Examining Marginalizing Acts of Social Positioning in Mathematical Group Work: Towards a Better Understanding of how Microaggressions and Stereotype Threat Unfold in Intergroup Interactions

by

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Abstract

Mathematics learning is documented as being racialized and gendered. Power dynamics between students from various social groups can become particularly problematic during collaborative group work when students from dominant social groups position group members from stereotyped social groups in ways that hinder their opportunities to learn. The present study seeks to investigate how marginalization unfolds during everyday interpersonal interactions within mathematical group work and how students from stereotyped social groups talk about these experiences. Employing an interdisciplinary theoretical framework that cuts across the fields of the learning sciences and social psychology, this qualitative study aims to further understand not only the sociohistorical stereotypes and systems of power that are entrenched within mathematics classrooms, but also how power is constructed through the ways students position one another in their moment-to-moment interactions.

Drawing from six episodes of videotaped collaborative group work wherein students from stereotyped social groups are working with students from dominant social groups, the study examines the microdynamics of marginalizing acts of social positioning. Using a stimulated recall interview technique, the study also explores how six focal students from stereotyped social groups, identify, interpret, and discuss their experiences with marginalization.
The findings demonstrate the verbal and non-verbal dimensions of marginalization; highlight the intersectionality of race and gender and pinpoint racialized and/or gendered patterns in social positioning; and acknowledge the different interpretations and observations of the researcher versus the focal students. The findings also demonstrate how the focal students responded to potential threats to their identity and pushed back against marginalization: While two of the focal students appeared to adopt silence as a means of resistance to marginalization; two of the other focal students verbally contested marginalizing acts of positioning; and the remaining two focal students *pretended* to agree and get along with group members in an attempt to maintain group cohesion.

The study’s theoretical contributions include a synthesis of sociocultural theories of learning with social psychological theories that foreground race and gender. Implications for mathematics education are also raised, including suggestions for the design and implementation of collaborative group work as well as incorporating video methods into professional development initiatives.
Acknowledgements

Completing a doctoral thesis is a collaborative process. I encountered a number of obstacles throughout this journey and I attribute my success and perseverance to a number of special people in my life. From tackling the hurdles involved in recruiting research sites; to enduring multiple, rigorous iterations of microanalysis; to feeling lost in the seemingly endless abyss of writing; I had a village of supporters who helped me through. It was incredible to have people who celebrated in my successes, but perhaps more importantly, I am grateful for those who were there to help me through the hardships.

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offered by my committee members added to the interdisciplinary reach of my thesis and offered innovative directions for future research.

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CHAPTER 1: INTRODUCTION

The Need to Understand Students’ Experiences with Marginalization in Mathematical Group Work

Mathematics classrooms are built upon racialized, gendered, classed (to name a few) hierarchies of power that mirror the broader social world. Power relations within mathematics classrooms shape students’ interpersonal interactions, access to learning opportunities, achievement outcomes, and so on. The body of North American research documenting the racialized and gendered nature of mathematics learning continues to grow (e.g., Esmonde & Langer-Osuna, 2012; Langer-Osuna, 2011; Martin, 2006) and together highlights that students from non-dominant social groups must contend with far more than mathematical content when in mathematics class. For example, negative achievement stereotypes are known to hover over students from non-dominant social groups and influence their interpersonal interactions and performance on mathematical tasks (e.g., Steele & Aronson, 1995, Nasir, Atukpawu, O’Connor, Davis, Wischnia, &Tsang, 2009; McGee & Martin, 2011). Who students are can also impact the ways in which they are positioned by others during classroom interactions, thus producing differential access to learning opportunities (Gee, 2000; Engle, Langer-Osuna, & McKinney de Royston, 2014; Kurth, Anderson, & Palinscar, 2002). These and other findings shed light on why we continue to see racialized and gendered achievement gaps in mathematics and the underrepresentation of women and people of colour in mathematics-related domains (National Science Foundation, 2004). Taken together, findings from equity-focused research contradict the once popular notion that mathematics learning is culturally neutral (Nasir et al., 2009).
The present study seeks to investigate how marginalization occurs during everyday interpersonal interactions within mathematics classrooms and how students from stereotyped social groups talk about these experiences. The broad questions guiding the present study are three-fold: (1) What are the microdynamics of social positioning in mathematical group work when a student from a stereotyped social group is marginalized by group members who are from dominant social groups; (2) How, if at all, is race and/or gender involved in social positioning?; and (3) How, if at all, do students from stereotyped social groups identify, explain, and interpret marginalizing acts of positioning? The study aims to further understand not only the sociohistorical systems of power that are entrenched within mathematics classrooms, but also how this power is constructed through the ways students position one another in their moment-to-moment interactions.

In the forthcoming sections, I will describe the racialized and gendered nature of mathematics learning, discuss critical research perspectives that can further our understanding of marginalization, and elaborate on the related goals and questions that guide the present study.

**Mathematics Learning as Racialized and Gendered**

*Defining Race and Gender*

The present study conceptualizes both race and gender as socially constructed categories. It stems from the viewpoint that race and gender categories and differences are culturally, not biologically, determined. The present study defines race “not as distinct biological or genetic groups, but rather as a set of social configurations that support particular patterns of access to power and resources” (Nasir et al., 2009, p. 231). The present study draws on Butler (1991) to understand gender as a social construct built on societal norms that is performed by people:
…gender is a performance that produces the illusion of an inner sex or essence or psychic gender core; it produces on the skin, through the gesture, the move, the gait (that array of corporeal theatrics understood as gender presentation), the illusion of an inner depth (Butler, 1991, p. 28).

Based on their sociocultural underpinnings, race and gender are best understood when interpreted through the lens of cultural practices (Nasir & Hand, 2006). By understanding race and gender as “consequences of communities” that have developed according to a history of participation in cultural practices, race and gender become “a part of a person’s experience” (Nasir & Hand, 2006, p. 466). This perspective allows us to conceptualize race and gender as products and mediators of cultural practices that are sociocultural phenomena rather than inherent characteristics of people.

**Racialized and Gendered Hierarchies of Power in Mathematics Classrooms**

Drawing from data representing the mathematical experiences of African American students, Martin (2009) describes the salience of race in mathematics classrooms and discusses the widespread perception of a racial hierarchy of mathematical ability that positions African American and Latino/a students as inferior. Underlying power hierarchies in the mathematics domain also position girls and women as less competent than boys and men. After conducting a series of interviews with 16-year-old students, Mendick (2005) demonstrated that student discourses inscribed mathematics as masculine and the author concluded that as a result, women are less likely to feel comfortable with mathematics and are less likely to pursue it. Similarly, Rodd and Bartholomew (2006) investigated women’s participation in undergraduate mathematics classes and used student narratives to demonstrate a gendered trajectory of
participation. Women reported feeling invisible in the dominant university mathematics community.

The racialized and gendered nature of the mathematics domain has significant long-term implications for students of colour and women. In addition to disidentifying with the mathematics domain (e.g., Martin, 2000; Crocker, Major, & Steele, 1998; Aronson, 2002), students from marginalized groups are more likely to switch their major areas of study or drop out (e.g., Solórzano, Ceja, & Yosso, 2000). What results is an underrepresentation of these students in the mathematics domain, particularly at the level of post-secondary education (National Science Foundation, 2004). This underrepresentation serves to perpetuate negative stereotypes about the mathematical ability of women and people of colour.

**Mathematics Achievement Stereotypes**

Walter Lippmann introduced the term *stereotype* to social psychology in 1922 and described it as pictures in our heads. In his 1954 book, *The Nature of Prejudice*, Gordon Allport more narrowly defined stereotypes as exaggerated beliefs associated with social categories. From a social cognitive perspective, stereotypes are viewed as “cognitive structures that contain our knowledge, beliefs, and expectations about a social group” (Kunda, 1999, p. 315). They are commonly held notions or images of a social group based on prior assumptions about that group. They are oversimplifications based on observed or imagined traits of behavior or appearance. According to Bodenhausen (1990), stereotypes serve as judgmental heuristics that simplify the process of classifying and identifying people. Social cognitive psychologists suggest that in our daily interactions, we use stereotypes as mental shortcuts that help facilitate our social interactions (Kunda, 1999). That is, stereotypes can make it easier to form
impressions about people so that our attention and cognitive resources can be applied to other tasks (Macrae, Milne, & Bodenhausen, 1994).

From a sociocultural standpoint, stereotypes, like the notions of race and gender, are social constructions based on deep-rooted hierarchies of power and histories of oppression. The present study defines stereotypes as socially constructed ways of seeing recognizable groups of people. Stereotypes are perpetuated through culture and, regardless of whether a person believes them to be true, they can mediate the ways we see and interact with others (e.g., Devine, 1989; Lepore & Brown, 1997; Chen and Bargh, 1997; Greenwald, Banaji, Rudman, Farnham, Nosek, & Mellott, 2002; McKown & Weinstein, 2008).

Within the mathematics domain, women and people of colour (particularly Black men and women) are traditionally negatively stereotyped. With respect to mathematical ability, the stereotype that men are more competent than women and that White and Asian individuals are more competent than Black and Latino/a individuals are notorious in North America. Students from stereotyped social groups are well aware of the ways in which they may be perceived by their fellow classmates and teachers (Aronson, 2002) and research documents how they wrestle with stereotypes on a daily basis within mathematics classrooms (e.g., Nasir et al., 2009). Because of their notorious nature, achievement stereotypes hover over students from non-dominant groups and can shape the way they are viewed and treated by students from dominant groups (Steele, 1997; 2010). Even stereotypes that are presumed to be positive in nature can negatively impact a person. For instance, research documents the ways that Asian individuals feel pressure to live up to the stereotype that they are highly competent in mathematics which can be anxiety provoking (Cheryan & Bodenhausen, 2000).

Taken together, stereotypes are social constructs that serve to reinforce the racialized and gendered hierarchy of power that underlies the mathematics domain. The present study seeks to
consider how these hovering sociohistorical stereotypes play out in moment-to-moment interactions between students in mathematics classrooms. The study focuses specifically on how students position one another as they work collaboratively in small groups, a learning context prone to inequity (e.g., Cohen & Lotan, 1997; Esmonde, 2009a), and whether and how stereotypes are involved in marginalizing acts of positioning.

**Perspectives Needed to Further Our Understanding of Marginalization**

*Considering the Voices of Students from Stereotyped Social Groups*

Reform initiatives in mathematics education tend to be centered on the improvement of curricula and structural factors such as equitable school funding and classroom sizes (e.g., Remillard, 1999; People for Education Annual Report on Ontario’s Publicly Funded Schools, 2014). Although these endeavors are intended to improve opportunities to learn mathematics, they do not necessarily ensure that students are in a position to take these opportunities up (Walton & Carr, 2011). Research documenting the racialized and gendered nature of mathematics learning suggests that more emphasis should be placed on understanding students’ day-to-day classroom experiences. Once a better understanding of the experiences of students from non-dominant social groups is achieved, more effective educational reform can be designed and implemented.

Understanding how students from non-dominant social groups experience and interpret marginalization remains an understudied area. Based on the tenets of critical race theory (Ladson-Billings & Tate, 1995), it is important to employ interview methods in research involving individuals from non-dominant social groups in order to provide them with voice. This perspective is essential to truly understanding the lived experiences of marginalization and
is particularly important within the context of group work among culturally and racially heterogeneous students wherein marginalization may be routinely experienced by students from non-dominant social groups (e.g., Kurth et al., 2002; Langer-Osuna, 2011). In the endeavor to better understand how marginalizing acts of positioning are associated with social identity (i.e., social categories including but not limited to race and gender) and stereotypes, it is important to gain an understanding of how they are interpreted by those who are on the receiving end. Furthermore, in the pursuit of creating more equitable learning contexts, it can be beneficial for educators to understand how students from non-dominant social groups experience and talk about marginalization.

As researchers, there is danger in making assumptions about students’ interpretations of and experiences with marginalization. For example, in his analysis of a video recorded student interaction, Leander (2004) was surprised to find that although his analysis was centered around student-student interactions, a posthoc interview with a focal student, Latanya, instead revealed her preoccupation with the classroom teachers who were not captured in the video footage. Leander (2004, p. 207) stated, “While Latanya and I watched the same videotape of the interaction, she appears to have attended primarily to [the classroom teachers] who were, for the most part, off camera.” These findings point to the potential for misinterpretation when we rely too heavily on the sole perspective of researchers in our microanalyses of social interaction and highlight the importance of considering the perspective of the participants involved.

Goodwin (1994) defines *professional vision* as “socially organized ways of seeing and understanding events that are answerable to the distinctive interests of a particular social group” (p. 606). Our ability to see events is socially situated and “accomplished through a range of historically constituted discursive practices” (p. 606). As a researcher, my professional vision is informed not only by my theoretical orientations and interest in stereotypes and marginalization,
but also by my life experiences. I have a host of life experiences that shape the way I see the world. For example, I am a multiracial woman who grew up in a single-parent, low-income household and I attended predominantly White, middle-class elementary and secondary schools. Based on first-hand experiences, I am keenly aware of issues of race and gender that play out in school contexts. Being phenotypically White, heterosexual, well-educated, and English speaking, I am also privileged by mainstream society in many respects. My positionality, life experiences, and theoretical orientations serve as the lens through which I engage in research.

