority families’ lower socio-economic status, lack of English language proficiency and parents’ prior learning experiences (drills oriented) as evidence that these parents were not concerned about their children’s learning (Stagg-Peterson & Heywood, 2007). Yosso (2017;2005) described such teacher perspectives about minority families as “deficit thinking,” which Yosso (2017; 2005) believes has been a prevalent contemporary form of racism in schools. According to Yosso (2005), deficit thinking positions minority students and communities as problematics who are blamed for poor academic performance for two reasons: “(a) students enter school without the normative cultural knowledge and skills; and (b) parents neither value nor support their child’s education” (Yosso, 2005, p. 165). The result of such racialized assumptions of people of colour is that teachers and schools resort to the passive transmission of knowledge to minority students
in a bid to inculcate in them the dominant cultural values and norms. For instance, schoolteachers and administrators are likely to interpret acceptable and unacceptable behaviour in the school context through the lens of the dominant culture. More often, children of minority or children from other cultural backgrounds whose behaviour does not conform to the “norms” of the dominant culture are likely to be seen as complex needing interventions to put them on “track.” Such deficit thinking also manifests in instances where bilingual students are often excluded from more cognitively challenging mathematics tasks, especially those that require them to explain their thinking. Instead, this group of students is asked to participate in more procedural or drill-oriented tasks (Celedón-Pattichis & Turner, 2012). As indicated earlier, similar deficit thinking was reported in Anyon’s (1997; 1981) study with working-class schools in her seminal “Ghetto schooling” project.

Such deficit thinking and racial stereotyping of minority children and their families through oppressive school practices and structures result in minority children either showing resistance or being disengaged in mathematics classes (Martin, 2009). For instance, in response to racial stereotypes in mathematics, African American students in McGee’s (2015) study demonstrated either a fragile or robust mathematics identity. McGee (2015) defined fragile identity as the delicate and vulnerable relationship between Black students’ mathematics success and the persistent racialization they endure in the discipline, whereas robust identity refers to the “resilience and agency of Black students to be self-motivated to succeed in mathematics in the face of racialization” (p. 604). This begs the question: What might be the role of families in supporting children’s robust mathematics identity? Similarly, mathematics educators should be interested in why Afro-Canadians and African immigrant families support their children’s
mathematics learning. In other words, what does the learning of mathematics mean for Afro-
Canadians and immigrant families? How do racial stereotypes shape African immigrant families’
agency in supporting their mathematics education of their children?

2.3 Cultural Nature of Mathematics Participation and Learning

To delve into a cultural model of education, it is significant to define what I mean by culture due
to the complex nature of the term. I draw largely on Hollins’ (1996) conceptualization to provide
a broader definition:

…essence of who we are and how we exist in the world. It is derived from
understandings acquired by people through experiences and observation (at times of
speculation) about how to live together as a community, how to interact with the physical
environment and knowledge or beliefs about their relationship within the universe
(p. 183).

It is important to also acknowledge both the shared and heterogeneous nature of culture among
the same ethnic or racial groups. Hence, there are unique and shared features, which distinguish a
particular group from another. The notion of culture here is not only limited to the practices and
beliefs of families and communities but also includes how those beliefs are shaped by the
education one has experienced. Bishop’s (1988) book on Mathematical enculturation: A cultural
perspective on mathematics education introduced the conversation about the cultural nature of
mathematics learning by emphasizing that mathematics is not neutral or universal, neither is it
devoid of socio-cultural spheres of the society we live in. The cultural and social nature of
mathematics is seen in how different communities and societies employ mathematical resources
from their cultural settings to solve everyday problems. For instance, in my MA research, rural
parents with no formal education in Ghana described how they employ mathematics in their daily lives and how they support their children’s (9 – 10 years) mathematics learning. One such way was the use of local business transactions (local trading). Even though parents in the study were not formally educated, they had a profound understanding of basic financial literacy such as “change,” “profit,” and “loss.” They apprenticed their children informally on the daily use of cash and coins in transacting businesses. This finding parallels earlier work, such as Glick (1975), who reported that Kpelle farmers in Liberia drew on local cultural resources, such as local forms of measuring.

Despite the rich cultural practices children might bring to mathematics learning in school, studies indicate that in most cases, there exists a dissonance or cultural conflict between the culturally embedded home mathematics practices and those of school. For instance, De Abreu’s (1995) study in a low-income Brazilian sugar cane farming community revealed that children at school were taught the metric system of measurement while an indigenous system based on bracas (system of measurement predominantly used by rural Brazilian farmers) was usually used during their family’s farming practices. Indeed, studies have shown that teachers and schools are often unaware of the culturally situated home mathematics practices in which families engage children in out-of-school settings (Civil, 2012; Ezeife, 2011). From a sociocultural perspective, learning or knowledge construction is a reflection of distinct cultural tools, structured through our families and community practices, prior mathematics beliefs, and previous school experiences, and they act as mediators of the psychological activity that shape students’ and families’ conception and thinking of mathematics (Gorgorió & De Abreu, 2009). Vygotsky (1979) argued that cognition is mediated by cultural tools, with a direct connection with land, space and time.
Similarly, how we learn mathematics or think about mathematics problems has to do with which place, or culture, or context within which mathematics problems are situated (Nicol et al., 2020) and the prior understandings we bring to this knowing. However, the general lack of understanding of mathematics as cultural knowledge and the belief that mathematics is culture-free and value-free (Bishop, 1994) seem to compound the dissonance between school mathematics and the daily cultural activities families and children engage in at home. This begs the question, how immigrant parents make sense of and are involved in their children’s mathematics learning in the host country? The following section will explore this question in more detail.

### 2.4 Cultural Models of Education and Families’ Perceptions and Involvement Practices

Socio-cultural backgrounds in which parents were raised and educated are critical in informing their perspectives on their children’s mathematics learning and involvement practices (Anderson, Kim, & McLellan, 2016). Such parental cultural background and schooling experiences are what has been extensively documented by scholars in education research as “cultural models of education” (Anderson, McTavish, & Kim, 2017; Crafter, 2012; Fryberg & Markus, 2007; Reese & Gallimore, 2000;). Cultural models, largely drawn from Bourdieu’s concepts of “habitus and capital” (see Bourdieu, 1990), are the assumptions or beliefs, patterns of ideas and practices relevant to education that are derived from past experiences and that mediate and regulate people’s perceptions and behaviour; “what is valued and ideal, what activities should be enacted and avoided, who should participate and the rules of interaction” (Reese & Gallimore, 2000, p.106). These cultural models are so familiar, invisible, and taken for granted that they are only
recognized when one finds oneself in a remarkably different socio-cultural context. Mostly, the concept of cultural models and how they shape parents, especially minority parents, participation in education is well researched in the field of language literacy. For instance, Reese and Gallimore’s (2000) study with Mexican and Central American immigrant families in the US investigated cultural models and practices of early literacy development of children. Reese and Gallimore (2000) noted that most Latino parents in the study do not perceive children’s early literacy awareness, such as reading to their children, to be developmentally significant prior to children’s formal schooling. The parents’ goal for reading to their children was targeted at imparting moral lessons and instilling values, such as obedience and respect, through reading the bible and other religious books (Reese and Gallimore, 2000). Reese and Gallimore concluded that “parents share a model of what reading is and how it develops based on their own experiences with learning to read” (p. 115).

Similarly, parents’ cultural model of mathematics learning emanating from parents’ own prior educational experiences, major curriculum reforms since parents’ own schooling experiences, and the introduction of multiple mathematics strategies in the new schooling context (de Abreu & Cline, 2005) shape parents’ and students’ understanding of mathematics. Differing views of what counts as mathematics, as well as the school’s normative expectations from parents (De Abreu, Bishop, & Presmeg, 2002; Gorgorió & de Abreu, 2009), have also been associated with how mathematics is conceptualized in “the home” which in many cases differs from the school mathematics or expectations (Bishop, 2002; Meaney & Lange, 2013). For instance, Civil, Planas, and Quintos (2005) illustrate how immigrant parents’ cultural model of mathematics education influenced their beliefs about mathematics algorithms that their children were currently learning.
With diverse immigrant parents from Tuscon (US) and Barcelona (Spain), Civil, Planas and Quintos (2005) described parents’ awareness of the differences between their mathematics experience in their home countries (before) and what they are experiencing in the US and Spain (now). Marisol, one of the participants in the study, described differences between a mathematics algorithm for division. She had opted to teach her son how she learned division in Mexico by performing some of the operations mentally without writing them down. She thought her son’s teacher’s approach to the division was “too slow, messy and inefficient” (Civil et al., 2005, p. 275). Similarly, Colegrove & Krause (2017) described how a cultural gap affected the pedagogical approaches used at home in their study with Latino immigrant parents. According to Colegrove and Krause (2017), the Latino immigrant parents were often frustrated and confused by the teacher’s expectation that children needed to describe their process of solving mathematics problems or show multiple strategies of solving a problem as they described such a “demand as complicating things” (p. 196). Although the extra steps or multiple strategies are meant to help children gain a deeper understanding of concepts, rather than merely memorizing the answer, parents in Colegrove and Krause’s (2017) study preferred to teach their children tricks and simplified processes they learned from their home countries.

However, it is important to point out that other studies have also documented immigrant parents’ value and acceptance of the differences in home-school mathematics in terms of algorithms. Such parents viewed these differences as an opportunity for reciprocal learning – children learning from parent and vice-versa- and indeed, saw the value of different methods of approaching mathematics (Civil et al., 2005), an indication that not all immigrant parents resist the “new” mathematics approaches that counter their beliefs, and conflicts with how they were
taught in their home countries. Nonetheless, a fundamental conclusion from these studies overall is that parents do care and support their children’s education through showing a keen interest in and understanding of the curriculum and their awareness of the pedagogical differences or practices of the school. Such a position, therefore, challenges the stereotypical view that immigrant families do not care about their children’s education or are unengaged/disinterested in their children’s schooling.

I agree with Colegrove and Krause (2017) that the probable persistence of the “deficit thinking” that position minority parents as uninterested in their children’s learning might be a result of the dissonance between the parents’ and children’s schooling experiences which make them feel inadequate and incapable of helping their children with mathematics homework. I will speculate that another reason for the persistent deficit view about immigrant families could be their lack of political consciousness and the ability to advocate for their children in a system that already positions them as subordinate or marginalizes them. Bridging home-school cultural dissonance will require extensive communication between home and school, with the latter taking the lead in explaining to families what kind of mathematics their children are learning and the rationale of teachers’ expectations. This will require us (researchers and educators) to examine what shapes families’ understanding, and representation, of mathematics, in both home and school contexts – i.e., the social representation of mathematics.
2.5 Social Representation: Mathematics Valorization and Devalorization

The cultural nature of mathematics is closely linked with the social representations of mathematics learning, what counts as mathematics, what mathematics knowledge is valued or not valued in which context, and the culturally defined “correct” ways of doing mathematics (Gorgorió & de Abreu, 2009). Even within the dominant population, it is often common to hear parents make statements that the current mathematics their children are learning is different from what they had experienced growing up. For instance, in recent times, there have been agitations by a group of parents in Ontario, Canada protesting what they see as “new math” (the inquiry approach mathematics) and are calling for what they call “going back to the basics” (e.g., memorizing multiplication tables, procedural math). For immigrant parents and their children, such dilemmas are likely vaster, considering that they were raised and educated in different cultural and educational contexts than what they are currently experiencing in the host country. These home-school differences have been described as home-school discontinuity, where learners have to juggle two opposing social practices (Gorgorió & de Abreu, 2009; Meaney & Evans, 2013; Meaney & Lange, 2013; Svensson, Meaney, & Norén, 2014). Research on home-school discontinuity has shown that families’ understanding of mathematics and practices in which they engage children in the home setting differs from that of the school. In other words, the interpretations and what families value as mathematics tend to be different from the school’s notion of mathematics. The belief about what counts as mathematics from a school perspective presents a challenge to the pedagogical transformation of community or household knowledge into mathematical knowledge for classrooms (Civil, 2016; 2007). Civil (2016) described one of her elementary school teacher candidates’ (Vicky) experiences engaging in open-ended problem-solving tasks. Civil (2016) noted that while most of her teacher candidates approached problems
in a more algebraic way, Vicky, the focal participant, used drawings to correctly reason through the problem. However, despite Vicky’s deeper understanding of the problem and her ability to relate the task to her everyday life, she did not seem to value her approach as much as that of her peers’ who used algebra. Civil (2016) concluded that “algebraic approaches were generally privileged by the teacher candidates in the course (as well as by many others in my many years of teaching mathematics content courses for preservice elementary teachers)” (p. 42).

Civil’s (2016) observation is indeed unsurprising. In general terms, conventional abstract math holds value over the everyday practice. Algebra holds similar privilege throughout Eurocentric/Western curriculums – and abstraction is where all school math efforts tend to lead. This appears to be an indication that the teacher candidate's prior schooling experiences where abstraction (e.g., use of algebraic expressions) seems more valued tend to shape their understanding of what kind of mathematics is considered more valuable, at what time, and in what context. In a similar vein, studies have documented parents’ differing views of what kind or form of mathematics they value. For instance, in my MA thesis (Yaro, 2015), I described how rural Ghanaian parents with no formal education draw on out-of-school activities such as business transactions to support their children’s mathematics learning. The parents in the study spoke highly of their children and praised them for their capability to efficiently calculate “change” when they are sent out to sell items along the streets. However, teachers in the study described these children mostly as low achievers in mathematics (Yaro, 2015). The schoolteachers did not value the mathematics capability of the children - their ability to efficiently calculate “change”- in local transactions or were unaware of these capabilities. Similar findings were reported in numerous other earlier studies (de Abreu & Cline, 2003; 2005;
Goldman & Booker, 2009; Guberman, 1996). More recently, Takeuchi (2018) examined immigrant parents’ involvement in early years mathematics learning, focusing on learning multiplication in in-school and out-of-school settings. The Filipino immigrant parents living in Japan described their finger multiplication methods as illegitimate in the Japanese context because it was contrary to the formal memorization method used there; as a result, they refrained from teaching their children the finger techniques or only “taught it to their struggling children” (p. 46). From Takeuchi (2018), the context of schooling plays a very important role in deciding what defines a culturally appropriate strategy of mathematics computation; while finger multiplication may be accepted as a legitimate calculation strategy in the Philippines, the same valorization is not apparent in the Japanese school context. This makes me wonder when coming to understand parental practices for supporting children’s mathematics learning, what form of mathematics representation is considered legitimate and who has the power to determine this legitimacy. Bishop’s (1995) notion of mathematics valorisation and issues of power (see Bourdieu, 1990) provides us with the language to theorize and critique practices in relation to whose culture of mathematics is valued and whose culture is represented. De Abreu & Cline (2007) write:

Valorisation is a relational construct. The same practice can be valorised or devalorised, depending on its positioning in a web of social and historical relations, which is relevant for the group or participant in a practice. Like currency, valorisations are not fixed. At a particular point in time they can change, depending on the positioning one takes on. (p. 121)
Different forms of mathematics may be given different valorization, and it is often the case that children, especially from marginalized communities or immigrants, become the ‘victims’ whose home mathematical knowledge may not be valued in the school context (Civil, 2012). I find the concept of valorization or de-valorization particularly important in my work with African immigrant families and their children. Particularly, immigrant parents who had their education in their home countries are likely to possess certain mathematics experiences that, perhaps, they valorize, but those experiences may not be given the same value in the host country. While parents may value their approaches and perceptions about what counts as mathematics, teachers or schools may not share similar habitus. Bourdieu (1982) defines habitus as a collection of informal skills, experiences and knowledge which people have constructed overtime. For mathematics success to be realized, Jorgensen (2015b; 2016a) has argued for the need for the reconstitution of the familial habitus in a way that does not require students or parents to “sacrifice” their home habitus in favour of the school, rather social practices of both worlds (home/school) could coexist. In the next section, I will discuss how immigrant families (re)negotiate home/school boundaries to adjust to their children’s mathematics learning in the new cultural context.

2.6 Parental Involvement Practices

Researchers suggest that there are different ways parents and families from different cultures provide mathematics learning support for their children. More recently, Anderson et al. (2016) drew on data collected during research with 32 parent-child dyads from multilingual, mixed socioeconomic backgrounds. The study focused on three South Asian dyads who played a mathematical board game for the first time. The researchers concluded that these three children
paid close attention to their parents’ nonverbal interactions as parents “enacted executive autonomy” by demonstrating to their children how the game is played and what they needed to do, a practice which appeared to be a culturally appropriate way of learning among these South Asian families, likely shaped by how parents themselves were taught (Anderson et al., 2016). Similarly, in Anderson, Anderson, and Shapiro’s (2005) study with culturally diverse parents and their 4-year-olds, the researchers suggested that shared-book reading is a potential resource for families to engage 4-year-olds children in mathematics learning. However, despite the prospects of shared book reading in the development of early mathematical concepts as noted above, the phenomenon (i.e., shared book reading) is not universal but rather more prevalent with middle-class Caucasian parents (Anderson, Anderson, Friedrich, & Kim, 2010). Thus, parents or families from different cultural backgrounds support their children’s mathematics learning, but the manner in which this is accomplished may vary from culture to culture and may also depend on the age group of their children. Although cultural and home activities are full of potential for teaching mathematics, it is still unclear whether African immigrant families bring with them similar cultural practices (or otherwise) to the host country or not. Are these cultural practices adapted or discontinued, and what new practices may arise when situated in the Canadian context?

Civil (2007) worked with elementary (Grades 1-5) teachers who conducted ethnographic household visits to learn about daily lived experiences of their students’ household chores and play in which families engage children within the home domain. Through such visits and interactions, teachers realized that many of these families have deep knowledge about construction, repairs, carpentry, household management, folk medicine, and farming, all of
which involve the application of mathematical knowledge and skills. Such everyday contextualized mathematics practices were consistent with the findings of a later study by Goldman and Booker (2009) with six families (parent-child dyad) from diverse sociocultural backgrounds in San Francisco, United States. Goldman and Booker reported that mathematical concepts such as “arithmetic, categorization, figuring percentages, solving for n, ratio and proportions, linear algebra, use of multiple data representations, scale, rate problems, mental calculation, optimization, and rounding and estimation” (p. 384) were embedded in those families’ daily practices. González (1996) earlier argued for “re-conceptualizing households, not as the source of barriers to educational attainment, but as repositories of resources that can be strategically tapped for the betterment of children’s learning” (p. 3). Since knowledge cannot be constructed in a social and cultural vacuum, family knowledge and resources are both situated in cultural and social spheres. Hence, African immigrant families’ cultural model of mathematics education: Habitus, lived experiences and perspectives would be rooted in their culture as practiced in their home country, and one would anticipate that such background experiences could be applied and utilized in supporting their children’s mathematics learning in the host country. That said, I do not suggest all African immigrants will engage in an absolute transfer of their culture and experiences from their home countries to a Canadian context. In other words, they may either engage in total or partial utilization of their previous cultural experiences in supporting their children’s mathematics learning in the new cultural context. Likewise, I acknowledge that there will be differences in cultural experiences across families despite all being Africans. Moreover, there is also a possibility of immigrants’ practices changing over time as they encounter a new school system and culture.
In the context of this study, I recognize that African immigrants’ practices in a Canadian context and how they support their children’s mathematics learning in the host country may be influenced by their encounter with European or Western practices or demands from the host country’s school system. Similarly, their children may be influenced by multiple cultural worlds because of immigration and families’ introduction into diverse cultures. Moreover, I am aware of differences in the generational gap among Afro-Canadians (or immigrants) which may also influence the degree of experiences and how immigrants construct their reality considering the culture, language, customs, and norms to which they are exposed to in Canada. How such cultural dynamics may play out in how African immigrant families support their children’s mathematics in the Canadian context is worth investigating.

2.7 Dealing with transitions: Families negotiating oppositional spaces

Gorgorio, Planas, and Vilella (2002) described immigrant children’s schooling as a transition because when they arrive in a new country, they have to cope with many changes as a result of moving from one culture to another. Specifically for children born outside the host country, they have moved from one culture of schooling to another if they have had any previous schooling. For those children with no schooling, they have moved from a no-schooling culture to school culture. For their parents, they have also moved from a school system they had experienced growing up to a completely new school culture with a huge responsibility of assisting their children to succeed. The term *border or boundary crossing* has been used widely to describe immigrant or refugee families’ experiences, including struggles of moving from their home culture to a different culture (Kumi-Yeboah, 2018; Meyer et al., 2019; Phelan, Davidson, & Cao, 1991). Drawing on Henry Giroux’s (2005) metaphor of border crossing, Meyer et al. (2019)
stated that, beyond crossing physical borders, refugees encounter cultural borders, wherein social codes, experiences, and language differ. Thus, borders or boundaries could be real or perceived cultural barriers between cultural “worlds.” Phelan et al. (1991) used the phrase “students’ multiple worlds” to denote students’ “cultural knowledge and behaviour found within the boundaries of students’ particular families/home, peer groups, and school…. each world contains values and beliefs, expectations, actions, and emotional responses familiar to insiders” (p. 225).

Although home-school is seen as two oppositional social spaces, their inherent tensions and conflicts disrupt the normative practices in each space and a new site for learning emerges known as a third space (Gutiérrez, Baquedano-López, & Tejeda, 1999), which is beneficial to the children. In this study, I refer to third space as supportive, safe learning space or practices that comes as a result of parents and children merging beliefs and practices from their home countries and that of the host country in fostering mathematics learning. For instance, these practices could be in the form of mathematics algorithms or strategies, beliefs and experiences drawn from multiple cultural contexts (home and host country) in support of the child’s mathematics learning in the host country. The process of creating “third space” is itself an adaptation and meaning-making endeavour as children begin to see the two oppositional social spaces as complementary learning sites. Immigrant families and their children will, in one way or the other, go through the process of transitioning through adaptations in their beliefs and practices in order to adjust to the dominant or new culture to create a space where practices in both home and school could emerge into a new learning opportunity. This transitioning process is ongoing and never-ending. As Meaney and Lange (2013) put it:
transitions between home and school occur on a regular basis and although learning may result in a reinterpretation of each context, the knowledge valued in one context would not be replaced by that from the other context. In these situations, learners have to learn how to juggle the discontinuities between the different social practices (p. 2).

The concept of transitioning as a process is important in interpreting African immigrant families’ experiences, particularly their struggles and potentialities in negotiating what is largely perceived as oppositional cultural contexts; home country and host country’s school/classroom cultures and experiences in relation to mathematics learning. For immigrant families, their children’s success or otherwise in mathematics learning will largely depend on how successful they are able to navigate the conundrum between multiple cultural contexts. Previous studies have shown that immigrant children experience cultural conflicts in terms of pedagogical approaches and algorithms they use (Civil, 2014). Civil, Planas and Quinotos’ (2005) study with low-income immigrant parents from Tucson affirmed differences in mathematics instruction immigrant children are used to in their home country compared to their new country. Civil (2012) cited one parent participant:

This is all new to us, new school, new country, new people. Our children did not have such problems with mathematics before: It is nobody’s fault! They must get used to the new mathematics (p.274).

This parent cited felt it was unavoidable for her child to experience such differences; she sees the school as helpless in addressing the needs or bridging the gap between children’s previous and
current mathematics experiences. For example, there is research pointing out that immigrant children experience different algorithms for arithmetic operations or variations in topics studied. In a study with immigrant students (14-16 years old) from diverse cultural backgrounds, Gorgorio, Planas, and Vilella, (2002) noted the different algorithms immigrant students bring into mathematics learning in a Catalonia school. A key finding from the study is that the inability to deal with cultural differences on the part of students slows the development of the potential that immigrant children have (p. 38). For example, the researchers described the case of Mohamed, an immigrant student whose teacher diagnosed him as not knowing the basic mathematics algorithms. He spent two years in school learning how to subtract. When Mohamed moved to another school (in the same country) the following year, his new teacher asked him if he could do simple subtraction.

Interestingly, Mohamed showed his new teacher his own way of subtracting $314 - 182$, which was quite different from what the textbook modelled, thereby indicating that Mohamed’s former teacher did not acknowledge his prior knowledge, which appeared different from what is modelled in the textbook. Similarly, Gorgorio and De Abreu (2009) noted differences in long division approaches across immigrants from four Spanish-speaking countries, namely, Mexico, Chile, Spain, and Ecuador, despite noting the consistency in the language spoken by the immigrant children in the study. The researchers concluded that although some teachers in the study were receptive to different algorithms used by immigrants, others were not only dismissive but also threw up their hands in despair. Teachers’ reactions demonstrate that some of them saw cultural diversity in different math problem-solving approaches as problematic instead of seeing it as a source of richness for mathematics learning hence further widening the home/school
dichotomy and making the transition process traumatic for immigrant children.

To better interpret immigrant children’s (and their families’) transitioning processes within home-school social practices, it is important to consider the nature of the transition process they are likely to encounter (De Abreu et al., 2002). De Abreu et al.’s (2002) notion of “collateral transitions” offers a perspective in examining potential transitioning processes of immigrant parents and their children. They defined collateral transitions as involving individuals' relatively simultaneous participation in two or more historically related or unrelated activities requiring one to possess skill sets that allows him/her to participate fully in each given social context without, or with minimal, difficulty. In relation to immigrant children’s mathematics learning, I view collateral transitioning as a form of mechanism or adaptation skill in negotiating home-school as learning spaces. The transitioning process could render either positive or negative experiences to immigrants. For example, one of the participants in Civil et al.’s (2005) study, described how she sees her son’s different strategy for division as an additional learning opportunity for her.

If your child brings something home that you don’t know then you should not say “I don’t know” right away, don’t be so negative, “I’m going to try and we’ll learn together” so they don’t get discouraged and so they’ll come to you later. I waited to see if my kid understood what the teacher taught him. I wouldn’t say one way was better than the other but say that there are different ways to do all sorts of things (p. 275).

Civil et al.’s (2005) participant appreciated and valued different strategies of approaching mathematics tasks and knowing that both strategies could simultaneously co-exist without
putting a premium on one over the other (Jegede, 1997; Jegede, & Aikenhead, 1999). Other examples of collateral transition could be seen in studies of teachers and students drawing on community-based knowledge and wisdom in their classroom literacy practices (González et al., 2006) and mathematics learning (Civil, 2016; González, Andrade, Civil, & Moll, 2005). In essence, home and school practices collaterally co-exist, and perspectives from both contexts are used to make meaning of a learning situation. Just like other immigrant families, African immigrant families are likely to experience similar transitioning from their home country’s school culture to Canadian school culture; hence, it is important to investigate how this immigrant group supports their children’s mathematics learning as they negotiate such transitions.

2.8 Language and Mathematics Learning

Research in language and mathematics learning is largely drawn from Vygotskian sociocultural theory of learning, in which language is seen as a cultural tool and the role of the teacher is to mediate between students’ informal understandings and formal mathematics concepts (Barwell, 2018). In addition, from an African perspective, I view language as central to human identity, as it denotes and communicates who we are and our relationship with the community. Based on research from different bilingual and multilingual mathematics classroom contexts, it has been established that the use of two or more languages in mathematics classrooms is productive and beneficial to the learner, countering the previously held deficit views that position bilinguals and multilinguals as less capable academically (Barwell, 2018; Barwell, Barton, & Setati, 2007; Leith & King, 2016; Civil, 2016; de Araujo, Roberts, Willey, & Zahner, 2018; Maluleke, 2019; Moschkovich, 2010; Parvanehnezhad & Clarkson, 2008; Planas & Civil, 2013; Salehmohamed
& Rowland, 2014; Setyaningrum, 2015; Xenofontos, 2015). Assuming a socio-political stance, Setati (2005) argued that decisions about which language to use, how to use it, and what purpose are both pedagogic and political. In the school context, for example, the non-neutrality of language is particularly obvious in bilingual and multilingually diverse classrooms where some languages are perceived as important due to situational and ideological differences, power, and rights and privileges accorded to them through the state-sanctioned language policies (Barwell, 2012; Moschkovich, 2010; Planas, 2011). In other words, the school curriculum and mathematics classrooms become a place of enfranchising one group’s linguistic capital and disenfranchising another’s (López-Robertson & Schramm-Pate, 2013). Barwell (2018) described the net effect of language stratifying (i.e., privileging one form of language over the other) as producing two kinds of socio-political tensions (centripetal and centrifugal forces). Barwell (2018) wrote:

This stratification arises from the inherent tendency in language towards uniformity (a “centripetal force”). When people work together on a common activity, for example, the language they use tends to homogenize in some respects to facilitate communication. Hence, in mathematics, the use of particular terms and expressions becomes widely used and standardized. This centripetal force is in constant tension with an opposing tendency towards novelty and variation, i.e., heteroglossia (a “centrifugal force”) (p. 162).

Within the centripetal force, proficiency in the official language or language of instruction then becomes a marker of class, status, or worth and a criterion for assessing one’s eligibility to study in academic institutions such as schools (Barwell et al., 2007). In their quest to succeed academically and break social stereotypes, the immigrant bilingual or multilingual learner has to
master the official language or the language of instruction of their host country while keeping their home language which identifies them as Africans (Wa Thiong’o, 1992). For instance, for African immigrant families on the West Coast of Canada, it is typical that the official or language of instruction is different from their spoken language at home or the mother tongue (L1); however, immigrants acknowledge that they still have to master the host country’s official language as this will provide them with an added capital (Bourdieu, 1990). The classroom then becomes an arena to negotiate these language inequalities, where mostly, the marginalized group or those whose language is not given the same valorization as the dominant group find themselves in the forefront of this negotiation. As a way of negotiating this space of inequality and disenfranchisement, bilingual and multilingual mathematics learners deploy their hybrid language identity in making sense of mathematics (Planas, 2011). Hybridity is a theoretical concept that displaces conceptual boundaries between discourses that are generally seen as distinct (Gutiérrez et al., 1999; Planas, 2011). Hybridity, or what is also known as third space, acknowledges contesting or conflicting opinions, knowledge or understanding and calls for pedagogical approaches that bridge the gap between official (school) and unofficial (home) practices in children’s development and learning (López-Robertson & Schramm-Pate, 2013). Hinged on the above understandings of hybrid spaces, I see language identities in mathematics classrooms as fluid; bilingual or multilingual learners having the degree of agency as to how they construct meaning or make sense of mathematics by drawing on all their language repertoires – the official and non-official print, text, or oral expressions. In a study with ten 13-year-old students who were Spanish and Catalan speakers in Spain, where Catalan is the language of instruction, Planas (2011) examined the students’ written responses to the question, “what language do you use during group work in your mathematics class and why? (p.129). Planas
(2011) concluded that despite the monolingual language policy in the Catalan school context, students pointed to the “effective existence of two languages in their classroom and their behaviours, an indication of students’ hybrid language identities” (p. 137). Planas (2011) emphasized that

it is not that the students in the study do not know a word or sentence in one of the languages and are then forced to switch, nor is it that the switching is attributed to external impositions. Changing language is rather shown as a consequence of the interest in including all speakers (p. 138).