When examining marginalization and the ways in which students position one another when they work in small groups, my interpretations and observations may be different from the ways in which students from stereotyped social groups, themselves, experience and interpret them. It is thus important to appreciate the ways in which the students in the present study see the world rather than simply imposing my interpretations and perspectives. With this in mind, by highlighting both student and researcher voices, the present study aims to acknowledge and demonstrate the notion of professional vision. Such an investigation allows for the appreciation of both researcher and participant voices and sheds light on the importance of considering both researcher and participant positionality.

**Considering Multiple Timescales**

Research aimed at better understanding marginalization requires the consideration of multiple, intersecting timescales (Wortham, 2006). The present study is concerned with the ways students position one another in their moment-to-moment interactions during mathematical group work. However, to truly understand the positioning that takes place at a given moment, one must also consider the broader influences inherent in any context, including sociohistorical stereotypes and deep rooted power dynamics that exist between various social
groups as well as meso-level influences such as the more locally constructed racial climate of a school and students’ evolving interpersonal relations (Wortham, 2006; Anderson, 2009). For example, in her analysis of student positioning in mathematical group work, Langer-Osuna (2011) revealed the ways in which one girl who positioned herself as the group’s leader was, in turn, positioned as bossy by her group members. When the boy in her group made very similar positioning moves as he took up a leadership role, he, instead, was positioned as a necessary leader in the group. The ways in which the girl and the boy in this study were positioned was shaped by broader sociohistorical gender roles and stereotypes (i.e., macro-level influences) as well as the dynamics between the students that emerged throughout the course of the school year (i.e., meso-level influences). These macro- and meso-level influences came to bear on the micro acts of positioning observed in the session of group work and, in turn, the moment-to-moment acts of positioning shaped and further perpetuated the macro- and meso-level influences.

To truly understand how issues of race and gender play out in mathematical group work, the present study focuses not only on the moment-to-moment interactions between students, but it also appreciates how they are shaped by macro- and meso-level influences operating at broader timescales. The study also examines the ways in which these local acts of positioning in turn perpetuate both the macro- (e.g., sociocultural stereotypes) and meso- (e.g., student relations, racial climate within the classroom) level influences. It is often the case that researchers consider solely macro or micro levels of activity (Anderson, 2009) and so to achieve greater external validity, the present study considers multiple timescales and their intersectionality.
Considering the Intersectionality of Social Identities

In addition to considering multiple, intersecting timescales, research investigating marginalization must attend to the multiple social identities that intersect and operate in concert to influence the lived experiences of a person (McCready, 2004; Collins, 1990; Warikoo & Carter, 2009). Social identities such as race and gender do not exist as discrete categories and instead are inextricably linked. The concept of intersectionality was developed by feminist and critical race theorists and generally asserts that people are composed of a number of intertwining social identities (Crenshaw, 1993). For individuals who are part of multiple non-dominant social groups, their marginalized aspects of social identity are interlocked (Collins, 1990). For example, one cannot compartmentalize race and gender when attempting to understand how Black girls and women are marginalized within mathematics classrooms. The way Black women are treated is not the intersection of how Black people/men are treated and how (White) women are treated. While perceptions of Black women are not unrelated to perceptions of Black men and of White women, they are not simply a blend of these. Instead, aspects of social identity are woven together (Solórzano et al., 2000) forcing Black women to navigate their race and gender at the same time (Jackson, 1998). Social identities such as race and gender are said to operate “distinctly yet in relation to one another” (Gatzambide-Fernandez, 2009, p. 161) as well as other aspects of social identity.

Given the methodological complexities of studying intersectionality, most research investigating the marginalization of individuals from non-dominant social groups tends to compartmentalize race, gender, social class, and so forth. For example, research examining how achievement stereotypes impact students from stereotyped groups reduces race and gender into mutually exclusive categories for the purposes of analysis (Croizet & Millet, 2011).
Investigations such as this do not account for intersectionality and therefore do not provide a complete depiction of how social identities operate in the real world.

Given the vast number of social identities and their interwoven, constantly evolving nature, it is impossible to take into account all the dimensions of social identity that may be at play at any given moment. However, at certain moments, particular social identities may be more salient than others (e.g., Branscombe, Ellemers, Spears, & Doosje, 1999). For example, in a group interaction, if the one Black boy in a group is marginalized by the White boys in the group, he may have race on his mind. However, we cannot dismiss the fact that other aspects of his social identity, such as his sexual orientation and his gender, may also be involved. Herein lies the complexity of studying social identity.

In an attempt to adopt a more critical perspective, the present study aims to consider intersectionality in its study of social identities. Given my interest in the notorious achievement stereotypes in mathematics, I foreground race and gender while recognizing that other aspects of social identity that may be at play\(^1\). This analytic argument is drawn from the work of Gatzambide-Fernandez (2009) who asserts that:

\[
\text{Race, class and gender are intertwined- but it is difficult to talk about them all at once.}
\]

To deal with this challenge, we can foreground the dynamics of one category while keeping the others, at least analytically, in the background (p. 161).

\(^1\) Although the study foregrounds race and gender, aspects of social identity that independently arise in the data will be incorporated and discussed in the analysis. This will be further explained in the Methodology chapter.
Considering Canadian Contexts

The need to investigate issues of race and gender and how they play out through moment-to-moment interactions in Canadian mathematics classrooms is great. The majority of studies investigating marginalization related to race and gender power hierarchies in the mathematics domain have primarily been done in the United States. Although the broad sociohistorical achievement stereotypes in mathematics are similar in Canada and the United States (e.g., based on similar media portrayals), how they are perceived by students in Canada and how they play out in local contexts is likely different given Canada’s own history of race relations; systems of power; political ideologies; as well as school curricula, academic standards, pedagogy, philosophical underpinnings, local demographics; and so forth. Given these cultural and historical differences in context, it is problematic to rely on American research to inform our understanding of students’ day-to-day encounters with marginalization and inequity in Canadian classrooms. Racism and sexism are alive and well in Canadian schools (e.g. Alladin, 1996) and greater equity-focused research within these contexts is warranted.

Research Goals and Questions

The present study aims to qualitatively investigate marginalization within the context of group work in Canadian mathematics classrooms. With a focus on the experiences of students from stereotyped social groups, I am interested in investigating how students are marginalized through their moment-to-moment interactions, how social identity and related stereotypes are involved in these processes, and how the students, themselves, describe and interpret these experiences. The analysis will take into account the intersectional nature of social identity as
well as influences from multiple timescales of activity. The research questions guiding the study are as follows:

1. What are the microdynamics of social positioning in mathematical group work when a student from a stereotyped social group is marginalized by group members who are from dominant social groups?
   a. How, if at all, is social identity and associated stereotypes involved in this process?

2. How, if at all, do students from stereotyped social groups identify, explain, and interpret marginalizing acts of positioning?

3. How do focal student perceptions about marginalization compare and relate to the researcher’s perceptions?

I will now describe the theoretical underpinnings of this work, introducing its sociocultural theoretical backbone and how it synergizes positioning theory with social psychological theories that foreground social identity and associated stereotypes.
CHAPTER 2: THEORETICAL FRAMEWORK

The Synergy of Positioning Theory, Microaggression Theory, and Stereotype Threat Theory

The present study takes an interdisciplinary perspective to examining how students from stereotyped groups experience marginalization in mathematical group work. It cuts across the fields of social psychology and the learning sciences, drawing on theories that facilitate an analysis of the relationship between identity and student interaction. In the sections that follow, I will: (1) review the theories that frame the present study in terms of how, specifically, they support the investigation, (2) address the empirical as well as theoretical gaps pertaining to each, and then (3) discuss how I synergize the theories in order to address the study’s research goals.

Review of the Literature on Sociocultural Theories of Learning and Identity

First and foremost, this research is grounded in sociocultural conceptualizations of learning and identity. The present study views learning not as the acquisition of knowledge or skills, but instead as shifts in identity that can be evidenced through changes in the way one participates in a cultural practice (Lave & Wenger, 1991). Learning, according to sociocultural theory, is mediated by interpersonal interactions and the use of artifacts (i.e., objects that have become meaningful over time as a result of their repeated use in goal-directed human activity, Cole, 1996; Vygotsky, 1986). This conceptualization strays from cognitive learning perspectives, which view learning as something that solely occurs within the brain. Instead, sociocultural theorists present learning as something that is shaped by a person’s sociohistorical
context. This means that who a person is, where they are, who they are with, previous life experiences, what artifacts are available, and so forth, all shape whether and how they learn.

The sociocultural perspective uses the context, also referred to as activity systems (Engeström, 1999, 2000), cultural practices (Cole, 1996), or collective practices (Saxe, 2002), as a unit of analysis. This lens affords an appreciation of the situated nature of learning. Drawing from Cole (1996), the present research uses the term context to denote, “the connected whole that gives coherence to its parts” (p. 135). For instance, various parts of a classroom context include (but is not limited to) interpersonal interactions (e.g., student-student and teacher-student interactions), learning artifacts (e.g., worksheets, textbooks) and the physical environment (e.g., spatial organization of desks within a classroom). A person is said to be embedded in this context and the organizational structure of the activity, context norms, social interactions, and various artifacts together mediate their goal-directed activity (Engeström, 1999; Saxe, 1999). For example, a student within a classroom context engages with fellow students and the teacher as well as learning artifacts to mediate their learning and achievement (i.e., goal-directed activity). Their actions are constrained by a set of school norms as well as organizational structures. This mediated activity has multidirectional consequences because it simultaneously modifies the student in relation to others as well as the context as a whole (Cole, 1996).

Sociocultural theory links the process of learning with identity development (e.g., Wortham, 2006), positing that learning is not merely about acquiring knowledge and mastering skills, but includes shifts in identity (Lave & Wenger, 1991) and becoming (Nasir, 2002). (I will elaborate on the relationship between identity and learning in the section below on practice-linked identities). Like the construct of learning, rather than viewing identity as something static.

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2 The present study draws broadly across sociocultural conceptions of ‘context’, adopting the assumptions and language of multiple sociocultural theorists. With respect to the notion of ‘context’, the main intent here is to demonstrate the situated nature of learning and identity.
and internal to a person, sociocultural theorists posit that identity is a social construction that is constantly emerging.

The sociocultural perspective broadly describes identity as “a fluid construct, one that both shapes and is shaped by the social context” (Nasir, 2002, p. 219). However, identity can be conceptualized in a multitude of ways depending upon one’s theoretical orientation. Gee (1999), for example, makes the distinction between socially situated identity which refers to “multiple identities . . . [taken] on in different practices and contexts” (Gee, 1999, p. 39) and core identity which he describes as a “…relatively fixed sense of self” (p.39). Sociocultural theorists such as Kotsopoulos (2014) argue that, “although some aspects of core identities may prove to be durable and relatively stable over time, the potential for shifting core identities nonetheless does exist” (p. 36). Aligning with this theoretical orientation as well as Esmonde (2009b) and others (e.g., Wortham, 2004), the present research strays from the notion that identity is a fixed, personal trait “that a person carries with him or her from place to place” (Esmonde, 2009b, p. 251) and instead takes up the understanding that identities are constantly emerging.

With these sociocultural theoretical perspectives in mind, the present study defines identity as the socially constructed positions that a person comes to take on that are negotiated through social interactions and are inextricably linked to the context. I now turn to some of the more specific aspects of identity presented in the literature that help to frame the present research. Specifically, I will review the notions of positional identity and practice-linked identity and how they are intertwined with social identity (i.e., social categories including, but not limited to, race and gender). Returning to the study’s underlying goal to explore intersectionality, it is important to view these dimensions of identity not as operating in isolation, but as interrelated and reciprocally shaping one another. I will demonstrate this point in the forthcoming sections.
Positional Identities

*Positioning* is an inherent part of everyday social interactions and occurs through the way a person dresses, how people speak to one another, how people orient their bodies towards one another, and so forth (Holland, Lachiotte, Skinner, & Cain, 2001). Holland and her colleagues (2001) assert that moment-to-moment interpersonal interactions position individuals in the social world in ways that provide them with differential access to spaces, conversations, and overall participation in a practice. Positioning highlights the ways in which identities shift as a person moves across contexts and how people do not “have an identity, but rather inhabit or invoke multiple identities” (Esmonde, 2009a, p. 1012). In the present study, *positional identities* are conceptualized as the micro-identities that are constructed through moment-to-moment social interactions.

*Positioning theory* (Davies and Harré, 1990) “is used to describe relationships and interactions of people jointly engaged in conversation and/or activity” (Kotsopoulos, 2014, p. 35). It has multidisciplinary theoretical underpinnings, with roots in fields including social psychology (e.g., Anderson, 2009; Howie & Peters, 1996), linguistics (e.g., Holland, 2001b) and sociocultural theories of identity (e.g., Holland & Leander, 2004; Holland, 2001b) and uses interpersonal interaction as a unit of analysis. Given the study’s overarching goal to investigate the relationship between identity and student interactions, positioning theory serves as a useful theoretical and analytical lens.

Davies and Harré (1990) distinguish *reflexive positioning*, or the ways in which a person positions themselves in an interaction, from *interactive positioning*, or the ways that people position one another through interaction. Both forms of positioning can be either implicit (e.g., communicated subtly through body language) or explicit (e.g., communicated through talk) as well as intentional or unintentional. For example, failing to provide a person with eye contact while they speak can convey inattention and, whether intended or not, can position a speaker as
lacking authority. However, in the study of positioning, we cannot consider individual acts, such as eye gaze, in isolation. Positioning theorists frame it as a collective process that is best understood as an interactional dance between individuals (Davies & Harré, 1990). Each act of positioning can only be understood relative to the acts that precede and follow it. Further to this, the positional identities that are created at any given moment are inherently historical (i.e., based on the previous interactions and experiences of the people involved) and contextual (i.e., shaped by the physical setting, the artifacts available and so forth; Davies and Harré, 1990, 1999; Engle et al., 2014; Esmonde & Dookie, under review).

During any social interaction, there can be misalignment between reflexive and interactive positioning moves (e.g., Kotsopoulos, 2014, Wagner & Herbel-Eisenmann, 2009). For instance, a student in group work may attempt to position themselves as mathematically competent but may be positioned by another member of the group as lacking competence. Further to this, interactive positioning may be done by one person towards another or may be collectively performed by a group of individuals (Kotsopoulos, 2014; Langer-Osuna, 2011). For example, one student may reflexively position themselves as mathematically competent by offering an idea but they may be ignored by their entire group (interactive positioning). Interactive positioning can also be contested through reflexive positioning. For example, a student who is being restricted access to participation by her or his group members may push back by explicitly asking to take on a more central role in the activity (e.g., Esmonde & Dookie, under review). However, the social structures of group work may sometimes make it very difficult for students to speak out and engage in potentially contentious positioning moves (e.g., Kotsopoulos, 2014).

As previously described, group work is a learning context prone to issues of power and inequity, particularly when students from dominant social groups are grouped with students from non-dominant social groups (Esmonde, 2009a; Cohen, 1982). Under these circumstances,
perceived status differences between social groups and associated stereotypes are inevitably salient and may shape the ways students position one another. As such, students’ social identities are inextricably tied to the ways in which students position and are positioned by other students. In other words, race, gender (and so forth) are centrally involved in the construction of positional identities (Holland & Leander, 2004; Holland, Lachicotte, Skinner, & Cain, 1998; Leander, 2002b).

There are a number of studies that have begun to raise questions about the racialized and gendered nature of positioning that takes place during mathematical group work. For example, Leander (2002b) engaged in a microanalysis of talk, eye gaze, and bodily orientation to demonstrate how one girl was silenced by a group of boys in a classroom interaction. Employing similar analytic techniques, Esmonde and Dookie (under review) engaged in a microanalysis of student positioning and demonstrated the mechanics of how one Black girl (Kyla) was marginalized by the White girls in mathematics group work. The authors traced the process of marginalization, considering verbal as well as non-verbal positioning moves. Specifically, we used sketches of the students’ bodily orientations to study how Kyla was physically restricted access to the group’s interactional space and also considered whether and how Kyla’s intellectual contributions were taken up by the group. Taken together, the data demonstrated that Kyla was positioned as a peripheral member of the group through both verbal and non-verbal means.

These and other examinations of student positioning (e.g., Langer-Osuna, 2011; Kurth, Anderson, & Palinscar, 2002; Ritchie, 2002) not only highlight the subtle yet profound ways that moment-to-moment acts of positioning deny students opportunities to learn, but also suggest that who students are shapes patterns of positioning. Although these studies of positioning suggest its racialized and/or gendered nature, as Esmonde and Dookie (under review) point out, further research is needed to help develop tools for analyzing implicitly
racialized, gendered (and so forth) patterns of positioning. To build on this work and help address this research methods gap, the present study focuses on how marginalizing acts of positioning are experienced and interpreted by students from stereotyped social groups. Critical race theorists (e.g., Ladson-Billings & Tate, 1995) advocate that the best way to understand the daily experience of race and gender is to consider the voices of those on the receiving end.

Figured Worlds: Framing Student Perceptions about Mathematical Group Work

In an attempt to better understand the nuances of positioning (and how it is tied to social identity), the present study captures students’ interpretations and explanations of marginalizing acts of positioning. By centering on the student perspective, the present study also allows for the examination of the storylines about group work that students construct. Storylines are a central concept in positioning theory and are described as conversations or interactions wherein the individuals involved assume particular roles and follow a set of norms and scripts based on their preconceived notions about the particular context (Harré & van Lagenhove, 1999). These storylines “can stem from culturally shared repertoires or can be invented” (Wagner & Herbel-Eisenmann, 2009, p. 2). Within the context of mathematical group work, for example, students have perceptions about the roles available as well as the ways of speaking and participating that are jointly constructed and negotiated. These storylines shape the ways in which students position and are positioned by others: “Positioning is comprised of positions and storylines that together delimit possible actions and the meanings of what is said and done by people who are positioned in particular ways” (Anderson, 2009, p. 292).

The concept of storylines can be likened to Holland’s (2001a) notion of figured worlds. Figured worlds are defined as: “socially and culturally constructed realm[s] of interpretation in which particular characters and actors are recognized, significance is assigned to certain acts,
and particular outcomes are valued over others” (Holland, 2001, p. 52). Like storylines, figured worlds are “interactively constructed narratives that give meaning to the actions of participants within those narratives” (Esmonde & Langer-Osuna, 2012, p. 3). For example, in a student’s figured world of group work, the actors and characters may include teachers and students, there are recognized ways of being a good math student and a good group member, and there are artifacts such as calculators and worksheets that serve a particular purpose. The present study draws on the notion of figured worlds to capture students’ conceptualizations of collaborative mathematical group work.

Although they are constructed based on local influences such as school and/or classroom norms, figured worlds of group work are also based on broad sociohistorical categories such as race, gender and associated stereotypes (e.g., Esmonde & Langer-Osuna, 2012). Holland (2001a) describes figured worlds to be “as-if worlds” (p. 52) that are sociohistoric interpretations or imaginations that mediate positioning. As such, depending on who they are, students perceive differential access to the roles, actions (and so forth) available in group work. For example, returning to Langer-Osuna’s (2011) analysis of positioning, the girl in the group positioned herself as an authority but was positioned by others as bossy whereas the boy in the group positioned himself as an authority and was positioned as the group’s recognized leader. This observed pattern of reflexive and interactive positioning can be attributed (at least in part) to broad sociohistoric gender roles in mathematics and group work. Over time, as they are “played out” (Holland, 2001a, p. 53), participants become more familiar with the figured world and its norms. A girl who is consistently marginalized by boys in group work, for example, may perceive a figured world wherein her role is peripheral to the type of role that boys are permitted to take on. As a result of a student’s repeated experiences with group work as well as the hovering sociohistorical stereotypes pertaining to mathematics, there is a thickening of the figured world of group work over time (Holland & Lave, 2001). The construction of figured
worlds of group work wherein a person views themselves as having a marginal role can have negative long-term impacts including, disidentification with the mathematics domain (i.e., the permanent psychological withdrawal of one’s identity from a domain in which they experience failure or the threat of failure as a means to protect their self-esteem; Crocker et al., 1998), disengagement (Nussbaum & Steele, 2007), drop out and so forth (e.g., Solórzano et al., 2000).

Taken together, in the present study’s pursuit to understand the marginalizing acts of positioning experienced by students from stereotyped social groups, the literature suggests that it is important to not only carry out an investigation of moment-to-moment acts of positioning, but to also consider students’ underlying mathematical figured world of group works. These conceptualizations of mathematical group work likely shape the way students interpret and explain acts of positioning. Adopting a sociocultural theoretical perspective, the present study also maintains that the positioning experiences that students have in group work, continuously shape and reinforce their figured worlds of group work. In other words, students’ daily social positioning experiences contribute to their constantly evolving figured worlds of group work and their ever-changing positional identities. Who students are (i.e., their social identities) is an inextricable component of these processes. Students’ experiences with social positioning and their emerging mathematical figured world of group work can, from a broader perspective, have an impact on their mathematics learning. With this in mind, I now turn to the notion of practice-linked identities and elaborate on the relationship between positional identities, social identities, and learning.

Practice-Linked Identities

The study aims to consider the intersection of multiple timescales in the study of social positioning and, as such, in addition to focusing on micro-level identities (i.e., positional
identities constructed through moment-to-moment interaction) and macro-level identities (i.e., social identities such as race and/or gender), the study also considers meso-level aspects of identity (i.e., identities that are neither micro-level nor macro-level that develop over time and are tied to specific contexts such as mathematics). Over the course of the school year, for example, when students repeatedly position themselves and/or are positioned by others in recognizable kinds of ways, their positional identities thicken and they may come to view themselves and be viewed by others as certain kinds of people who engage in certain kinds of actions within a classroom (Wortham, 2004, 2006). It can be difficult for students to change the ways they are viewed by their teachers and classmates. This can become particularly problematic when imposed identities are at odds with the ways students want to be viewed or when imposed identities counter conventional views of what it means to be a good student.

Wortham (2006) demonstrated the process of identity thickening in an ethnographic study he conducted across a school year within a joint ninth grade English and History class. He demonstrated how at the beginning of a school year, an African American girl, Tyisha, was positioned as a good student and discussed how this was influenced by the broad, gender-based sociohistorical stereotype that girls are good students. Over the course of the school year, Wortham demonstrated how Tyisha’s attempts to contribute to class discussions in conjunction with the class’ unit of study on collectivist versus individualist societies prompted both the teacher and students to position Tyisha as an individualist and a disruptive outcast in the class. Wortham described how Tyisha’s tendency to speak out in class to share her opinions (which were often in contradiction to the ideas of other students in the class) served to perpetuate the construction of her identity as a disruptive outcast. In sum, Wortham asserted that Tyisha’s identity thickened from a good student to a bad one as a result of three main, intersecting timescales: (1) sociohistorical categories (e.g. social identities such as race and/or gender), (2) event-level categories (e.g. micro level positional identities) and (3) local categories (e.g.
student identities that emerge across an academic year). He maintained that these timescales reciprocally influence one another in the course of identity development (Wortham, 2006).

The identities that students develop across a school year within a particular domain can be conceptualized as practice-linked identities. Practice-linked identities are “the identities that people come to take on, construct, and embrace that are linked to participation in particular social and cultural practices” (Nasir & Hand, 2008, p. 147). For example, students in mathematics classrooms come to develop mathematics identities over time through their various experiences in the domain.

The concept of practice-linked identity illustrates the relationship between identity and learning by highlighting that learning “is about becoming as well as knowing” (Nasir, 2002, p. 219). There is an imaginative component to this process of identity development in that, over time and repeated experiences, students in mathematics classrooms, for instance, may come to see themselves in ways that incorporate mathematics (Lave & Wenger, 1991; Wenger, 1998; Nasir, 2002). For example, when a student comes to learn a new mathematical concept, this can offer them new ways to participate in collaborative group work, which can allow them to further develop their identities relative to the mathematics community. By providing opportunities for meaningful participation, engagement, and self-expression, practices can support the development of positive practice-linked identities and thus facilitate learning (Nasir & Hand, 2008). At the same time, however, experiences that deny these opportunities and limit students to marginal forms of participation can increase the likelihood that a person develops a negative practice-linked identity and hinder learning. Social identities such as race and gender are involved in the development of practice-linked identities:

As individuals come to participate in a cultural practice, they negotiate an identity that is part what they have come to view as consistent about themselves in their lives, part what they perceive to be available to them in a practice, and part how they are perceived by social
others (Nasir and Hand, 2006, p. 467).

As a result, students from stereotyped social groups who experience marginalization in the classroom may be more prone to develop negative practice-linked identities (as was the case with Tyisha from Wortham’s study).

Although the present study is focused on the microdynamics of moment-to-moment acts of positioning (and how students interpret and explain them), it also considers students’ emerging mathematics identities because they shape (and are shaped by) the figured worlds students construct about mathematical group work as well as how they interpret, explain, and experience moment-to-moment acts of positioning. Furthermore, as Wortham (2004, 2006) demonstrates, moment-to-moment acts of positioning that take place in group work, over time, shape and reshape students’ evolving mathematics identities and vice versa with both positive and negative potential outcomes.

Social Identity

The present study conceptualizes social identity as socially constructed categories, including (but not limited to) race and gender. As described in the Introductory chapter, the present study defines race and gender as socially constructed categories that are attributed to recognizable kinds of people (i.e., social groups). Social identities are conceptualized as “consequences of communities” that have developed according to a history of participation in cultural practices that become “part of a person’s experience” (Nasir & Hand, 2006, p. 466). Rather than view social identities as being inherent characteristics of people (i.e., genetically based), this perspective allows for the understanding that social identities are both products and mediators of cultural practices with inherently different access to power. As previously
described, social identity is involved in the development of both positional and practice-linked identities. With this in mind, I now discuss the intersectionality of these identity components.

The Intersectionality of Positional, Practice-linked, and Social Identities

The preceding sections demonstrate the relational nature of the dimensions of identity. Any analysis of identity is complex because it is composed of multiple intersecting parts, which operate at various timescales. Positional identities that are constructed in the moment are shaped by macro-level stereotypes about race, gender (and so forth) as well as the pattern of positioning students experience across a school year or during a particular unit of study. Social identity underlies the construction of both positional and practice-linked identity. That is, who students are shapes the ways they are positioned in the moment as well as the ways they are repeatedly positioned in a given practice (i.e., mathematical group work) over time and thus, the types of practice-linked identities they may develop (e.g., good math student) and so on. Although they operate at different timescales, these dimensions of identity are all socially constructed and are constantly negotiated, evolving, and reciprocally shaping one another (see Figure 1, below).
With these underlying theoretical conceptions of learning and identity, I now discuss the social psychological theories that help to foreground the impact of stereotypes and marginalization in the study of social positioning.
Review of the Literature on Microaggression Theory

Empirical studies employing interview methods have uncovered the ways in which people from non-dominant social groups experience subtle forms of discrimination in their everyday social interactions. Pierce, a psychiatrist at Harvard University, coined the term *microaggressions* in 1970 to account for these subtle yet pervasive forms of discrimination (Sue, 2010). More recently, Sue, Capodilupo, Torino, Bucceri, Holder, Nadal, and Esquilin (2007) elaborated on the definition of microaggressions and described them as:

…brief and commonplace daily verbal, behavioral, and environmental indignities, whether intentional or unintentional, that communicate hostile, derogatory, or negative racial slights and insults to the target person or group (p. 273).