The fluidity in language usage in making sense of mathematics concepts or articulating one’s mathematical ideas or understandings is a way of demonstrating how bilingual and multilingual learners negotiate their complementary language identity in mathematics classrooms contrary to the monolingual ideologies in many school contexts (Barwell, 2012; de Araujo et al., 2018; Planas & Civil, 2013).

Although Planas (2011) did not label her study participants’ practices as translanguaging or code-switching, her participants’ seamless use of both Spanish and Catalan embodies these linguistic practices. In sociolinguistics, translanguaging has been conceptualized as “the deployment of a speaker’s full linguistic repertoire without regard for watchful adherence to the socially and politically defined boundaries of named (and usually national and state) languages” (Otheguy, García, & Reid 2015, p 283). In a more expanded view, Vallejo and Dooly (2020), drawing on García & Kleyn’s (2016) notion of translanguaging, added that, indeed individuals
not only draw on the linguistic features of their repertoire but also those that they embody (e.g.,
their gestures, their posture), as well as those outside of themselves, which through use become
part of their bodily memory (e.g., computer technology). Building on Otheguy et al. (2015), I see
translanguaging as a more encompassing description of how bilingual and multilingual learners
use language, and also as a more fluid way learners perform their identities through utilizing
their linguistic repertoires (verbal, non-verbal, texts, gestures digital tools etc.) as compared to
code-switching, which involves alternating between two languages during communication. To
me, translanguaging serves as a means by which learners exhibit their “hybrid linguistic
identity,” choosing how they want to be identified, how they wish to express themselves and
make meaning in a manner that portrays their multiple, plural and complex identities as humans
(Lauwo, 2019). Therefore, it would not be far-fetched to conclude that in mathematics classroom
contexts, bilingual and multilingual learners are likely to draw on their language repertoire to
make sense of mathematics concepts and to express their mathematical ideas. A typical example
of translanguaging in mathematics classrooms could be seen in Barwell’s (2018) study in a
Grade 3 mathematics class in a French immersion program in Ontario, Canada, where schools
offer French immersion programs for English speakers to develop their fluency in French. From
class observations and audio-recorded interactions during students’ interactions on the
mathematics topic of “capacity,” Barwell noted that students drew on their repertoire from both
languages in reading the text of the task and orally formulating the wording of their written
responses. He described students’ translanguaging practices as follows:

they do not find meaning in each language separately; rather, they relate aspects of
English to aspects of French, often in quite systematic ways. For example, when Kyle
says to Sara “two c’est deux um litres (writing) « deux litres » (2.0) just do two and a capital L”, his alternation from “two” to “deux” and then back to “two” contributes to the development of the two students’ written response in French, and the meaning of these words, through relating it to equivalent words in English (Barwell, 2018, p. 163).

From Barwell’s (2018) work, it can be gleaned that the use of linguistic repertoire from both English and French in a fluid manner is an indication of the student's awareness of their linguistic identity as bilinguals. Similarly, Parvanehnezhad and Clarkson (2008) studied language switching among sixteen Year 4/5 Iranian bilingual students during mathematics problem-solving. The researchers concluded that most of what the students know was embedded in their LI social context, and they found it easier to communicate their mathematics ideas in their LI (Persian language) during problem-solving. Although some scholars have indicated that switching during mathematics learning does not mean students are deficient in one language per se (Barwell, 2009; Moschkovich, 2012; Parvanehnezhad, & Clarkson, 2008;), in many cases, teachers and schools, in general, misconstrue this as such (Barwell, Barton, & Setati, 2007). Clarkson (2009) argued that translanguaging if it is encouraged, could be an asset for educators to better understand children’s thinking during problem-solving. It could go a long way in enhancing the mathematical competencies of students, especially at the time students are still trying to grasp the foreign language of instruction (Xenofontos, 2015). Thus, in some cases, students placed in “special classes” are those who find difficulties in communicating in the language of instruction (Clarkson, 2009). Unfortunately, mathematics teachers are implicated in this situation. Civil (2012) shared a story of one immigrant parent called Eugenia in her case study. Eugenia’s daughter’s mathematics teacher recommended testing the child for a learning
disability or switching to another school because her child failed to communicate effectively in English during instruction. However, she could communicate her ideas fully in Spanish to her mother. Eugenia found it difficult to explain to the teacher that her daughter, in most situations, did not understand the foreign language of instruction (English). The teacher went ahead with the learning disability assessment. Fortunately, it turned out that Eugenia’s daughter only had a challenge understanding and communicating her mathematical ideas in the language of instruction (L2). Just like Eugenia’s daughter, there might be many bilingual and multilingual students who struggle to communicate their thoughts in the language of instruction despite their capability in doing so in the L1. Thus, the inability of bilingual or multilingual learners to express themselves in English does not necessarily mean they are intellectually incapable (Jorgensen, 2015b; Moschkovich, 2010).

Studies in language and mathematics have also examined teachers’ code-switching in upper primary mathematics classrooms in South Africa, where English is the L2 and Tswana, the first language of most of the students in the class. Setati (1998) identified the frequencies of code-switching by counting instances of utterances in English and Tswana. Setati concluded that teachers’ code-switching was used in the class for three main purposes; explanatory (teacher illustrates facts and elaborates on them), informatory (teacher gives information or clarification) and regulatory code-switching (teacher gives direction and maintains control). Although instances of direct translation were not a common code-switching practice among Setati’s teacher participants, one conclusion was that, regardless of the nature of code-switching, the practice was an education resource that allowed teachers to teach mathematics concepts freely and enabled students’ understanding of these concepts. Similarly, in the context of Mauritius,
there are three main languages: English (the medium of instruction), French (the language of the media and high-status language), and Creole (the local language of the majority of the Mauritians). Salehmohamed and Rowland’s (2014) study reported that in secondary mathematics classrooms, teachers preferred to switch from English to French and teachers’ main reason for doing so was to reduce social barriers between them and their students (p. 565). However, Salehmohamed and Rowland noticed that teachers rarely used Creole, which is the local language students speak. The authors explained that the rare use of “Creole in the classroom could be their awareness of the lower status of the language in Mauritian society, and the [perceived] inappropriateness of its use in an educational setting” (Salehmohamed & Rowland, 2014, p. 566). This is an indication that sanctioned language policies are sometimes detrimental to local languages as they tend to decimate the status of local languages of communities while elevating foreign languages and, in their worse form, suppress multilingual and bilingual students from confidently exercising their linguistic identity.

Through a socio-cultural and ethnomathematics lens, mathematical knowledge and thinking can be generated in any language and all cultures; hence limiting mathematics teaching and learning to one language (state-sanctioned language of instruction) for me, is problematic because it simply denies the hybrid identity of bilinguals and multilingual learners. Studies on code-switching, and translanguaging, in bilingual and multilingual classrooms across cultural contexts have indeed shown that such linguistic practices, if encouraged, can be a resource in children’s mathematics learning (Maluleke, 2019; Parvanehnezhad & Clarkson, 2008; Setati, 1998). However, one wonders how bilingual and multilingual parents negotiate their hybrid language
identities when interacting and supporting their children’s mathematics learning in the home context.

2.9 Technological Resources and Family Involvement

Access to technological/digital tools has become ubiquitous in many homes and classrooms, especially in advanced countries like Canada (Orlando & Attard, 2016). However, due to this proliferation of digital tools in this fast-paced technological world, some parents, educators and other professionals are concerned that children will be “glued” to technologies to the extent that they might no longer engage in traditional childhood outdoor activities as we use to see in the past. However, some studies have indicated otherwise. For instance, Teichert and Anderson’s (2014) study investigated the role of digital media in the life of a five-year-old girl in a middle-class home in Canada. The researchers indicated that despite being surrounded by digital tools, the opportunity for “social (i.e. with other family members) or independent artistic creation, through her print-based drawings, seems to be what is most important to her” (Teichert & Anderson, 2014, p. 1688). Thus, children’s access to technology does not always mean they will no longer be interested in their childhood outdoor activities in favour of digital tools.

In mathematics education, studies have documented the affordance of technology in children’s mathematics learning (Jorgensen, 2015a; Lewin & Luckin, 2010; Orlando & Attard, 2016). In relation to parental involvement, Lewin and Luckin’s (2010) study documented two large-scale projects in the United Kingdom (UK), the ICT Test and Homework Project. The two projects were purposely designed to bridge the home-school gap through the use of technology – software and web platforms, in particular, “providing parents with access to information about their
child’s homework, progress, attendance and behaviour” (Lewin & Luckin, 2010, p. 752). Both projects provided specific guidelines to parents to engage their students. For instance, the homework project software had interactive collaborative resources to encourage children and their parents to work on mathematics tasks. The ICT and Homework projects are state-sanctioned projects and are purposely designed technological tools to engage parents in their children’s learning across various subject areas, including mathematics. In instances where there are no such state-sanctioned projects like those reported in Lewin and Luckin’s (2010) study, how would parents use the technology available to them to support their children’s mathematics learning? Specific to immigrant families, literature on the intent or rationale of immigrant families’ use of technology/digital tools to support their young children’s mathematics learning appears scanty. In other words, how do immigrant families leverage technology and other digital tools as capital to support their children’s learning in the host country?

Based on the literature reviewed so far, the positioning of mathematics as a gatekeeping subject through state and international policy documents tends to shape the perceived relevance parents and children attach to mathematics learning, and the kind of mathematics parents want (or do not want) their children to learn at school (valorization or devalorisation of mathematics). Similarly, parents’ cultural model of mathematics education or prior experiences of mathematics informs how they support their children’s mathematics learning at home: the mathematics strategies and algorithms to use. Specific to immigrant children, expressing their hybrid language identity (bilingual or multilingual) through translanguaging in a mathematics classroom context is an enabler and not an inhibiter to their mathematics learning. While technology provides many
affordances to children’s mathematics learning, it is, however, unclear how immigrant families utilise available home technologies to support their children’s mathematics learning.

2.10 Theoretical Framework

This study is informed by Afrocentric worldviews or paradigm (Asante, 1989; Asante & Mazama, 2005; Asante, 2014; Mkabela, 2005) and Bourdieu’s (1990) concepts of cultural capital and habitus. I will first discuss each theoretical perspective in order to provide a more detailed and broader understanding of them. Then, I provide a synthesis of relationships and connections among these theoretical frameworks and how they inform my interpretations of the experiences, dispositions and cultural capital of Africans or Africans\(^3\) in diaspora (immigrants and Afro-Canadians) and how they support their children’s mathematics learning.

2.10.1 The Afrocentric Paradigm

Afrocentricity could be better understood as a “paradigm” rather than a mere “category of thoughts”. Paradigm, as a philosophical concept, has been well elaborated by Thomas Kuhn (2012) in his landmark publication, *The Structure of Scientific Revolution*. Paradigms, according to Kuhn, are sets of beliefs, methods, and standards of problem-solving held by a scientific community. Kuhn (2012) added that the scientific community’s mode of operations is guided by various cognitive apparatus; symbolic generalization, models and exemplars. Kuhn’s definition in the natural sciences is still largely relevant in defining thoughts and worldviews within the \(^3\)Africans: “Wherever people declare themselves as African, despite the distance from the continent or recentness of their out-migration, they are accepted as part of the African world. Thus, the Indigenous people of Australia and New Guinea are considered African and in a large context subjects for Africalogists who maintain a full analytical and theoretical discussion of African phenomena” (Asante, 1990, p. 15).
humanities and social sciences. Drawing on Kuhn’s notion of paradigm, I argue, Afrocentricity consists of various African worldviews, set of beliefs, and philosophies that guide inquiry and analysis. These worldviews are clearly distinct regarding their unique African cultural and historical traits. They are in fact rooted in the beliefs and practices of Africans and shared by a community of scholars (Afrocentrists) who employ them in the process of inquiring, analysing, and interpreting phenomena or human interaction. The idea of African centeredness, that later became Afrocentricity, could be credited to forefathers who believed and championed African and Black liberation across the globe; Kwame Nkrumah of Ghana, Nelson Mandela of South Africa, Julius Nyerere of Tanzania, Anta Diop of Senegal, Jomo Kenyatta of Kenya, Marcus Garvey of Jamaica, Martin Luther King Jr. of United States of America and so on. As an intellectual paradigm, the term Afrocentric, or Afrocentrism, was first coined by Mole Asante, a leading scholar in African American studies (born Arthur Lee Smith, Jr) in the late 1980s. In his subsequent works such as in the 1990s and beyond, Asante provided a discourse on method and language in Afrocentricity. In all of his works, Asante has been consistent in his description of Afrocentricity. In his book chapter titled *Afrocentric Idea in Education* (1991), Asante described “Afrocentricity” as a frame of reference wherein phenomena is viewed from the perspective of the African person. The Afrocentric approach seeks in every situation the appropriate centrality of the African person… as an intellectual theory, Afrocentricity is the study of the ideas and events from the standpoint of Africans as the key players rather than victims (Asante, 1991, p. 172).

What are the characteristics that distinguish Afrocentricity from other paradigms? In the next
section, I discuss the tenets of Afrocentricity in light of axiology, cosmology, and epistemological orientation.

### 2.10.2 Axiological Orientation of an Afrocentric Paradigm

The axiological dimension of Afrocentric analysis takes into consideration values and ethics in search for truth and advancement of knowledge. In the context of an Afrocentric paradigm, questions of axiology interrogate the African values, which one holds and applies in the Afrocentric analysis. To better understand the axiological orientation of African centred perspectives, I will contrast it with Euro-American-oriented worldviews. Venon Dixon’s (1977) early work enables us to carry out this exercise. Dixon, with the aid of a diagram (see Figure 2.1 below), discussed the distinction between the two worldviews; Euro-American and African-oriented worldviews.

![Figure 2.1 African-oriented and Euro-American oriented worldviews (Dixon, 1977, p. 123)](image-url)
From Figure 2.1 above, Dixon (1977) described the dominant value-orientations in the Euro-American worldview as that of the Man-to-object\(^4\) relationship as opposed to Man-to-person relationship in the case of the African worldview. In other words, the two worldviews examined human relationships with the external or phenomenal world (other men, things, nature, invisible beings, gods, wills, powers, etc.). It is worth noting that the philosophical traits of a particular worldview in this discussion do not necessarily characterize the people in that ethnic group. Neither are they attributed to a particular race or colour. This implies that regardless of one’s race, he/she could hold either worldview or even both.

In a Euro-American worldview, people exist as individuals rather than groups, hence giving way to an individualistic lifestyle. As Dixon (1977) argued, in the Euro-American worldview, “the responsibility of the individual to the total society and his place in it is defined in terms of goals and roles which are structured as autonomous” (p. 124) as opposed to the collective. In research practices, an Euro-American worldview lends itself to the notion that the reality is always “out there” for which man needs to work towards to apprehend and the task of the individual here, as Asante (1991) rightly puts it, is to “predict human behaviour in order to advance more direct control over nature” (p. 28).

Contrarily to a Euro-American worldview, African-centred worldviews (see fig. 2.1) depict non-separation of man, nature, and the invisible (supernatural). The existence of these creates a unified and complete entity or a whole. The “self” immersed in the world and everything else

\(^4\) Man: The word man in this paper does not refer to man as in gender. Instead, it refers to humans in general.
(apart from the self) influences the self. The self must, therefore, internalize and personalize the phenomenal world (Dixon, 1977) and thrive in harmony between man and nature. In this worldview, magic, sorcery, or pour of libation are not necessarily to bridge the gap between man and nature but instead, the use of forces in nature to ensure continuous harmony between man and the phenomenal world (Dixon, 1977). For instance, there is interdependence between the observer/observed, subject/object, the speaker/audience, and dancer/spectator (Asante, 1991), and each partner is as important as the other. Separation of any kind is therefore considered artificial.

The interconnectedness of all things translates to the social lives of African people. The individual is a non-existent being without the community or the collective society. Who you are comes as a result of your relationship with the community. As Karenga (1997) noted: “Personhood is a process of becoming rather than a simple state of being. Personhood is achieved not simply by existence but by successive stages of integration in the community” (p. 37). As a result, the community has the responsibility to ensure the wellbeing of the individual.

On the other hand, the individual in the community has the responsibility to ensure the continued survival of the entire group or community by taking up responsibilities and roles that will ensure the benefit of the community. Thus, communalism prevails in the African worldview rather than individualism. In this sense, “communalism refers to the individual becoming conscious only in terms of other people of his own being, duties, privileges and responsibilities towards himself and others” (Dixon, 1977, p. 129). It is not uncommon for an individual to share with his/her
relatives (both nuclear and the extended family) and kinsmen his/her grief or happiness. This is evident in the manner burial and marriage ceremonies are organized as a community affair rather than just a family. The communal and social nature valued by Africans is eloquently expressed by the famous African Nobel laureate in literature, Chinua Achebe. Achebe (1994) wrote:

A man who calls his kinsmen to a feast does not do so to save them from starving. They all have food in their homes. When we gather together in the moonlit village ground, it is not because of the moon. Every man can see it in his own compound. We come together because it is good for kinsmen to do so (p. 60).

Again, Achebe’s assertion of togetherness and care for others in the community resonates with a popular story of a Western anthropologist who visited the Ubuntu tribe, an indigenous tribe in South Africa. The anthropologist decided to study the social behaviour of Ubuntu children. The researcher proposed a simple game, and the children were interested in partaking. He placed a basket full of fruits under a big tree and told the children that whoever gets there first would win the entire basket full of fruits for him/herself. He lined up the children and blew his whistle to signal a start. Interestingly, the children held each other’s hand and ran together for the basket, and sat in a big circle, and enjoyed the fruits together. This surprised the anthropologist. So he asked them why they waited for each other instead of one person enjoying the fruits. The children smiled and replied, “Ubuntu, how can one of us be happy if all the others are sad?”
These and other stories demonstrate the value placed on a sense of community and sharing among African people. How, then, might this idea of collectivism or communalism inspire education and research in general?

The African value orientation of oneness or communalism redefines the concept of family as going beyond the nuclear to include extended members (uncle, aunt, nephews, niece, nannies, grandparents, elders in the community, etc.). This is important, especially in research with African immigrant families, as researchers ought to understand the broader definition of “family” as encompassing. This conceptualization of “family” shapes the expected roles and responsibilities of the family and community in terms of children’s upbringing and education. Per my experience growing up in Ghana and also living and interacting with the African community in Vancouver, the upbringing of a child (including his/her mathematics learning) is entrusted in the hands of the entire community; close relatives, extended family members, Nannies (as “Aunties” are affectionately called by African children) and neighbours. Older people (e.g., grandparents) form part of the extended families and live with the families in the same home or compound rather than nursing homes, as may be the case of most Western communities. Africans believe old age comes with wisdom and a better understanding of the world (Dei, 1996; Dei & Kempf, 2013). As a result, older people are revered and seen as models/counsellors or advisors for the younger children. Parents, siblings and other adults in the family and the community see it as a responsibility to guide the child through what is deemed appropriate in the cultural context of the society in terms of education, moral standards, societal norms, and social responsibilities.
On the other hand, children see every adult in the community as a mother, father, uncle, brother or sister regardless of the close, distant or no blood relationship and hence, accept to be corrected, guided, or mentored through the socialization process. From my personal experience, it does not come as a surprise to me when some Africans in the church I attend here in Vancouver phone me or even approach me after church service to seek mathematics homework assistance for their children. Also, parents are comfortable taking their children to other familiar African neighbours for homework support. This might look very different from most urban Euro-American (Euro-Canadian) neighbourhoods where in most cases neighbours, may seem less familiar with one another, and often one does not know the name, let alone academic abilities, of the other. Such an African value orientation towards communalism in an axiological sense means that each child’s education is not the sole responsibility of the nuclear family as it may be the case in Euro-American communities. Instead, the extended family, neighbours, and community also play a crucial role in children’s mathematics learning and learning in general. The sense of community also translates to Africans participation in a research process as subjects and human agents rather than objects (Mkabela, 2005).

2.10.3 Cosmological Orientation of Afrocentric Worldview

Cosmology, from an Afrocentric perspective, deals with issues of reality and creation in consonance with the culture, society, and history of the African people (Akoto & Akoto, 2005; Asante, 1990). Legends, literature, and other oral traditions constitute the mythology of African people (Asante, 1990) and shape the reality and thought within the African culture and context. In African cosmology, language is considered paramount as it serves as a conduit for socialization and transmission of oral traditions and values. For Africans, language is not just an
isolated entity used to convey information in classrooms or formal settings. Instead, language is embedded in the social practices and cultural context within space and time (Bakhtin, 1986; Culler, 1976). Within the African context, language in most cases identifies “who you are” because it is intertwined with personal and cultural identity. Indeed, it holds people’s worldview as all forms of values, norms, thought processes are expressed through the various languages we speak. For research with African immigrant parents and their children, it is important to pay attention to their daily use of “language” at home, as it forms a core part of the cultural identity of African people. For instance, what language(s) is/are being used at home, and how is the language used to express their identity during interactions, especially when parents support their children’s mathematics learning at home.

The cosmology in an Afrocentric paradigm seeks to tease out or question the role culture plays in African people’s interaction with the universe, including the metaphysical world (belief in traditions such as ancestral spirits, gods, etc.). In other words, the basic assumption of Afrocentric inquiry is framed around Africans’ orientation to the universe and how Africans form thoughts and realities. The cosmology is what some scholars have referred to as the common culture themes and this in part explains why some scholars have suggested most Africans trace their ancestral genealogy to one ancestry (Schiele, 2017). Hence, across the globe, it is usually claimed that Africans have some common cultural traits, which informs their interactions and way of life in the communities in which they live. However, within these cultures, one can find some degree of diversity or variance among them. For instance, in research with African immigrants from different countries, it is expected that there will be both similarities and differences in their experiences as a result of their encounter with a new culture,
such as how each parent is negotiating their cultural transitions, how they have adjusted or are adapting to the Canadian culture and school system.

2.10.4 Epistemological Orientation of Afrocentric Worldview

Every research paradigm defines for its inquirers or researchers what they are about and what falls within the ambit of legitimate inquiry (Guba & Lincoln, 1994). Epistemological assumptions of research address what constitutes the quest for truth and how knowledge is constructed. In other words, how do people create knowledge, and how is it conveyed and assessed? Epistemologies are tied inherently to historical periods, culture and ideologies. The questions we ask about the “world and human behaviour reflect our life experiences, culture, and historical development” (Nkulu-N’sengha, 2005, p. 2). An African centred approach to knowledge is evident in the social way of life (collectiveness), language, creation myths, stories, proverbs, folklores, artworks/traditional symbols and other oral traditions (Asante, 1990; Oyebade, 1990, Verharen, 2002). The collectiveness or social way of life depicts that knowledge is collectively or socially constructed. Phrased differently, the reality is constructed by individuals interacting with their social worlds (the physical and the supernatural). African epistemology rejects the Cartesian dichotomy of object/subject where the researcher (subject) becomes the neutral observer seeking or searching for the truth that exists outside itself (object).

Following non-dualistic ontology, Mkabela (2005) suggest that Afrocentric researchers should depart from what he/she called “alienated mode of consciousness,” which perceives the knower as separate from the known, [to what he terms] as “collective mode of consciousness” which emphasizes the interconnectedness of the self and the world or self and the other (p. 185). In this
study, my participants and I were both negotiators of the path towards truth and construction of meaning, through conversations and dialogues on how we as African immigrant parents and stakeholders in our children’s education could support our children’s mathematics learning in a new cultural context like Canada. In the context of this study, I respected participants’ oratory mode of communication as they express their views and experiences through their personal stories.

In summary, Afrocentricity employs worldviews, myths, motifs, symbols embedded in African culture to reinforce the centrality of the African as a valid frame of reference to inquire, understand and analyze problems related to Africans (Asante, 2005; 1999; 1990; Dei, 2012; Karenga, 1997; 1996, Mazama, 2001; Schiele, 2017; 1994). Since human experiences are grounded in places, cultures and within time-space, the worldviews established within the socio-cultural and historical experiences of African people become a useful reference point to better interpret African immigrants’ families and how they support their children’s mathematics learning in the host country. However, these socio-cultural and historical experiences (habitus) (re)produce various forms of cultural capital (Bourdieu, 1990) that African immigrant families deploy in support of their children’s mathematics learning.

2.10.5 Theoretical Concepts of Bourdieu

In this section, I will explore the philosophical assumptions of Bourdieu’s key theoretical concepts (habitus, field, practice, and capital) and establish how a combination of them could help us better understand the relationships and complexities between immigrant
family/community (background), cultural capital, field and habitus and immigrant children’s mathematics learning and learning in general.

_Habitus_, according to Bourdieu (1994), is a property of social agents (whether individuals, groups or institutions) that comprises a “structured and structuring structure” (p.170). Habitus is structured by our past and present circumstances and influenced by our family background or educational experiences and a structuring in the sense that our behaviours acquired as a result of family or social or educational experiences helps to shape one’s present and future. In Marsh’s (2006) interpretation of Bourdieu’s habitus, the author described the theoretical concept of habitus as a set of dispositions created in an individual over time and shaped by structural elements in society, such as the family or school. These dispositions affect how one behaves. Habitus also connects the

social and individual and as a result, one’s lifetime experiences may be unique in context and contents, but are shared in terms of their structure with others of the same social class, gender, ethnicity, sexuality, occupation, nationality, region, and so forth (Maton, 2008, p. 53).

Habitus appears to receive the most criticism of Bourdieu’s work. For example, King (2000) argued that the habitus relapses against Bourdieu's intentions into the very objectivism which he rejects; however, King (2000) acknowledged that the concept of habitus had contributed tremendously to the agency–structure debate. In my own terms, the concept of habitus in Bourdieu’s work helps us to better understand how one’s background (family, cultural or social)
influences behaviour, thoughts and responses to cultural differences. Of course, habitus does not act in isolation but rather interlocks with concepts such as *capital* and *field* to reproduce what Bourdieu described as a *practice*.

According to Bourdieu (1982), different forms of *capital* such as cultural, social and economic compete for recognition in a *field* (e.g., education). Bourdieu (1982) defined *capital* as the valued resources underlying actors’ interactions and their relationships with society. Cultural capital reflects the way of doing and being acquired through an ongoing process of socialization (Bourdieu & Passeron, 1990). Social capital denotes the social network the individual develops through his/her life, while economic capital refers to material goods. The forms of capital are defined through social relations between agents that comprise the social order within a given society (Schneidhofer, Latzke, & Mayrhofer, 2015). Moore (2008) summarized some features of cultural capital as follows:

(a) they are acquired over time

(b) they are acquired through the systematic process of inculcation

(c) they differ in terms of their transposability across fields (p. 114)

In education, cultural capital refers to the knowledge individuals acquire throughout life experiences and is largely influenced by family background, social class and sociocultural experiences. Bourdieu’s concept of capital helps to interrogate issues of power in that some knowledge counts more highly than others, and some dialects are better than others. Of course, what counts and what is better is determined by people who have more power in society. For
instance, in mathematics learning, learners approach every learning situation with acquired cultural capital, which could impact their new learning. For example, what practices are considered to be mathematics, what mathematical strategies are valorized or devalorized, and who has the power to make these decisions? Again, from my experience and interaction with immigrant families, it appears most immigrants are proud of their culture, and through intergenerational learning, they transmit such cultural values and ways of knowing as they raise their children in a totally different cultural context like Canada. These could be language, cultural norms, traditions and values, or even mathematical computation strategies. All of these constitute repositories of cultural capital children may carry with them to mathematics learning situations. However, these repositories of capital may differ from family to family and are valued differently in the dominant culture. Although, ethnomathematics researchers (e.g., Ascher, 1991; Babbitt, Lachney, Bulley, & Eglash, 2015; Bourdieu, 1990; D'Ambrosio, 2006; Rosa, Shirley, Gavarrete, & Alangui, 2017) have been arguing for valuing mathematics in different cultures and other alternative forms of mathematics knowing, how immigrants enact their cultural experiences and alternative forms of mathematics “away from home” (i.e. host country) is not adequately addressed through ethnomathematics studies.

Bourdieu (1990) defined “practice” as routine behaviours, the patterned sociocultural activities in which individuals engage. This implies that within a field like education, people have varying dispositions or behaviours (habitus) as a result of the different cultural and social capital they bring with them regardless of the socio-cultural context they may come from. In other words, no matter what our background, we all bring this “baggage” with us and that the “baggage” of some aligns well with the practices of societal institutions and the “baggage” of others does not. In
mathematics learning situations, a *practice* could be formed as a result of the individual’s habitus and cultural capital they possess, which are then mostly transferred and utilized or applied in mathematics learning classrooms. However, this will not be the case for those whose “baggage” does not align with the practices of the institution. For instance, a child from rural Ghana may approach a new mathematics learning situation like the concept of money with his/her prior home experiences in “giving and receiving correct change” in local business transactions (Yaro, 2015) but those practices are usually not considered mathematical by school teachers in North America and hence, are less valued in the mathematics classroom context (Yaro, 2015). In Li’s (2003) study with Canadian immigrant families, she employed Bourdieu’s capital theory to examine the politics of schooling that may have hindered Liu’s family's possibilities for educational success. The researcher concluded that the “school's literacy and cultural practices, which were incongruent with those of the family, failed to respond to "the perceived psychological needs of the developing child, which in turn are related to her/his perceived emergent competencies and dispositions" (Serpell 1997, p. 595, cited in Li, 2003).

Drawing from literature, family, as an actor within the field of education, influences the type of cultural capital children acquire and whether, and how, this cultural capital is activated during interactions and subsequently in learning situations (Bourdieu & Passeron, 1990). It is reasonable to conclude that African immigrant families (from different cultural origins) possess diverse cultural capital, which may be invoked in supporting their children’s mathematics learning that is very different from that depicted in the Western research literature.
2.10.6 The Need for Complementary Frameworks: Cultural Capital, Habitus and Afrocentric Worldviews

Theoretical concepts have their implicit and explicit inadequacies. Hence, there is the need for educators to be circumspect in drawing on the strengths of various theories and theoretical frameworks in pursuing their research agenda while paying closer attention to critical issues of race, ethnicity, culture, and historical experiences of participants (James, 2003). For example, Kingston (2001), in an article titled “The unfulfilled promise of cultural capital theory,” critiqued the notion of cultural capital by examining what he calls the “exclusionary” nature of the concept. Kingston argued that Bourdieu’s explanations are often vague, even contradictory, because his conceptual arguments are “weakly linked to specific, concrete referents, and context; hence, researchers have an uncertain guide about proceeding with empirical tests of the concept” (p. 88). Despite this critique, Kingston (2001) also agreed with DiMaggio (1982) that, indeed, culture has an impact on later educational attainment, even though he suggested such findings offered only partial support for Bourdieu’s concept of cultural capital (p. 91).