Microaggression theory has its roots in social psychology and is a theory of implicit forms of marginalization, most often in relation to race, gender, sexual orientation, class, and religion (Sue, 2010). Through interview methods, microaggression theory explores the negative experience of microaggressions, using the individual and their account of a social interaction as a unit of analysis.

Microaggressions frequently manifest in everyday intergroup (e.g., interracial or intersexual) interpersonal interactions and are unconsciously delivered through verbal and nonverbal means, including facial expressions and body language. Empirical support from focus group interviews (e.g. Sue, Capodilupo, Torino, & Holder, 2008), personal narratives, and life stories (e.g. Conyne & Bemak, 2005 as cited by Sue et al. 2007) suggest that the experience of microaggressions is related to feelings of alienation, invisibility, intellectual inferiority, and powerlessness. Students’ experiences with racial microaggressions are well documented (e.g. Sue, 2010; Solórzano et al, 2000) and findings from focus group interviews indicate that microaggressions occur during everyday interactions in both academic and social spaces within schools. For example, an African American student described the experience of failing to be
acknowledged by a White teacher when their hand was up (Sue et al., 2007) while another African American student enrolled in a prestigious university described how White students tend to glare at her when she enters study spaces such as the library (Solórzano et al., 2000). Another African American girl enrolled in a post secondary university science course described her daily experiences with racial microaggressions that led her to change her major area of study to English:

…When I took my science courses, I had to fight every day through all the racism I felt…Each time I took a new class, the same thing happened over and over and over and over again. Many times I was the only African American in the class…And when you try and voice something to somebody, they don’t want to hear it. They’re not about to hear it! And they’re like, Well, you need to be along with your other peers. I’m upset. I’m tired of it.

That’s why I changed my major to English (Solórzano et al., 2000, pp. 69-70).

Students of colour enrolled in racially diverse schools in the United States have also described the common occurrence of being asked, where are you really from? by White students. Questions such as this can serve to alienate and otherize the target person (Sue et al., 2007).

Examples of gendered microaggressions are also well documented and include reports of girls feeling invisible and undervalued within mathematics classrooms to the point where some have resorted to changing their major areas of study to humanities or social science domains (e.g., Solórzano et al., 2000). Within a mathematics class, if a boy asks a girl if she needs help, regardless of his intentions, the girl may perceive condescension and experience his offer as a gendered microaggression.

Although they may seem subtle, the pervasive nature of microaggressions can lead to significant, cumulative impacts on those who are on the receiving end (Sue et al., 2007). Research demonstrates the destructive long-term impact of microaggressions on the mental and physical health of those who chronically experience them (for a review see Sue, 2010).
Microaggressions are said to be subjective experiences that can only truly be identified by the person who experiences them. If a man opens a door for a woman he works with, to a third party observer, this may appear to be a considerate gesture. However, based on her previous experiences with the man, the salience of gender stereotypes, the context of their interaction, and so forth, the woman may experience his gesture of opening the door as a gendered microaggression. Given this conceptualization of microaggressions, they have been primarily studied through interview methodologies wherein the person on the receiving end reports their experience.

The present study draws on microaggression theory as a theoretical framework because it is a theory of implicit marginalization that foregrounds the role of social identity. It lends itself to the investigation of the microdynamics of positioning and how social identity is centrally involved. Microaggression theory appreciates the subtle ways in which marginalization can occur during interpersonal interactions, accounting for both verbal and non-verbal slights. It brings to light the fact that something as subtle as a person avoiding eye contact can be perceived as intentional and may have significant implications in an interracial and/or intergender interaction. In addition, microaggression theory is centred around the perspective of the person who is on the receiving end of marginalization. Given the study’s interest in how students from non-dominant social groups experience marginalizing acts of positioning, microaggression theory lends itself well to the investigation.

One of the main shortcomings of microaggression theory is that the empirical evidence for microaggressions is primarily based upon retrospective interview data. Participants may be asked to reflect on a school year, for example, and recall microaggressive experiences. While this data is rich in that it captures the first-hand voices of those who have been marginalized (Solórzano et al., 2000), the nuances of the experience may be lost because of participants’ limited ability to recall events from the past. Although all interviews represent a subjective
account of an event, retrospective interviews may be more prone to inaccuracy given the mere passage of time.

The present study attempts to address this shortcoming and build on microaggression theory by interviewing focal students immediately following a group work event and using stimulated recall interview methods. Specifically, the present study uses video recorded footage that depicts (potentially) marginalizing acts of positioning as a prompt for students from non-dominant social groups to discuss their interpretations, explanations, and experiences. Using video footage as a prompt allows for students to pinpoint the precise moment-to-moment acts that served to be marginalizing and has the potential to shed light on the nuances of how marginalization occurs in group work interactions. (I will further elaborate on the study’s methodology in the next chapter.)

At this point, it should be noted that I intentionally use the phrase “potentially marginalizing act of positioning” or, most often, just “marginalizing act of positioning” instead of the term microaggression. As previously described, microaggressions are subjective experiences that can only be identified by the person who experiences them. Returning to the notion of professional vision, my interpretation of an event may be very different from the way the person participating in the event interprets or experiences it. As such, in an attempt to distinguish what I, the researcher, observe to be a potential microaggression, I use the phrase, “marginalizing act of positioning” because this, unlike a microaggression, is observable by an outside party. In sum, the term marginalizing act of positioning is intended to carry the same meaning as microaggression, however it is more cautious and interpretive, distinguishing my professional vision from that of the focal students in the study.

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3 Furthermore, interviews are limited in that they do not necessarily represent the actual interpretations or experiences of the interviewee. Interviewees choose what to share in their interviews and we cannot ever gain true access to their internal thoughts and so forth. This point is elaborated on in the Methodological Limitations section.
Microaggression theory has its roots in psychology and adopts a more static notion of identity than does sociocultural theory. Rather than view identity as being fluid, complex, and composed of multiple intersecting dimensions, empirical work investigating microaggressions tends to compartmentalize race, gender, and various aspects of social identity into separate entities. However, the experiences of an Asian woman in a mathematics class, for example, cannot be parsed into her experiences as being Asian versus her experiences as being a woman. These aspects of her identity are intertwined and the ways in which she positions herself and is positioned by others is associated with her race and gender.

As discussed in the section on intersectionality, it is often necessary to focus on individual aspects of identity during analyses for logistical and methodological reasons. For instance, the present study is primarily concerned with race and gender achievement stereotypes in mathematics and thus foregrounds these aspects of social identity in the analysis, despite the fact that other aspects of social identity are involved in students’ mathematical group work interactions. This is a challenge in studying the complex, multifaceted construct of identity. The present study does not ambitiously endeavor to resolve these challenges. By incorporating a sociocultural perspective of identity, the present study instead aims to simply broaden the investigation of marginalizing acts of positioning (or microaggressions), consider the multiple aspects of social identity that may be at play at any given moment, and add complexity to the traditional microaggression theory framework.

Microaggression theory is based on the premise that people are aware of the ways in which race, gender and other aspects of social identity play out in interpersonal interactions. However, other bodies of psychological research suggest that people are not always aware of the subtle and implicit ways in which social identity and associated stereotype threats impact interaction. With this in mind, I now discuss stereotype threat theory.
Review of the Literature on Stereotype Threat Theory

Most people are aware of how certain social groups are perceived in particular settings (Brewer & Brown, 1999) and when there is the risk of threat towards a particular social identity. This general situational predicament can be referred to as a social identity threat (e.g., Steele, Spencer, & Aronson, 2002; Branscombe et al., 1999). For individuals with stereotyped social identities, this threat can elicit a great deal of vigilance and discomfort within particular settings. Furthermore, despite the fact that every person belongs to a number of intersecting social identities, people often see themselves in terms of the social identity that is most stigmatized in a given situation (Branscombe et al., 1999). As a result of stigma salience, social identity threats are said to be constantly hovering (Steele, 1997).

The fact that these negative achievement stereotypes are in the air (Steele, 1997) can threaten the academic performance of students from stereotyped social groups. This phenomenon is a specific form of social identity threat referred to as stereotype threat. Claude Steele and Joshua Aronson (1995) define stereotype threat as a situational predicament wherein the fear of confirming a self-relevant stereotype can impede a person’s performance on a task. Specifically, when an individual who is from a stereotyped social group is in a situation wherein the self-relevant stereotype is salient and the individual is at risk of confirming that stereotype, the fear and anxiety that results can hinder their performance on the task at hand. What often results is a self-fulfilling prophecy (i.e., that the person confirms the stereotype). Although stereotype threat is not unique to the mathematics domain, given the notorious nature of both race and gender achievement stereotypes in mathematics, it is a context particularly prone to stereotype threat and is thus the focus of the present study.

In their seminal demonstration of stereotype threat, Steele and Aronson (1995) had Black and White college students take a test and told them that it would be diagnostic of their overall intellectual ability. The researchers contended that the known diagnostic nature of the
test was stereotype threat-inducing because it made salient the stereotype that Blacks are intellectually inferior. In an alternative, non-threatening condition, both groups of students were given the exact same test with no mention of test diagnosticity. The results showed that when Black students believed the test they were writing was diagnostic of their intellectual ability, they were outperformed by their White peers. In the absence of stereotype threat, however, there was no difference in the performance between Black and White college students (Steele & Aronson, 1995). In a subsequent manipulation, Steele and Aronson (1995) demonstrated that simply having Black students indicate their race on the top of the test paper could significantly hinder their subsequent performance on it.

In addition to racial achievement stereotypes, research investigating stereotype threat has also centered around gender achievement stereotypes and explored how these stereotypes impact the mathematical performance of women. For example, Spencer, Steele, and Quinn (1999) had mathematically skilled women and men college students take a notoriously difficult mathematics test and reasoned that the sheer difficulty of the test would make the gender achievement stereotype salient and trigger stereotype threat. As predicted, the women underperformed in relation to the men on the difficult mathematics test and when given a notoriously difficult English test, there was no performance difference between women and men. These findings highlight the domain-specific nature of stereotype threat. Other studies have shown that exposing women to gender stereotypic television commercials prior to writing a mathematics test can subsequently hinder their performance on the test (Davies, Spencer, Quinn, & Gerhardstein, 2002).

As the above empirical studies demonstrate, stereotype threat can be triggered in very subtle ways. It is driven by a person’s awareness of stereotypes and their perception that they may be judged by others in accordance with the notorious stereotype, irrespective of whether or not they endorse it (Aronson, 2002). In fact, the stereotype threat research corpus suggests that
stereotype threat operates outside of a person’s conscious awareness (Aronson, 2002) and although they may report heightened stress or anxiety (e.g., Spencer et al., 1999), people are unaware that their performance on a task is impacted by stereotypes.

Broadly speaking, stereotype threat theory is rooted in social and cognitive psychology. As a unit of analysis, stereotype threat theory generally considers achievement outcomes such as test scores and other markers of performance at the group level. In the sections that follow, I will briefly review the mediators (i.e., variables within a context that facilitate the occurrence of stereotype threat, e.g., Baron & Kenny, 1986) and moderators (i.e., variables within a context that impact the degree or strength of stereotype threat, e.g., Baron & Kenny, 1986) of stereotype threat, describe the applicability of stereotype threat theory in the context of mathematics education, describe how the theory can be used as a critical lens in the present investigation and how, reciprocally, the present study can further develop stereotype threat theory.

Cognitive Mediators of Stereotype Threat

Multiple neurobiological models have been offered to explain the stereotype threat phenomenon and they vary according to the situation and/or social identity involved (Davies, Spencer, & Steele, 2005). A thorough review of the cognitive psychological mechanisms that mediate stereotype threat is beyond the scope and goals of the present study, however, in the interest of providing an appropriate theoretical context, I will identify some of the major hypotheses (for a more comprehensive review see, e.g., Mendes & Jamieson, 2011; Smith, 2004; Steele et al., 2002).

The debilitating impact of stereotype threat has commonly been associated with increased arousal (i.e., a state of readiness or excitement; Ben-Zeev, Fein, & Inzlicht, 2005; O’Brien & Crandall, 2003; Mendes & Jamieson, 2011) as well as anxiety (e.g., Osborne, 2001; Spencer et
al., 1999, Blascovich, Spencer, Quinn, & Steele, 2001). For example, based on self-reports, Spencer et al. (1999) found that when women were told they were about to write a test that had previously produced gender differences in performance, they were more anxious than women who were told that the test they were about to write had not been shown to produce gender differences in performance. Similar studies have examined blood pressure levels of participants as a physiological indicator of anxiety and come to similar conclusions about stereotype threat and increased levels of anxiety (e.g. Blascovich et al., 2001).