Another critique of Bourdieu’s work states that his traditional view of cultural capital is narrowly defined by White, middle-class values, practices and, more especially, wealth—one’s accumulated assets and resources (Yosso, 2017). Hence, middle-class norms and practices become the gold standards with which other cultural capital is judged. In contrast to this traditional view, Yosso (2017) argued for a broader conceptualisation of capital beyond cultural capital defined by white-middle class norms. Drawing on critical race theory, Yosso (2017) argued that people of colour and other marginalized groups possess “community cultural wealth” that the traditional definition of cultural capital does not recognize. She defines cultural wealth as
“an array of knowledge, skills, abilities and contacts possessed and utilized by Communities of Colour to survive and resist macro and micro-forms of oppression” (p. 77).

Yosso (2017) proposed what she referred to as community cultural wealth possessed by marginalised people and people of colour not acknowledged by Bourdieu’s cultural capital theory; *aspirational, navigational, social, linguistic, familial*, and *resistant capital*. I have already dealt with cultural capital and issues related to language and mathematics in previous sections, so here, I will focus on briefly explaining the other forms of capital described by Yosso (2017). Yosso (2017) defined *aspirational capital* as an ability to maintain hopes and dreams for the future, even in the face of real or perceived obstacles. For African immigrant families, it reflects their high hopes to succeed, meet their goals, and stay focused on what brought them to the host country.

Yosso (2017) referred to *familial capital* as “those cultural knowledges nurtured among familial (kin) that carry a sense of community history, memory and cultural intuition” (p. 79). This form of capital recognizes the role of community, kinship and relationships. For immigrants, this could relate to extended relations both far and near and maintaining healthy connections with them while being supportive to one another.

*Resistant capital*, according to Yosso (2017), refers to “knowledge and skills fostered through oppositional behaviour that challenges any form of inequality” (p. 125). For instance, people of colour may resist any decision or institutional structures that seem to devalue or subordinate
them. Through verbal and non-verbal lessons, Black parents teach their daughters to assert themselves as intelligent and to value their Black identity (Ward, 1996).

*Navigational capital* in Yosso (2017) refers to skills and ability needed to manoeuvre through social institutions, which are historically created with no communities of colour or immigrants in mind (e.g., school systems, health care, legal system). For instance, this could include strategies immigrants’ families use to support their children’s mathematics learning in a school culture completely different from what they (parents) experienced growing up in Africa, how immigrants deal with racial stereotypes, and how they deal with transitions or home-school discontinuities. There is the need to understand how worldviews shape our understanding of these different forms of capital, which marginalized people or people of colour bring to the table. Figure 2.2 shows Yosso’s (2017) conceptualization of community cultural wealth.

![Figure 2.2 A model of community cultural wealth adapted from Yosso (2017, p. 122)](image)

It must also be noted that these forms of capital do not act in isolation or are not mutually exclusive (Yosso, 2017). For example, in order to achieve any aspirations or goals in any context, especially in a racialized environment, it appears that people of colour will likely develop strategies in an attempt to navigate through unfavourable and oppressive social and
institutional structures that might work against achieving those aspirations (Yosso, 2017). Their linguistic repertoire (L1 and L2; oral, written texts, gestures and so on) becomes a resource for communication within all institutional structures such as the school, serving as a medium of communication in classrooms and communicating between school-home.

Indeed, theories, worldviews and practices cannot detach themselves from the culture, history or context of their proponents and times of their construction. In effect, “all theories, models and paradigms of human behaviour are inherently culturally biased, they are bound by culture, historical time, life experiences and knowledge base of their proponents” (Turner, 1991, p. 36), and they are more relevant in the context in which they were created than outside those contexts. For example, although different forms of capital proposed by Yosso (2017) are relevant in offering an interpretation of experiences of people of colour and marginalised communities, I argue that such interpretations need to be grounded with African centred worldviews and epistemologies, especially considering that there are differences in culture and identities of learners and other actors in a child’s education. Dei (2013) noted:

the student is not simply a universal learner. Rather, learners are embodied beings with ethnic, culture, class, linguistic, race, gender, sexual, [dis]ability, and religious identities. Such identities are connected to schooling and knowledge production. Learners are supposed to speak from their embodied identities and are encouraged to come to know through such situatedness (p. 123).
Therefore, to better situate the study in the sociocultural context of African immigrant families and their children, it is imperative to interpret theoretical concepts of capital and habitus through an African worldview to account for the unique lived experiences of Africans and their relationality with others in the society or community. Such worldviews will be rooted within the African culture, epistemologies, axiology and cosmologies and be used as a frame of reference in analysing and interpreting experiences of African immigrant families.

2.10.7 Summary

In this chapter, I have provided a detailed review of the extant literature on immigrant families and their children’s mathematics learning in the host country. Specifically, I explored the role of mathematics in immigrants’ aspirations in racialized contexts. Moreover, I reviewed research on deficit perspectives held by some stakeholders (teachers, school administrators and policymakers) about immigrant families’ involvement in their children’s mathematics learning. One common thread that weaves through the literature is the need for absolute rejection of a deficit model that often positions immigrant, or ethnic and language minority, and working-class, families as non-engaged and disinterested in their children’s mathematics learning and education in general. In fact, the literature advocates for immigrant families’ funds of knowledge, prior cultural models of education, bilingualism and multilingualism as resources for, rather than impediments to, their children’s mathematics learning. What is not clear is how African immigrant families’ deployment of these resources is shaped by their own socio-cultural and historical experiences.
Finally, I have discussed two theoretical perspectives upon which I ground this study: Afrocentric worldviews and Bourdieu’s (1990) theoretical concepts of cultural capital and habitus. While Bourdieu’s theoretical concepts of capital and habitus allow us to interrogate issues of power within a socio-cultural context, the traditional interpretation of Bordieuan concepts does not recognize other forms of capital possessed by marginalised people or people of colour. Inspired by Yosso’s (2017) extension of Bourdieu’s concept of capital, I proposed five forms of capital that marginalised people, or people of colour may deploy to support their children’s mathematics learning and education in general, especially in a racialized setting.
Chapter 3: Methodology

3.1 Introduction

The choice of a methodology is largely driven by the phenomena, and the research questions one intends to study, rather than one’s allegiance to a particular methodological paradigm (Krauss, 2005). Focusing on the phenomena under investigation (rather than the methodological paradigm) allows researchers to make appropriate methodological choices for their study (Falconer & Mackay, 1999). This study explored how African immigrant parents support their children’s mathematics learning in Canada’s socio-cultural context. Considering the exploratory nature of this study, I utilised a qualitative case study methodology (Merriam, 1998; Stake, 1995; Yin, 2002) as it appears suitable for an in-depth investigation of the experiences and practices of African immigrant parents and how they support their children’s mathematics learning. Since many of our problems related to education are culturally and “place” rooted, it is important that interpretative or qualitative work draws on culture-centric perspectives in data collection, analysis and interpretation of the data. James (2003) called for a “cultural analytical perspective,” which argues for a more contextual understanding of problems as the first step in addressing issues individuals or groups face in community, family or school settings. James argued that taking a specific cultural stance provides insights into the complexities regarding peoples’ lives in a given context. To this end, I drew on African centred (or Afrocentric) worldviews (Asante, 1991;1990) and Yosso’s (2017;2005) community cultural wealth largely drawn from Bourdieu’s (1990) theoretical concepts of cultural capital, habitus and field to guide my data collection and analysis, in order to center the cultural knowledge, values and experiences of African immigrant families in the study.
In this chapter, I first justify and describe qualitative case study design (Merriam & Tisdell, 2016; Stake, 2006; Yin, 2015. Then, I describe my data sources and explain data analysis. I also discuss standards or criteria of assessing the quality and credibility of this study, drawing on Afrocentric methodological ideals (Asante, 1990; Mkabela, 2005; Reviere, 2001) to elucidate both cultural and institutional ethical standards. In closing, I describe the study’s context and participants to provide background knowledge of the African immigrant families with whom I worked. I offer this thorough description of the research process to develop a vicarious experience for my readers; to give readers a “sense of being there” during the research” (Stake, 2006, p. 63) or “live” the research experience or journey with me as they read this work. To begin, I remind the reader of the research questions guiding my study:

1. What are African immigrant families’ experiences and perspectives with respect to their (10–15-year-olds) children’s mathematics learning in the home, community and school settings, within the Greater Vancouver Area?

2. What socio-cultural strategies and ways of understandings (if any) do African immigrant families, now living in Greater Vancouver, draw upon to support their children’s mathematics learning?

### 3.2 Research Design: Case Study

As previously indicated, I employed a case study design to address my research questions. Due to different philosophical assumptions underlying the use of case studies, I provide a brief overview of issues pertaining to case study research design (Yin, 2002; Stake, 2006; Merriam, 1998) before delineating how I conceptualize case study in my own study.
Many researchers have proffered different definitions of a case study. Notable among scholars whose work has influenced the qualitative case study research discourse include Merriam (1998), Stake (2006) and Yin, (2002). These research methodologists have largely defined “case study” based on certain epistemological traditions to which they subscribe. Merriam’s (1998) and Stake’s (2006) notion of case study aligns more with an interpretative paradigm I employ in this study. Merriam (1998) noted that qualitative research acknowledges multiple realities and the subjective nature of how the world is interpreted; this is similar to Stake’s view that knowledge is co-constructed rather than discovered (p. 12). Thus Merriam (1998) and Stake (2006) agree that constructivism and existentialism (non-determinism) should inform qualitative work and case study at large.

Merriam (1998), drawing on Smith (1978), defined case study as “bounded systems,” with boundaries having a common sense of obviousness (p. 10). Merriam proceeded to add, “a case study is an intensive and holistic examination of a specific phenomenon such as a program, an event, a person, a process, an institution, or social group in a bounded context (p. 9). For Stake (2006), a case is “a specific complex functioning thing” … an integrated or a bounded system with a focus on the “object rather than process” (p. 2). Stake (2006) was more precise when he illustrated his idea of a case by describing the criterion he used to select schools for his case study research in Chicago on the operation of a system wide reform plan that had been ongoing for about a year. Stake wrote;

The principal criterion in selection of schools was less “What schools represent the totality of Chicago?” but, rather, “what group of schools will help us understand the problems facing school reform in Chicago?” (p. 5).
For Stake (2006), the selection of a case is more about its “uniqueness and what insight or understandings the case might offer to the researcher” (p. 6). Thus, I draw on Stake’s idea of a case study to define my case as bounded within the confines of African immigrant families (parents and their children in the lower and intermediate grade levels) in Greater Vancouver, British Columbia, Canada. Bounding the case was essential to focusing, framing, and managing data collection and analysis (Harrison, Birks, Franklin, & Mills, 2017). The study focused on six families in Greater Vancouver, with data from each participant contributing to the broader case, that is, a holistic case study of six families (Stake, 2006). Just as with Stake (2006), the families selected for this study were largely based on the potential insights they would provide and their ability to yield rich data for the study.

While the choice of my particular research methodology here is dictated by the research questions, my research design (case study) built on my previous MA research, which also employed a case study design to investigate how rural Ghanaian parents with low formal education support their (8-10 years old) children’s mathematics learning in a rural Ghanaian context. The experiences I acquired in working with families in Ghana on a similar problem (but in a different context) equipped me with the needed knowledge and understanding to design and implement a case study involving immigrant families in Canada.

There were several benefits of using a case study as a research methodology in this study. Limiting the case study to six families (parent-child dyads) not only bound the case (Merriam, 1998) but gave me ample time for deeper engagement with participants over the period of the study. Furthermore, the interpretative nature of qualitative case studies (Merriam, 1998) offered
room to legitimize the centrality of African ideals and values as a valid frame of reference in the
data collection and analysis processes (Reviere, 2001). For instance, the experiences and
perspectives of my participants were interpreted through the African cultural lens by employing
the epistemological, cosmological, and axiological traits of the Afrocentric paradigm, as
elaborated in Chapter 2 of the dissertation. Indeed, established scholars in the field (e.g.,
Anderson, 1997; Anderson et al., 2005; Civil, 2007; Rogoff, Ellis, & Gardner, 1984) have also
demonstrated the usefulness of case study research design in gaining insights into families’
support in their children’s learning. Finally, since there are very limited studies conducted with
African immigrant families, this case study provides insights into this understudied population
and phenomenon hence broadening our understanding of possible areas that might require our
attention as researchers and further research trajectories with families.

3.3 Study Context

The area chosen for the proposed study (Metropolitan Vancouver, BC) is considered a Western
middle-income city and is one of the most ethnically and linguistically diverse cities in Canada,
with 40% of its population being immigrants. The Black population in Vancouver is just about
1.2% compared to other major ethnic groups such as the Chinese population, which constitutes
about 19.6%.

Metro Vancouver, the third-largest city in Canada, has 12 school districts, including Surrey
(School District 36) and Vancouver (School District 39) School Boards, where my research
participants’ children are enrolled. Surrey School district has 101 elementary schools and 20
secondary schools with a population ranging between 80 to 952 and 1,062 to 1,902, making it
the largest in Metro Vancouver (Surrey Schools, 2019). More than half of the total student population in the school district is reported to come from a household in which a language other than English is spoken. This attests to the diversity of the student population in this district. The Vancouver School Board has 89 Elementary schools and 18 Secondary schools with student populations of 29,000 and 21,000 respectively, with 48% of students speaking other than English at home. Similar to the Surrey school district, the Vancouver district is one of the largest urban multicultural school districts in Canada (Metro Vancouver, 2016).

Both school districts value parental involvement and have set up Parent Advisory Councils at both the elementary and secondary levels to champion views of parents or concerns regarding their children’s education at the provincial level through representation to the British Columbia Confederation of Parent Advisory Councils (BCCPAC) (Surrey Schools, 2019; Vancouver School Board, 2019).

The Surrey School district has a “StrongStart” free drop-in program where parents and caregivers and their children (0-5 years) can participate and learn ways to support their children’s learning at home and get the opportunity to network with other parents. The school district has also designed settlement and multicultural support programs aimed at offering orientation programs to Newcomers and English language assistance to English Language Learners (ELLs) and their families to enable them to integrate successfully into the district and community. Just like Surrey school district, Vancouver school board has a Strong Start program and offers opportunities for parents (including immigrant parents) to volunteer in their children’s schools if they wish to do so. There are also various language assistance programs and multicultural
workers in many schools who assist immigrant students and Newcomers’ integration into the school districts. These school districts were chosen for this study not only because of their diversity but also due to their proximity to the researcher and access to African immigrant families.

3.4 Sampling and Recruitment Process

As defined in the previous chapters of this dissertation, the immigrant in this context refers to “the case when students or their parents were born in a country other than the one they are currently living in and attending school” (Civil, 2014, p. 278).

More specific to this study, African immigrant parents refer to parents who were born in Africa but have immigrated to Canada or are seeking or have sought refuge or asylum in Canada and have their children living with them and attending school in metropolitan Vancouver, Canada. I focused on African immigrant families from Sub-Saharan Africa because of my background as an African immigrant from that area living in Greater Vancouver. In order to obtain rich data, I further “zoomed in” to African immigrant families from Sub-Saharan Africa who have been living in Vancouver and Surrey and have children (10-15-year-olds) enrolled in schools there for at least a year. These criteria were expected to facilitate rich conversations with the study’s participants as the immigrant parents, and their children had lived and experienced the context (Canadian school context) sufficiently to have “stories to tell” about their lived experiences (Creswell, 2013). For instance, on the one hand, parents had enough lived experience to share what their children do or experience in Canadian classrooms with respect to their mathematics learning and the general school system. Children, on the other hand, had enough experience
learning mathematics in Canadian classrooms and could share these experiences in-depth (Merriam & Tisdell, 2016). As Creswell (2013) noted, in purposeful sampling, the inquirer purposely selects "information-rich" cases, that is, individuals or sites for study because they can purposefully inform an understanding of the research problem in the study. Therefore, in this study, I purposefully selected parents who were willing to share, in detail, their experiences with supporting their children’s (10-15 year olds) mathematics learning in Canada and who could provide insight into the research questions (Creswell, 2013; Merriam & Tisdell, 2016; Miles & Huberman, 1994).

I have lived in Vancouver for the past six years and have developed strong connections with African communities across the metropolitan Vancouver area. This relationship and rapport (Thomas, 2006; Lincoln, 2009) with the general African community was useful in accessing and contacting potential family participants for this study. After receiving ethics approval from the University and school districts, I began recruiting African immigrant families with children aged 10-15 years through social gatherings such as church services, Annual African community gatherings and so on. After identifying families who might wish to participate in the study, I provided interested families with formal introductory letters and remained available at the gatherings for families who might have questions or might need further clarifications. I later provided consent and assent forms to parents and their children, respectively, who indicated an interest in participating in the study. It is important to note here that, per cultural norms, most African immigrant families welcomed my recruitment request and showed great enthusiasm to participate as a way of supporting the work of “a younger brother or a son” from home (Africa). As a result, six families, instead of the four that I had originally proposed, constituted my case.
Ten families in total did agree to participate in the study after my initial contact. My familiarity and intimacy with participants posed a challenge in deciding who not to invite to participate, especially when there were many enthusiastic potential participants seeking acceptance. In African culture, it sounded impolite to turn down an African “brother or sister” who is willing to support my studies. Regrettably, due to the limited time I had for my data collection, once I received consent from (the first) six families, I had to decline the four other families who volunteered.
### 3.5 Participants

<table>
<thead>
<tr>
<th>Family Category&lt;sup&gt;5&lt;/sup&gt;</th>
<th>Mashy’s family</th>
<th>Joseph’s family</th>
<th>Kata’s family</th>
<th>Agalga’s family</th>
<th>Malee’s family</th>
<th>Leticia’s family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent</td>
<td>Mashy</td>
<td>Joseph</td>
<td>Kata</td>
<td>Agalga</td>
<td>Malee</td>
<td>Leticia</td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
<td>Female</td>
</tr>
<tr>
<td>Years in Canada</td>
<td>Seven (7)</td>
<td>Ten (10)</td>
<td>Six (6)</td>
<td>Sixteen (16)</td>
<td>Ten (10)</td>
<td>Eight (8)</td>
</tr>
<tr>
<td>Highest Level of Education</td>
<td>Bachelors</td>
<td>Masters</td>
<td>Masters</td>
<td>Masters</td>
<td>Masters</td>
<td>PhD</td>
</tr>
<tr>
<td></td>
<td>Home Economics</td>
<td>Linguistics</td>
<td>Physics</td>
<td>Chemistry</td>
<td>Engineering</td>
<td>Education</td>
</tr>
<tr>
<td>Country of Origin</td>
<td>Somalia</td>
<td>Tanzania</td>
<td>Tanzania</td>
<td>Ghana</td>
<td>Somali</td>
<td>Kenya</td>
</tr>
<tr>
<td>First Language</td>
<td>Arabic</td>
<td>Swahili</td>
<td>Swahili</td>
<td>Fante</td>
<td>Arabic</td>
<td>Swahili</td>
</tr>
<tr>
<td>Immigration status</td>
<td>Permanent Resident</td>
<td>Permanent Resident</td>
<td>Student Visa</td>
<td>Citizen</td>
<td>Permanent Resident</td>
<td>Permanent Resident</td>
</tr>
</tbody>
</table>

<sup>5</sup> Names of all family categories and participants (parents and children) are pseudonyms.
<table>
<thead>
<tr>
<th>Family Category&lt;sup&gt;5&lt;/sup&gt;</th>
<th>Mashy’s family</th>
<th>Joseph’s family</th>
<th>Kata’s family</th>
<th>Agalga’s family</th>
<th>Malee’s family</th>
<th>Leticia’s family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socio-economic Status and Occupation</td>
<td>Working Class (Janitor)</td>
<td>Middle Class (University Part-time lecturer)</td>
<td>Working Class (Waitress)</td>
<td>Middle Class (College lecturer)</td>
<td>Middle Class (Private tutor)</td>
<td>Middle Class (Teacher on call)</td>
</tr>
<tr>
<td>Child</td>
<td>Hakeem</td>
<td>Jones</td>
<td>Amy&lt;sup&gt;6&lt;/sup&gt;</td>
<td>Evans</td>
<td>Zahara</td>
<td>Princess</td>
</tr>
<tr>
<td>Age/Grade (At the time of the study)</td>
<td>10 years (Grade 5)</td>
<td>12 years (Grade 7)</td>
<td>13 years (Grade 8)</td>
<td>11 years (Grade 6)</td>
<td>12 years (Grade 7)</td>
<td>10 years (Grade 4)</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
<td>Female</td>
</tr>
</tbody>
</table>

Table 3.1 Research Participants’ Background

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<sup>6</sup> It is worth noting that Amy did Grade 1-4 schooling in Tanzania before joining her mom (Kata) in Vancouver. She is the only child participant who experienced both school systems (Tanzania and Canada).
Table 3.1 shows the background of the participants at the time of study. One adult (parent) and one child from each family\(^7\) consented and assented to participate in the study. As anticipated, families (parents and their children) self-identified their country of origin as being from diverse East, West and Southern African countries (e.g. Tanzania, Ghana, Kenya, Uganda, Somalia, and Burundi) and self-identified as either middle class or working-class families, and self-disclosed their education levels, and immigration status in Canada. Despite an effort to recruit a balance of both middle-class and working-class families, the recruitment of family participants yielded four (4) middle-class families and two (2) working-class families – four (4) mothers and two (2) fathers with children in Grades 4, 5, 6, 7, and 8, respectively, with ages ranging from 10-15 years, at the time of the research. All parents in the study had completed at least their bachelor’s degree in their home countries, in various disciplines ranging from sciences to humanities (that is, Physics, Home economics, Biology, Chemistry and Linguistics) before immigrating to Canada. In addition, four of the six parents had obtained their master’s degrees, and one parent had already completed her Ph.D. here in Canada. For three of the parent participants, the English language was their medium of instruction in their bachelor’s degree, while the remaining three had only learned to read and write in English when they immigrated to Canada. All parents used languages other than English at home with their children.

As indicated, six (6) children participated in this study. Within homes with siblings, only one child from each family (within the targeted age range 10-15 years) was identified with the help of a parent, and that child assented to participate (focal child) in the study. Recruited child

\(^7\) To minimize the time commitment on individuals within the families, I recruited one parent and one child from each to be the participants.
participants ranged from grade levels of four to eight (4-8) and aged between 10-15 years at the time of the study as indicated earlier. Five (5) of the child participants immigrated to Canada with their parents before their sixth birthday, and only one child (11 years old) was born in Canada. One child participant had experienced schooling in both her host and home countries (i.e., Canadian and Tanzanian school systems). She had completed Grade 5 in Tanzania before her mother immigrated to Canada with her, and she was enrolled in Grade 8 at the time of the study. In several instances, this focal child shared her contrasting mathematics learning experiences from Canadian and Tanzanian school contexts. The six children were enrolled in six different public schools within the Greater Vancouver area.

3.6 Data Sources and Collection Procedures

Merriam and Tisdell (2016) argued that the idea of data collection could sound misleading as data could be thought of as something already in existence out there in the field waiting to be collected or gathered. Rather, the researcher has to notice the data and treat it as data for the purpose of addressing the research questions guided by the problem statement and the theoretical construct of the study (Merriam and Tisdell., 2016; Stake, 2006). This study sought to document the perspectives that influence strategies African immigrant parents employ in supporting their children’s mathematics learning in a Canadian context. These experiences, perspectives, and strategies could either be observable (tangible) or unobservable (intangible) hence requiring multiple data sources. Yin (2015) suggests that case study research should utilize multiple sources of evidence, with data needing to converge in a triangulating fashion. Creswell (2013) identified fieldnotes, observations, and interviews as the main methods of data collection in case study research; hence, in this study, I used participant observations during home visits. Besides
observations, I also conducted one-on-one semi-structured interviews with each parent and child as the main sources of data. In other words, parents and children were interviewed separately. Collecting data from these multiple sources was a means of validating the data and maximizing the quality and credibility of this study (Yin, 2015). For elaboration and clarity, I discuss each data source, interviews and observations in separate sections and how I used it in the study.

3.7 Interviews as a Source of Data
Interview is one of the major data collection methods in a qualitative study (Kvale & Brinkmann, 2009), a process in which the researcher and the participant engage in a conversation focused on the research questions with the purpose of obtaining specific information from participants (Creswell, 2013; Harrison, Birks, Franklin, & Mills, 2017; Merriam & Tisdell, 2015; Merriam et al., 2016; Stake, 2006; Yin, 2009). In documenting the purpose of interviews for a qualitative study, (Patton, 2015) wrote:

We cannot observe behaviours that took place at some previous point in time. We cannot observe situations that preclude the presence of an observer. We cannot observe how people have organised the world and the meanings they attach to what goes on in the world. We have to ask people questions about those things…The purpose of interviewing, then is to allow us to enter into the other person’s perspective (p. 426).

Kvale and Brinkmann’s (2009) conceptualization of interviews as a social production of knowledge informed my approach to interviewing my participants, where I see the process of knowing through my conversations with participants as intersubjective and social, involving the
interviewer (myself) and the interviewee (participants) as we both co-construct knowledge through our dialogues. For example, being an African immigrant parent myself, interested in learning how to best support my young children’s mathematics learning in the Canadian context, created conditions for me (as a researcher) to learn alongside the participants (African immigrant parents) about “what we do” or “could do.” In addition, our interviews allowed us (researcher and participants) to reflect on why we support our children’s math learning the way we do or the various strategies we might use to support our children’s mathematics learning. This interviewing strategy engaged the participants and the researcher in a mutual search for “self-understanding” similar to indigenous scholars’ (Kovach, 2009; Rand, 2011) approach to interviews as a form of conversation which privileges the relational sharing and co-constructing of knowledge between the researcher and the participants. From an Afrocentric perspective (a theoretical perspective that informs this study), interviews as a form of conversation become a means of valuing the oratory and storytelling tradition of African people, which characterizes African epistemology. Indeed, an Afrocentric worldview privileges this relational dialogue and sharing as a legitimate aspect of interviews because this relation (self in relation to others) in data collection is a major characteristic of how knowledge is constructed and what it means to know within the African context. Hence, interviews in this study drew on African tradition that honours reciprocal dialogue and an oratory way of knowing. However, I acknowledge the power imbalance inherent in this process of knowledge production since my research agenda drove the conversation throughout the interviews. In other words, I, as a researcher, I had more control of the direction of the interviews, although there were instances where we (i.e., I and my participants) veered away from the research agenda to talk of other matters regarding our lives as diasporic Africans.
Kvale and Brinkmann (2009), reflecting on this power imbalance in what they termed “power asymmetry,” suggested a more “collaborative interviewing where the researcher and the participants approach equality in the questioning, interpreting and reporting the data” (p. 33). Throughout the interview process, data analysis and reporting of my findings, I remained vigilant of this potential power imbalance, especially with the children, to whom I was much older. I will elaborate more fully on these issues of positionality and power relations in my study when discussing how I ensured credibility and validity.

Semi-structured interviews allowed me to delve into participants’ perspectives and lived experiences to better understand what families think about their involvement in their children’s mathematics learning and to hear from families the strategies they deploy to support their children in a Canadian context. Each interview with parent participants lasted approximately 40 minutes, while separate interviews with their children lasted about 25 minutes. Data from parents, where they shared their experiences, perspectives, thoughts, interactions and support strategies revealed, how they support their children’s mathematics learning in a Canadian context. Interviews with the children’s parents also offered insights into their roles and daily activities with which they engage their immigrant children in support of their mathematics learning. Immigrant children’s interviews provided first-hand information regarding what their parents (and other related adults) do to support their mathematics learning.

While interviews were initially conceived of as ‘one-shot’ interviews, upon recognizing that some of the statements needed clarification, I conducted follow-up interviews with four parents

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8 In semi-structured interviews, an interview guide includes a mix of more and less structured interview questions with all questions used flexibly during the interview process (Merriam et al., 2016, p. 110)
and children participants two weeks later after I had the chance to listen to all audio-recorded interviews from the participants. (See Appendix A and B for sample interview questions that guided my semi-structured interviews with parents and their children). While I designed these questions for semi-structured interviews, the questioning did not necessarily follow any definite pattern or order. Instead, flexibility in the interview style allowed the participants to freely provide in-depth detailed responses through back and forth questioning. All semi-structured interviews with parents and child participants were audio-recorded and transcribed verbatim, forming the primary data source of this study.

3.8 Observation as a Source of Data

I made five observational home visits (at least one visit per every two weeks) to each immigrant family, in addition to scheduled interviews with parents and children, to observe the mathematics-related supports and interactions with which African immigrant parents engage their children over a period of 12 weeks. For what to observe, I largely drew on Merriam et al.’s (2016) general suggestions of what is likely to be present in any observation setting – physical context, participants, activities and interactions, conversations, subtle elements such as verbal and non-verbal cues, and my own behaviour or role in the context. The observational home visits were pre-scheduled with family participants and focused on observing specific mathematics activities African immigrant families engage their children at home. In other words, observational home visits in this study were planned or invited, in order to keep up with the natural flow of daily routine activities of the families and minimize the effect of my presence in the homes of the families. In Appendix C, I have provided for two brief anecdotes to illustrate the sense of the type of activities which occurred during the home visits.
The duration for the observational home visits mostly depended on families’ comfort in allowing me into their homes but was mostly for about 2-3 hours depending on their availability. I noticed that the longer I stayed with the families during my observational visits, the more the family saw me as part of their unit. This resonates with my own cultural understandings of Africans as people who value relationships and are welcoming. Being treated as “part” of the family minimized the effect of my presence as a researcher. During such observational home visits, I made field notes in the form of short phrases/sentences to document key happenings and events of the day. I also took photographs to capture children’s mathematical activity in a similar way that families might “normally” photograph such family events. At times when I was deeply engaged in the activity with the family, writing field notes at the same time became almost impossible. In such situations, I turned on the audio recorder to audio tape the background happenings and interactions to serve as a reminder of what families were doing during the visit. After each observational visit, I wrote a more detailed reflective journal based on my experiences during the visit. In Appendix C, I have provided a brief anecdote to illustrate how such home visits may look like.

Although I had not previously visited the homes of family participants prior to this study, I had known all of them for years through African community gatherings, so I anticipated that my presence in their homes would not cause a drastic change in their usual routine. In other words, it appears that my presence in the homes of the family did not distract the daily natural flow of life or activities of these families, and this enhanced the credibility of the observational data. As I became “a member” or part of the family after long hours of stay with them, by African cultural
norms, I was expected to become involved in their routine activities. As a result, I participated or engaged in some of the routine activities of the household or the family such as, playing games with children/families, accompanying families grocery shopping, assisting with children’s homework and so on. Premised on this, I term my role in this observation process as a participatory observer or “participant as an observer” as opposed to a complete observer detached from the activities in the context I was observing (Merriam et al., 2016, p. 144). My role as a participatory observer enabled me to observe families in a more naturalistic sense (Tracy, 2019). However, my familiarity with the families did not mean I was immune to challenges. Sometimes, I became so immersed in the activities with the families that I lost sight of my role as a researcher in the context. For instance, it was difficult to tell when to disengage from an activity or game in which I was actively involved and, indeed, enjoying with the family. Patton (2015) cautioned researchers to be mindful of “balancing the observation with reflections and manage the tensions between our (researchers) engagement and detachment” (p. 413). In a similar vein, I wonder to what extent my presence in the homes of the families affected their behaviour or the activities with which they engaged their children? Such meanderings and questionings are not new in qualitative data collection. Meriam et al. (2016) admitted that the “presence of persons or researcher in the research context has a potential to influence the data collected and that, it is better to own one’s positionality to it and account for it” (p. 148). Being aware of the possible influence of my presence in the context (homes) enabled me to account for how my presence might have affected how the participants acted in any given situation in my interpretations and reporting. The observational home visits enabled me to access first-hand information on the daily, culturally situated activities African immigrant families engage their children in at home in support of their children’s mathematics learning.
In closing this section on data collection, the use of multiple data collection methods (interviews and home visit observations) is important in ensuring convergence of the data for triangulation purposes hence increasing the credibility of the subsequent findings from the study. In other words, to ensure rich and reliable data, I did not solely rely on what participants told me during the interview but also what I observed during the home visits.

3.9 Data Analysis Procedures

Smagorinsky (2008) described data analysis as an “epicentre” of every study regardless of the paradigm in which the study is conducted and offers a means by which researchers could justify how the data collected, the corresponding analysis, and the evidence that supports the claims, align with their research questions. In an attempt to ensure a thorough and robust analysis of the data collected for this study, I drew on various analysis procedures and techniques proposed by several qualitative scholars (Clarke & Braun, 2017; Merriam et al., 2016; Patton, 2015; Saldaäna, 2018; Smagorinsky, 2008; Stake, 2006; Tracy, 2019).

As researchers, we carry both our cultural and spiritual traits into the research process (Schreiber, 2000), although spirituality seems relegated to the background in the mainstream sciences. From an Afrocentric sense, I view data collection and analysis as a spiritual endeavour, allowing me to delve into the “spaces of discernment, wonderment [contemplation and questioning]” (Meyer et al, 2014, p.5) through constant meditation upon and about the data throughout the research process.
According to Merriam et al. (2016), data collection and data analysis should be a simultaneous process in qualitative research. However, this does not mean analysis of data ends once data collection is completed. In this study, my analysis process involved a constant review of my interviews and observation field notes as the data collection progressed. This allowed me to make initial notes – wherein I raised questions needing further probing and commented on what I heard from the participants and what more I needed to know from them.

Audio-recorded parents’ and children’s interviews were transcribed verbatim and analyzed alongside field notes from home observational visits. My data analysis drew on phronetic iterative analysis, “which alternates between emic, or emergent readings of the data and etic use of existing models, explanations, theories in the field” (Tracy, 2019, p. 209), rather than dwelling solely on the emergent ideas from the data. This process involved two levels of iterative analysis, moving back and forth between inductive-deductive approaches in making sense of the data. I occasionally stepped back from my close engagement with the data and the emergent key ideas and reflected upon ideas against both empirical studies and theoretical concepts that informed this study to gain a deeper insight into the data. This enabled me to move emergent ideas towards a more conceptual or theoretical level. For instance, transcribed data across participants suggested the value African immigrant parents place on their children’s mathematics learning.

These descriptions of instances where participants indicated relevance or importance of mathematics were later reframed or refined as “Mathematics as a Gate Keeping Subject” – drawing on the conceptual understandings of the role of mathematics and the relevance the society (especially people of colour) attach to the learning of the subject (Martin, 2010).
Similarly, a theoretical concept of “capital” (Bourdieu, 1990) enabled me to ponder on how African immigrants rely on mathematics excellence to succeed in a racialised society and what mathematics learning as social capital means for them. From an Afrocentric lens, I examined critically how experiences shared by participants in the study resonate or not with African worldviews or ways of knowing.

As indicated, the analysis process involved two main phases. In the first phase of the data analysis, Boyatzis (1998) suggests selecting sub-samples for initial coding and determining the reliability of the codes by applying them to the remaining raw data, and finally interpreting the results. Since parents were my primary respondents for this research, following Boyatzis (1998), I first coded two, of the six, parents’ interviews transcripts (sub-samples) and the corresponding field notes from the home observational visits, after several rounds of listening to the audio recorded interviews, re-reading the transcribed data and re-reading and reviewing the observational field notes. Here, I use Boyatzis’ (1998) definition of code as “a short phrase or word that symbolically assigns a summative, salient, essence-capturing, or evocative attribute for a portion of language-based or visual data” (p. 3). To determine a code, Boyatzis (1998) suggests that a “good code” should capture the qualitative richness of the phenomena and what the data segment represents. The author uses the phrase “a codable moment” to describe the moment researchers sense and recognize a code during the coding process. For me, questions such as ‘what are surprising or intriguing’ or ‘what is happening here?’ , ‘what does this mean for my research study?’ guided my determination of how I coded each data segment (i.e., codable moments). While these questions offered the possibilities to be open to emergent ideas from the data, I also viewed and interpreted what I coded in the light of the theoretical, epistemological
and conceptual understandings within the field of mathematics education (as I illustrated above, using one of the major themes of the study; “mathematics as gatekeeping”). Drawing on Boyatzis (1998), I compared the codes across the two selected subsamples of the interviews and field notes, checked for commonality in the meaning and generated common ones with which to code the entire data set – parent interviews, children’s interviews and observational field notes while being cognisant of the subtle nuances across the data. It is important to acknowledge the iterative nature of this process. I kept revising the initial codes from the two sub-samples of the data to accommodate new emergent ideas (contradictions, subtle or overt nuances) from the data set. For instance, all parents described how they support their children’s mathematics learning in the Canadian context. However, further analysis of the other four (4) sets of family interview transcripts (children/parents) also revealed how parents sometimes negotiated with their children in terms of push-back from their children hence, warranting new codes to be included for complex interpretation of the data. For instance, the following data segments necessitated new codes like: TENSIONS, RESISTANCE, and NEGOTIATIONS

“…sometimes we have to fight (literally)…”
“…lots of discussions to convince her to do math homework…”
“…we discuss different strategies we both use to solve the problem…”

To test the reliability of these codes, I applied the codes to the remaining data- interview transcripts from parents and their children and observation field notes gathered during home visits. Still, within the first phase of the data analysis, I re-analyzed the data by identifying recurring patterns of codes that seem to cut through the family data sets. Specifically, I was more
interested in the codes that were commonly expressed across at least four families’- parent and/or child participants data set. For instance, for a code to be used to code the rest of the data set, it was not necessary for all six families (either parent or child) to express that common statement, phrase or word. Rather, if at least one parent shared a practice, which in turn surfaced in the remaining data set of four-six families (parent and/or child participants data), a code was formed.

The second phase of the data analysis involved a close examination of the codes generated in the first phase of analysis, organizing, synthesizing, categorizing and transforming them into interpretive concepts (Tracy, 2019) in the light of my research questions and the epistemological underpinnings of my study. The initial grouping of about 23 codes led to a formation of 12 themes which were further distilled and re-grouped or collapsed into six (6) themes since some themes fit better as sub-themes to others, upon further exploration of their meaning in relation to the totality of data. To strengthen the credibility of the codes and accompanying themes, I shared them and their related data segments with members of my supervisory committee. This resulted in further re-categorization of the data. For example, initial themes that included ‘parents’ use of linguistic, cultural resources (e.g. books from their home countries),’ and ‘parents’ use of technology’ to support their children’s mathematics learning were constituted as one theme (i.e. leveraging different forms of capital in support of children’s math learning) which captured the broader sense of these separate themes (Clarke & Braun, 2017; Creswell, 2013; Merriam et al., 2016). Table 3.2 indicates the process of data transformation from the first phase (coding stage) through to the second phase of analysis (formulation of themes) for one of the themes as an illustration:
<table>
<thead>
<tr>
<th>First Phase Analysis (Codes)</th>
<th>Second Phase Analysis (Initial Themes)</th>
<th>Representative Excerpt(s)</th>
<th>Re-categorized or Refined Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUT OF SCHOOL EXPERIENCE WITH MATH (e.g., Use of physical cash in daily transactions)</td>
<td>Prior cultural engagements and application of mathematics within informal contexts</td>
<td>...I remember those days when we were young, sometimes it is not that you could know well exactly when I go with 1,000 shillings in those days, and then I buy so and so and so… sometimes shopkeeper either returns the change or sometimes they used also not to return [Kata – Parent]</td>
<td>Parents cultural models of mathematics education influence their perspective on their children’s math learning and involvement in Canada</td>
</tr>
<tr>
<td>Weaving</td>
<td>Parents’ memories of school mathematics learning in their home countries</td>
<td>Now after I can say that after 20 years studying in Kenya and having that stress</td>
<td></td>
</tr>
</tbody>
</table>
Table 3.2 Illustration of Theme Formation through First and Second Phase Analysis

| because of the test and exams, you cannot imagine that right now, I am 40 years-old I still have the nightmare that I have[sic] in high school when we had the exam. I still have the nightmare. (Malee- Parent) |

3.10 Assessing Quality of Qualitative Research with People of African Descent

Qualitative scholars have suggested standards or criteria within which qualitative research might be evaluated for quality. Lincoln and Guba’s (1985) work on “trustworthiness criteria” is considered seminal for establishing quality in qualitative research. They proposed four criteria for ensuring the trustworthiness of qualitative work: credibility, transferability, confirmability and dependability. Since then, other researchers have proposed their own criteria (Creswell, 2013; Golafshani, 2003; Lincoln, 2010; Merriam et al., 2016; Patton, 2015; Schwandt, Lincoln, & Guba, 2007 Stake, 2006; Tracy, 2019; Yin, 2009).

In line with using Afrocentric ideas and epistemologies as theoretical and philosophical foundations of this study, I instead adopt an Afrocentric methodological lens which encourages
centering of all cultural and eco-cultural groups in the research process and recognizing the legitimacy of African ways of knowledge construction (Schreiber, 2000). According to Asante (1990), research with people of African descent must strive to legitimize the centrality of African ideals and values as a valid frame of reference for acquiring and examining data. Such research with Africans should also maintain an inquiry, which is rooted in the interpretation of place (Asante, 1990). Drawing on Asante’s (1990) criteria, Reviere (2001) described five canons for judging Afrocentric research; namely, Ukweli, Kujitaa, Utulivu, Ujamaa and Uhaki, all phrased in Swahili (one of the most populous languages spoken across the African continent) translated for research purposes as; truth, honesty, just or fairness, recognition of experiences of the community, and fair representation of research participants’ voices. To assess the quality of this study, I adapt Reviere’s (2001) canons.

Afrocentric methodologists propose a holistic approach to inquiry and analysis of research with people of African descent (Asante, 1989; Asante & Mazama, 2005; Mkabela, 2005; Reviere, 2001; Schiele, 2017; Tillman, 2002). The notion of holism recognizes that various phenomena could only be understood from the dynamics of the whole. Indeed, what we call a part of a whole is actually a pattern within a system of interrelationships. This parallels Plains Cree’s (Indigenous tribe in Canada) epistemology of knowledge expressed by Kovach (2009). Kovach described knowledge from a tribal point of view as not fragmented, holistic in nature, focusing on place, values, metaphysical, and relationships. By extension, in order to better understand humans, there is the need to recognize the interrelationships and interdependent nature of humans and the phenomenal world (other people, invisible beings, nature, culture). This translates into a collective ethic that recognizes that group survival drives from group harmony working in a
collective and interrelated fashion in a common interest of the community (Mkabela, 2005). Such collectiveness further stresses humanness (*Ubuntu*), which is characterised by respect, generosity, hospitality, understanding, humility, and politeness (Mkabela, 2005).

Methodologically, research thrives on collaboration and co-operation between the researcher and the community, with participants being part of every step of the research process from the recruitment of participants through to data collection, analysis and interpretation of the data (Mkabela, 2005; Riviere, 2001). With respect to this study which involved both observational home visits and semi-structured interviews, I was respectful of participants' schedules and times; hence, I conducted my home visits and interviews on times and days mutually agreed upon with my participants. For instance, I was cognizant and respectful of the play dates and times of child participants and gave children the chance to choose when they like to be interviewed or observed at home. This goes beyond the usual scheduling etiquette in mainstream research because, in the African context, decisions are mostly made by adults with limited inputs from children, and obviously, there were many times that parents had proposed dates/times for visits that were not suitable for children, and I had to intervene to ensure that the children were involved in deciding when I could visit their homes – ensuring respect for all participants. Stepping in to respect child wishes is significant in a culture where adult’s decisions appear final and, in some cases, could override the wishes of youth. However, I made such interventions through respectful negotiating with both parents and their children to agree on suitable dates for observations and interviews. Being mindful of my own language throughout my interactions with the participants was important in ensuring respect and politeness. This involved respecting participants’ conversational styles and ensuring that I gave participants the chance to express their opinion
without interruption and acknowledging that their views or ideas were valuable. In this sense, multivocality through the research process was essential (Tracy, 2019) in ensuring credibility. By multivocality, I mean the inclusion of multiple views (both convergent and divergent) and being self-aware of how identity, race, gender, age might shape the conversation (Mkabela, 2005). I was cognisant that immigrant families draw on their prior cultural experiences to support their children’s mathematics learning in the Canadian context (Aldridge, 2014; Anders et al., 2012; Anderson, 1997; Civil, Planas, & Quintos, 2005; Goldman & Booker, 2009; Takeuchi, 2018); however, I did not assume a homogeneous practice of providing such mathematics support across families. In this way, I was open to both similarities and differences in practices of families grounded in participants’ narratives in order to enrich the analysis and interpretation of the data by giving voice to all participants as co-owners of the research enterprise. I honoured each participant’s contribution through the inclusion of their interview excerpts (voices) and home observational field notes in reporting the findings of the study for the collective benefit of the Black community in diaspora. As the study provides critical insights into how African immigrants in diaspora involve or may be involved in their children’s mathematics learning, drawing on their prior cultural and present lived experiences and values was deemed essential.

Through an Afrocentric lens, truth is grounded in the experiences of the community upon which qualitative work with African people is judged (Asante; 1990, Mazema, 2001; Nkulu-N’sengha, 2005; Wiggan & Watson, 2016) and objectivity in Afrocentric research is an impossible pursuit (Asante, 1990). The “experiences of the community members or the participants are the ultimate authority in determining what is true and, therefore, are the final arbiter of the validity of research about their lives” (Rievere, 2001, p. 713). As an Akan (one of the major ethnic groups
in Ghana) proverb puts it; “knowledge is like a baobab tree, a single person’s hand cannot embrace it” or “Nyansa nnyi nyimpa kor tsir mu,” which translates as; “knowledge is not bestowed in one person’s head,” further demonstrating the collective construction of “truth or knowledge.” Findings of this study draw on both participant's and researcher’s interactions and interpretations of their lived experiences as African immigrant parents in Canada. Afrocentric methodologists suggest the need for researchers to identify their motive for the research project, declare their epistemological and ontological stands, as well as any other personal idiosyncrasies or personal obstacles that might hinder fair interpretation of the research data (Asante, 1990; Reviere, 2001; Schreiber, 2000). Asante (1990) proposed introspection and retrospection as key methodological techniques in dealing with a researcher’s subjectivities. Building on Asante’s (1990) work, Schreiber (2000) suggests, introspection involves declaring one’s positionality; “who am I as a researcher?” Indeed, my status as an African immigrant parent in Canada, whose epistemological and ontological stance is located within an African worldview, shaped the perspective I brought to my research. In Chapters 1 and 2, I articulated my positionality, epistemological and ontological orientations, and how these might have influenced the research process and the measures I took to ensure fairness in the research process.

Again, the quality of research with Africans is judged based on the interest and significance of the research to the researched community (Asante, 1990; Mkabela, 2005). In other words, it is the zeal of every African immigrant family to see their children succeed in mathematics learning, especially in a racialized setting, where mathematics as a school subject appears to “trouble” many. The purpose of knowledge in any Afrocentric inquiry is to enhance the lives of individuals and the community as a whole. Any form of knowledge, including processes of its acquisition
that appears to privilege an individual to the detriment of a community, is considered (Un)African and inconsistent with the tenets of African epistemology. Considering the relevance of mathematics in academic pursuits and the general wellbeing of immigrant children in their host country, this study is in the collective interest of and seeks to benefit, all African and Black communities in the diaspora. Indeed, as a Black community, we all want our children to succeed in mathematics and have a brighter prospect in gaining entrance into higher education, both in Canada and across the globe. Hence, it is within our collective interest to discuss and share ideas on ways we, as parents, could better support our children’s mathematics learning.

From an Afrocentric worldview, the quality of research is judged within the values and the ethical and moral consideration that the researcher undertakes throughout the research process (Asante, 1990). These ethical values and moral standards are evaluated within the context of the community. By implication, research in the social sciences with African communities demands knowledge of the community and social immersion there as opposed to scientific distance (Asante, 1991). This is important as it enables the researcher to have a fuller grasp of the ethical and moral sense of judgements pertaining to the researched community. Without such immersion and community knowledge, Asante (2003) argues, the researcher loses all sense of ethical values and becomes a researcher for the sake of research. Thus, research and quest for knowledge have to be approached with high ethical and moral standards and openness to all participants. For instance, the participants had known me as a trusted member within their African immigrant community prior to this study. This trust led participants to share some sensitive and personal life experiences/stories openly during my home visits and interview sessions. While such a level of familiarity strengthens the study, as a researcher, I at all times foregrounded ethical issues
regarding what to report. In this regard, I constantly sought their verbal consent throughout the data collection process (interviews and observations) and explicitly asked participants to identify what they felt comfortable including as data. Through this, I ensured that I did not overstep my boundaries or take for granted participants’ privacy and confidentiality. In addition, at all times, the focus of the research on support for children’s mathematical learning guided what I documented/recorded as data. Finally, I provided participants with a draft of the portions of the findings I intended to report in the dissertation and any subsequent publications/presentations for their perspectives and approval. To maintain confidentiality and anonymity, I used pseudonyms for all participants and data were secured on an encrypted/password-protected hard drive.

I am of the conviction that I have adhered to both cultural and institutional ethics. In fact, the articulation of institutional and cultural ethical standards within an Afrocentric sense indicates that research with humans is inherently complicated and incomplete in a methodological sense; the deeper we go, the shallower we find ourselves.

3.11 Caveat of the Study

To a larger extent, I have discussed the caveats of this study throughout various sections of this chapter. Here, I will explicitly highlight a few of them. First, coincidently, the volunteered African immigrant family participants of the study were less diverse in terms of their socio-economic and educational backgrounds. In other words, participants who volunteered were parents with high education (at least each participant had a bachelor degree before moving to Canada) and socioeconomic status and who had been in Canada for several years. Hence the findings of the study lack perspectives from African immigrants from other backgrounds such as
lower socio-economic, lower educational background, fewer years in Canada and so forth. Notwithstanding the lack of diversity in educational background of the parents, the study validates these African immigrant families’ funds of knowledge for supporting their upper elementary children’s mathematics learning and provides directions on what researchers and educators might be interested in learning more with regards to African immigrant families’ support for their children’s mathematics learning in Canada.

3.12 Summary

In this chapter, I presented the study’s research design, described research participants and context of the study, and outlined details of the data collection and analysis process. This was followed by a discussion of the credibility and trustworthiness of the study. The chapter concluded with ethical considerations and limitations. The next chapter includes the results of this study.
Chapter 4: Results

I begin this chapter by reminding readers of my research questions and providing a brief overview of the analysis process to remind readers briefly how the themes I am about to present were constructed. The qualitative data sources from which the themes were generated include:

- separate individual semi-structured interviews of immigrant parents and their children
- field notes from informal home visit observations of family participants.

The following overarching research questions guided the study:

1. What are African immigrant families’ experiences and perspectives regarding their (10-15-year-old) children's mathematics learning in the home, community, and school settings, within the Greater Vancouver Area?

2. What socio-cultural strategies (if any) do African immigrant families, now living in Greater Vancouver, draw upon to support their children’s mathematics learning?

As detailed in the methodology chapter, the analysis of the data involved two main phases: coding the data, analyzing for initial categories, and recategorizing and refining themes to better capture the sense of the data. This included seeking common threads or differences that were cutting through storylines in the form of patterns or themes that characterized African immigrant parents and children’s transcribed interviews and field notes from home visit observations. It is worth reiterating that this study is a holistic case study of six family participants in this study (parent-child dyad) (Stake, 2006). Thus, I employed a holistic approach to analyzing the data (Stake, 2006; Yin, 2013). Interview transcripts were reviewed separately to ascertain how an excerpt from each story contributed to answering the research questions. The field notes from the
informal home visit observations of African immigrant families were used to compliment the individual interview data.

In the section that follows, I will present the emergent themes with accompanying excerpts from the data to honour the voices of my participants. This resonates with a key tenet of an African-centred worldview, which privileges knowing through collective wisdom and shared experiences as highlighted in the theoretical framework. The analysis of the data yielded the following five (5) key findings:

- Parents perceived math as a gatekeeping subject.
- Parents perceived math as an empowering subject.
- Parents' cultural models of mathematics education influence their perspectives of their children’s math learning and involvement in Canada.
- Parents adjust their math support strategies in response to Canadian school expectations, curriculum and pedagogical practices: creating a “third space” as an involvement strategy.
- Parents leverage different forms of capital to support children’s mathematics learning in Canada: cultural, linguistic, technological and navigational capital.

4.1 Theme: Parents Perceived Mathematics as a Gatekeeping Subject

Informed by parents’ prior school mathematics experiences and their relevance in the education systems they had experienced, the participants revealed the importance they attached to mathematics as a subject. This was evident through their shared educational experiences from their home countries, in which both the education system and the society place a high premium
on school mathematics success as an avenue to higher education and future career prospects. These parents continue to hold onto this prominence of mathematics from their home country after immigrating to Canada. In other words, they still see mathematics as a gateway to succeed in education and life; hence, they place more emphasis on their children's mathematics learning and provide them more support at home than they do in other subjects. The following interview excerpts highlight parents’ perspectives of mathematics as a gatekeeping subject:

_Irrespective of whether you are majoring in sciences or commerce or arts, mathematics was mandatory. You cannot drop it until today. You need it to go to the university or college._ (Kata – mother of Amy)

_In Kenya Mathematics is a required course for every day. Five days a week, five days I had mathematics. It's mandatory for all levels. I did mathematics until high school, I needed it to go to the college…I chose to go to arts at the university, even at the university level, actually, I did some courses in statistics: introduction. Mathematics was still mandatory and had to pass to get my degree._ (Mashy – mother of Hakeem)

Malee also points to how mathematics has been used as a “critical filter” (Stinson, 2004; Watt et al., 2017) at all levels of education in many educational systems, especially in most Sub-Saharan African countries where gaining access to higher education and future academic prospects depends on one’s success in mathematics. Indeed, the gatekeeping function was further reinforced when personally experienced by some of the participants. For instance, a low score in mathematics exams at the national level shattered the hopes of some parents to pursue their
"dream" programs such as engineering or medicine at the university or college level. As one of the parents expressed:

_In our time we had board exams starting in Grade 10 so that they'll be like two years’ curriculum and we had to give one three-hour exam covering whole Grade 9 math, whole Grade 10 math, and if you don't pass, you fail. If you don't pass one single course, including mathematics, you fail and you start over again from Grade 9. If you fail twice, you cannot take science major again, so you cannot study any engineering or medicine which is like a dream field for many people...I wanted to become a medical doctor, but could not pass the entrance stage, once and then did it twice. Then last hard, didn't want to work on that, so moved into doing Bachelor of Science, Master of Science, Master of Philosophy in Science and then moved into research, agricultural research taught at the university level... (Leticia- Princess’ mother)_

Having experienced "shattered" career dreams due to a low score in mathematics, some of the parents still expressed high expectations for their children's mathematics learning. As one parent said, _"I don't want them to be struggling later in their career like I'm struggling now."_ [difficulty finding job after her PhD in Education] (Leticia - Princess’ mother). Parents appear to believe that being inadequately prepared in mathematics has future career ramifications as children might not be able to pursue the career choices that would have otherwise been available to them.

Considering the gatekeeping role of mathematics, parents appear to hold their children accountable for achieving excellence in mathematics in school, even though the "board exams" they had experienced do not exist in Canada. That said, Leticia, one of the parents, recognized that children seeking to pursue a program in “medicine are required to score very high in mathematics in a competitive entrance exams.” Hence, she wanted her daughter to acquire excellence in mathematics to excel in the medical entrance exams offered here in Canada to pave
the way for her career in medicine. An excerpt from Agalga (Evans’ father), buttresses Leticia’s assertion:

*If you fail mathematics, for example, your GPA or your grades go lower and affect your chances of being admitted into the university. So in terms of math, I always want my kids to excel in mathematics. I always want them to be the best. I don’t expect anything other than A or A+. They know that. It is not questionable. You have to get it all. Now, Evans is a little bit exceptional. I want him even to get it all.* (Agalga-Evans’ father).

Since parents attach importance to mathematics due to its gatekeeping role and have high expectations for their children, they invest effort in ensuring that their children excel in the subject to gain access to higher education in Canada and globally. For instance, they perform a monitoring role, as one parent said, “to understand his ability to learn math” and believe that they would lack a deeper sense of their children’s mathematics performance if they did not monitor. As Joseph (Jones’ father) put it: “*If the term report says, ‘Jones is acquiring, or Jones is developing’. How developing? These things are easy, and he is still developing’.*”

To support children in meeting the high expectations in mathematics that they have for them, parents create enabling mathematics environment and provide different forms of supports. For instance, a scan of Joseph’s home environment during my observation visit reveals a “home” that is well-resourced with mathematics reading materials, worksheets, and other related math literature ranging from lower to high grades, all stacked in shelves in the corner of the living room. Walls in the living room were decorated with mathematical formulas on posters, an
indication of the school math literacy environment of this family. When asked how such an open display of posters might help in his child’s math learning, Joseph believed that as the child always sees the poster and formulas, he will always be able to “recall or visually picture” these formulas whenever it becomes necessary to use them in math problem-solving. Similar mathematics posters, worksheets, varying kinds of mathematics textbooks sources both locally and from families’ home countries were openly displayed on tables and walls of living rooms of all the families. Fig. 4.1 and 4.2 respectively give a glimpse into the math literacy environment of two families as examples. Fig. 4.1 shows a poster in Joseph’s living room showing various mathematics formulas from geometry to fractions, while Fig. 4.2 depicts Agalga using a math textbook from his home country to teach Evans, his son. Parents also scheduled mathematics tutoring days/time with their children at home. For instance, Agalga (Evan’s father) has routine mathematics tutoring with his child every evening for one hour five days a week. I visited this family six times throughout the study period, and during my visits, I noticed that this father had either finished teaching the son math before I had arrived or was tutoring him during my visit.
Figure 4.1 A poster in the living room displaying math formulas
From these parents' own experiences of the gatekeeping role of mathematics in their home countries, they appear to perceive their involvement in their children’s mathematics learning as paving the way for their children’s prospects in higher education and careers. Acknowledging this gatekeeping role of math appears to lead parents to set high expectations for their children and work with them towards achieving these expectations, as they believe success in mathematics has the potential of unlocking doors of opportunities for their children to pursue their dream of attaining high earning/in-demand careers, associated with medicine, engineering and other science-related programs at the university. This perspective of mathematics as a gateway subject appears to be consistent with the purpose of education in the African tradition, as a way of socializing an individual to become a good and productive human being in the community. However, it is unclear as to the extent to which these African immigrant parents’
high education contributed to the press for high status careers, and high expectations for their children, that they expressed.

4.2 Theme: Parents Perceive Mathematics as an Empowering Subject

Analysis across the data sets from parents and their children revealed that African immigrant parents perceive their children’s mathematics learning as empowering. This perception appears to be informed by parents’ own experiences as Africans living in the diaspora and, more especially, being Black Africans in racialized communities who might have experienced or heard different forms of racist comments questioning Black children’s intelligence or academic ability. For instance, participants shared the view that showing or exhibiting mastery in mathematics gives them a sense of accomplishment as they feel "valued," "show of smartness," “feeling special," high "self-esteem" among their peers. The excerpt from one of the father’s in the study illustrates the empowering role mathematics plays in the lives of these African immigrants:

*I also try to encourage them that math is a good subject, and I think they have also come to know that if you know math, you look a bit special and look like you a smart kid, so I think math is being used a measure of smartness so in this society where we [African immigrants] are not considered to be that smart. Is good to show them that you [African] can also do what smart people do (Agalga – Evans’ father)*

Evans corroborated what his father (Agalga) said in an earlier interview as he expressed joy for being among one of the students his teacher had selected to participate in the Gauss⁹

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⁹ Gauss contest is a mathematics and computing contest designed by the Centre for Education in Mathematics and Computing at the University of Waterloo, Canada for Grade 7 and 8 students across Canada. The centre awards certificates to all participants and schools who enrol their students in this
mathematics and computing contest that he believed is reserved for “the kids who understand
math more than other students.” With smiles and shows of excitement, Evans described the
Gauss contest he was studying to participate:

She [the teacher] only does it for the kids who understand math more than other students.
It is more challenging questions in math to really test what you can do in math. Basically,
you would search that year up or you’d click one of the years and then it just gives you a
list of math questions. It's just practice questions. Then, there's an answer key as well that
you can go to later to mark as well just to get us prepared for the 2019 contest. My Dad
has downloaded some PDFs of practices from the Gauss website that I can do. [Evans-
Agalga’s son].