In an attempt to uncover some of the cognitive mechanisms of stereotype threat, Schmader and Johns (2003) hypothesized that stereotype threat reduces working memory capacity and thus produces performance decrements. Conducting a series of studies that primed self-relevant negative stereotypes, the researchers confirmed their hypothesis and demonstrated that stereotype threat reduced women’s and Latino/as’ working memory capacity which in turn mediated mathematical performance decrements. Other research focused on the cognitive mechanisms of stereotype threat has investigated the process of stereotype activation (i.e., the cognitive process through which a person becomes aware of a particular stereotype). Referring to an experimental manipulation of Steele and Aronson (1995), after being told that the test they were about to write would be diagnostic of their overall intellectual ability (and thereby experiencing stereotype threat), Black college students completed more word fragments with words consistent with Black stereotypes thus suggesting that the relevant group stereotype was activated. These and other researchers (e.g., Davies et al., 2002) contend that the mental activation of the stereotype plays an important role in mediating stereotype threat. The integrated process model of stereotype threat (Schmader, Johns, & Forbes, 2008) suggests that, together, working memory deficits, stereotype activation and other cognitive processes, overburden executive functioning (i.e. the cognitive system responsible for higher order mental
functioning and performance within information processing tasks) which leads to processing deficits that in turn hinder one’s performance on a task.

Although the above mediational studies have been valuable in beginning to illuminate the cognitive mechanism through which stereotype threat occurs, there is still a need to develop a more unified model to explain this phenomenon (Davies et al., 2005; Smith, 2004). In addition to examining these neurobiological mechanisms, I, as well as others (see e.g., Inzlicht & Schmader, 2011), suggest that it is important to increase our understanding of the everyday, contextual mediators of stereotype threat and qualitatively consider the sociocultural context as opposed to performance outcomes as a unit of analysis. Such an examination would yield insight into how stereotype threat operates in a real world situation and unfolds during intergroup interactions. (I will return to this point and further elaborate below.)

**Moderation of Stereotype Threat**

A number of situational factors moderate stereotype threat occurrence and strength. For example, stereotype threat is more commonly observed with difficult tasks (e.g., Spencer et al., 1999) and the focal stereotype must be relevant to the domain or performance at hand (Steele et al., 2002). Another important moderator of stereotype threat is one’s identification with the targeted domain (Steele et al., 2002; Aronson, Lustina, Good, Keough, Steele, & Brown, 1999). Identification in this sense refers to the degree to which one values, finds importance, or is personally invested in the domain. There is a general finding that stereotype threat is most common among individuals who identify with the targeted domain (e.g., Smith & White, 2001). However, it has also been argued that an individual who is not generally identified with a domain can become situationally identified if their reputation, future, general intelligence and so forth are on the line (Steele et al., 2002).
Whether an individual identifies with the stereotyped group is another potential moderator of stereotype threat. While more recent work suggests that individuals who are more identified with their stereotyped social group are more vulnerable to stereotype threat (e.g., Schmader, 2002; Wout, Danso, Jackson, & Spencer, 2008) other research findings are mixed and remain inconclusive (for a review see Steele et al., 2002). To add to this complexity, it has been suggested that the moderators of stereotype threat have interactive effects and should therefore not be considered in isolation (Keller, 2007). For example, Keller (2007) demonstrated the interactive effects of domain identification and task difficulty and concluded that both are important factors to consider when investigating the impact of stereotype threat.

Another consistent finding regarding stereotype threat moderation is that it does not occur as a result of internal doubts about ability or the internalization of stereotypes (Steele, 1997). Instead, stereotype threat is elicited by situational cues. It is described as, “a predicament of a person in a situation” (Steele et al., 2002, p. 397) and occurs as a result of “the broad dissemination of negative stereotypes about one’s group—the threat of possibly being judged and treated stereotypically, or of possibly self-fulfilling such a stereotype” (Steele & Aronson, 1995, p. 798). In this respect, stereotype threat theory is consistent with the sociocultural perspective, in that it emphasizes the role of the context (or, as social psychologists refer to it, the situation) in mediating a person’s experiences and interactions.

Another moderator of stereotype threat is the extent to which a person may perceive and respond to the situational cues that serve to trigger the threat (Murphy & Taylor, 2011). Stereotype threat theorists propose a step-by-step model to explain this cognitive process, which proceeds as follows: To begin, certain situational cues can make certain social identities more salient than others. If, depending upon the context, the social identity that is made salient happens to be a stereotyped social identity, a vigilance process is said to be initiated (Murphy & Taylor, 2011) and individuals may become sensitive to additional situational cues (e.g., such as
facial expressions) that confirm that their social identity is at risk of being threatened (e.g., Inzlicht, Kaiser, & Major, 2008). A person can then become hyper-attentive to particular aspects of the context such as the race or sex of other members of the interaction (Murphy & Taylor, 2011; Wout, Shih, Jackson, & Sellers, 2009). If cues that confirm threat are appraised, the stereotype threat experience may be triggered, setting into motion the chain of psychological processes described in the previous section on cognitive mediation (Inzlicht et al., 2011).

What is important to note for the purposes of the present investigation is that there are individual differences in this vigilance process (Murphy & Taylor, 2011) that vary according to the context as well as the person’s past experiences, the salience of negative stereotypes and a host of other factors. Within mathematical group work, for instance, the members of the group; the mathematical task; the focal person’s social identity, emerging mathematics identity, figured world of group work, and their relationship with the other members of the group; the racial climate of the school; the salience of stereotypes; and so forth, all shape whether and how a student may detect and respond to potential triggers of stereotype threat. Rather than focus on psychological mechanisms that attempt to explain the stereotype threat experience, the proposed work is interested more specifically in the everyday events in mathematical group work that serve to trigger stereotype threat and how this threat, in turn, further influences the group work interactions, social positioning, and opportunities students have to learn.

Relevance of Stereotype Threat Theory to Mathematics Education

Research on stereotype threat abounds and has been extended to a number of stereotyped social groups (e.g., pertaining to race, gender, sexual orientation, class, age etc.; Steele, 1997; Davies et al., 2002; Bosson, Haymovitz, & Pinel, 2004) and across a variety of domains (e.g., mathematics, science, child care facilities, basketball, automobile driving, golf etc., for a review,
see Steele, 2010). Although it is primarily used to investigate task performance, some studies have demonstrated the potential for the broader applicability of stereotype threat theory, particularly within the field of education. For example, a seminal study by Crocker and Major (1989) demonstrated how Black students attributed the negative feedback they received on a task to prejudice. The broader implications of this work suggest that when students from non-dominant racial groups receive negative feedback on a task from a White teacher or classmate, this can trigger stereotype threat.

By demonstrating how stereotype threat prevents perceptual learning, the work of Rydell, Shiffrin, Boucher, Van Loo and Rydell (2010) also has important implications in the field of education. Specifically, the researchers measured the time it took women to search for a target Chinese character among a display of such characters and found that the search rate did not improve for women who were under stereotype threat (versus a control group) even after training. The researchers concluded that this lack of rate increase was due to the fact that women under stereotype threat failed to acquire the requisite attention response (Rydell et al., 2010). This and other stereotype threat studies are rooted in cognitive views of learning. The present study aims to build on the stereotype threat corpus by incorporating a sociocultural perspective of learning and further demonstrating the real world applicability of stereotype threat. (I will further elaborate on this point below.)

Goff, Steele and Davies (2008) also broadened the applicability of stereotype threat and demonstrated the influence of stereotype threat on social distancing (i.e. the physical distance a person allots themselves away from another person during an interaction). Working with participants who were White men, the researchers primed the racism stereotype by telling the participants that they would be subsequently discussing racial profiling with two other men. After showing the participants a photograph of their discussion partners (who were either both Black or both White), the participants were led to a room and asked to assemble three chairs to
prepare for the discussion and take a seat while, ostensibly, waiting for the other two members to arrive. Goff et al. (2008) found that when the participants were led to believe that they were about to engage in a discussion with Black men, they physically distanced themselves from the chairs of these discussion partners significantly more so than when they were led to believe that they were about to converse with two other White men. The authors concluded that stereotype threats (such as the fear of confirming the stereotype that White people are racist towards Black people) are as important to consider as prejudice when investigating interracial interactions because they can shape the actions of a person (e.g., social distancing) regardless of whether or not they are prejudiced (Goff et al, 2008). This study has implications for mathematical group work contexts wherein interracial and/or intergender groups are formed and achievement stereotypes are in the air (Steele, 1997). When investigating how stereotype threat unfolds in an interaction, Goff et al’s work also highlights the importance of considering physical actions, bodily orientations and so forth.

Davies and colleagues (2005) investigated the impact of stereotype threat on women’s leadership aspirations to further demonstrate the broader implications of stereotype threat. After exposing women to gender-stereotypic television commercials that elicited gender stereotypes, they had the women read a description about an impending leadership task wherein they could take on a leadership role or a more subordinate, problem solving role. The researchers found that women who had been exposed to the gender stereotypic television commercials tended to avoid a leadership role in favour of a nonthreatening subordinate role. Thus, stereotype threat was shown to undermine women’s leadership aspirations within this particular laboratory context.

More recent work has uncovered stereotype threat spillover (Inzlicht, Tullett, & Gutsell, 2011; Inzlicht & Kang, 2010), which suggests that stereotype threat can have lingering effects that spill over into other contexts. For example, Inzlicht and Kang (2010) demonstrated how
following a stereotype threat experience, women went on to exhibit less self-control than women who had previously been exposed to a non-threatening experience. Inzlicht and Kang (2010) also demonstrated how coping with stereotype threat led women to subsequently engage in aggressive behavior and were less able to restrain their aggressive impulses than women who were not previously exposed to stereotype threat. Their reasoning behind this phenomenon is that the cognitive processes involved in stereotype threat can leave people unable to self-regulate and restrain impulsive behaviours (Inzlicht et al., 2011; Inzlicht & Kang, 2010). These findings have important implications in mathematical group work in that although stereotype threat is a momentary experience, its lingering effects can in turn influence student interactions, opportunities to learn, and so forth, impacting the entire collaborative learning session.

In sum, stereotype threat has important implications in mathematics education, and group work more specifically, as a result of its influence on academic achievement as well as skill acquisition (Rydell et al., 2010); the social dynamics and bodily orientations that shape intergroup interactions (Goff et al., 2008); and leadership aspirations (Davies et al., 2005). Furthermore, as Inzlicht and Kang (2010) demonstrate, the impact of stereotype threat is not momentary. It can spill over and impact students’ subsequent interactions with students and so forth: “Identity threat isn’t a passing threat that happens just on tests. It’s a cloaking threat that can feed on all kinds of daily frustrations and contextual cues and get more disruptive over time” (Steele, 2010, p. 177).

As outlined in the introductory chapter, the present study is specifically focused on mathematics achievement stereotypes. In traditional North American society, the most widely recognized achievement stereotypes in the mathematics domain include the gender stereotype that boys/men are more competent in mathematics than girls/women (e.g., Spencer et al., 1999) and the racial stereotype that Asians are highly competent in mathematics (e.g., Ng, Lee, & Pak, 2007; Cheryan & Bodenhausen, 2000). The present study focuses on these mathematics
achievement stereotypes and also considers the broad and notorious stereotype about Black
student intellectual inferiority. Although this stereotype is not necessarily specific to the
mathematics domain, it is well documented that Black students contend with negative
achievement stereotypes across academic contexts (e.g., Steele, 1997; Aronson, Fried, & Good,
2002; Niemann, Jennings, Rozelle, Baxter, & Sullivan, 1994; Martin, 2009). The focal students
in the present study self-identified as girls who are Black, White, East Asian (i.e., Chinese),
and/or South-East Asian and the investigation thus focuses on the stereotypes associated with
these various social groups.

The stereotype threat studies involving women and Black students previously described
have all demonstrated the impact of negative achievement stereotypes on task performance.
However, the stereotype threat corpus also consists of research, albeit mixed, around the impact
of positive mathematics achievement stereotypes. Although some of this research shows that
positive self-relevant achievement stereotypes can enhance a person’s mathematical
performance (e.g., Shih, Pattinsky, & Ambady, 1999), other research suggests that even positive
self-relevant achievement stereotypes can impede one’s performance on a task (e.g., Cheryan &
Bodenhausen, 2000). Specifically, Cheryan and Bodenhausen (2000) conducted a study on the
“psychological hazards of model minority status” (p. 399) and demonstrated that when the
stereotype that Asians are good at mathematics was made salient, Asian women exhibited
impaired performance on a mathematics task (relative to a control group). The researchers
concluded that, “although people commonly hold positive stereotypes about Asians'
mathematical skills, making these stereotypes salient prior to performance can create the
potential for choking under the pressure of high expectations” (p. 399). The present study aims

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4 It should also be noted that within North America, other students of colour, particularly
Hispanic students, are also traditionally stereotyped across academic domains. Because no
students in the present study self-identified as Hispanic, I focus specifically on the stereotypes
pertaining to Black students.
to build on this body of research by qualitatively examining how Asian girls talk about mathematics achievement stereotypes and whether and how they are impacted by them when they engage in collaborative group work.

*Incorporating Stereotype Threat Theory as a Critical Framework and Broadening its Reach*

Despite its empirically supported applicability, stereotype threat theory has yet to be incorporated into mainstream discussions within the field of education. One reason for this is that the research investigating stereotype threat is experimental in nature and primarily conducted under laboratory-like conditions wherein the threat is artificially induced via carefully crafted manipulations (Aronson & Dee, 2011). In a meta-analysis of stereotype threat studies, Nguyen and Ryan (2008) reported on 116 experimental studies conducted within laboratory conditions. The generalizability of these findings to real-world settings has been challenged and critics suggest that future work should investigate stereotype threat outside of highly controlled settings (Sackett & Ryan, 2011; Aronson & Dee, 2011).