Indeed, considering the gatekeeping function of mathematics (as indicated in theme 1),
knowledge of mathematics is often used as a proxy for intelligence and is often associated with
white, middle-class and wealthy students, and in other cases, Asians (Martin, 2019). For these
parents, they opine that one way to dispel the “deficit thinking” about their children (African
immigrant children) is to support them to gain mastery of mathematics content to be able to
demonstrate their math excellence in the Canadian classroom and to show the smartness and
academic prowess of their children.

contest. Special recognition is given to highest achieving students in their schools and nationwide in the
form of medals.
For instance, Joseph (Jones’ father) shared that their children have indeed benefitted from regular mathematics support they give them, and they feel “happy” to learn that their children could serve as resources for supporting struggling children in their classes. Joseph reported a memorable instance when his son came home with excitement, saying that his teacher had complimented him for solving a math problem that everyone in the class found challenging, and the teacher had asked him, the child, to support other struggling peers in his class.

I feel happy and comforted when he shows them he could do math. We did algebra way before they started learning algebra. Now, when he came back home, he [Jones] said; “Daddy, today we did algebra and guess what? Man, I was the first person in the class to finish.” The teacher was like, “What? How did you do it so fast?” “Then some other students were still figuring out and all that and the teacher had to ask me to go and actually tutor them and help them.” (Joseph – Jones’ father)

Although not stated directly, Joseph’s response indicates how such compliments from his son's teacher boost his child's self-esteem in the mathematics classroom and gives him, as a parent, the reason to continue to support his child’s mathematics learning at home since he is “comforted and happy” to know that his effort is paying off. In another example, Zahara, the daughter of Malee, expressed similar feelings during a separate interview. Zahara added how she now has many friends in school because of what she believes is her mastery of mathematics concepts. Just like Jones, she shared that her teacher sometimes calls on her to help others who struggle with math concepts. Zahara appeared somewhat happy, while at the same time humble and modest in her words:
It always feels like I know more. I don't know how to explain it but it's just that I know I know a little bit more whenever the teacher teaches a lesson in math. I wouldn't say it has a feeling, it's more like the teacher sometimes makes you teach other students what you know. I now have many friends than before because they want me to teach them (Zahara-Malee’s daughter).

Conversely, Leticia seems to share what might happen if children’s mathematics output does not match their peers in their mathematics classroom. Leticia described Princess, her daughter, as bright, but she thinks Princess has lower “self-esteem” in her own ability and, more especially, being the only Black child in the class. Leticia appeared to understand the relevance of self-esteem in her daughter’s mathematics learning. She believed that she needed to “push her [daughter] a little harder at home” in order to uplift her daughter’s “self-esteem” so she could know that she is as bright as any other student in her class. By “pushing her a daughter a little harder at home,” Leticia acknowledges the need to provide her daughter with more mathematics support at home beyond what she was doing as a parent. She believes that with more support, she could help Princess, her daughter, to develop high self-esteem in mathematics. The excerpt below illustrates Leticia’s view:

I feel that if she doesn't get that self-esteem now, she won't feel comfortable in class. Because she will feel demoralized, she cannot learn…I know her. If she doesn't understand the concept well, she won't feel happy going to the class the next day. Her teacher told me she sometimes cries in class anytime she struggles with math problems. It
was hurting for me as a mother. Now, I want her to be pushed a little bit harder at home to build her self-esteem (Leticia – Princess’ mother)

All parents and children shared similar views to that stated above. This is indeed an indication that parents and children believe that in a racialized environment, knowing mathematics appears to be "a currency" to gain respect in a dominant culture where many students seem to be struggling with the subject. Bourdieu (1990) described similar experiences as a form of “capital” in that knowledge in mathematics for Black African immigrants is a valued resource underlying how they interact and relate with the society. Framed differently, knowing mathematics is actually a way to gain acceptance into the dominant culture. For example, Zahara (Malee’s daughter) indicated she now has more friends at school than before because they want her to teach them mathematics. The feeling of being valued and respected for what one knows means a lot for African immigrant children, especially in a white-dominated environment where many might have experienced, or have seen others experience, some forms of racial bigotry. Being viewed as “smart” or “valued” by teachers and classmates is empowering and off-sets the negativity they otherwise experience as people of colour.

4.3 Theme: Parents' Cultural Models of Mathematics Education Influence their Perspective on their Children’s Math Learning and Involvement in Canada

The analysis of the data suggests that African immigrant parents’ perspectives and engagement with their children’s mathematics learning were shaped by parents’ “cultural models of mathematics education” (Anderson, McTavish & Kim, 2017; Fryberg & Markus, 2007). Here I refer to cultural models as parents’ beliefs shaped by their experiences and reflected in their
practices (Anderson et al., 2017). Parents’ beliefs and perceptions were evident in their descriptions of i) their own mathematics experiences in Africa, ii) what they believe are their children’s mathematics experiences in Canadian schools, and iii) their perceptions about the role of school and teacher in their children’s mathematics learning in the Canadian context.

Each parent shared his/her memories of mathematics learning growing up in Sub-Saharan Africa. The description of parents’ personal school experiences was filled with catch-phrases such as “intense pressure” to memorize for national exams,” “fear of failing and fear of what others would say if you don’t do well”, and a “nightmare”. The following excerpts are representative of parents’ voices with regards to their schooling experiences echoed across the data set:

would say I was not very extraordinary but not very poor also, so my achievements were okay in terms of if you think about percentages, but if I think about enjoyment, I don’t see that there was an enjoyment in learning math. It was much of it like it was a routine you have to do well because it is an expectation, societal expectation that you need to fulfil. If you don’t do a math question correct, you got beaten or whipped by the teacher. (Leticia-Princess’s mother)

Another parent (Malee) noted:

After say 20 years studying in Kenya and having that stress because of the test and exams, you cannot imagine that right now I am 40 years old I still have the nightmare that I have[sic] in high school when we had the exam. I still have the nightmare. (Malee-Zahara’s mother).
Another parent (Joseph) saw the many required subjects studied in the elementary and high schools back home as a “burden.” He felt his teachers were always in a rush to complete the curriculum to get them prepared for the next national exams. For these parents, having many other subject areas in school adds to this stress. Joseph, one of the fathers in the study, recounted his school experiences in Tanzania:

Because of the pressure of the national exam. I don’t think really the governments sit down to do the number of subjects its students are learning by the number of, not the number now but the hours. Because they have so many classes. Grade 3, for instance, they have up to 11 subjects. These 11 subjects are taught by different teachers...What that means is every teacher will need to have their time. That way, everything is rushed. They [teachers] won't get enough time to cover all the topics (Joseph – Jones’ father).

Leticia explained that although her understanding of mathematics has "shifted" since moving to Canada, "there is still that anxiety as a parent," whereby she does not want her daughter to make "silly mistakes and lose her points." Therefore, Leticia ensures that her daughter practices more mathematics at home even if it is not homework assigned from school, suggesting how Leticia’s own cultural model of education might have shaped her mathematics involvement practices:

I think my understanding of learning and teaching and engaging with the math has shifted, because growing up in that culture where everything was either right or wrong and then moving into different cultural contexts and knowing from my daughter's math
projects that math learning can come in different ways, has already shifted my understanding about how should the math or science be taught. Sometimes when she is doing math, I want to see. There is that anxiety still, as a parent. I don’t want her to make silly mistakes and lose her points. Still, there is that cultural emphasis. She might have shared with you that even if her science teacher says, "This, not a homework." She brings the worksheet home, I tell her to sit down and complete it now (Leticia - Princess’ mother).

These experiences echoed by other parents emphasize the intense pressure to pass national exams leading to more stressful school mathematics experiences. Thus, in one form or the other, all of these immigrant parents shared pressure-filled school mathematics experiences growing up in Sub-Saharan Africa. However, what is interesting here is that despite these negative experiences, the parents hold mathematics in high esteem and want their kids to excel in the subject. This could be attributed to African immigrant parents’ understanding of mathematics as a “gateway” subject and also a subject that could potentially break racial barriers that inhibit their access to opportunities in the dominant community. Parents, therefore, felt motivated to support their children so that their children will have less pressured experience with their school mathematics learning than what they (parents) had experienced.

In contrast to parents’ own experiences of mathematics in Africa, parents described their children’s mathematics experiences in a Canadian school system as “more relaxed,” “more freedom in the curriculum,” and “progressive.” Although parents welcome what they described as “progressive mathematics” or education in general, they believe that such autonomy in the
school system might endanger their children’s learning. They instead prefer what they described as “a little bit of supervision,” “less pressure,” but less “free will.” For instance, stemming from Joseph’s own previous educational experience from his home country, he believes that children need more explicit “guidance” and “less free will” in school:

> It’s not that the teachers are not teaching, the teachers are teaching but because of this free will thing like, “You can do whatever you want, you choose to do this, you can do your whole assignment here or you can do it later, you can—In class you better listen, if you’re not listening then you’re going to miss out on all that...Learners—we define learners as people who need to be guided. They have a master. It’s just like when you’re doing Kung Fu. You need to pay maximum attention to your trainer (Joseph – Jones’ father)

Malee expressed a similar sentiment and added that; “since they [schools in Canada] do not have this “kind of pressure and supervision, I have to do that at home.” Malee believes her daughter still needs some form of pressure (e.g., assigning her more math homework) from the school or teachers to make her study. Not getting this “pressure” (somehow similar to what her home country offers), Malee decided to do that herself, although on a limited scale and not without resistance from her daughter:

> In high school, I know that they have several good teachers, they have good methods, but they don’t put any pressure, no pressure at all. You can choose to study, you can choose not to study. I think a little bit of pressure and a little bit of supervision need for a
student. Since they do not have this kind of pressure and supervision, I have to do that at home. I prefer teachers to give them the homework because when she has the homework from the schools, she does it right away, but when I ask her to do any math at home, she just says, no, I’m tired. I do not want to do that. Not now. Then after that, after lunch, after dinner, after that. (Malee – mother of Zahara)

These excerpts suggest to me that ways of understanding and mathematics education experienced from parents’ home countries indeed are reflected in, and foster parents own ways of thinking, perspectives and actions that govern their involvement in their children’s mathematics learning in the Canadian context (Fryberg & Markus, 2007; Reese & Gallimore, 2000; Crafter, 2012). While some of these cultural models or perspectives of parents’ involvement were drawn from parents’ home cultural background, the data analysis further revealed that these perspectives and involvement practices seem to be evolving as parents encounter the new culture of schooling in the Canadian context. For instance, parents were becoming supportive of the curriculum and pedagogy their children were experiencing in Canada, although these appear to contradict their cultural models of education. As noted, four parent participants believed mathematics learning and the school system their children are experiencing in Canada could be best described as “fun,” “more freedom”, “less stressful,” “emphasis on process rather than correct answer (product)”, no exams,” and “project-based.” As one of the fathers in the study expressed:

I was explaining the differences between here and back home. Here is a more to understanding the concept rather than memorising, but back home they do things faster, because the education there is measured in terms of passing Grade 7 exam. Here, you will not even hear about the exams and stuff. Back home, everything you do counts. There
is always the question; “Is this important for him to pass a Grade 4 exam or Grade 7 national exam?” (Joseph – Jones’ father).

For Joseph, there is less emphasis on examination or any form of standardized testing when his son enrolled in the school here in Canada; hence, he assumes teachers get more time to ensure students understand the concepts taught.

Leticia, a parent with a daughter enrolled in Grade 6, shared similar views about the emphasis schools in Canada place on the “process” of understanding mathematics. She cited a specific example in multiplication and long-division which appeared different from what she experienced in her school days back in Africa:

In my daughter’s experiences I’ve also seen the teacher says, “How did you do this problem?” They are actually explaining certain other things like we didn’t understand in our mathematics like long multiplication or long division we just computed that-and put two crosses or three crosses when you were doing multiplication but here I think the teachers do more explanation of the process (Leticia – Princess’ mother).

Although Kata (parent) did not use the phrase like “process of understanding” like Leticia and Joseph, her explanation and use of the terms like “project-based” and phrases and statements like not “jumping to an answer,” and “paying attention to some small, small, details” appear to mirror what the other two parents have shared above. She believes her daughter does more project-based learning in her Canadian classroom.
Amy\textsuperscript{10} corroborated what her mother (Kata) said during a separate interview. Among other things, I was interested to learn more about what her mom meant by “project-based learning” and what she is doing in her Grade 8 math classes. During one of my observation visits, Amy walked to her file cabinet, pulled a pile of documents and displayed in front of me some mathematics tasks she has been working on. Amy explained to me as she flipped through her math assignment description:

\textit{Math is math anywhere, but I think it’s more of how it’s taught. I think here, it’s a little bit easier. For example, the project we’re doing, it’s supposed to help us in the future too. We do a lot of projects here that are easier to understand. It’s basically explaining if you have a job and then you take all the expenses, like food, utilities, home supplies, grant, taxes and everything. Then it would help you calculate your budget and then your RSP, I think. Then at the end, you have a list of what you would, for example, food, what you’d have a month. Then for your job, you take out a 25% tax off. I think it’s supposed to help the calculation but also your future life (Amy - Kata’s daughter).}

Four of the parent participants mentioned the flexibility of the Canadian school system and how mathematics activities/tasks their children are doing in schools are more contextual, in contrast to their own school experiences and particularly in mathematics (i.e., strict, exam oriented, abstract and overloaded curriculum). However, two parents seemed to hold a different view of this. For

\textsuperscript{10} It is worth noting that Amy had her Grade 1-6 schooling in Tanzania before moving to Vancouver with her mom (Kata) in 2014. She is the only child participant who had experienced both school systems (Tanzania and Canada).
instance, Mashy and Agalga added that their children continue to “complete drills,” and “sets of worksheets,” more so than their peers, in these same classrooms, because, as Mashy said, “They [teachers] said our children [African immigrant students in the class] don’t understand English.” This seems to indicate that for these two parents, the drills and practice children are currently experiencing in mathematics classrooms in Canada are not too different from what they (the parents) experienced learning mathematics in Africa.

Again, parents in the study appear to see a teacher’s responsibility to teach their children as unquestionable, which is typical of the cultural model of education of these parents. For instance, from the interview excerpts, five parent participants seem to believe teachers are the authority and “knows what they are doing.” They seem to perceive that any attempt to engage their children’s mathematics teachers in the way of regular visits to the school to inquire about their children’s mathematics learning could be seen as an interruption of the work of the school and the teacher, which they believe could lead to conflict. For instance, Kata said:

I wish I had time to observe what they do in the class how they are taught. I've wished very much to see how. I don't know if this is allowed...I don't want to bring conflict between myself and the teacher...because I told her I would wish to see what is happening in the class and how they are taught. Since I’m now in a different country [Canada], I don't know how teaching is done here and what the teacher wants... (Kata – Amy's mother)

Kata’s excerpt also indicates her uncertainty and uneasiness regarding what the school’s expectations are of her as a parent. For instance, she seems unsure how school teachers will
perceive her visits to her daughter’s mathematics class, although she would like to learn more about the new teaching and learning environment her child is experiencing in Canada. I could sense that Kata’s perspective, which was also shared by four other parents, on the role of the school and the nature of relationship and interaction between the teachers and school, appear to be partly informed by parents’ own cultural beliefs about the role of the school and teachers. In many African school systems, there is a tremendous trust and authority bestowed on the school and the teachers. Teachers are mostly seen as parents of the children when they are away from home, and there is trust that teachers will offer the best care and teachings, and for that matter, parents’ role is only to provide the necessities such as food, shelter, books and so on, needed for the day to day child-rearing. However, in the North American context, teachers may interpret this non-interference as parents being disinterested in their children’s mathematics learning (Civil, Planas, & Quintos, 2005; Cline & de Abreu, 2005; de Abreu & Cline, 2005; Reese & Gallimore, 2000; Yaro, Amoah, & Wagner, 2020).

On the contrary, not only do all African immigrant parents in this study show great interest in their children’s mathematics learning through supervision, teaching them at home, and so forth, they also have high expectations and aspirations for their children, as illustrated in parents excerpts throughout the “gatekeeping” theme, and “math as “empowering” theme. In some instances, although willing to get involved with their children’s mathematics learning in Canadian classrooms, the parents seem to face challenges of being accepted into their children’s classrooms. For instance, Malee (Zahara’s mother) with a master's degree in Engineering from her home country thought she could volunteer in her daughter’s Grade 8 class, but the school principal was not comfortable accepting Malee’s offer. Malee believed some teachers might not
be comfortable having parents in their classroom because teachers misconstrue parents’ presence as assessing their mathematics teaching competence. Malee shared the following:

I went to the principal, and I talked to her and let her know that I have this ability to help the student voluntarily, to support them with mathematics, and I just offer her. I just offered the principal and she just refused. They do not want my experience, I am offering my time voluntarily, the valuable time to be honest, my time is valuable, and you know that...Since they do not want our [immigrant] experience, I will just teach my child. (Malee – Zahara’s Mom)

Kwesi: Why do you think the principal refused?

Here in Canada, most school teachers do not have a very strong mathematical background. This is the problem, and they know about this problem, especially in elementary school, teachers have math anxiety, because of the math anxiety, when they know that somebody is coming and she's good at mathematics, she might show that I am [the teacher] not good at math in front of my class (Malee - Zahara’s mother)

Similarly, Leticia shared her frustration when she wanted to sign up as a volunteer in her daughter’s class. However, her frustration was not about the school per se but the structural processes she had to go through, including obtaining a criminal clearance from the city’s police department, which in itself adds a layer of a financial burden on her as a single parent.
First, I waited for about a month to get a response from the school to go for criminal checks. This was expensive as a single mother still struggling to find a permanent job. The criminal checks also took another six weeks... At home (Africa), you will not need these criminal checks (Leticia – Princess’ mother)

Although some parents are willing to be involved beyond teaching their children at home, there seemed to be institutional barriers (Colegrove & Krause, 2017) that hindered their effort. It is worth mentioning that volunteering in their children’s schools is something these parents would have easily done in their home countries. However, the current circumstance of being an immigrant in a new context and the demand from the Canadian schools seems to be affecting how they are involved or want to be involved in their children’s schooling.

In contrast to the perspectives on schooling and teachers’ role shared by five parents above, one parent appeared to have a different view. Agalga, one of the fathers in the study, maintains frequent contact and visits to his child’s school/teachers to determine how his child is doing in school. Agalga feels that he has an obligation to know what is going on in the school with regards to his son’s (Evans) mathematics learning and feels the school, on the other hand, is mandated to keep him informed on Evans’ mathematics learning. Agalga, who has been living in Canada for the past 20 years, seems to have a better sense of the culture of education and his roles and expectations as a parent in the Canadian school context. Two things perhaps might have contributed to Agalga’s understanding of his roles and expectations as a parent in the North American school context. Agalga has a daughter who has gone through the Canadian school system before Evans, his younger child. This could have influenced this parent’s familiarity or
comfort with the school that other parents seem not to have (as of yet). More so, Agalga’s familiarity with the school system could be due to his prolonged encounter with the education system and interactions with other people from the dominant culture after 20 years of living in Canada. The following excerpt illustrates Agalga’s engagement with his son’s teachers:

_They know I follow up with my children and know what they are doing, and I want to know whether they are doing good or bad. I always want to be kept informed. so my kids, if they are involved in anything in school, if it is good or bad or related to their math learning or not, the teachers will always call and tell me. Any time they change a grade, I meet every single teacher of the subject, not just math, but I always start with Math. I emailed them. I set an appointment and meet them and let them know that I support Evans and ask what we can do to support them well in mathematics and other subjects. I keep visiting regularly till he moves to another grade (Agalga – Evans’ Father)_

Although all parents in the study regard mathematics as a very important subject and take interest in supporting their children’s efforts to excel through different strategies, including teaching their children math at home, they appear to share many similar perspectives on the extent to which they could get involved, and what expectations of the school and teachers are. For instance, five parents perceive that the teacher has the ultimate responsibility and authority, and regular school visits to inquire about their children’s math learning could be misunderstood as interfering with the activities of the school. One parent thinks otherwise, as he believes it is within his right as a parent to know from the school what his son is learning, and he is, indeed, exercising this right. The finding as discussed is an indication that cultural models of education
of these African immigrant parents influence their beliefs about their children’s mathematics learning in Canada, how they want to get involved, and their roles as parents in supporting their children’s mathematics learning vis-a-vis the role of their children’s teachers. Based on parents’ experiences, cultural models of education are not constant, in fact, they may change over time, such that views of parent-teacher (home-school) relations prominent in the host country might offset those previously held in the home country.

4.4 Theme: Parents Adjust their Math Support Strategies in Response to Canadian School Expectations, Curriculum and Pedagogical Practices

The data analysis revealed that parents adjust their mathematics learning support for their children by hybridizing their experiences from two “cultural worlds of education”: their home and host culture. Here I share some specific strategies African immigrant parents adopt/adapt in the current context.

First, across the data set, each parent shared that he/she employs less authoritative parenting strategies in their Canadian context contrary to their own personal experiences growing up in Sub-Saharan Africa, which was more characterized by “strictness” and “fewer negotiations” between parent and the child. Parents shared specific examples, including engaging in “lots of discussion” and negotiations to have their children do some mathematics or any extra learning at
home. They, however, stressed that they sometimes draw on what one parent (Joseph) referred to as “an African way”\textsuperscript{11}\textsuperscript{10} of parenting which they still find useful in the Canadian context:

\textit{Sometimes we fight [literally], and we have lots of discussions so to just convince her to do some mathematics, to do some homework…If the teacher will just ask them to do homework, I will appreciate that because they do it right away. Since we don’t have such things [homework] here, I have to add a little bit of pressure and supervision to help her go ahead. The point of view here in a school is like this; if a student wants to study, she or he is going to study. Otherwise, if they don’t want to study, don’t put pressure on them. I would like my child to study, and I would like my child to go to university. So this is me—sorry. I have to pressure her but not the kind of pressure at home [Africa] (Malee-Zahara’s Mother).}

I have the responsibility and accountability to make him listen. He has a free will to choose within the domain of good things as free will, but if I see something is going to ruin him, he has no option. He has to listen, and he has to unlearn certain things. Still, this African way is helping. It’s not only helping in math, but it’s helping also in behavioural problems. Very few African students here have behavioural problems, very few unless their parents are extremely busy or something. Although the government said this and that, but there’s a way to train the kids (Joseph – Evans’ Father).

\footnote{The phrase “African way” is predominately used in the circles of African immigrant communities. Usually, the phrase denotes parents showing some strictness in raising their children while emphasising virtues such as obedience, good behaviour, respect, and morality.}
From the above, Malee and Joseph appear to draw on their cultural education model and childrearing to parent their children in their Canadian context. Both parents believe it is their ultimate responsibility to ensure their children do their homework or obey them [parents] at home because they want their children to succeed in mathematics and make it to the university or get higher education (as discussed in the “gatekeeping” theme). Malee’s excerpt above further highlights “power structure” or “command” vested in her daughter’s teacher, which seems to indicate that Malee is drawing on her prior cultural, educational experiences in that in African cultural contexts, students are expected to revere, respect, and obey teachers and do what the teacher asks them to do. She believes her daughter will do math homework “right away” if it is sanctioned by the teacher or school. However, the desire for hard work and success in math could also be attributed to the gatekeeping role of mathematics, as perceived by both parents and their children. Children appear to attach “high stakes” to math homework from school with the notion that homework counts towards their overall assessment and failing to complete it could potentially lead to failure in mathematics, which they believe they will need to pursue their dream programs at the universities.

Second, parents appear to meld Western/Canadian ways of thinking (learning through play; finding ways to engage/motivate students) while also affording considerable significance to learning math consistent with their own math experiences. For instance, while Agalga and Mashy, and Malee, sometimes insist on what they want their children to do at home, on many occasions, they negotiate to reach an agreement with their children, which appears in contrast to these parents’ own cultural upbringing in African culture where children are expected to do what their parents want them to do, sometimes to children’s displeasure. In other words, in many
families in Africa, parents decide what is right for the children, and children have to listen and obey their parents’ instructions. However, being in Canada, parents indicated that sometimes, they just agree to the wishes of their children or allow them to do what they want to do, especially when they think their children are “feeling bored” (as one parent put it) with the assigned math activities at home. Each of the parents reiterated that the school system does not encourage extra work at home. Hence, children seem to resist attempts to get them to do additional mathematics at home or any school-related work. However, parents still find creative strategies to engage their children in mathematics learning at home. Such effort by parents and push for extra math support for their children appear to be consistent with parents’ own cultural model of education where math is seen as the gateway to career opportunities. The excerpts below indicate parents’ effort to engage their children in mathematics learning at home despite the pushback they sometimes encounter with their children:

*Sometimes at home, I tell him you must do it [math] whether you want it or not. His teacher doesn’t know [chuckles], nobody knows this, [chuckles] but I do not force him too much. I just ask nicely, and we agree. There are several days that he didn’t do math at home. I say, “Okay. That’s okay.” Sometimes I say, “You have to do this right now.”* (Agalga – Evans’ father).

...I came up with some ideas, I bought a curriculum book for my child, for his age, to start doing some extra math practice at home. Then he starts to feel bored, he said, “Why should I do that? The teacher told me I don’t have to do anything at home, I supposed to have fun at home.” I changed that to do more of a game things for him to have fun because he feels so bored doing study from the curriculum. He doesn’t want to open the
Mashy had to change her approach to supporting her son because her son felt “bored” anytime she opens the textbook for him to practice some mathematics. She had to resort to math games that she feels will excite her son, and at the same time, learn the school mathematics. By doing so, Mashy appears to be melding the two oppositional discourses or social practices of learning, the informal (games) and formal (school mathematic). Gutiérrez, Baquedano-López, and Tejeda (1999) refer to similar practice as “hybridity” or locating a “third space.” What is interesting here is that Mashy did not view play or games as “counterscript” to her son’s school mathematics, but instead, she opportunistically viewed the emergence of both the formal or school math and the game as a potentially legitimate context for her son’s mathematics learning. For instance, during one of my visits, I observed and participated in a game Hakeem (Mashy’s son) initiated. Hakeem, his father, mother and I engaged in this game. After one round of playing a simple card game, he learned from school (making a sum of 25), he amended the rules for the second round of play, which involved the use of addition and subtraction to make a sum using at least three cards from the deck. During this game, I could sense Hakeem’s excitement and passion. He spearheaded the game and was actively involved throughout.

Similarly, Agalga (Evans’ father) and Joseph (Jones’ father) appear to blend African with Western/Canadian culture (e.g., engaging their sons in cooking) in their involvement with their children. For instance, both parents shared how they draw on cooking/baking to engage their children in measurements and fractions. However, this seems not typical in many African
traditional homes as males are not usually encouraged to cook, but it appears being in Canada has changed these parents’ perspectives of how they engage their children in learning. In fact, Agalga and Joseph shared that their sons would not have engaged in cooking if it was “back home” (Africa). In separate interviews, they both stressed that their home cultures “bars” boys from going to the kitchen and people find it “awkward,” as Agalga put it, to see boys there. The following excerpt exemplifies how Joseph navigates through the cultural barriers being in a new cultural context with different values and expectations on what male children should be engaged in (or not), especially at home:

I don’t see anything wrong with my son going to the kitchen or learning how to cook. At home, it is kind of not allowed. Is not part of our culture. Here [Canada], you have taught him how to cook and bake for himself. His mom is always busy at work, and he has to do it. He learns math from doing so also (Joseph - Jones’ father).

The excerpt above demonstrates the role of the current society and culture in the development of these families. From a socio-cultural point of view, by virtue of being in a new cultural context, parents appear to be interacting with people and engaging in other activities, and through that, parents are beginning to identify with the practices of the host community’s culture, which appear to be influencing the strategies they employ in engaging their children at home (Canada) (Rogoff, 1994).

Although some of their current practices, like boys cooking, seem to counter their home cultural values, both parents and their children were aware and indeed acknowledge the potential of such
informal settings in mathematics learning. For instance, Agalga appeared intrigued by how informal contexts, like kitchen, & shopping activities, offer his son the opportunity to learn mathematics. For instance, in one of my arranged home visits, Jones (Joseph’s son) volunteered to teach me how to make cupcakes. With support from Joseph in the kitchen, Jones brought out all the measuring equipment and ingredients. He started measuring, following the recipe he found online. Joseph and his son talked about the measuring tools they were using and related their thoughts to fractions as they use various sizes of the measuring tools to measure out the ingredients. Aglaga was also intrigued about his son’s (Evans) ability to approximate prices, calculated tax on goods, compare prices of items and helping him (Agalga) and his mother to make good purchases or to obtain good deals on items in stores. In a separate conversation, Evans (Agalga’s son), he reiterated how he applies his mathematics skills in informal contexts:

I learned about fractions in baking. Because baking, sometimes, it's mainly based on the fractions of stuff. Because if I were to make bread. Let's say get three and one-fourth cups of flour. I have to get three cups filled with one cup. Then a one-fourth. So four-quarters of one cup (Evans – Agalga’s son)

Evans further shared how he helps his mother to make decisions on what to buy when they go shopping.

Say that there's a deal going on. Say they're selling four bags of five kilograms of sugar. You can buy four bags of five kilograms of sugar for, let's just say, $20. Then there was a bigger bag of 25, and it would be just a little over the $20. Let's just say $23. Then, you would take 10% off $23 or the $20 and add it to that number. The way to get 10% is you
have one decimal. What you would do is you would move the decimal one to the left. Say it's one, zero and zero. Since the decimal is here, you move it up here. Therefore, that's 10 cents. Therefore, since GST in Canada, which is a tax when you buy groceries, is 12%, just round the 12% to 10%, then take that 10% and add it. Since 10% of 23 would be 2.30 cents, then you add 2.30 cents to the actual price, which is $24. Then after your base, you just see the difference, comparison, and quantity and how much depending.

(Evans – Agalga’s son)

Similar ideas about the importance of informal context and melding of practices from two cultural worlds (Africa and Canada) were evident in Mashy’s interactions with her son. As shared earlier, in her home country Mashy, used to be given money to budget for an entire week and needed to decide how much she had to use every day for lunch at school. Mashy shared that since her son’s (Hakeem) school has a lunch program, she does not usually give him money to buy lunch at school as she would probably have done in her home country. Consistent with Mashy’s own experience learning about money when young, she finds it useful to engage her son in improvised activities that she believes will help her son understand the concept of money. For instance, she uses monopoly (a Western/Canadian money game) to support her son in understanding the concept of money. She described the game and added the relevance of this money game in her child’s mathematics learning:

Nowadays, we start to spend one hour every day playing Monopolies. Monopolies[sic] has so many calculation and mathematics aspect including knowing more about money. I
want his brain to be active in numbers and playing with numbers adding subtracting all 
these things faster… (Mashy- Hakeem’s Mother)

Mashy added,

There is a bank so you have money. My son always is the one responsible. He is a banker. He’s responsible to give people money. When somebody gives him extra money, he knows how to take that extra and give him the change. He knows how to divide the money equally. We have to play with a token and goes in a certain area. Sometimes when you purchase something, he said, “No, it’s cost this. You have to give me this. I will give you back this.” (Mashy - Hakeem’s Mother)

These African immigrant parents shared various ways in which their parenting and supporting styles have changed as they now draw on both Western/Canadian experiences and their prior cultural experiences from Africa in supporting their children’s mathematics learning in Canada. More important here is how parents modified such engagements to mirror the present culture (Canadian context) in response to the Canadian system of education and general parenting. In short, parents found a need to foster children's practical or contextual learning of mathematics hence, parents find it necessary to adapt culturally situated ways to the new context. It is important to note here that parents themselves saw these modifications or alterations to their prior cultural experiences or practices happening more or less spontaneously. In other words, the families tended to retain some features of their African culture or backgrounds and modify others for the benefit of their children’s mathematics learning in Canada.
4.4.1 Theme: Parents Leverage Different Forms of Capital to Support Children’s Mathematics Learning

The data revealed that parents leverage different forms of capital when supporting their children’s mathematics learning in Canadian schools. Here, I draw on Bourdieu’s (1982) definition of “capital” as the valued resources underlying families' interactions, actions and their relationships with the society, which are deemed important or relevant to their children’s mathematics success in the Canadian context. The data corpus suggests at least four forms of capital that these African immigrant families use in supporting their children’s mathematics learning: cultural capital (material resources such as textbooks), technological capital, linguistic capital and navigational capital (Yosso, 2005).

**Cultural capital:** Cultural capital in the form of educational material resources is one form of capital families in the study draw on supporting their children’s mathematics learning in a Canadian context. For instance, five of the African immigrant families shared various cultural resources they brought with them to Canada, including textbooks, worksheets, and other materials that they believe are relevant in their children’s mathematics learning in Canada. These were largely drills and worksheets, based, which appear to reflect the cultural model of mathematics education parents themselves experienced back in their home countries.

*You can see we bought a lot of books here, mathematic books, and we're trying different curricula materials here (Joseph – Jones’ father)*
In my interactions with Joseph, Mashy and Kata’s families during my visits, they all referred to mathematics textbooks they had brought from their home countries. In most cases, the families consulted these textbooks for either a mathematical formula or for alternative algorithms to explain a particular mathematics concept to their children.

Similar usage of cultural materials was seen in Leticia’s case with her daughter. Although Leticia appears to use drill-based, and worksheets-oriented, materials from her home country, she added, “I help her to see that connection not just memorizing like what is 2x2 and what is 2x4 like I learned but helping them to see the connection between different tables”. Leticia (Princess’ mother) brought out print multiplication table with algorithms they brought with them from their home country and further illustrated how she used it with her daughter. What is of interest here is Leticia’s appreciation of the need to use these materials to emphasize mathematical understanding rather than teaching her daughter to memorize facts as she experienced in her home country. Perhaps Leticia’s new perspective on mathematics learning (emphasis on the process of learning and patterning) could be attributed to her encounter with the new school system that appears to encourage children to make connections and explain their process of thinking, as Leticia herself alluded to when she described her “new” perspective of mathematics learning (as reported in theme 3).

The use of similar cultural resources in the case of Malee appears to be a way of staying connected with the culture of education, school system and curriculum in her home country. For instance, Malee expressed her anxiety or fear over her daughter falling behind in terms of mathematics learning in her grade level in her home country. She believes her daughter would be
doing more advanced mathematics there, than she is currently doing in Canada. Malee shared the following:

> she gets books from home every day. I ask my relative at home that have the same age children like my daughter. I ask them, "What are you doing? What kind of math books are they learning? What strategies? (Malee – Zahara’s mother)

In contrast to the five participants who brought in resources from their home countries and used them to support their children’s mathematics learning in Canada, one parent (Agalga-Evans’ father) appeared not to draw on any materials from Kenya, his home country. He noted that he has “not thought about integrating or bringing some resource from Kenya and use here…I think I’m very comfortable with the books here”. It is worth mentioning here that Agalga has lived in Canada for over 20 years, far more than other families in this study. Perhaps, with many years of living in Canada, Agalga seems to have assimilated well enough in terms of easiness in accessing and using learning resources of the dominant culture (Gsir & Mescoli, 2015) in support of his son’s mathematics learning. Agalga also demonstrated similar cultural assimilation when he shared that he has been teaching his son to cook, something which might not have happened in traditional African cultural context where not many households will assign boys to the kitchen.

Interestingly, although parents brought curriculum materials from home, how these materials were used to support their children’s mathematics learning appear to differ across families. For instance, while Joseph made posters of mathematical formulas in his living room for his son to memorize, Leticia modified such materials. She shared how she used multiplication tables she
brought from home (with algorithms) to emphasise “meaning-making and pattern recognition” and not to memorize the multiplication table as learned in her home country. Common among the families (except Agalga) is that they all, in one form or the other, make use of mathematics curriculum materials that appear to mirror their cultural models of mathematics education as experienced in their country of origin. In the use of these materials, parents apply their judgements in evaluating the two “curricula worlds” (Canadian and their home country) and meld the strengths in both curricula to support their children's mathematics learning in Canada.

**Linguistic capital:** I make reference linguistic capital as accumulated communication experiences in more than one language/style (Yosso, 2005). In the context of this study, linguistic capital is broadly defined as families' ability to draw on their bilingual and multilingual repertoire (L1 and L2) – verbal, visual, print, or digital in support of their children’s mathematics learning (Barwell, 2018). All six families in this study draw on their linguistic capital in supporting their children’s mathematics learning in Canada. All parents, despite living in Canada for 7-16 years, still used languages other than English at home with their children. Parents continue using L1 with their children after several years of living in Canada, which points to the significance these parents attach to their home language, not just for cultural relevance. In addition, they use their mother tongue or home language to guide and organize mathematical thinking. In other words, parents’ fluency in the mother tongue seems to play a role in how they render support for their children’s mathematics learning in a Canadian context. For instance, all six parent participants shared that since the English language is not their first language, neither was it a medium of instruction in the education system of their home countries, they sometimes
Especially in mathematics, I study mathematics in my language [Arabic], everything in my language, nothing in English. When my son started to study mathematics in school in Vancouver, I started to learn everything from basic English. Because I have no idea about the English terminology they use in mathematics, so I have to teach myself, and I continue teaching myself those things. I have to translate in my head to English from Arabic and back to English…Sometimes through “YouTube videos” to understand the math in English (Mashy-Hakeem’s Mother).

During their interviews, parents referred to their actions as ‘translating from English to home language’; however, I observed them doing something more than translating words from one language to another. Instead, both children and their parents seamlessly switched between languages, from the mother tongue to the English language and vice-versa, when interacting and making sense of concepts. This practice is called “translanguaging” in the literature (Anderson et al., 2017; Conteh, 2018; Makalela, 2015; Makalela, 2016; Vogel, Ascenzi-Moreno, & García, 2018; Wei, 2018). For example, Mashy (Hakeems’s mother) would mention a mathematics concept in Arabic and use Google or YouTube to check the English meaning of the concept before discussing it with her son, drawing on words/phrases from both English and Arabic. Other instances include when Mashy, Leticia, and Kata would internalize the mathematics concept in their first language and, more importantly, then translanguage using both L1 and L2 to re-voice or repeat their math thinking in order to further explain an idea. What was obvious throughout
my observations and interactions with the families was that both parents and children felt confident processing and expressing their thinking in their respective local languages. As Kata put it, "I still count and do all mental calculations in my local language.” Leticia shared how she could perform more complex mathematical computations in her local language even after more than seven years of living in an English dominant country. Aside from her Grade 4 daughter, Leticia also has an older daughter in first-year university. She gave an example of how she draws on her local language to support her daughter’s mathematics:

*I still do multiplication in my head in my language. I still say tables in my mother tongue and then translate them into English. Like right now, even my older daughter from university, she's sent me a question. It was about additions of vector...There was trigonometry—I just thought of the problem in my language, then drew it on a paper, and I took a picture and sent it to her, but I can see how it makes sense. Then she did it, and she was told my interpretation was correct (Leticia- Princess’ mother).*

Despite families continued use of their first language alongside English as they engaged in translanguaging at home, they expressed the need to use English as they worked with their children when at home. Because English was the medium of instruction in the Canadian schools, they felt that using it in supporting their children at home creates some consistency in the language of instruction, thereby making their children’s learning of mathematics easier at school. Kata’s statement exemplifies this perspective.
I have to understand it and explain it to him [son] in English..., because the school language is English. So it just makes it easier for him as well. (Kata – Amy’s mother)

Similar communicative practice was observed in the case of Joseph. For example, I observed Joseph and his son working on “order of operations” (see figure 4.3 below), where they both seamlessly switched from English to Swahili in explaining their thinking. Joseph illustrated how he taught his son "Order of operations" in Swahili, which uses the acronym MAGAZIJUTO. MAGAZIJUTO in full means MABANO, GAWANYA, ZIDISHA, JUMLISHA & TOA in Swahili. Joseph's explanations and illustrations appear similar to "BODMAS" (Bracket off, Division, Multiplication, Addition, and Subtraction) as commonly known in mathematics across Sub-Saharan Africa. He shared that he and his son use Swahili because they could "relate more to it." It appears, though that, Joseph and his son translanguge for better understanding and expression of their mathematical ideas. Literature has also shown that incorporating a familiar grammatical structure and vocabulary enhances a child's understanding (Anderson et al., 2017) of mathematical concepts.
In an interview with Joseph’s son (Evans), he noted that the school has an “English only” policy which prohibits him from speaking or writing anything in a foreign language. In British Columbia, where this study was conducted, there is no official language policy that impose one language code on students or restrict them from communicating or expressing their thinking in their home language in classroom contexts. Indeed, the language of education policy states that “English and French will be taught as first languages, and all other languages will be taught as second languages” with approval from the Board of Education (BC Ministry of Education, 2021, para. 4). However, it appears that the school is constrained by monolingual norms and policies, which means that “translanguaging” in Evans’ classroom is not a practice that is encouraged by his teacher. Restricting students’ cultural language and emphasizing practices of the dominant culture has been problematized in the literature (Jorgensen (Zevenbergen), 2016a&b; 2005).
However, the dominant practice might not always fit the needs of the marginalized group(s), a point that I will elaborate on in the discussion chapter.

Although Malee spoke about the benefit to herself of translanguaging in supporting her child, she finds the process somewhat hard and exhausting when supporting her child. She has to process “complex” mathematical computations in her local language and revoice some of her statements in English for her daughter to understand even though it would be easier to think and verbalize her thinking in the L1. Malee uses English because her daughter has more facility in that language.

_The way we just memorize the multiplication and then I can say that the word we're using in the local language is much easier than English. It rhymes. It’s like a rhyme... It’s so much helpful because it just registers in your mind... but I sometimes don’t like to just translate one language to another language. It's just frustrating for higher-level math, especially when I have to explain a math concept to her [daughter] in English (Malee - Zahara’s mother)_

To a larger extent, all families draw on their home language to support their children's mathematics concepts, but they do so in different forms, as described above. However, the common thread here is that they see their local language as an asset in the host country where English is the dominant language. This is interesting because there appears to be a deficit discourse that has characterized home language use in children's mathematics and learning in general in the context where the language of instruction is different from the child's mother tongue (Barwell, 2018; Barwell, 2012; Barwell et al., 2007). However, this finding points to
families’ bilingualism as linguistic capital (or resource) in fostering their children’s mathematics learning at home.

**Technological Capital:** Technology use is another form of capital that the families deploy to support their children’s mathematics. I broadly define technological capital as ability to use digital tools (navigate through websites and applications), decipher and critique those digital tools (Teichert & Anderson 2014). Throughout my home observation visits, it was obvious that parents were using technologies ranging from software applications to web-based platforms. Thus, I inquired about how they were using these technologies to support their children’s mathematics learning specifically.

All parents stated that technology was new to them when they first arrived in Canada, coming from countries where there was limited access to technology (that is, lack of computers/laptops, software applications, and low internet bandwidth or no internet all) for learning. Parents shared what they saw as both affordances and constraints of technology in providing support for their children’s mathematics learning. While some of these technological tools were school recommended, others were sought out by parents themselves, through friends and online. For instance, Mashy shared that since many mathematical terminologies in English were unfamiliar to her, she relied on YouTube explanations on mathematics concepts so she can teach her son:

*There is a lot of YouTube explanations I use... I only knew that terminology in my language, in my first language. I watch videos with teachers explaining, so I understand what it means.* .... (Mashy – Hakeem’s mother)
For Mashy, technology (e.g., YouTube) is a resource for herself and, more indirectly for her child, when she uses the knowledge gained to mediate her son’s mathematics learning. First, Mashy’s use of YouTube indicates a fundamental technological skill in searching for content and educational resources through various web platforms. Even more important is Mashy’s ability to choose the most suitable videos that she believes would aid her to better explain mathematics concepts to her son, making her use of technology a form of capital in supporting her son’s mathematics learning in Canada. Moreover, Mashy’s utilisation of YouTube videos for herself to understand math concepts points to her belief that to effectively support her son’s mathematics learning at home, there was the need to first build her confidence level in the subject.

Leticia and Kata both have registered their children on web-based platforms, such as Khan Academy, to ensure their children practice more mathematics at home after school, reflecting the significance they attach to their children’s mathematics learning. Both parents find such platforms useful in creating opportunities for continuing mathematics practice. The two parents like these math web platforms because their in-built monitoring feature sends out progress reports to parents to enable them to keep track of their children’s mathematics learning, including how much time spent practicing math concepts, the math skills being mastered and so forth. Figure 4.4 gives a sense of a progress report of students from Khan Academy. Using technology in this way points to these immigrant parents leveraging their digital knowledge to monitor their child’s progress and engagement while providing additional practice in mathematics.
For Agalga, besides periodic personal visits to his son's school to inquire about his child's learning progress, one other way of keeping daily track of his son's mathematics progress is
through the software FreshGrade\textsuperscript{12} provided by his son’s school. In a separate interview with Evans (Agalga’s son), he explained to me how his teacher is using FreshGrade to communicate his mathematics progress to his parents:

\textit{Whenever you do work at school, or say, you do a test or something like that, instead of the teacher handing it back to you and showing your parents what you’ve got, she would post the score on FreshGrade. For teachers, it's a more efficient way to keep the parents on top of what the students are doing. The students have access to only their accounts. The teachers have access to all the kids just in their class. Then the parents only have access to their child’s FreshGrade (Evans - Agalga’s son)}

Evans added:

\textit{I like that my dad sees the math I have done in class and comments on things that I’ve done. I keep working harder because my dad will always get the report from my class teacher if I don’t do well in class…. (Evans – Agalga’s son).}

Although the use of FreshGrade is an initiative of the school, the ability of Agalga to use the platform to monitor his son’s progress makes the tool a resource for supporting his son’s mathematics learning as it allows him to know how his son is doing in school through daily class updates on class activities. This enables Agalga to offer additional support to his son (Evans) on

\textsuperscript{12} FreshGrade: Software application which allows teachers to instantly capture and share student’s learning with their guardian or families through photos, videos, audio, and notes. The software allows families to comment or respond to the post of the teachers. \url{https://www.freshgrade.com/parents/}
certain key areas where he feels his son is lagging. In addition, as Evans revealed, the father’s technological capital indirectly motivates his son to perform well.

While parents acknowledged the affordance of their use and engagement with technology to support their children’s mathematics learning, they also identified what they saw as some constraints of some of the technological web-based platforms they were using. This is an indication of technological capital because they had enough content knowledge and technological skills to be able to understand or identify that some web platforms were, indeed, problematic. For instance, Malee shared her personal experience using one of the mathematics learning web platforms, “Mathletics,” with her daughter at home. Her daughter's teacher had registered their class on the website. Daily, the teacher assigns students mathematics tasks to complete through the website. In sharing her and her child’s frustration using the Mathletics, Malee made the following comments:

I do not like the Mathletics because it is just not very well designed. It just asks the answer and doesn't mention, for example, "round to the nearest tens or 100". When putting the answer in the box, it just says that it is wrong. It [is] exhausting, and it makes me angry because we are sitting together and we were just solving, and it said, "Wrong, wrong, wrong," but we are right. Afterwards, she said that "Oh, mom is saying I'm wrong," "I just solved it too, is right." "The teacher thinks that I did all of these wrong," and I said, "Forget about Mathletics, do it on the paper... I just print the questions and ask her to write all of the steps in the paper and show me the steps. The answer is not important for me, actually. The steps are important.
(Malee – Zahara’s mother).

Figure 4.5 Picture of a sample Mathletics math task sent to me by Malee (Parent)
Figures 4.5 and 4.6 show sample pictures of mathematics tasks from Mathletic and Khan Academy, respectively used by families. In the case of Malee, she cited an instance where her daughter was given a problem on Mathletic to “decrease $42 by 73%”. It is shown in Figure 4.6, her daughter worked out the problem on a sheet of paper and had 11.3 as her final answer. However, the system (Mathletic) marked her daughter’s answer wrong and suggested 11.34 as the right answer to the problem. Malee thought either answer in one decimal place (11.3) or two decimal places (11.34) to the problem should be correct. Malee thinks that although her daughter (Zahara) is capable of solving the task, the Mathletics application system invalidate this when her daughter’s response is marked wrong, as seen in Figure 4.5. She thinks the Mathletics web platform does not allow users to show their “steps” to demonstrate their deeper understanding of the problem. These parents’ ability to understand, engage and raise concerns about these technological web platforms indicates a capital that they leverage to support their children’s mathematics learning.

Another common concern shared by parents is the nature of mathematics tasks on the mathematics learning platforms schools are using (See Figure 4.5 and 4.6). For instance, two parents expressed concerns that the math promoted through these platforms contradicts what the school seems to encourage. While the schools encourage process, inquiry-based mathematics, the nature of mathematics tasks on the web platforms sanctioned by teachers appears to promote declarative or procedural mathematics knowledge. For instance,
This instant gratification of technology can also hinder their tedious process of doing math because sometimes you don't get the answer immediately. You need to go through the process. Calculations can be tedious then you need to go through the step by step, and technology eliminates some of those steps (Leticia – Princess’ mother).

To sum up, these families’ uses of technology was two-fold. First, parents used web-based applications as media for their children to practice more mathematics at home due to the significance these parents attach to the mathematics learning of their children. The monitoring feature of the software applications, which sends progress reports on children’s mathematics directly to parents, enables these African immigrant parents to keep track of their children’s mathematics engagement on these Web platforms. Although some of the web platforms, like Mathletics and FreshGrade, parents were using were school initiated, parents demonstrated technological knowledge in accessing these platforms and even critiquing them (like Malee did in the case of Mathletics). This points to parents’ utilisation of technology as capital (or resource) for supporting their children’s mathematics learning.

Navigational Capital: African immigrant families demonstrated their ability to navigate through an education system not designed with the cultures and experiences of communities of colour in mind. Parents’ skill and ability to navigate through the education system in a completely different socio-cultural context (Yosso, 2017; Yosso, 2005) appears to be a form of “capital” they deploy in support of their children’s mathematics learning. African immigrant parents and their children continue to navigate differences in mathematics content and algorithm expectations in Canada. For instance, considering that parents’ cultural models of education, or
beliefs about, and experiences with mathematics learning in their home countries, appear
different from that of the host country (Anderson et al., 2017), they grapple with
school/classroom mathematics expectations in a Canadian context, as well as how they interact
or communicate with the teachers or schools regarding their children’s mathematics learning. As
one parent (Leticia - Princess’ mother) puts it, "I felt lost. I had no idea from where I should start
because back home we have the curriculum and the textbook, you just have to follow page by
page, lesson by lesson". Another parent (Kata - Amy’s mother) said, “the math teacher told me
like if I like, I can buy any math book I want for my daughter but not necessary…I was
confused”.

_He comes home without anything. At the beginning of the year, I thought the schools send
me boxes of curriculum materials, but they did not. Not even a paper. Maybe my child is
not qualified for being a student in the school, or there is a problem, or he has difficulty,
needs, or something. I talked to the teacher at that time, and she said, "No, you can
support your children with whatever things you want, but we don't have a curriculum
textbook for your child for homework. If you want to do it, it's optional for you. You can
pick up anything. (Mashy – Hakeem’s mother)_

From Mashy’s excerpt, we see that she experienced different expectations. In her home country,
Mashy would have been given direct instructions from the school on what mathematics textbook
her son needed to purchase for his grade level. However, coming to Canada, she faces the hurdle
of making decisions on what mathematics curriculum materials she needs to obtain. Mashy’s
ability to navigate this critical decision-making process regarding resources for her son’s
Mathematics learning is a form of capital for supporting her son’s mathematics learning in Canada. This is because considering the gatekeeping function these parents attach to their children’s mathematics learning, a parent’s ability to choose which mathematics curriculum material to use to better enhance her child’s mathematics fluency serves as capital or a wealth of knowledge for decision making regarding various aspects of their children’s mathematics learning.

Again, families expressed having to navigate differences between content expectations required in Canadian (Vancouver) mathematics classrooms. They perceived the mathematics content learned in Vancouver classrooms as less demanding. The following excerpts are illustrative of the voices of parents and their children across the data set:

*Because we talked a lot about mathematics at home, and she's involved, she's engaged with my students and me, she just finds the mathematics at the school so easy. Sometimes she told me that, "Mom, we don't do real maths." [laughs]. (Malee – Zahara’s mother)*

*Did you ask her what real math is? (Kwesi-Interviewer)*

*Yes, she knows that I am talking about polynomials, equations, addition, subtraction or something like multiplication. These are the real math. Just talking about the ancient number-- Okay, they need to know about the ancient number too, but maybe in just one class or two classes. Not for a whole term. (Malee – Zahara’s mother)*

*What I’m studying here in Canada, I'll study them in Grade 5 at home, but then when I come here, I was studying them in Grade 8. There, it's more move forward. (Amy – Kata’s daughter)*
I know that in Grade 7, they need to know about percentages. They need to know about linear equations. They need to know about many things that are required for high school. Until now, there is still nothing like that, and the year is ending. now maybe the teacher will just talk about percentage a little bit. So how about the rest of the math? That’s why I am helping her [daughter]. (Kata- Amy’s mother)

The above excerpts suggest “heteroglossic of accounts – school and families’ differing perspectives” (Li, 2006 p. 80) on mathematics content and expectations of the host culture, indicating that parents valorize a specific kind of mathematics (Bishop, 2002; de Abreu, Bishop, & Presmeg, 2001; de Abreu & Cline, 2005; Gorgorió & de Abreu, 2009). For example, privileging "polynomials and equations" and “percentages” over "ancient number system." The value Malee and Kata ascribe to this kind of mathematics (equations, etc.) appears to drive how they support their children’s mathematics at home by offering their daughters tasks that appear to mirror their mathematics content expectation for their children per their cultural model of mathematics education they experienced back in their respective home countries. Navigational capital is evident here in these parents’ ability to support their children to meet the mathematics content expectations of the two curricula worlds (their home and host country’s). With different curricula expectations, parents support their children to master those mathematics content areas they deem useful or valorize while at the same time ensuring children excel in the mathematics content taught in the Canadian school system.

However, parents also have to deal with differences in mathematics content and algorithms with which parents are familiar and what their children are currently studying in a Canadian context.
As noted, parents' cultural models of approaching mathematics seem different from what their children are learning in Canadian schools. Hence, in an attempt for parents to support their children’s math learning at home, it appears that children tend to disagree with their parents on strategies and approaches to use in accomplishing the math task. For example, Leticia did not understand why Princess would add or subtract, say four from each side of a mathematics equation with one variable. Leticia thought her daughter was rather complicating the process of solving the problem. However, the families explained that such differences lead them (both parents and children) to learn from each other’s experiences and approaches to mathematics tasks, an indication of parents and their children navigating the process of mathematics learning in the new school context. All families expressed this in the interviews. For instance, Leticia (Princess’ Mother) was categorical in her response; "sometimes we fight [laughter]", [in literal terms]. This phrase from Leticia indicates the conflicting understanding that occurs when she is helping with her daughter's mathematics learning at home. The excerpts from Leticia (Princess’ Mother) and Kata (Amy’s Mother), and Amy (Kata's daughter) exemplify how families navigate the differences in approaches in mathematics algorithms and strategies of solving mathematics tasks:

_Because like factors with Princess, she was the older one when she was learning, I don't know like you were saying balancing four here and four there, I never get it, and I feel like why is Princess making it more complicated? You can simply cross out the things and do it. Then she would fight, and she would say, "I have to show my work." Sometimes they will say, "You are telling me wrong." (Leticia – Princess’ mother)._
She will tell me, "No, no, mom... you don't understand what the teacher wants. So many steps before the answer." Sometimes she cannot even remember all the step (Kata- Amy’s mother)

The strategies are different. My mom’s strategy is usually the long and a little bit harder than the strategy that we were taught. It's just the way to do it, but only a few steps that it is different, not the whole thing (Amy – Kata’s daughter)

While Leticia describes her daughter's approach to many of the mathematics tasks as "complicated," her daughter (Princess) thought otherwise. Again, Amy (Kata’s daughter) described her mom’s approach to mathematical tasks as "little harder" and "longer", but her mother (Kata) countered her, instead of describing Amy's approach as containing too "many steps." These cases cited above are just two of the many responses that show conflicting understanding in mathematical algorithms that run through the data set between parents and their children but that the families were able to navigate.

The parents and their children had different approaches to solving the same problems, and both drew on approaches that were more familiar to them. While parents tended to draw on their previous mathematics learning from their home country, children draw on what their teachers had taught them in Canadian classrooms. Although these differences in approaches led to conflict or misunderstandings, the discussion in many cases appears to lead to new learning between parents and their children:

I usually do it in both ways. Anyways, I just choose the way that I would understand
or what I always remember, the easier version (Amy- Kata’s daughter)

In some way, I did not understand what they were doing it looks like there was some sort of cultural mismatch ... they will approach mathematics from a different angle that I have absolutely no idea of what they are doing, but I will tell them what I know and how and how I was taught. We both arrive at the same conclusion or answer, and they will see, and I will learn from them, and they will learn from mine (Agalga – Evans’ father)

Parents and their children mostly saw the differences in mathematics approaches or algorithms as something positive. Parents, even when they think their experiences do not mirror the expectations of the current school context of their children, were still able to draw on those experiences to "help their children to think clearly about the concept even if the approach was different." Children, on the other hand, feel that the differences in these approaches offered them multiple ways of knowing, from which they could have the luxury to choose which approach works best or is easier for them. Parents and their children had to continuously navigate the differences in mathematics content and algorithms expectations due to differences in cultural models of education they each experienced. However, both parents and children were receptive to the difference and were opened to learning from one another.

4.5 Summary

Despite parents’ negative experiences of mathematics learning in their home countries, they still attached great relevance to mathematics and perceived it as a "gatekeeping subject" that has the potential of unlocking opportunities for their children in the new cultural context. Due to the gatekeeping function of mathematics, families in the study perceive the subject as
"empowering," when their children perform well, especially in a racialized context where the subject appears to pose challenges for other children in the classrooms. Parents believe that knowing mathematics gives their children a huge sense of accomplishment and a sense of value, relevance and social status within a society that seems to marginalize them. In other words, their children’s ability to do well in mathematics is a way of challenging the status quo and the discourse that portrays Black or marginalized children as academically less capable.

The findings also revealed that parents' experiences and perspectives of their children’s mathematics learning inform parents’ mathematics identity construction. This could be interpreted as ongoing in that parents’ perceptions about mathematics appear to change as they become more aware of what is expected of their children’s mathematics learning in a Canadian context. Two contextual, cultural models of mathematics education appear to shape parent's perspectives of their children’s mathematics learning in Canada, namely cultural models of math education from their home country and that of the host country (Canada). For instance, parents’ previous memories of school mathematics from their home countries were characterized by catchphrases such as "intense pressure" to “memorize for national exams,” "fear of failing and fear of what others would say if you don't do well.” Yet, five parents, upon moving to Canada, appear to shift their perspectives and (re)construct new understanding and identity of math as “fun” “project-based,” and “not only for passing high stake exams.” Families' perspectives and beliefs about their children’s math learning seem to be evolving (or at least during the study) to reproduce the models of education that appear to be prevalent in the host country. That said, it is important to remember that one parent in the study recounted that most of the mathematics tasks her son was doing in school were drills similar to what parents experienced in their home.
countries. However, two parents indicated that they sometimes ensure that their children “go with their instructions” since it is their responsibility to adhere to high moral standards. These parents appear to draw on Western/Canadian (learning through play; finding ways to engage/motivate) perspectives, while affording considerable significance to learning math consistent with their own cultural model of math education from their home countries.

Researchers such as Guitierrez et al., (1999) refer to this phenomenon as hybridity, which I will discuss in detail in the next chapter. Lastly, the findings suggest at least four forms of capital families draw on in supporting their children’s mathematics learning in Canada: cultural, linguistic, technological, and navigational capital. The decision as to when and how they deploy these forms of capital could be interpreted as a strategy these parents use to support their children’s mathematics learning in Canada. Parents acknowledged that transitioning into a new culture could be challenging; however, they saw the transitioning process as offering new opportunities to co-learn mathematics with their children. These African immigrant parents in turn, used these new understandings to reflect on their prior experiences and ways of thinking about, and using mathematics to further support their children’s mathematics learning. The chapter that follows offers discussions of key conclusions in response to the research questions and connections to relevant literature in the field.
Chapter 5: Discussions and Conclusions

In this chapter, I discuss the findings largely in the light of the study’s theoretical framework and literature review. I then conclude the chapter with the study’s implications for theory, practice and research in the field of mathematics education.

As discussed previously, the knowledge and experiences of Africans living in diaspora and Africans, in general, are usually absorbed into the categories of other minority groups and people of colour in general (Tillman, 2002). More specifically, in mathematics education, there appears to be a deficit discourse that not only ignores the distinctive contributions and experiences of immigrant families to the general education of their children in the host countries but also sometimes frames immigrant families as disengaged and disinterested in their children’s mathematics learning and education in general (Colegrove & Krause, 2017; Martin, 2013). However, researchers and scholars have challenged this deficit perception and promoted an asset-oriented view that positions immigrant families as people with very high aspirations, expectations and with a keen interest in their children's mathematics learning and education in general (Anderson, McTavish, & Kim, 2017; Civil, Planas, & Quintos, 2005; Daniels, 2017; Weisskirch, 2017). By conducting this study, I not only join the broader conversation in countering the deficit discourse, but I also articulate the often “taken for granted” cultural capital of African immigrant families and how they deploy it in support of their children’s (10-15-year-olds) mathematics learning in a Canadian context. The following research questions guided my study:
1. What are African immigrant families’ experiences and perspectives regarding their (10-15-year-old) children’s mathematics learning in the home, community and school settings, within the Greater Vancouver Area?