Even the studies that have attempted to study stereotype threat within real-world contexts such as classrooms have artificially induced the threat, producing laboratory-like results. For instance, Keller and Dauenheimer (2003) and Keller (2007) had boys and girls (approximately 15 years old) write a mathematics test in a classroom under typical school testing conditions. Adopting the protocol of Spencer et al. (1999), stereotype threat was induced by presenting some students with a paragraph indicating that the test they were about to write had produced gender differences in performance in the past. The researchers demonstrated the traditional stereotype threat pattern of results, with girls underperforming relative to boys under the threat condition but performing equally as well in the non-threat condition.
Although the test was administered within a classroom, the researchers created an artificial scenario to elicit stereotype threat (Huguet & Régner, 2007). Furthermore, in the real world, stereotype threat can be elicited much more subtly. In an attempt to overcome this weakness, Huguet and Régner (2007) examined whether stereotype threat could influence girls aged 10-12 years in quasi-ordinary classroom circumstances. Specifically, they presented girls with a memory task and in the stereotype threat condition, this task was framed as a geometry test and in the non-stereotype threat condition, it was framed as a memory game. The results demonstrated that when the memory task was framed as a geometry test, girls underperformed relative to boys. In a subsequent manipulation, Huguet and Régner found that when the memory task was framed as a geometry test and girls completed it within a mixed-gender grouping, the traditional patterns of stereotype threat were found. However, when girls completed the geometry test in the presence of only other girls, there was no performance deficit. This research raises important questions about the importance of critical mass and the impact of stereotype threat on heterogeneous group work in mathematics.

Inzlicht and Ben-Zeev (2000) also conducted a study to demonstrate the importance of critical mass in intergroup contexts. Specifically, the authors showed how stereotype threat can be elicited when women write a mathematics test in a small group setting consisting of other men. The researchers had highly competent undergraduate women complete a difficult mathematics exam in small groups and found that the sheer presence of one man was sufficient to trigger stereotype threat and subsequently lower the performance of the women in the group. In fact, the researchers found a linear relationship between the number of men present in the group and the corresponding drop in the women’s test scores. These findings are compelling in that they begin to show how readily stereotype threat can be induced in intergroup interactions (i.e., the mere presence of a person from a dominant group).
Similar research has corroborated the work of Inzlicht & Ben-Zeev, demonstrating that when women wrote a mathematics test in the presence of other men and no women (i.e., a solo-status context wherein women lack critical mass), they underperformed on the test compared to women (equally skilled in mathematics) who wrote the test in the presence of other women (Sekaquaptewa & Thompson, 2003). The present study aims to extend these studies by not only considering group work contexts wherein students from stereotyped social groups lack critical mass, but also by qualitatively investigating the interactions that take place within these heterogeneous groupings of students.

Taken together, the few studies that have examined stereotype threat in classroom and group work settings (e.g. Huguet & Régner 2007; Keller & Dauenheimer 2003; Keller 2007; Stricker & Ward, 2004) have been incidental or quasi-experimental in nature. In addition these studies have had a focus on achievement test outcomes rather than on how stereotype threat is naturally triggered through day-to-day classroom activities. As a result, we know very little about the ways in which stereotype threat plays out in real world settings. Because stereotype threat can be implicitly induced and mathematics achievement stereotypes are said to be ever-hovering, particularly during intergroup interactions (Richeson & Shelton, 2011; Inzlicht and Ben-Zeev, 2000), a qualitative examination of stereotype threat within mathematical group work is warranted. The present study aims to qualitatively investigate how stereotype threat is elicited through intergroup interactions, specifically through the ways students position one another. To achieve this, the present study shifts the unit analysis away from achievement outcomes and instead, drawing from positioning theory, uses student interaction as a unit of analysis. (I will elaborate on the present study’s unit of analysis below). By shifting the unit of analysis from achievement outcomes to interaction, the present study hopes to gain a new perspective on how stereotype threat unfolds naturally in the real world.
The present study aims to build on stereotype threat theory by replacing its cognitive perspective on learning and identity with a sociocultural perspective. Traditionally, stereotype threat theory views learning as the cognitive acquisition of skills and information and argues that stereotype threat impedes learning because it depletes cognitive resources such as working memory (Rydell et al., 2010). Adopting a sociocultural perspective allows for an alternative appreciation for how stereotype threat may impact learning. That is, when learning is conceptualized as shifts in identity and the notion of becoming, we see how threats to identity can result in the construction of negative positional and (over time and repeated marginalizing acts of positioning) negative practice-linked identities and thus hinder learning. (I will more fully elaborate on this point in the synergy of positioning theory, stereotype threat theory, and microaggression theory section, below).

In addition, like microaggression theory, stereotype threat theory traditionally considers aspects of social identity such as race and gender as discrete categories. Studies examining stereotype threat analytically compartmentalize race and gender when in reality, these aspects of identity are intertwined. This becomes particularly problematic when we examine the experience of stereotype threat for individuals who contend with multiple, self-relevant stereotypes that are conflicting in nature within a particular domain. For example, Asian women contend with the racial stereotype that Asians are good at mathematics as well as the gender stereotype that women are not as strong as men in mathematics. Studies on Asian women’s performance on mathematics tasks when under stereotype threat demonstrate that their performance is impaired when their gender identity is salient and it is enhanced when their racial identity is salient (Shih et al., 1999). The present study aims to bring some complexity to this discussion and examine how Asian girls, White girls, and Black girls contend with multiple (and sometimes contradicting) self-relevant stereotypes during an everyday group work experience.
In sum, the present study employs stereotype threat theory as a component of the theoretical framework because, like microaggression theory, it brings social identity to the centre of the analysis of positioning. The stereotype threat theory literature demonstrates the relevance of stereotype threat within mathematics classrooms and particularly within group work comprised of students from non-dominant as well as dominant social groups. To supplement microaggression theory, stereotype threat theory not only highlights the very subtle ways in which social identity and associated threats can become salient, but it suggests that these processes can occur outside of a person’s awareness yet still shape their performance on a task, interactions with other people, and so on. Although stereotype threat theory is traditionally concerned with performance and achievement outcomes, by incorporating positioning theory and shifting the unit of analysis to student interaction, the present study qualitatively examines how marginalizing acts of positioning (or microaggressions) and stereotype threat play out in mathematical group work and impact students from stereotyped social groups.

It is important to note that the present study is rooted in an interpretive rather than positivist paradigm of knowledge (Creswell, 2013). It strays from mechanistic views of nature, the concern with objectivity that underlies the positivist research paradigm, and the notion that knowledge is based on one objective truth (Creswell, 2013; Cohen, Manion, & Morrison, 2007). Instead, this study is focused on understanding the lived experience of stereotype threat. It stems from the understanding that knowledge is created intersubjectively and is constructed through the interpretation and professional vision of the researcher (Creswell, 2013; Cohen et al., 2007). In accordance with the interpretive paradigm, this study maintains that research is a subjective endeavor and that my voice, as the researcher, is woven throughout the research process. As a result, the findings of this study are conceptualized as being constructed through negotiation and interpretation as opposed to representing an absolute, objective truth (Creswell, 2013).
This study resists the application of external influences inherent in positivist research and instead aims to retain the integrity of the phenomena being studied (i.e., marginalizing acts of social positioning and stereotype threat). Drawing from the interpretive paradigm, this study rests on the assumption that “the social world can be understood only from the standpoint of the individuals who are part of the ongoing action being investigated and that their model of a person is an autonomous one, not the plastic version favoured by positivist researchers” (Cohen et al., 2007 p. 19). As such, the study foregrounds the voices of the focal participants and takes strides to distinguish these voices from the interpretations of the researcher.

Contrary to positivist research on stereotype threat, this study does not endeavor to use quantitative analyses of achievement outcomes to prove whether or not stereotype threat is in fact elicited during group work at a particular moment. Instead, it attempts to understand the lived experience of stereotype threat and relies upon the theoretically grounded interpretations of the researcher as well as the narratives provided by the participants. This research draws on the robust body of empirical stereotype threat research and makes the assumption that under the right contextual circumstances, stereotype threat is imminent and likely to occur. As will be elaborated in the Methodology chapter, the present study makes every attempt to investigate student interactions wherein the conditions for stereotype threat are met, but is cautious in its claims given that there are individual differences in the experience of stereotype threat and so forth.

In addition to the pursuit to understand the lived experience of stereotype threat, this study applies stereotype threat theory as a theoretical lens to help better understand the microdynamics of social positioning within mathematical group work and whether and how social identity (and associated threats) are involved. I adopt stereotype threat theory as well as microaggression theory as part of my professional vision and use these theoretical orientations to help inform my analysis of social positioning. With these underlying philosophical
orientations and research intentions in mind, I now elaborate on the study’s synergy of positioning theory, microaggression theory, and stereotype threat theory.

**The Synergy of Positioning Theory, Microaggression Theory, and Stereotype Threat Theory**

*Acknowledging the Theoretical Tensions Between Positioning Theory, Microaggression Theory, and Stereotype Threat Theory*

As the preceding literature reviews indicate, there is complexity in incorporating positioning theory, microaggression theory, and stereotype threat theory into one theoretical framework. The theories stem from different disciplines and contradictory research paradigms. As a result, each theory has its own underlying assumptions, goals, language, and they are informed by different methods of research. These underlying differences produce some tensions between the theories. For instance, both microaggression theory and stereotype threat theory are rooted in cognitive perspectives of learning and identity, which are fundamentally in contradiction with sociocultural views of learning and identity. Further to this, rather than viewing social identities as dynamic and intersectional, microaggression theory and stereotype threat theory generally consider race and gender to be discrete social categories. Another underlying tension between the theoretical perspectives is that stereotype threat theory, rooted in a positivist research paradigm, draws upon linear, causal models to account for the stereotype threat phenomenon. On the other hand, positioning theory (and sociocultural theory more broadly) is rooted in an interpretive research paradigm and would argue that although these linear, mediational models are plausible, the stereotype threat experience is unlikely to follow the same mediational sequence every time as a result of differences in the context, the person and so forth. Moreover, while stereotype threat theory emphasizes the role of the context (or situation) in the experience of stereotype threat, it views stereotype threat as a predicament of a
person within a particular context whereas sociocultural theory instead views a person and their context as one, inextricably linked entity.

Differences in the underlying research paradigms of microaggression theory, stereotype threat theory, and positioning theory also give rise to variations in their employed research methodologies. While positioning theory and microaggression theory tend to engage in qualitative analyses of data obtained from real world events, stereotype threat theory primarily conducts quantitative analyses of data obtained from experimental manipulations. Further to this, the theories each have different units of analysis. That is, microaggression theory generally investigates individual retrospective accounts of microaggressions, stereotype threat theory generally examines performance outcomes at the level of groups, whereas positioning theory employs interpersonal interactions as a unit of analysis. Because of these differences in underlying assumptions and methods of research and analysis, the theories employ different kinds of language that also create a barrier for integration.

Rather than ambitiously endeavor to overcome these tensions, the present study acknowledges the incompatibilities that exist between positioning theory, microaggression theory, and stereotype threat theory and aims to demonstrate how their synergy can still facilitate an investigation of marginalizing acts of social positioning. As previously described, the study grounds itself in an interpretive research paradigm. It adopts the theoretical underpinning of positioning theory (and sociocultural theories of learning and identity in general) and employs microaggression theory and stereotype threat theory as supplemental perspectives that help to foreground social identity and stereotype threat. Drawing specifically from positioning theory, this study employs social interaction as a unit of analysis and considers the ways microaggressions and threats to students’ social identities might play out in interpersonal interactions. Employing sociocultural theoretical assumptions and qualitative
research perspectives, the present study also aims to build on stereotype threat theory and microaggression theory.

In the sections that follow, I will further elaborate on how the present study attempts to address the theoretical tensions between positioning theory, microaggression theory, and stereotype threat theory and demonstrate how they will be used in synergy. I will then discuss how this synergy has implications for learning; explain how the synergy facilitates the present study’s goal to consider intersectionality and multiple timescales; and end with a demonstration of how the synergy of positioning theory, microaggression theory, and stereotype threat theory can add a critical layer to the analysis of student interactions.

*Understanding Microaggressions, Stereotype Threat, and Social Positioning as Relational Processes*

As previously described, stereotype threat theory is traditionally rooted in a positivist paradigm of knowledge. As such, the mechanisms and impact of stereotype threat are generally presented through linear, unidirectional models wherein each stage of the process causes the subsequent stage (see, Figure 2, below). Based on this model, the present study is most interested in the cues in the environment that serve to trigger stereotype threat as well as the short-term consequences of the threat (see Figure 2, below).
Cues in the Environment (Take from Inzlicht et al., 2011, p. 109). A linear model representing stereotype threat as a unidirectional, causal process. The boxes indicate the phases of the model that are of interest in the present study, namely, cues in the environment that trigger stereotype threat and the associated short-term consequences.

To develop a framework for understanding the lived experience of stereotype threat (i.e., shifting from a positivist to an interpretive paradigm of research), the present study conceptualizes microaggressions (or marginalizing acts of positioning) as the implicit, everyday triggers of stereotype threat (depicted in Figure 2 as cues in the environment) that unfold in interpersonal interactions. For example, if a boy ignores the intellectual contribution of a girl in a session of group work, this marginalizing act of positioning may make the gender mathematics achievement stereotype salient and trigger stereotype threat. The theoretical stance of the present study suggests that this threat can produce more than just performance decrements and
may go on to impact the subsequent social relations within the group as well as the girl’s opportunities to learn and develop a positive mathematics identity.

Using interpersonal interaction as a unit of analysis and drawing from the dialogical nature of social positioning, the present study moves away from viewing microaggressions and stereotype threat as operating in a unidirectional manner. Instead, the present study calls for the understanding that microaggressions, stereotype threat, and identity construction are reciprocally related and together emerge and develop through interpersonal interaction. Rather than analytically view performance decrements as the final outcome of stereotype threat, the present study maintains that the marginalizing acts of positioning and identity threats experienced by a person in turn shape the positional identities that are constructed in that moment. These positional identities go on to shape subsequent reflexive and interactive acts of positioning which may trigger additional marginalizing acts of positioning, experiences of stereotype threat, and so on. The synergy of positioning theory, microaggression theory, and stereotype threat theory thus suggests that positional identities can be shaped and reshaped by microaggressions and stereotype threat and these processes occur in a relational (rather than a linear, unidirectional) way (see Figure 3, below).
Figure 3. Intersectional Identities

A visual representation of the synergy of positioning theory, microaggression theory, and stereotype threat theory that demonstrates its consideration of multiple timescales and intersectional nature of identity. The moment-to-moment interactions that take place in group work can give rise to microaggressions, which can shape and be shaped by students’ positional identities. Students’ positional identities can also shape and be shaped by stereotypes (and associated threats, e.g., the development of local stereotypes). Stereotypes (and associated threats) can also shape and be shaped by the microaggressions that are elicited through the group interaction. These group interactions shape and are shaped by both meso- and macro-level influences.
This theoretical representation suggests a mechanism through which microaggressions and stereotype threat are elicited through everyday interactions and offers a model of how these processes play out in the real world. It also helps to account for some of the broader implications of stereotype threat discussed in the stereotype threat theory literature, such as stereotype threat spillover (Inzlicht et al, 2011; Inzlicht & Kang, 2010). That is, the present model represents how the lingering effects of stereotype threat can spill over and impact a person’s subsequent behaviours.

Using Sociocultural Theory to Reconceptualize the Impact of Stereotype Threat and Microaggressions on Learning

By grounding itself in a sociocultural conceptualization of learning and identity, the present study calls for a reconceptualization of the impact of stereotype threat and microaggressions on identity construction and learning. When a person is positioned as a marginal member of a group, their opportunities to learn may be inhibited as a result of limited access to group discussions, shared learning artifacts, and the interactional space. Students can either assume these peripheral positions in the group (through no fault of their own) or, they can attempt to contest them and, potentially, strain the social relations within the group and trigger further marginalizing acts of positioning and so forth. Thus, microaggressions and stereotype threat elicited through interaction can have an immediate impact on student learning. They can also, however, have a more cumulative, enduring impact on learning and opportunities for learning.

Over time and repeated experiences, microaggressions and the identity threats they elicit can lead to the thickening of negative positional identities and thus contribute to the development of negative mathematics identities. Wenger (1998) and Nasir (2002) describe the role of imagination in the development of practice-linked identities, suggesting that learners
need to be able to see themselves in new ways that involve the particular practice. Microaggressions and stereotype threat are likely to influence this imagination process, making it difficult for students from non-dominant social groups to see themselves involved in mathematics in a positive light. For instance, these negative experiences can shape students’ developing figured worlds of group work, altering their perception of the norms of group work and the roles available to them.

Mathematics learning is also associated with students’ need to feel as though they are valued members of the learning community, have an integral role in the activity, and as though they make a meaningful contribution to the activity (Nasir & Hand, 2008). When students from non-dominant social groups are positioned as incompetent members of the group, they may take up these marginal positional identities (due to lack of support to overcome these power dynamics), retreat from central forms of participation, and over time, develop negative mathematics identities (Davies et al., 2005; Nussbaum & Steele, 2007). The development of negative mathematics identities can lead students to avoid the domain entirely by dropping out of mathematics classes and/or switching their major area of study (I will return to this discussion in Chapter 11). In sum, marginalizing acts of positioning can inhibit learning not only in the moment (i.e., as a result of restricted access) but also over time, as a result of the development of negative mathematics identities.

The Synergy of Positioning Theory, Stereotype Threat Theory, and Microaggression Theory Facilitates the Consideration of Multiple Timescales

The study’s proposed theoretical framework lends itself to the consideration of macro-, meso-, and micro-level timescales by attending to macro issues of race and gender (e.g., via stereotype threat theory and microaggression theory), micro moments of marginalizing acts of social positioning and the construction of positional identities (e.g., via positioning theory and
microaggression theory) as well as how patterns of positioning unfold over time within classrooms, schools and other meso-level scales of activity (e.g., via the consideration of practice-linked identities). Importantly, the proposed theoretical framework emphasizes that these timescales operate in a relational way and mutually influence one another during the construction and shaping of social, positional, and mathematics identities.

The synergy of positioning theory, stereotype threat theory, and microaggression theory allows for the investigation of how broad sociocultural stereotypes can play out and impact student relations in a given moment. Reciprocally, the synergy allows for the consideration that moment-to-moment acts of positioning can serve to reinforce broad sociocultural stereotypes. For example, when a girl is continuously marginalized by a group of boys in mathematical group work and resorts to taking on a marginal role in the activity, it serves to reinforce the negative stereotype that girls are not as good as boys in mathematics.

The synergy of positioning theory, stereotype threat theory, and microaggression theory also has the capacity to consider the ways in which stereotypes, themselves, get constructed through moment-to-moment interactions. Returning to the work of Wortham (2006), broad cultural stereotypes interact with local classroom interactions to produce more localized stereotypes, or what he refers to as metapragmatic models. Metapragmatic models are constructed when a certain type of person is repeatedly positioned or repeatedly positions themselves in a recognizable way. Recall the illustrative example Wortham provides regarding the identity development of Tyisha, the disruptive outcast. Tyisha started the school year being positioned as the good student and over the course of the school year as well as repeated acts of reflexive and interactive positioning, became the disruptive, individualist. It was a combination of sociocultural stereotypes about race (e.g., the negative stereotype about loud black girls; Fordham, 1993), gender (e.g., girls tend to be good students; Wortham, 2006), moment-to-moment acts of reflexive and interactive positioning that continued over time to thicken
Tyisha’s identity as a disruptive student. Through its examination of students’ mathematical figured worlds of group work as well as their interpretations and explanations about social positioning, the present study will consider some of the local stereotypes (or metapragmatic models) that students construct and how these are related to macro- (e.g., race, gender) and meso- (e.g., school culture, classroom social relations) level influences.

Applying the Synergy of Positioning Theory, Stereotype Threat Theory, and Microaggression Theory to Previous Empirical Work

To demonstrate the utility of the present study’s theoretical framework, I will review examples of research grounded in sociocultural theory and illustrate how incorporating microaggression theory and stereotype threat theory as an additional lens adds a critical layer of analysis.

Nasir et al. (2009) conducted observations in mathematics classrooms and suggested, through vignette analyses, how the fear of being stereotyped can be related to classroom performance and interactions. They described an African American boy as appearing studious and academically focused until he received negative feedback on a quiz at which point he engaged in racialized behaviors, including making reference to a promiscuous mother and a song about drug dealing. Nasir and her colleagues concluded that this behavior was likely helping the student to “manage the fear of failing or the potential stigma of not being smart in math” (Nasir et al., 2009, p. 243). Using the lens of stereotype threat theory, the negative feedback on the quiz can be viewed as a trigger of stereotype threat (Crocker & Major, 1989) and the subsequent racialized behaviors displayed by the boy can be interpreted, at least in part, to this perceived threat. The notion of stereotype threat spillover (Inzlicht & Kang, 2010; Inzlicht et al. 2011) can also be used to understand the boy’s racialized behavior, demonstrating how stereotype threat effects can linger and have more broad impacts on student conduct,
interactions, learning and so forth. Repeated experiences such as this may serve to shape the boy’s emerging mathematics identity.

In another ethnographic classroom study, Rubin (2003) found that despite teachers’ attempts to foster community by developing racially diverse collaborative groups, African American students reported feeling marginalized and being aware that they were viewed as members of racialized groups. For example one African American student, Sasha, shared:

…the darker your skin is, the less you’re respected. . . . The expectation is different. They would expect me to not do as well in class and stuff like that, and when people expect that of you, you kind of do what they want in a sense because it really lowers your self esteem to the point where you’re, like, “I guess that’s all I can do” (Rubin, 2003; p. 554).

When Sasha described how the “expectation is different” for African American students, we see the salience of race and thus the potential for stereotype threat within collaborative mathematical group work. When students from dominant groups perpetually make racist assumptions about students of colour, it comes as no surprise that students of colour may come to expect to be treated differently, become hypervigilant and thus vulnerable to perceiving microaggressions and experiencing stereotype threat (Steele et al., 2002). Students’ heightened vigilance may impact their interactions with students from dominant groups and thus shape the group work activity.

Focusing on student talk alone is insufficient when examining the potential triggers of stereotype threat in everyday settings. Leander (2002b) and others (e.g., Engle et al., 2014; Swann, 1988) demonstrate the microdynamics of positioning and marginalization and how the production of social spaces can powerfully influence these processes. In addition to analyzing student talk, Leander (2002b) traced the physical organization of students including their eye gaze and bodily orientation, to demonstrate the way marginalization of students occurs through interaction. He concluded that limiting analysis to the modality of talk alone “leaves out
important insights concerning the nuanced nature of participation in interaction, the negotiation of power, and relations between interaction and social identity” (Leander, 2002b, p. 194).

Incorporating stereotype threat theory and microaggression theory into this work, we can see how marginalizing students through such physical positioning acts may be perceived as microaggressions that trigger stereotype threat. For example, work by Logel, Walton, Spencer, Iserman, von Hippel, and Bell (2009) demonstrated how the body positioning of men triggered stereotype threat for highly skilled women, engineering majors when they were writing an engineering test. That is, when the men engaged in what the researchers referred to as sexist physical behaviors during a conversation with the women engineering students (e.g., scanning the body of the woman conversation partner, showing confident facial expressions, or displaying open body postures such as having their shoulders back or knees far apart), the women underperformed on a subsequent engineering test. Similarly, research on the experiences of racial microaggressions has demonstrated the power of eye gaze and facial expressions. For example, Solórzano and colleagues (2000, p. 68) documented the following African American student’s account:

Last time we went to the library…to study…obviously, it’s finals time…people are going [italics added] to study… But when we walked in there looking for somewhere to sit down, it’s like…they’ve [White students] never seen Black people before in their lives, or they’ve never seen Black people study before!

Summary and Research Questions

Taken together, the present study employs the synergy of positioning theory, microaggression theory, and stereotype threat theory to facilitate the qualitative investigation of marginalizing acts of social positioning within mathematical group work. This theoretical framework can lend itself to the consideration of social identity and stereotypes, multiple
timescales (i.e., macro, meso, and micro), the intersectional nature of identity, and can help to broaden traditional conceptualizations about how microaggressions and stereotype threat operate in real-world, everyday social interactions. It can afford an appreciation of how broad systems of power operate in mathematical group work and also how this power gets constructed through moment-to-moment interactions. This theoretical underpinning informs my professional vision and shapes my investigation of the following specific research questions:

1. What are the microdynamics of social positioning in group work when a student from a stereotyped social group is marginalized by group members who are from dominant social groups?
   a. How, if at all, is social identity and associated stereotypes involved in this process?

2. What are students’ perceptions about group work and how can this be related to their figured world of group work?

3. How, if at all, do students identify, explain, and interpret marginalizing acts of positioning?

4. How do focal student perceptions about the observed social positioning compare and relate to the researcher’s perceptions?

I now discuss the study’s methodology and specifically elaborate on the means by which the study captures the perspective of students from stereotyped social groups to facilitate the investigation of professional vision as well as the nuances of marginalization.
CHAPTER 3: METHODOLOGY

Research Context

The present study of marginalization was conducted within mathematical learning contexts that are particularly prone to issues of race and gender and that warrant further equity-focused research. In the sections that follow, I present elite, private secondary schools as well as collaborative mathematical group work as contexts prone to marginalization and inequity for students from stereotyped social groups. I end with a general description of the schools and classrooms involved in the study and how they were selected.

Private Secondary Schools

Given the research goals and questions around marginalization, the present study sought to investigate the experiences of students from stereotyped social groups within the context of elite, private schools. Private schools characterized by their competitive application processes, restrictive enrolment, high rates of annual tuition, and rigorous academic programs have been documented as contexts rife with inequity for students from non-dominant social groups (e.g., Cooper & Datnow, 2000). Although a greater number of non-White students have begun attending elite, private schools in North America, they are still largely populated by White students (Fairlie, 2014; DeCuir-Gunby, 2007). In addition, elite private schools continue to be populated by students from upper class families and the power dynamics associated with social class remain as pressing to consider as issues of race and gender (DeCuir-Gunby, 2007). Most elite, North American private schools are historically rooted in White, heterosexual, male, upper class norms. What results is a climate that challenges students from non-dominant social groups
both academically and socially (Horvat & Antonio, 1999; Gaztambide-Fernandez, 2009; Cookson & Persell, 1991).