2. What socio-cultural strategies and understandings (if any) do African immigrant families, now living in Greater Vancouver, draw upon to support their children’s mathematics learning?

To address the research questions, I employed a qualitative case study approach that utilized individual semi-structured interviews with African immigrant parents and their children and home visit observations. Six families (parent-child dyads) residing within Greater Vancouver, Canada, voluntarily participated in the study. In particular, I focus on four conclusions to frame this discussion in response to my research questions. Namely, these African immigrant parents:

1. were aware of both the gatekeeping function of mathematics and its role in reproducing or disrupting race or class hierarchies.

2. articulated perspectives of their children’s mathematics learning and their parental involvement based on familiar cultural models of education.

3. located a “third space” as a form of mathematics support for their African immigrant children’s success in the Canadian system.

4. leveraged cultural, linguistic, technological/digital, and navigational capital to support their children’s mathematics learning in the Canadian system.

These four conclusions were inferred and synthesized from the five key findings taking into account overlaps between some of the findings. For instance, there is a connection between the “gatekeeping function of mathematics” and the “empowering role of mathematics” in the
findings chapter. Thus, the connection between these two themes necessitated their emergence into one discussion point (i.e., conclusion 5.1.1).

5.1 Research Question 1

What are African immigrant families' experiences and perspectives regarding their (10-15-year-old) children's mathematics learning?

5.1.1 Parents' Awareness of the Role of a Gatekeeping Function of Mathematics and its Role in Reproducing or Disrupting Race or Class Hierarchies

Broadly, African immigrant parents in this study viewed their migration to the industrialized economy (Canada) as an opportunity to turn their economic circumstances around, similar to the views expressed by immigrant parents living in the US about their children's education in the host country (e.g., Hispanic/Latino immigrant parents (Jonson et al., 2016; Roksa & Robinson, 2017; Yosso, 2017), Chinese immigrant parents (Li, 2018), and Ghanaian-immigrant parents (Kumi-Yeboah, 2018). With specific reference to their children's mathematics learning in the Canadian context, parents in this study perceive mathematics as "a gateway" to their children's future higher education and career prospects. This study’s finding while applicable to Canada, also resonates with earlier studies in the US (Johnson et al., 2016; Kumi-Yeboah, 2018; Li, 2018; Roksa & Robinson, 2017; Yosso, 2017). These researchers also speak to the overall value ascribed to mathematics as a pathway to moving up the social echelon in the lives of immigrants.

This study’s parents' perception of mathematics as a gatekeeping subject also appears to be informed by their cultural models of education or prior educational experiences (Anderson et al.,
growing up in Sub-Saharan Africa where mathematics excellence paves the way to higher educational institutions and future economic prospects. In contrast, failure in mathematics at the high school level in most of Sub-Saharan Africa means one's dream of pursuing college or university education is shattered. The gatekeeping role of mathematics in Sub-Saharan Africa can be illustrated with an "airport security gate system" analogy where one needs to pass through a security checkpoint to board a flight to a destination. Similarly, other researchers have described mathematics as being “a critical filter” for entry into post-secondary education (Stinson, 2004; Watt et al., 2017). While for Canadians, mathematics is also a gatekeeper, the impact for immigrant children especially Black/African immigrants is further complicated by issues of race. Although these parents find themselves in a new educational context, they seem to hold on to the relevance of mathematics as a gateway to a post-secondary institution.

African immigrant parents in the study perceive their children's mathematics learning as vital for their upward social mobility in Canada, where excellence in the subject could pave the way for Science Technology Engineering Mathematics (STEM) - related careers, which appear mostly preserved for “smart” people. Parents’ personal experiences with mathematics’ gatekeeping role was also evident and what “befell” the parents, seemed to inspire them to take a keen interest in, and support their children to excel in mathematics learning. According to Bourdieu (1990), habitus is a product of history and past experiences, which produces individual and collective practices, which become the lens through which people view their "worlds". Here we see parents' mathematics habitus (dispositions) playing a role in their interest and support for their children's mathematics learning in Canada. Framed differently, these parents’ expressed aspirations for
their children to secure future prestigious careers which would enable them to gain access to 

economic opportunities, in white-dominated communities that seem to marginalise Africans and 

other persons of colour. Similar to the perceptions of Martin’s (2006) African American parent 

participants, all African immigrant parents in this study expressed the belief that lack of 

mathematical fluency, coupled with their children’s devalued Black/African immigrant status 

could sing into the popular narrative about their children’s academic incapability and this could 

further relegate them to a second-class status in the society. 

Indeed, being in a racialised environment, where mathematics as a school subject seems to cause 

difficulty for many children, African immigrant parents perceive their children's success with 

mathematics as a way of empowering their children - to gain a "sense of value", "show smartness 
of their children", "make their children feeling special", "increase their high self-esteem" - in an 

attempt to break racial stereotypes. In other words, African immigrant families see their 

children’s mathematics (and general academic) success as a form of resistance to racial 

stereotypes, a finding which has also been reported in McGee’s, (2013) study with Black high 

school students. It is important to stress that attributes such as smartness and sense of value 

which African immigrant recognise in their children counter the deficit narrative or the 

misconception that Black and working-class children are less capable or “less smart" in terms of 

excelling in mathematics (Dumenden, 2012; Rubel & McCloskey, 2019). As Martin, (2010) and 

Dumenden (2012) have expressed, there seems to be an underlying "racial soft bigotry of low 

expectation" that could suggest African immigrant, or the Black children generally are incapable 
in terms of mathematics excellence. What is even more troubling is that this seems to be an 

ocurrence in discourses that have racial overtones that portray an African immigrant child’s
identity as mathematically inept. As Martin (2019) has suggested, excellence in mathematics is usually ascribed to white middle-class or Asian children. But for the African immigrant families (parent-child dyads) in the study, in an environment where this perception permeates (Martin, 2019), supporting their children’s mathematics fluency in the racialised environment, is one of the ways of counterbalancing their social exclusion, and positioning themselves as people of education, culture and intellect. African immigrant families' countering this soft-bigotry of low expectation, or deficit narrative of Black or Africans in itself, is consistent with an Afrocentric worldview of pursuing an agenda of "corrective history" in telling the "real story" of people of African descent (including African immigrants), and positioning Africans and the Black race as people with strong linkages with academic excellence (Asante 1990; Wiggan & Watson, 2016). Indeed, Africans were producers of mathematics, science, philosophy and religion before the Western world made contact with the Egyptian region (Asante, 1990; 1989; Asante & Mazama, 2005; Bangura, 2012). It could therefore be interpreted that African immigrant families’ quest to challenge the deficit perspective of their children by supporting them to acquire mathematics fluency is a way of reshaping their identity as academically capable children with an innate potential of excelling in mathematics. Although African immigrant children’s mathematics fluency could lead them to future economic prospects in the STEM areas, equally important for them was countering the racial stereotype, which positions African children as less intelligent to pursue mathematics. In other words, the “gatekeeping role of mathematics” for these African immigrant families enabled them to resist racial stereotypes within a racialized geo-political, socio-economic, and educational context.
5.1.2 The Influence of Familiar Cultural Models of Education on Parents' Perspectives of their Children’s Mathematics Learning and Ways of Involvement

Two contextual forms of cultural models of mathematics education appear to shape African immigrant family’s involvement practices (Anderson, McTavish, & Kim, 2017; Crafter, 2012; Fryberg & Markus, 2007; Reese & Gallimore, 2000) namely: the cultural model of education experienced in their home countries (Africa) and what they have experienced or are still experiencing in the host country (Canada). Cultural models largely drawn from Bourdarian perspective on habitus and capital (Bourdieu, 1990), are the assumptions or beliefs, patterns of ideas and practices relevant to education that is derived from past experiences and that mediate and regulate behaviour in the academic domain (Anderson et al 2017; Reese & Gallimore, 2000).

Some of the parents’ mathematics experiences such as “pressure to memorise for exams” for fear of failing, “math not enjoyable”, “stressful” seem to be shaped by their prior educational system and pedagogical approaches, in which they were raised, and how mathematics as a school subject was modelled for them. African immigrant parents in this study experienced education in their home countries (Sub-Saharan Africa) where the education system has a deep-rooted history of colonialism. Dei (2004), writing on schooling and education in Africa, noted that the structure and nature of the current African education system, a colonial legacy, appear to be in "crisis". Dei (2004) attributed this crisis to misguided and educational policies that failed to adequately account for a variety of human experiences that shape both the individual and societal growth.

Indeed, the education systems across the Sub-Saharan African countries where the study’s participants originate, seems to emphasise high stake tests. Success in these gatekeeping tests is the only means of climbing the academic ladder, thereby becoming the “cultural capital” to gain access to jobs in the formal economy (Adjei, 2007). For participants in this study, it appears that
the insistent pressure to succeed through state or country sanctioned high stake exams created anxiety and stressful school experiences for them.

Aside from assessments, another remnant of colonialism is the hierarchical structures of the school system bequeathed to African countries by their colonies. There seems to be too much power vested in the teachers and educational, and school administrators with little to no opportunity for parents and communities to ask questions about the mathematics children are learning in schools and how it is taught. Therefore, it was not surprising five out of the six parent participants in this study indicated that they seldom get in touch with the school teachers to inquire about their children’s mathematics learning because they believe doing so could be misconstrued as a lack of respect or trust in the teacher and the school system, broadly.

Parents’ experiences about pressure and stress in the school system was unsurprising to me. Growing up in Ghana, I experienced a similar cultural model of education which reminds me of the proverbial saying; "chew, pour, and forget", which literally means rote learning or learning by memorisation for the sole purpose of passing the examination. Rote learning in itself is stressful and cognitively demanding to many students. This prior educational experience of parents seems to influence their mathematics identity and how they model mathematics for their children (Colegrove & Krause, 2017). In Colegrove and Krause’s (2017) study with Latino immigrant parents, they noted that parents often felt confused and frustrated when teachers required their children to describe their process rather than just the final answer of a mathematics problem. The parents in Colegrove and Krause’s (2017) study viewed such requirements by teachers as complicating things rather than showing deeper conceptual understanding of the
problem. Similarly, Civil, Planas & Quintos (2005), found that some of the participating immigrant parents in their study expressed differences in pedagogical approaches. For instance, the participants described how division was taught as inefficient and slow due to the demand for their children to show detailed steps in arriving at a final answer. The current study’s findings are also consistent with these studies and with those with culturally and linguistically diverse immigrant parents in the UK (de Abreu & Cline (2005), and Crafter’s (2012) study with South Asian immigrant parents in England. While these latter studies highlight specific conflicting pedagogical practices between immigrants’ home and the host country’s school practices, African immigrant families in this study also described how they are impacted positively by their children’s schooling experiences in Canada, despite the parents’ own negative school experiences. The current study further points to the need for a nuanced understanding of parents’ beliefs in that parents retained some beliefs/perspectives and practices based on their own experiences in Africa but also took up new ones.

This study adds another layer to the conversation on parents’ perceptions on their children's mathematics learning by highlighting how the perspective of African immigrant parents has changed, as a result of their children’s encounter with a new school or mathematics learning experience. For instance, parents appear to have come to view mathematics as a more enjoyable subject, stress-free, and inquiry oriented. Therefore, while parents retained some cultural models from Africa such as being moderately authoritative in supporting their children’s mathematics learning in Canada, some of the perceptions of these parents seem evolved, or altered, to reproduce some aspects of models of education that are prevalent in the host country (Canadian education context). From an Afrocentric standpoint, “one’s life experiences are shaped
significantly by one’s social milieu – a person’s immediate and intimate environment” (Schiele, 2017, p. 19). Thus, the general dynamics of the host country’s school system appear to contribute to how these African immigrant parents make sense of their children’s mathematics learning in the Canadian context.

However, this transformed perception (stress free, inquiry oriented and so on) about their children’s mathematics learning in Canada and general school experience was not homogenous across families. In other words, there seemed to be variability of mathematics learning experiences for these African immigrant children, even though they attended schools in the same educational context using the same, provincially mandated, standardised mathematics curriculum. Indeed, the parents in this study pointed to disparities in mathematics learning experiences of the children within the same classroom, such as when Mashy reported that her son was assigned math drills (because of his low English competence), while others in the same class worked on inquiry-based math activities. This finding concurs with that found in Anyon’s seminal works on Ghetto schooling with working-class elementary schools in the US (Anyon, 1997; 1981) and lends support to Anyon’s claim that teachers sometimes downplay the mathematics capability of English Language Learners (ELLs) by assigning them less cognitive demanding tasks. Regardless of how teachers or schools justify such differences, it appears longstanding deficit views that children from certain marginalised communities, or linguistic backgrounds, are less capable of performing exploratory mathematics tasks persist. This deficit view contrasts the claim that ELLs are indeed, capable of engaging in cognitively demanding tasks if teachers engage in equitable mathematics teaching practices by providing avenues and
resources that support ELLs’ mathematical reasoning and conceptual understanding (Moschkovich, 2013).

Morton and Riegle-Crumb’s (2020; 2019) suggest that teachers in predominately Black neighbourhood schools in the US (considered lower socio-economic neighbourhood) tend to spend significantly less time teaching Algebra (a gateway course to post-secondary mathematics in US) and more advanced content in Grade 8 compared to schools in white and middle class dominated neighbourhoods. Teachers who teach in these poor neighbourhoods often misinterpret children’s low-socio economic status to mean less academically endowed (Morton & Riegle-Crumb, 2020). As Anyon (1997; 1981), & Bourdieu (1990) suggest, such a disparity in curriculum and teaching as seen in this study might lead to social stratification of knowledge with a potential of reproducing unequal class structures within the education system.

Parents’ valorisation, or de-valorisation, of their children’s mathematics seems to be shaped by their familiar cultural models of mathematics education. For instance, African immigrant parents perceive their children’s mathematics learning in the Canadian context as less challenging, in terms of content or curriculum expectations for their children’s grade level, hence influencing what they see as valuable mathematics content for their children. According to De Abreu (2000), social valorisation or de-valorisation is relevant in how we might interpret what these African immigrant parents see as legitimate mathematics, worthy for their children to study at school. De Abreu (2002) drawing on Wertsch (1991) notion of “privileging”, described how individuals come to make a judgement on what mathematics practices is more appropriate than others. More specifically, valorisation was defined as privileging or legitimatising a certain form of
mathematics practices from one culture over others (De Abreu, 2002). This was evident when immigrant parents such as Malee, drawing on mathematics curriculum models from her home country, referred to certain topics (e.g., polynomial functions, equations) as “real math” and viewed topics (e.g. ancient numbers) her daughter was currently studying in her Canadian math class as less important. Indeed, these African parents concur with immigrant parents from different socio-cultural and economic backgrounds in both the United States and England (see Bishop, 2002; Bishop, & Presmeg, 2002; De Abreu & Cline, 2005; Gorgorió & De Abreu, 2009).

From a Bourdieurian “economic exchange” perspective within the concept of capital, the possibility of exchange is dependent on the practices of the fields (home and school) and how these practices structure actions and rewards (Jorgensen, 2015a &b). In the context of African immigrant families in this study, some of the mathematics content they so desire for their children (polynomials, equations) may have value within the field of mathematics (i.e. necessary to pass gatekeeping exams in Africa) but may have no value in the current grade level in which their children are enrolled in Canada (British Columbia Ministry of Education, 2016). In other words, what is valued in one context and at a particular time or stage in the child’s schooling may not hold same, or similar, value in another. This is not unreasonable given the mechanisms and valued content expectations across the different schooling contexts (home and the host country). Interestingly, confidence in mathematics content knowledge from their home countries and its utilisation is comparable to that of Latino immigrants in the United States (see Civil, 2016; Quintos, Civil, & Bratton, 2019). However, this finding seems to contrast with Filipino immigrant parents in Japan who tended to undervalue not only their multiplication strategies, but
also their mathematics knowledge from their home countries, due to their low socio-economic background as immigrants who now live in an industrialised economy (Japan) (Takeuchi, 2018). However, considering the social status of African immigrant families in this study, it appears that they still hold strong views of what they think counts as legitimate mathematics knowledge based on their previous mathematics learning experience. They expect their children (now studying in Canadian schools) to master content similar to what they (parents) had studied in their home countries and anything less, or different seems to be perceived less valuable. However, parents still welcome the mathematics learning culture (i.e., less stressful learning environment) and pedagogical practices as a much-improved learning experience than they (parents) had in their home countries.

In the African context, school teachers are most revered and trusted to deliver not only content or school curriculum, but also ensure moral conformity of students. Parents see teachers as "second parents" away from home and have vested authority in them to teach and support the general upbringing of the children. Students, on the other hand, accept and respect the responsibilities vested in their teachers to act as their parents and in many cases, teachers become confidants of their students because of the parenthood responsibility they play in the community. Some African immigrant parents in the study seem to project similar trust, responsibility and expectation on their children's schools and teachers in the Canadian context, similar to what was reported in Civil, Planas and Quintos (2005) in their study with Latino immigrant parents in the US. For instance, for most (four) of the African immigrant parents, frequent visits to the school were seen as "interrupting the work" of the school or implying “a mistrusting the work of teacher”. Contrary to these parents’ perception, schools in North America and European contexts
seem to consider activities such as frequent visits to their children’s schools or volunteering for school events, field trips, Parent Advisory Council (PAC) membership as “appropriate” parental involvement practices (Epstein, 2005; Stagg-Peterson & Heywood, 2007). This seems to suggest an apparent communication gap between school and home, and not just conflicting worldviews on parental involvement, may be at play. Especially if we consider those immigrant parents in the current study, who expressed a desire/need for more detailed information about what the school expected from them as parents in the host country.

In summary, regarding parents’ perceptions on their children’s mathematics learning, parents demonstrated awareness of their children’s mathematics learning not only as a gateway to upward social mobility but also, a means of challenging racial stereotypes in racialized context. In addition, while African immigrant parents showed awareness of the differences in cultural models of education (Canada and home counties), they strategically merged strengths from both models in supporting their children’s mathematics learning in Canada.

5.2 Research Question 2

What socio-cultural strategies and understandings do parents draw upon to support their children’s mathematics learning?

5.2.1 Locating a Third Space in Support of their Children’s Mathematics Learning

African immigrant families in this study expressed cultural knowledge, values, beliefs and practices that appear different from that of the host culture and appear to locate a place to accommodate these differences for the benefit of their children's mathematics learning in
Canada. The process, (including what parents do) to accommodate or strategize new ways of supporting their children in Canada could be likened to Giroux’s (2005) notion of “border crossing or transitioning” process. Drawing on Giroux (2005), Meyer et al., (2019) argued that immigrant and refugee families who cross physical borders still encounter cultural borders, wherein social codes, experiences, and language differ. As a result of this apparent change in cultural contexts, it requires skills and effort to transition, since these contexts (home versus host country’s culture) are in many cases governed by different values and norms (Civil, Planas, & Quintos, 2005; Civil, 2016; Li, 2018; 2006; Quintos et al., 2019). A typical example is seen when African immigrant parents raised in a strict home environment with very limited space for negotiations between parent-child now have to “negotiate” with their children to get them to study more mathematics at home.

The parents in this study strategically incorporate their own prior beliefs and experiences from their home countries and ongoing experiences in the host country, and in so doing, reorganize their roles and practices as parents to foster their children's mathematics. The reorganisation of their involvement and changes creates a new or adapted form of practices. This is evident where parents in the study indicated parents’ ability to draw on their experiences (with modifications) in raising and supporting their children’s mathematics learning in the new cultural context (Vancouver). For instance, Mashy (Hakeem’s Mother), adopted a money game (monopoly) from the Canadian culture to teach her son about money instead of using real money as it was the case in her home country. Likewise, Agalga and Joseph allowed their boys to cook in Canada different from how they themselves were raised in Africa where boys were not encouraged to cook. Both parents believed cooking has mathematics concepts embedded. Such involvement
strategies illustrate these parents’ awareness of children's mathematics learning as a social activity whereby daily interactions and engagements form the basis for social-cultural learning (De Abreu, 2002). More importantly, although these social activities and informal interactions (e.g., playing monopoly game, cooking) were not attuned with parents’ prior mathematics learning experiences, they did not consider them as “counterscripts” (Guitirrez et al., 1999) to their children's mathematics learning in the Canadian context but instead, they opportunistically viewed such practices as new social spaces for mathematics learning. Parents accommodating some practices or beliefs from both cultural contexts (home and host country) is an indication of them creating or locating a third space. Framed differently, parents created a safe learning space wherein practices and beliefs from both home and host countries are harnessed to support their children’s mathematics learning.

Knapp, Landers, Liang, and Jefferson (2017) reported increased involvement among racially diverse parents after they participated in intervention programs aimed at increasing their understanding of their children’s mathematics content and curriculum expectations. Although African immigrant parents in this study did not benefit from similar intervention support as reported in Knapp et al. (2017), they still demonstrated their awareness of school mathematics expectations of the host country. They creatively negotiate the tensions (as a result of differences of cultural contexts) by adopting creative strategies that meld both Western ways and their own cultural beliefs in supporting their children’s mathematics learning in Canada. By doing so, these parents demonstrated their awareness of the contextual differences and ability to accommodate these differences for the sake of their children’s mathematics success in the Canadian context,
which they believe is critical for their social mobility (Jorgensen, 2018; 2016; Martin, 2012; Tarbetsky, Collie, & Martin, 2016).

5.2.2 Leveraging Cultural Capital in Support of Children’s Mathematics Learning

The study situates ‘cultural capital’ in its broader sense to include legitimised sets of knowledge and social dispositions that are valued and passed on to the younger generation through the process of socialisation. These include parental involvement practices, social and cultural resources that serve as enablers for African immigrant families to negotiate and overcome individual and institutional barriers that impede their social mobility within a context that marginalises people of colour. The study revealed four forms of capital that these African immigrant families deploy in support of their children’s mathematics learning, namely: cultural capital (educational material resources), linguistic capital, technological/digital capital and navigational capital (Yosso, 2017; Yosso, 2005).

Cultural Capital: African immigrant families in the study indicated using varied educational resources such as mathematics textbooks, worksheets and other curriculum materials they brought with them from their home countries to Canada. These resources were interpreted as cultural capital of these African immigrant families since Afrocentric worldviews legitimatises and reinforce the centrality of cultural resources from Africa as being valid and useful (Asante, 1990), as opposed to being deficit. From a cultural capital lens, these African immigrant parents clearly demonstrated the relevance & value of the educational resources from their home country in supporting their children’s mathematics learning in a Canadian context. More importantly, how these home resources were appropriated potentially shaped the way these African immigrant
children learn mathematics or respond to mathematics tasks in their Canadian classrooms.

Although these African immigrant families upheld and valued their educational resources from their home countries some studies in language literacy have indicated the lack of appreciation or recognition of such resources, by school teachers and educational administrators, as valuable cultural capital in the host country (Stagg-Peterson & Heywood, 2007). It appears that a deficit perspective may account for the lack of recognition of minoritized cultural resources in the host country, but parents in this study put this deficit view into question.

Five families shared that they were using educational resources from their home countries. However, there was heterogeneity across families with the use of the resources. For example, while one parent used content based posters to create a math literate environment, another used formulaic materials to emphasize pattern recognition & conceptual understanding. Such heterogenous use of resources across families also suggests that immigrant families in this study did not appropriate such resources in unilateral ways, as some school administrators or teachers might think. In previous research, teachers and principals not only invalidated the cultural capital of immigrant parents, but also viewed such parents’ cultural capital as disruptive to their children’s learning in Canada (Stagg-Peterson & Heywood, 2007). In fact, teachers and the principal, in Stagg-Peterson and Heywood's (2007) study, had observed that very often their new immigrant parents imitated their own schooling experience by using rote learning and drills to teach reading to their children in the home. However, the variability across African immigrant families in the current study indicate that immigrant homes and experiences are not socially static, as many may believe.
**Linguistic Capital:** All African immigrant families in the study made reference to their hybrid language identity (Planas, 2011), that is, being bilingual. As bilingual families, they speak a language other than English at home and it was common to hear families switch between English and their local language (L1) during interactions with each other. From an Afrocentric lens, African’s home language (L1) is intrinsically connected to their culture, history, ability to relate, and portrays their identity (Wa Thiong’o, 1992). As a result, use of the local language (L1) at home was one of the ways of sustaining their cultural heritage in an English dominant context. However, parents expressed their awareness of the “power of English” as a needed capital for their social mobility in this new context. Negotiating L1 and the medium of instruction (L2) seems not entirely new to them. For instance, the African immigrant families in this study come from countries with a multitude of local languages; Ghana has about 49 local languages, Tanzania has about 126, and Kenya has 68 but, the language of instruction in these African countries is that of the colonialist, (English in Ghana, Tanzania, and Kenya and Arabic in Somalia). English language in these African countries (from my Ghanaian experience), is seen as the "master's" language, and a language to get into the world of opportunities. For one to be successful in school, it means mastering and passing all English language tests and all other subjects instructed in English from primary to the university. A fail in the English language at any stage in one’s academic career will simply mean dropping out of school.

Similarly, in Canada, African immigrant families are required to negotiate two languages: their home language (L1) and the school language (L2 – English or French). In the context of this study, families spoke either Arabic, Swahili, or Twi as their L1 at home while the English language remained the medium of instruction in school. Specifically, their hybrid language
identity was evident in their practice of “translanguaging”, or “code-switching”, (Anderson et al., 2017; Barwell, 2012; 2018; Barwell, Barton, & Setati, 2007; Clarkson, 2009; Maluleke, 2019; Parvanehnezhad & Clarkson, 2008; Salehmohamed & Rowland, 2014; Xenofontos, 2015) as they use both the home language and the English language in offering mathematics support to their children seamlessly and unconsciously in their interaction. Translanguaging is the seamless “deployment of a speaker’s full linguistic repertoire without watchful adherence to the socially and politically defined boundaries of named languages” (Otheguy, García, & Reid 2015, p. 283).

In the context of this study, I observed five parents use both L1 and L2 seamlessly in re-voicing their mathematical thoughts, internalising their mathematical concepts, reformulating mathematical ideas, and translating some words or phrases within statements they made. Their use of language appears to resonate with Setati’s (1998) classification of language usage in bilingual and multilingual classrooms in South Africa. This ability to translanguage was a linguistic capital for them in that L1 allowed them as adults to "understand" concepts and then relay the meaning in English. Previous literature in mathematics education has highlighted similar findings in terms of how bilingual and multilingual students deploy multiple languages when working on mathematics tasks (Barwell, 2012; Barwell, 2018; Barwell, Barton, & Setati, 2007; Clarkson, 2009; Maluleke, 2019; Parvanehnezhad & Clarkson, 2008; Salehmohamed & Rowland, 2014; Xenofontos, 2015). While translanguaging is not a new phenomenon, reframing such practices as a hybrid bilingual repertoire, as African immigrant families demonstrated in the current study, has merit in valuing their effort as emerging bilingual and multilingual mathematics learners. Translanguaging as a linguistic capital allowed parents to better support their children’s mathematics learning because they were able to effectively harness their mathematical content knowledge by drawing on both L1 and L2 to explain complex
mathematical terms and expressions to their children. Also, parents drawing on their translanguaging capital enabled their children to acquire mathematical vocabulary not only in the dominant language (English), but also in the L2, as a means of expressing their bilingualism and African identity.

Indeed, in the classroom contexts, there is evidence that students who have a high level of proficiency in the first language and who demonstrate a similar level of proficiency in the language of instruction seem to outperform their monolingual counterparts in mathematics (Barwell, 2018; 2012). However, language policies that appear to impose an official language in many cases discourage the use of home languages in the classroom contexts and hence, translanguaging, regardless of the potential, is often not encouraged in mathematics classrooms (Parvanehnezhad & Clarkson, 2008). By extension, although both African immigrant parents and children seem proficient in the local language and were utilising both L1 and L2 in interacting and thinking about mathematical concepts, child participants indicated their inability to do so, in their mathematics classrooms. The children assumed English was the only acceptable form of thinking about and communicating their mathematical ideas in school.

Although immigrant families expressed usefulness of their hybrid language repertoire in support of their children’s mathematics learning, however, two of the parents pointed to what I interpreted as a contestation for language primacy with regards to the use of L1 and L2. Of course, immigrant families want their children to master the English language (official language) to be successful in Canadian schools, at the same time they want their children to keep their local or home language for its cultural significance. It appears that school language policies have
implicit potential of elevating and portraying English language or any language of instruction as the only one, or the more, suitable for mathematics teaching and learning.

Similar results were reported in Barwell (2018) as he identified two inherent tensions that bilingual and multilingual immigrant students face in Canadian classrooms. Barwell (2018) used the term centripetal to refer to:

institutional policies and forces that try to impose one language on others forcing speakers to adopt one unified language identity, and centrifugal forces to mean the forces that push speakers away from the common centre towards diversity to portray bilinguals multiple or plural linguistic identity. (p. 162)

While it is unclear if these tensions could ever be completely resolved in any culturally diverse society, the current study reminds us that translanguaging is not only a linguistic capital in the formal mathematics classrooms (as described in Barwell, 2018; 2012), it is also a resource in informal settings such as homes when families are interacting with their children and supporting their mathematics learning.

**Technological/digital Capital:** Technology in the homes of these African immigrant families exemplifies what would be found in a typical middle-class North American home, featuring digital devices (e.g., iPads, smartphones, desktops, and laptop computers) with access to Internet connectivity to which the participating children have access, although with strict parental supervision. The children in this study could be described as “digital natives” (Orlando and
Attard 2016; Prensky, 2009) considering their familiarity with various technological devices such as iPhones, laptops, and various gaming apps. On the other hand, parent participants self-identified themselves as “new” to technology and indeed conceded learning more about technology from their children. This was unsurprising to me as I share a similar experience with these African immigrant parents coming from countries with limited technological devices and internet connectivity especially considering the obvious disparity in generational terms where access to a basic mobile phone appear to have been luxury. Their current technological habitus could be best described with Prensky’s (2009) phrase “digital immigrants” since they were born prior to personal computers/internet or grew up in an environment with limited or no access to technology and therefore needed to learn to use these tools as adults.

All parents in the study had at least Bachelor degrees from their home countries and could be considered highly literate. However, after arriving in Canada, they also needed to become technologically literate by learning to use computers and other digital resources; an expansion of their print-based literacy to becoming multimodally literate.

Interestingly, this digitally and technologically immersive environment of African immigrant families seems to have created new dispositions (habitus) and mathematics involvement practices. Prominent among technologies used by parents was web-based platforms like YouTube which served as resources for parents to learn and internalise mathematics concepts, and then use their acquired competencies to support their children’s mathematics, an indication that parents themselves were willing to learn new mathematics content as they support their children in the subject. In Yaro’s (2015) study with rural parents in Ghana, the social-cultural
set-up is more communal in nature, making it easier for families to seek mathematics support from community members for their children in times of need. However, the social context of rural Ghana seems different from that of Canada where African immigrant families did not know their next-door neighbour, and even so, would likely feel uncomfortable to seek any support from them for their children's mathematics learning. In the absence of the in-person human resources parents would have sought from neighbours or community members in their home countries, they relied more on web-based platforms in Canada for similar support. This seems indicative of parents evolving habitus, and involvement practices in the new context as a result of technology. In fact, their habitus is shaped by the context in which parents deploy these technologies. Although I have no data to ascertain the nature or validity of mathematics content in the YouTube video resources parents were using and how they were internalising those resources and using them with their children in their homes, I am convinced that since parents themselves expressed their continued usage of such resources, it means they appear relevant and useful to them. For instance, Mashy (who learned mathematics in Arabic, her L1) relied on YouTube videos to learn how to express key mathematics concepts in English in order to tutor her son. That parents used such video resources to gain an understanding of the mathematics their children were expected to learn. This demonstrates parent's awareness of the need to, and their desire to, understand their children’s mathematics at a certain level so they could better scaffold their children’s mathematics learning at home.

Secondly, parents’ use of technology was for monitoring and supervision of their children's mathematics learning progress aside from the regular in-person supervision and mathematics tutoring support they provide to their children. For example, the school recommended websites,
such as Khan Academy and Mathletics, seemed to be common web platforms for all families to provide complementary tasks for children to work on while at home. Parents took advantage of the inbuilt monitoring system such sites provide regarding students’ progress in order to know how often (and how well) their children were learning mathematics. Studies have indicated the need to create technological learning platforms that ensure active engagement between parents and their children (Lewin & Luckin, 2010). However, such engaging features appear missing in the Mathletics and Khan Academy websites for these African immigrant families. In other words, there seem to be no features or activities in Mathletics and Khan Academy specifically designed to allow collaborative work between parents and their children. Nonetheless, these African immigrants’ technological capital (resource) afforded them the ability to communicate with their children’s teachers regarding mathematics learning of their children (e.g., FreshGrade), afforded parents the ability to monitor how often their children were learning mathematics (e.g., Mathletics), and as a means of internalising mathematics concepts (e.g., YouTube) and relaying those ideas in support of their children’s mathematics learning.

**Navigational Capital:** These African immigrant families possess the skills and abilities that allow them to navigate through and provide support for their children’s mathematics learning in a school system and cultural context that appear different from what parents themselves had experienced. These families’ unique abilities in overcoming institutional barriers as a result of implicit or explicit cultural and contextual differences inherent in the home and school divide appear similar to what Yosso, (2017) referred to as navigational capital. According to Yosso (2017), navigational capital acknowledges individual’s (people of colour) agency within institutional constraints. The African immigrant parents expressed how they grapple with
school/classroom mathematics content expectations in Canada, when dealing with differences between school and home mathematics algorithms (what their children are learning in Canadian classroom versus what parents are familiar with). These experiences of immigrant families appear to be clear manifestations of a transitioning process across different contexts of schooling where students participate in the mathematics experiences of more than one context – school and out of school, home culture and host culture. Gorgorio and Planas (2005) study with 15–16 year old immigrant learners described transitioning as “living discontinuities between cultures; in particular between school cultures and different mathematics classroom cultures and how the home and school cultures understand, value and use mathematics” (p. 93). African immigrant families seem to “live in similar discontinuities” with even more complicated transitioning process due to the multifaceted definition of what “home” is to them as a result of cross border migration. Families appear torn between their home country’s culture, and “a second home or host culture (Canada)” in terms of cultural models of mathematics education. Transitioning in-between these fluid cultural spaces (although distinct) in supporting children’s mathematics learning requires special abilities and skills.

One navigational strategy that children identified is accommodating and being receptive to their parents’ mathematics algorithms. For instance, the children explained how they leverage both strategies (what they learn from their parents and school) but most importantly, they skilfully drew upon what they saw as a best strategy at any given time. These children seem to engage in what Jegede’s (1997) described as “collateral learning” wherein learners evaluate seemingly conflicting worldviews or explanatory frameworks and draw from them a convergence towards commonality. Previous work on cultural border crossing and collateral learning have explained
the cognitive processes of learners as they process concepts or information from two different worldviews (home and school). Indeed, such cognitive processing has been found to enhance a better and deeper understanding of concepts (Jegede, 1997). Collateral learning could therefore be considered a form of a “navigational capital” highlighting children’s and parents’ ability to co-create mathematics learning opportunity by either merging two worldviews or strategically deploying approaches(s) that are relevant to tackling math tasks.

In other words, with exception of one child, five of the children in the study tended not see school pedagogies or algorithms as being in contestation with what I call “home mathematics pedagogies” – mathematics strategies children learn from parents. Instead, these two co-exist collaterally while children still negotiate school practices and mathematics learning in the context of the dominant culture. However, the literature shows that, some teachers hold deficit views about minority children’s mathematics experiences from home, and for this reason, prior knowledge of students of colour is usually relegated to the background, because their practices are seen as contradictory to that of the dominant community and are not considered “capital” in the field (Jorgensen, 2018; 2016a&b; 2015a&b; Martin, 2012; Tarbetsky, Collie, & Martin, 2016). As Bourdieu (1990) rightly expressed in ‘The Logic of Practice’:

> just as economic wealth cannot function as capital except in relation to an economic field, so cultural competence in all its forms is not constituted as cultural capital until it is inserted into the objective relations set up between the system of the economic production and the system producing the producers (which is itself constituted by the relationship between the educational system and the family). (p 124)
Students’ home experiences (acquired alongside parents and other family members) could only be considered as “capital” if they are given the needed recognition in the field (mathematics classroom). With regards to this study, African immigrant child participants indicated how they strategically make choices between mathematical strategies they deploy in solving mathematics tasks at home and school. The navigational capital of these African immigrants is evident in their ability to make choices on mathematical strategy between home and school and deploy these strategies to better aid their mathematics learning. Admittedly, it is unclear what teachers in Canadian schools might do or are doing to provoke and support African immigrant children to harness their navigational capital to foster their mathematics learning.

5.3 Conclusion

In this concluding section, I revisit the two questions that guided this study and briefly discuss insights from the study in relation to the research questions and how the study’s findings implicate future research, pedagogy and theory. The study sought to address the following research questions: What are African immigrant families’ experiences and perspectives regarding their (10-15-year-old) children's mathematics learning in the home, community and school settings, within the Greater Vancouver Area? What socio-cultural strategies and understandings (if any) do African immigrant families, now living in Greater Vancouver, draw upon to support their children’s mathematics learning?

In response to research question 1 on African immigrant families’ experiences and perspectives of their children’s math learning in Canada, the findings suggest that these families’ perceptions of their involvement with their children’s mathematics learning are framed within their own
racialized experiences of what it means to be mathematically fluent as a Black/African person in a white dominant context. Parents perceive their involvement in their children’s mathematics learning as a means to pave a way for their children’s future education and employment, as well as to fight the deficit view that seems to frame African/Black children as mathematically illiterate and less than ideal learners compared to other racial groups (Martin, Gholson, & Leonard, 2010; Martin, 2013; 2012; 2006). The deficit discourse seems not only to persist within the confines of mathematics education research but also appear to shape the public perceptions about Blackness and Black identity in white dominant contexts. Being aware of these racialised perceptions about their children’s mathematics inability, families therefore held the perception that taking keen interest, and investing time and effort to ensure their children do well in mathematics could be a means of challenging racial stereotypes about their African/Black children’s intelligence and ability to perform in mathematics. For these immigrant families, supporting their children’s mathematics learning and ensuring excellence in the subject could also be considered as a strategy for resisting Black/African subordination and the barrage of societal messages devaluing Blackness/African race with regards to academic excellence (Yosso, 2017; 2005).

The motivation for these African immigrant families’ support for their children’s mathematics was not only about the economic prospects that comes with mathematics related careers as it is suggested in several mathematics educational policies. These African immigrant parents held the perception that mathematics fluency, serves to highlight their children’s “smartness”, capabilities and successes. These perceptions and experiences of African immigrant parents begs further
attention to questions about whose interest school mathematics serves, and to what extent school mathematics addresses issues of inequality and inclusiveness?

In response to research question two (2) on socio-cultural strategies African immigrant families draw upon to support their children’s mathematics learning in Canada, the findings suggest that immigrant parents’ perceptions and involvement practices were shaped by their familiar cultural model of education. This in turn, seems to influence how parents’ render support for their children’s mathematics learning. Here I refer to cultural models of education as dispositions, perceptions, and beliefs (habitus) expressed by the parents that appear to shape their participation in their children’s mathematics learning in the host country. When encountered with socio-contextual differences in cultural models of education, they locate a ‘third space’ (Gutiérrez, Baquedano-López, & Tejeda, 1999) as a strategy to resolve tensions as a result of home-school discontinuity. In particular, parents in the study demonstrated awareness of the cultural and contextual differences in their children’s education and mathematics learning in the Canadian context compared to their own experiences in Africa. From a cultural capital lens, this awareness built through their habitus (past and present dispositions), enabled them to develop a field (Bourdieu, 1990) in order to adapt or accommodate the host country’s culture of education. This field sensibility allowed them to understand the “rules of the game”, develop collateral strategies (Jegede, 1997) for involvement and adjust their actions in the field (Bourdieu, 1990) for success in the Canadian system.

It is also worth pointing out that the practices of parents’ out of school practices are often not aligned with the involvement strategies sanctioned by the schools of the host country, and thus
lack recognition. Other studies have found that common parental involvement practices valued in most schools in North America include: (1) interactions with other parents, (2) parents’ understanding of school processes, (3) contact with school personnel, and (4) parents’ communication skills, (5) regular school visits, (6) volunteering on field trips (Li, 2018; 2006). Usually, these involvement practices are imposed on all parents irrespective of their cultural and socio-economic backgrounds and are used as a hegemonic yardstick to measure parental involvement in their children's learning (Cahoon et al., 2017; Colegrove & Krause, 2017; de Abreu & Cline, 2005; Johnson et al., 2016; Li, 2018; Ruvalcaba-Heredia, 2015). While these parental involvement activities are important, they seem to disregard the multiple meaningful ways families contribute to their children’s mathematics learning.

The study demonstrates that parents show interest and take up the responsibility of supporting their children’s mathematics learning in ways that likely go unnoticed by the schools or might appear too trivial for the school to acknowledge. Even when parents show a willingness to get involved in what the schools in the host country deem "conventional" involvement practices (volunteering etc), there seem to be inherent institutional barriers that discourage this effort (e.g. Malee’s and Leticia’s experiences). Li’s (2006) study documented limited English language proficiency as one of the major barriers of parental involvement, whereas prominent barriers of involvement cited by parents in this study include institutional based barriers. On the contrary, parents’ English language proficiency was not of concern in getting involved, instead, they identified a cumbersome process of signing up to volunteer, financial barriers associated with criminal checks, and school authority’s stigmatization of immigrant parent volunteers as deficit. It is possible such barriers are due to the urban setting. However, further research into
institutional sanctioned practices that limit non-mainstream families' easy access to schools and classrooms is warranted.

These experiences shared by parents only highlights a few of the many obstacles that immigrant families face in an attempt to get involved in the activities of the schools in the host country. However, if we see mathematics classroom as a “functioning community” like Cobb and Hodge, (2002) described the presence of parents in schools and classrooms regardless of their socio-economic and racial status will be welcomed. Knowing more about families' support for children's learning might assist with improving school-home accessibility.

Finally, the study revealed a multifaceted definition of capital as it identified at least four forms of capital African immigrant families draw upon to support their children’s mathematics learning in Canadian context, namely, cultural, linguistic, digital/technological and navigational capital. Although Yosso’s (2017;2005) model on community cultural wealth did not include digital or technology my study’s findings indicate that African immigrant families draw on digital and technological capital as a resource for supporting their children’s mathematics learning at home. Again, my findings indicate that African immigrant families’ forms of capital were largely influenced by their unique lived experiences as African immigrants (racialized experiences) as well as how these parents view the world (African centred worldviews) in relation to their children’s mathematics learning and involvement strategies.
Below, I have revisited Yosso’s (2017;2005) community wealth model to account for some of the findings present in my study which were absent from Yosso’s model: technological capital, racialized experiences of African immigrants, and Afrocentric worldviews.

Since immigrant families inevitably encounter obstacles as a result of being in a new cultural context within the host country, I argue that their ability to continuously manage dilemmas and other home-school discontinuities in quest of mathematics success for their children should be seen as (assets or) capital they possess. These forms of capital assume their meaning from families’ everyday encounters with realities of their new environment or country as they support their children, meaning they are deployed as to when reality of the circumstances demand.

Figure 5.1 An extended model of different forms of capital
More importantly, although I discussed these forms of capital separately in this chapter for the purpose of in-depth exploration of each of them, I conceptualise them as not mutually exclusive (Yosso, 2017). In fact, they are deployed concomitantly. For example, families understanding of mathematics as a gatekeeping subject motivated them to set high aspiration for their children’s mathematics success. Also, as noted in this chapter, families’ hybrid language identity through translanguaging served as a capital for reading and internalising mathematics educational resources from both the home and the host country as well as discussing their mathematics ideas. More so, parents use of technological capital involved deploying their translanguaging repertoire to make sense what their children were learning via web platforms and also monitor how often their children learn mathematics (e.g. Khan Academy). Similarly, their ability to translanguage was a useful resource in internalising mathematics concepts from web-based platforms such as YouTube and offering explanations that will better their children’s mathematics understanding. Families also demonstrated their navigational capital in their ability to identify potential home-school tensions in appropriating their cultural capital (educational resources) and seems to locate strategies to minimise the effect of these tensions.

5.4 Implications

In this section, I discuss some of ways this research informs theory, future research and future practice in mathematics education.

5.4.1 Implications for Theory

Previous works have employed Bourdieu’s concept of capital to explain how education reproduces inequality by limiting working class, minority and other marginalised communities’
mobility through reinforcing dominant power structures (Yosso, 2017; 2005). Wholesale application of this interpretation will simply mean that practices of white middle-class and dominant cultural practices become the yardstick with which other people’s cultural capital is measured, offering a narrower application of the concept of capital. African immigrants’ demonstration and use of various forms of capital (often taken for granted by the dominant class) which they leverage in support of their children’s mathematics learning (e.g., cultural, linguistic, technological/digital, and navigational) seems to challenge the narrowly conceived definition of capital as accumulated wealth, resources, and experiences of middle-class. The study therefore contributes to the broader theorisation of the concept of capital. In other words, mathematics education researchers interested in researching cultural capital of immigrants need to move beyond linguistic and cultural capital and consider other forms of capital especially those taken for granted, that enables minoritized or immigrant families to thrive in racialized contexts while supporting their children’s mathematics learning.

Socio-cultural experiences shape people’s understanding and their worldview. Thus, in this study, the interpretation of forms of capital and experiences of African immigrant families was situated within the cultural and historical reality of Africans (Graham, 1999). My participants’ experiences were interwoven with my own personal lived experiences as an African immigrant which provided deeper insights and understanding of the findings of the study thereby exemplifying the social construction nature of knowledge. Therefore, the study joins previous works to define knowledge as socially constructed through shared experiences between researchers and their participants.
5.4.2 Implication for Research

The findings from this study have varying implications for future research: with African immigrant families, on ways of engaging minoritized families in their children’s mathematics learning, on teacher education, and teacher professional development in mathematics education. First, African immigrant parents demonstrated knowledge about what their children do in school with regards to mathematics learning and provided specific examples of what they do in support of their children’s learning, contrary to the long-held deficit assumption that seems to project immigrant families as people who lack interest in their children’s education. The current study therefore implies that future research proceed from an asset point of view (positioning parents as experts of their children’s education) of families. The home visits hinted at strategies and practices that deserve more longer term investigation than this study did. Since the current study drew on interviews corroborated through home visits, future ethnographic research with diverse immigrant populations is recommended to document the nature of mathematics instruction immigrant families engage in with their children at home. Ethnographic study will provide a detailed account on “real-time” practices (over a long period of time) that occur on in immigrant families’ homes in providing mathematics support for their children. This is critical because, often times, there is a common misconception regarding mathematics instruction that mathematics is represented through a language of purely logical symbols, it is universal, i.e., culture-independent (Colegrove & Krause, 2017), and is the ideal subject for immigrants because matters of language should not substantially affect understanding of the content conveyed (Moschkovich, 2007). However, there seems to be a cultural dissonance in how mathematics symbols, procedures, and algorithms are represented in immigrant families’ home countries and
in host countries such as Canada, hence, it is important for researchers to document such cultural dissonance.

There is also the need for future research on teachers’ perspectives on immigrant family’s involvement in their children’s mathematics learning. This study has documented perspectives and strategies immigrant families deploy in support of their children’s mathematics learning, adding teachers’ perspectives would provide insights into their awareness (or lack thereof) of parents’ contributions. For instance, it will be important to hear from teachers their perspectives on immigrant families’ support, and what teachers’ expectations are. Based on the findings of this study, research into ways in which such perspectives could be shared with teachers - how can schools and teachers be informed about the differing cultural practices at home?

Again, the level of education of African immigrant parents in this study was likely an important factor in these parents' perceptions about their children’s mathematics learning and the strategies they deployed. However, findings from my previous study (Yaro, 2015) with parents with low formal education in rural Ghana indicate some commonalities with the current study. Therefore, it appears that differences in education levels of parents and how they perceive their children’s mathematics learning and involvement strategies might be less important than we think. Future research with immigrant families with varied levels of education and socio-economics to further broaden our knowledge of the various ways in which these parents will support children’s mathematics learning is warranted.

Finally, the study shows complexities and interplays between some taken for granted capital (cultural, linguistic, technological/digital, and navigation) of African immigrant families and
how they deploy them in support of their children’s mathematics learning in a host country. This implies that to better understand immigrant children’s mathematics learning, collaboration between communities, homes (parents-children), schools/teachers and scholars from different discipline - anthropology, linguistics, socio-linguistics, sociology, mathematics education, and so on (e.g. Anderson, et al, 2016; Anderson et al, 2010; Civil, 2016; Civil, 2012; Nicol et al, 2020 etc.) is no longer an option but a necessity.

5.4.3 Implications for Practice

Considering that this study was conducted with highly educated and somewhat middle class African immigrant families, as educators, there is need to be cognisant that people of colour, immigrants, refugees are heterogenous, just as Euro-centric populations. Thus, immigrant children do not all fit the stereotypical demographic of coming from poor, low educated, possibly dysfunctional or struggling families as people might think. This study therefore reminds educators adopt asset-oriented views about immigrant children by acknowledging and finding ways of using cultural capital (e.g. translanguaging) of these group of children to enrich their classroom mathematics learning.

I have highlighted various forms of capital and strategies immigrant families employ in support of their children’s mathematics learning. However, research has shown many schools either consider immigrant families’ cultural capital as disruptive to children’s learning in the host country or such cultural capital is underutilised by schools (González, Andrade, Civil, & Moll, 2005; Gonzalez, 1996). This study reiterates the call for culturally sustaining pedagogies that utilises students’ cultural repertoire not only as “a resource for access to educational
opportunities, but also together with evolving practices of students’ communities, as a focus for more pluralistic educational outcomes” (Nicol, Archibald, Glanfield, & Dawson, 2020, p. 19). What might such pedagogies look like in mathematics education? Some studies offer plausible points for incorporating culturally and socially situated mathematics pedagogies. Gutstein (2012; 2006), Civil (2016), González, Moll, and Amanti, (2006) and Yaro, Amoah, and Wagner, (2020), just to mention a few, have provided typical examples of how teachers might draw on students’ community and cultural backgrounds to create mathematical pedagogies and activities that are responsive to students socio-cultural, political and historical backgrounds.

However, I argue that this will require teachers to take initiative in learning more about families’ and children’s funds of knowledge and children’s prior mathematics experiences. As Yaro et al (2020) noted:

it is not enough for a teacher to know only how the student is functioning cognitively. Teacher knowledge of the cultural and linguistic resources students might bring to classrooms and what dispositions students may hold towards mathematics and its relation to their future or personal lives is essential to the teaching of mathematics (p. 227).

Teachers being aware of such learning experiences children bring to class will be a valuable asset in developing mathematical pedagogies that are responsive to diverse students’ needs. The current study revealed African immigrant’s families’ hybrid language identity as a resource in supporting their children’s mathematics learning at home through common practices such as code-switching/translanguaging. Considering the participants’ acumen with English, code-
switching and translanguaging by these African immigrant parents and their children was not due to low proficiency in English language but instead, the practice was used for elaboration and re-stating their mathematical thinking for clarity. However, it appears some schools and teachers in the Greater Vancouver area continue to act as there is a language policy that seems to impose one language code on everyone, leading students to adopt a single language identity and discouraging the use of home language in mathematics classrooms (Barwell, 2012) because there is usually a perception that code-switching disturbs the smooth running of lessons and derails learners from acquiring proficiency in English, the language of instruction (Maluleke, 2019).

Therefore, this study calls for the need for teachers to normalise and harness the potential of code-switching/translanguaging in multilingual mathematics classrooms by encouraging learners to draw on their linguistic repertoire (text, gestures, symbols, procedures etc) in thinking about, and making sense of mathematics. This will require classroom teachers to deconstruct the English Language Learner (ELL) tag which appears to stigmatise bilingual immigrants’ children and ELLs as less capable of engaging in rigorous mathematical tasks as their peers who speak the dominant language (e.g., Mashy’s son was given drills and worksheets because his teacher thought he had less proficiency in English). Instead, mathematics instruction for bilinguals and ELLs should be to support all students, regardless of their proficiency in English, in participating in discussions that focus on understanding and reasoning, rather than on low-level computational skills (Moschkovich, 2015). This also calls for teacher education programs, especially in mathematics education courses, to de-center the monolingual speakers as normative and acknowledge language and cultural diversity as mainstream, especially considering the fact that Canadian classrooms are increasingly diverse. Therefore, mathematics pedagogy courses should
be dedicated to addressing instructional strategies, and approaches in tackling multilingual, and
cultural, diversity in mathematics classrooms. Research shows that teachers are willing to
incorporate strategies that address multilingualism and cultural diversity in their mathematics
classrooms, but they feel ill prepared to do so (Maluleke, 2019).

Finally, the study revealed that some of the African immigrant parents due to cultural dissonance
felt lost and sounded frustrated regarding parental involvement expectations in Canadian schools.
By implication, there is the need to bridge the communication gaps between the school and home
– what pedagogical approaches are being used at school and why? What are the school’s
expectations regarding parental involvement? These families’ perceptions are indicating that
improved communications between African immigrant families and teachers will enhance
mutual understanding in fostering effective partnerships between home and school for the
mathematics success of African immigrant children. The study further revealed that even when
some parents were willing to participate in what many schools in Canada might deem key
parental involvement practice (e.g., volunteering), there were institutional barriers that hindered
this (e.g. class teacher’s unwillingness to accept parents in class, parents needing to go through
police criminal checks). By implication, there is the need for schools and principals to outline
measures that will encourage parental involvement practices and restructure school practices to
take advantage of knowledges, skills, abilities and networks possessed and utilized, by People of
Colour or immigrant families.
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Appendices

Appendix A: Interview Protocol for Parents

Research Title: *Understanding African Immigrant Families’ Support for their Children’s Mathematics Learning in Canada*

INTERVIEW PROTOCOL FOR PARENTS

At the beginning of the interview, verbal consent to proceed with the interview and to audiotape will be sought. Co-investigator will remain sensitive to the participants’ comfort and on occasions during the interview re-affirm that participants wish to continue.

*Introduction and Brief Background about Parent*

1) Could you briefly share a bit about yourself? (Education background, occupation etc)

*Parental Perceptions beliefs and experiences about Mathematics*

2) What are your own mathematics experiences more generally during your school age days?

- Interesting, can you tell me more about that?
- How did that happened?
- Can you explain a bit more on that?
- In what ways did you engage in mathematics informally (games, selling etc) outside the school mathematics
- In what ways do you apply mathematics in your daily life?
3) Generally, what do you think of schooling and learning in the Canadian context or classrooms?

- What were your child’s experiences when he/she first started school in Canada?
- Do you find difference between your child’s learning in Canada versus in Africa? How do you manage such differences (if any)
- Can you share a little about the kind of mathematics your child is learning at school now in Canada?
- How different or otherwise is the mathematics learned in Canada versus what you or your child experienced in your home country (Africa).
- Can you elaborate more on that? Any specific example to share?
- In what ways do you think your child navigates through such differences or finds his/her comfort level in terms of learning math in Canadian classroom?
- If there are challenges, what role do you play in helping your child overcoming such challenges in Canadian context?
- What are your own expectations for your child with regards to his/her mathematics learning?
- What are your views on the expectations of the school and your child in terms of mathematics education?
- Can you elaborate more on that?
**Parental support at Home**

4) How do you usually support your child’s mathematics learning at home?
   - Any specific strategy you use and why?
   - How do you find your previous school experience or math learning experiences (from Africa) helping or hindering the math support you provide for your child here in Canada?
   - Please can you elaborate more? Any specific example or case you would like to share?
   - What math learning resources or materials do you use to assist or support your child’s learning in Canada? Why do you use these resources or materials and how do you obtain them?
   - Do you use any math learning resource from your home country in helping your child’s math learning in Canadian context? If yes, why such resource(s) or why not? Any example or specific illustration to share?
   - If no, do you think resources from home might be helpful or hindrance in supporting your child’s math learning in Canadian context? Why?

**Informal interactions and engagements at home**

5) What informal activities do you engage your child at home that you think support his/her mathematics learning? E.g. household chores, games, play etc.

6) In what ways do you think the mathematics your child learns in school relate to his/her daily life activities?
   - Can you give any specific example(s) of daily activities that involve the application of mathematics?
Parents’ activities in promoting children’s mathematics education

7) How do you engage with the school or your child’s class teacher in terms of your child’s mathematics education?
   • Can you describe one memorable interaction you had with your child’s class teacher about his/her mathematics progress?
   • What makes it a memorable interaction?
   • How do you think the interactions with your child’s teacher changed the support or mathematics interactions/practices with your child in the home setting?

8) Is there anything else that you’d like to add that you feel I might have forgotten to ask?
   • Comments, thoughts, questions?

These interview questions are not prescriptive but instead, will be used to generate conversations that will help in formulating a response to the study’s research questions. These suggested questions are to encourage participants to expand on their responses.

NB: Parents participating in the interviews will have provided written consent prior to the first interview.
Appendix B: Interview Protocol for Children

Research Title: *Understanding African Immigrant Families’ Support for their Children’s Mathematics Learning in Canada*

At the beginning of the interview, verbal consent to proceed with the interview and to audiotape will be sought. Co-investigator will remain sensitive to the participants’ comfort and on occasions during the interview re-affirm that participants wish to continue.

*Background of Children*

1) Tell me a bit about yourself (your grade or class and your career goals)

2) What are your favourite subject(s) and why?
   - How will you describe your interest (like or dislike) in mathematics?
   - Can you tell me about that?

3) What do you think of learning in a Canadian classroom? (In case a child has previous experience studying outside Canada, I will probe for differences and similarities of such learning experiences in different contexts)

4) What math resources or materials do you use at home (here in Canada) and why?

5) From your previous experience studying in Africa (if applicable), is there any resource(s) from Africa you think could be useful in learning math here in Canada?

6) What learning challenges did you face when you first started school in Canada especially, in learning mathematics?
   - What challenges do you face now in class in learning mathematics?
   - Please can you share a specific example or illustration?
   - How did your teachers interact with you parents? (When, how often about what?)
• Can you share any example or illustration?

Children Mathematics Support at Home

7) In what ways do your parents (mother, father or guardian) help in your learning?
   • How do your parents (mother, father or guardian) support or assist you in your mathematics learning?
   • How do your parents assist you when you are given mathematics homework?

8) What motivation do you get from your parents (mother, father or guardian) in your mathematics learning?

Children’s Informal learning at home

9) What activities do you do at home after school?
   • What games or activities do your parents (mother, father or guardian) have you prior perform after school?
   • What kind of games or activities do you play together with your parents (mother, father or guardian) or with friends at home after school?
   • How do you like/dislike those games or activities?
   • Describe your feelings when playing or performing such activities or games with your mother, father or guardian, siblings,

10) What lessons do you learn from such games or activities with your parents?

11) Is there anything else that you’d like to add that you feel I might have forgotten to ask?
   • Comments, thoughts, questions?
These interview questions are not prescriptive but instead, will be used to generate conversations that will help in formulating a response to the study’s research questions. These suggested questions are to encourage participants to expand on their responses.

NB: Parent/guardian written consent for each child will be obtained prior to interviews. Verbal assent is in addition to the written consent.
Appendix C: A Sample Anecdote from the Home Visit Observations

Baking: Fractions and proportions with Joseph’s son – March 23, 2018

One parent participant invited me to observe his child bake some cupcakes for school. This family believed that their child’s ability to use measuring cups per the recipe and make temperature conversions (convert temperatures from degrees Celsius stated on the recipe to Fahrenheit as used on the stove regulator) was a mathematical activity that might interest me. Observation.

During the observation visit, the focal child (Jones – Joseph’s son) invited me to the kitchen to illustrate how he used different measuring cups/spoons to measure recipe for his cupcakes. Jones demonstrated to me his knowledge in equivalent fractions when he used different tablespoons to measure equivalent amounts on the recipe. For instance, he measured two half-table spoons as equivalent to one tablespoon of vanilla.
The Card Game with Mashy’s Family – April 23, 2018

During the visit, Mashy’s son, Hakeem proposed a card game he had learned in school but with some modifications. Four of us, Hakeem, Mashy, Hakeem’s father and myself played the game together – racing for 25 using additions, subtractions, and multiplication. In turns, each player made 25 using a given number of cards from the deck. The first to make 25 wins the round! We played several rounds of this game for about 45 minutes. Hakeem’s enthusiasm, passion and excitement was very telling as he spent time creating the rules and explaining them to us before the game starts. This was one of the joyful moments of Hakeem in my five home visits to the family. The photo below shows Hakeem taking his turn to make 25 using cards.