A number of ethnographic studies have depicted elite, private schools as having a Eurocentric curriculum (e.g., Russell, 2011; Horvat & Antonio, 1999; Peshkin, 2001). In addition, these schools consist of a teaching faculty and governing board comprised mostly of White, heterosexual men (Peshkin, 2001; DeCuir-Gunby, 2007). In her interviews with African American students, DeCuir-Gunby (2007) found that students were well aware of the lack of diversity in teaching staff and perceived that the school was built upon Eurocentric norms and was governed by wealthy, powerful White men. This led African American students to question their access to equitable opportunities and they expressed that their cultural interests were not represented by the staff or governing body of the school (DeCuir-Gunby, 2007).

The predominantly White teaching body has also been documented as employing a colourblind approach to addressing issues of equity across many elite private schools. For example, according to Arrington, Hall and Stevenson (2003), White teachers and administrators express the importance of treating all students equally and many intentionally do not discuss race, gender, class, sexual orientation, or any aspect of social identity. This colourblind approach sends the message that there is no need to address diversity and fails to acknowledge the centrality of social identity in the daily lives of students (Ladson-Billings & Tate, 1995; Russell, 2011).

Many African American students enrolled in elite, private schools report feeling disconnected from the predominantly affluent, White community and feel alienated from the dominant school culture (Datnow & Cooper, 1997; DeCuir-Gunby, 2007; Gaztambide-Fernandez, 2009). In a year long case study of 42 African American students enrolled in predominantly White elite independent schools in Baltimore, Datnow and Cooper (1997) found that although African American students were academically integrated into the elite school
world, they still expressed a sense of isolation. Many students of colour report a feeling that their role within these predominantly White, private schools is to represent diversity and to teach White students about their culture (Proweller, 1998). In addition to representing diversity, Gaztambide-Fernandez’s (2009) ethnography within an elite boarding school shows how students of colour feel that they have to be diversity. For example, one African American girl, Monica, explained how her curly hair became part of the curriculum of diversity that White students assumed they should explore. These experiences positioned her as the “exotic other” (Gaztambide-Fernandez, 2009, p. 173) and rather than being part of a context in which all students benefit from diversity, Monica was the diversity.

Other ethnographic work within predominantly White, private schools points to the way that alienation leads to serious anguish for students from non-dominant social groups (e.g., Russell, 2011; Horvat & Antonio, 1999; DeCuir-Gunby, 2007). For example, Horvat and Antonio (1999) interviewed and observed Black girls attending a predominantly White, all-girls independent school in the U.S. and when asked why one group of White girls appeared to be such a dominant force in the school, Megan, a Black senior responded, “It is their school. Their mothers went there” (Horvat & Antonio, 1999, p. 332). Taken together, although students of colour report being formally integrated into the elite school communities (e.g., wearing uniforms and enrolling in classes), their social status in the school remains peripheral.

Scholars have used the term ‘outsiders within’ (e.g., Collins, 1986) to describe how non-White students are caught between the culture of their home life and that of their school life and often times not fully accepted by either (Datnow & Cooper, 1997; Gatzambide-Fernandez, 2009; Cookson & Persell, 1991). Research documents the anguish that women and non-White students describe because they feel they have to abandon their identities or “check myself at the door” (Horvat & Antonio, 1999, p. 334; Fordham, 1991), “act White” (Fordham & Ogbu, 1986), and “act upper class” (Cookson & Persell, 1991) in order to thrive academically and socially.
This includes hiding one’s accent and changing one’s patterns of speech. Girls have reported having to downplay their intelligence and initiative in elite classrooms because otherwise they claim to be positioned as aggressive and become social outcasts (Gaztambide-Fernandez, 2009).

In summary, upper class, White, heterosexual, male norms are deeply entrenched in the culture of North American elite private schools. This makes issues of race, gender, class, sexual orientation (and so forth) particularly problematic for students from non-dominant social groups within these contexts. Within mathematics classrooms, given the prevalence of hovering race and gender achievement stereotypes, these issues are even more pronounced (e.g., Keller & Dauenheimer, 2003; Nasir et al., 2009). Girls and students of colour are largely outnumbered by White boys within many elite North American private school mathematics classrooms and thus an examination of microaggressions and stereotype threat within this context is warranted. As such, the present study seeks to focus specifically on the experiences of students who are negatively stereotyped in the mathematics domain (i.e., girls and/or non-White students) within private school mathematics classrooms.

Group Work in Mathematics Education

Within the mathematics domain, collaborative group work is a learning context prone to issues of power and inequity (Esmonde, 2009a). Given continuing reform initiatives in mathematics education that promote meaning-making through collaborative group work (e.g., Expert Panel on Student Success in Ontario, 2004; National Council of Teachers of

5 It should be noted that the findings of the present study are also relevant for non-elite schools, however, the focus, here, is on the elite school context.

6 Within this study, ‘collaborative group work’ is defined as a group of 3 or more students given a shared task with a common goal, requiring the students to work together (Dekker, Elshout-Mohr, & Wood, 2006). It may or may not involve the use of shared learning resources such as worksheets or manipulatives.
Mathematics/NCTM, 2000; Gutiérrez, 2002), this learning context is deserving of equity-focused research. Perceived status differences across groups can give rise to power dynamics when students from non-dominant social groups are assigned to work with students from dominant social groups (Cohen & Lotan, 1997). During such intergroup interactions, context-relevant stereotypes may also become particularly salient for students from non-dominant social groups (Shelton, Richeson, & Vorauer, 2006; Marx & Goff, 2005). This, in turn, can set in motion a vigilance process wherein students from non-dominant social groups are particularly sensitive to marginalization and exclusion which can increase the likelihood of stereotype threat and the experience of microaggressions (Inzlicht et al., 2008; Steele et al., 2002; Murphy & Taylor, 2011).

In addition to hovering stereotypes, increased vigilance towards microaggressions can take place when students from non-dominant social groups are marginalized by group members from dominant social groups (Kray & Shirako, 2011). Examples of marginalization include when students are denied access to shared learning resources, when their contributions are ignored, or when they are physically restricted access to the interactional space as a result of the bodily orientations of group members (e.g., Engle et al., 2014; Esmonde & Dookie, 2012; Dookie & Esmonde, 2012). The body of research examining social positioning (i.e., the ways in which people position one another in an interaction through talk and non-verbal forms of communication) within the context of collaborative group work is growing and points to its gendered and racialized nature. For example, Langer-Osuna (2011) demonstrated how a girl’s displays of authority in a session of group work were positioned as bossy and inappropriate by her group members whereas similar authoritative moves performed by a boy in the group were positioned as acceptable and necessary.

The present study examines the context of mathematical group work because, when working in heterogenous groups, students from stereotyped social groups must often contend
with hovering stereotypes, deep-rooted racialized, gendered, classed (to name a few) power dynamics, as well as moment-to-moment acts of positioning that, together, may restrict them to marginal forms of participation. This highlights the reality that at any given moment, students from stereotyped social groups encounter issues of power that operate at various timescales (e.g., from broad sociohistorical stereotypes to moment-to-moment acts of marginalization).

The Selection of Schools and Classrooms

The research was conducted at four private secondary schools within advanced level mathematics classes. The selection of schools was guided by the requirements of stereotype threat. That is, they were considered to be elite contexts wherein pressure for academic success was an explicit part of the school culture (e.g., as evidenced by the school’s mission statement) and students from non-dominant social groups tended to lack critical mass (i.e., the schools were mainly populated by White students and a White teaching and administrative staff). Three of the schools were located within a large Canadian city centre while a fourth school was located on the outskirts of the city. Greater details about each specific school will be provided within the description of each case.

Given the study’s focus on collaborative group work, the participating classes were selected based on the classroom teachers’ incorporation of group work into their mathematics program. Specifically, I sought after teachers who employed group work on a semi-regular basis (i.e., at least once a week or two to three times per unit of study). Five teachers across the four schools participated in the study with four of them involving one mathematics class and one of them involving two of their classes. In total, there were six mathematics classes involved in the study. Three of the classroom teachers were White women, one was a White man, and one
classroom teacher was an Asian woman. The specifics about each case of group work (e.g., task, group composition) will be provided in the case-by-case presentation of results.

Participants

One student from each of the six mathematics classes was selected to be a focal student. These focal students were videotaped during the sessions of group work and interviewed. There were a number of parameters that shaped the focal student selection. Given the research questions pertaining to marginalization as well as the moderators of stereotype threat, attempts were made to select focal students who: (1) were part of at least one stereotyped social group within the mathematics domain (i.e., girls, students of colour); (2) highly valued the mathematics domain; (3) highly valued their performance in the mathematics domain; and (4) reported negative or mixed-feelings about mathematical group work (based on experience). (The fourth parameter was not a requirement, but I ended up selecting six focal students who did report having mixed-feelings about mathematical group work as a result of negative prior experiences.) This information was gleaned from a survey (see Appendix A) that was administered during one of the initial classroom visits.

Following an introductory classroom visit wherein I stated the general research goals (i.e., to investigate learning within the context of mathematical group work), I provided every student (with consent) in the class a survey that served to capture their feelings about mathematics and mathematical group work in particular. The survey contained seven statements about mathematics and mathematical group work and the students were asked to state the degree to which they agreed with the statements using a Likert scale ranging from 0 (strongly disagree) to 5 (strongly disagree). An example of one of these survey items is depicted in Figure 4, below.
**I highly value my performance in math.**

<table>
<thead>
<tr>
<th></th>
<th>0 strongly disagree</th>
<th>1 disagree</th>
<th>2 somewhat disagree</th>
<th>3 somewhat agree</th>
<th>4 agree</th>
<th>5 strongly agree</th>
</tr>
</thead>
</table>

Figure 4. Example survey item taken from the Likert scale.

Item #3 taken from the student survey used to select the focal students.

In addition to the Likert scale items, the survey contained one open-ended question asking them to describe their feelings about mathematical group work and to elaborate on these feelings by providing examples of when “group work went well and when it did not go well and why this was the case.”

The final portion of the survey was also open-ended and elicited demographic information including the students’ self-identified age, race, gender, and family socioeconomic status. The students were also invited to indicate the race, gender, SES that they believed others perceived them as. Based on the principles of stereotype threat theory, the demographic information was intentionally elicited at the end of the survey so as not to inadvertently trigger stereotype threat (Steele & Aronson, 1995) or influence their responses to the other survey items. The self-identifying language employed by the focal students in their surveys was used in the presentation of the results (see Table 1, below). For example, because Abida, one of the focal students, self-identified as “Black (Nigerian)” in her survey, I too adopted this racial language in the presentation of the results when making reference to her. I opted to designate all races with upper case in accordance with APA style guidelines.

I privately approached six girls to be the focal students and they all agreed. Each of these girls highly valued mathematics, their performance in the domain, and reported negative or mixed feelings about mathematical group work. Specific information about each focal student
will be provided in the case-by-case presentation of the results, but a summary of the focal student demographic information is presented in Table 1, below.

Table 1. Focal Students

*Focal Students’ Self-Identified Race, Gender, Family SES, Age, and Grade Level*

<table>
<thead>
<tr>
<th>Focal Student Pseudonym</th>
<th>Race</th>
<th>Gender</th>
<th>Family SES</th>
<th>Age (years)</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abida</td>
<td>Black (Nigerian)</td>
<td>Girl</td>
<td>med.</td>
<td>16</td>
<td>12</td>
</tr>
<tr>
<td>Ariana</td>
<td>South Asian/African</td>
<td>Girl</td>
<td>med.</td>
<td>16</td>
<td>12</td>
</tr>
<tr>
<td>Hailey</td>
<td>White/Asian (Chinese)</td>
<td>Girl</td>
<td>med.-high</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td>Jackie</td>
<td>Asian (Chinese)</td>
<td>Girl</td>
<td>med.</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>Kathryn</td>
<td>White</td>
<td>Girl</td>
<td>high</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Valerie</td>
<td>Asian (Chinese)</td>
<td>Girl</td>
<td>med.-high</td>
<td>17</td>
<td>11</td>
</tr>
</tbody>
</table>

It should be noted that the other students in the class were intentionally not made aware that there was a focal student. Interviews were set up discreetly and took place outside of class time. During the videotaped group work observations, I approached the focal students’ entire group and asked for their permission to be taped. I opted to use table mics instead of attaching a lavalier mic to the focal student. These measures were taken to help: prevent additional attention being brought to the focal student; mitigate stress and pressure put on the focal students, and, overall; minimize interference with the group dynamic and social relations.

**Methods**

**Overview**

Figure 5, below, depicts an overview of the methods and data sources obtained. Each focal student engaged in an introductory interview and approximately one to two weeks later, they were videotaped as they engaged in a session of group work. A preliminary analysis of the video footage was conducted and the target segments of video to be shown to the focal student were selected. Within 24 hours of their session of group, each focal student engaged in the
stimulated recall interview. Within a week of their stimulated recall interview, each focal student engaged in the final interview. In the following sections, I will chronologically describe each aspect of the data collection.

Figure 5. Data collection, preliminary analysis and data obtained
Overview of methods depicting the flow of data collection, preliminary analysis, and data obtained from each event.

*Introductory Interview*

The introductory interview was semi-structured and designed to gain qualitative insight into the focal students’ mathematics identities and figured worlds of group work. Specifically, they were asked questions to elicit their feelings and perceptions about mathematics and group work in particular. The introductory interview was intentionally designed to afford students the opportunity to openly discuss any challenges they had encountered and to see whether and how social identity and stereotypes were mentioned in an unsolicited manner. This unsolicited approach was also used to help reduce focal student reactivity.

The interview generally lasted about 15 minutes and was conducted outside of the mathematics class at a time and location (within the school) that was convenient to the focal
students. The interviews were audio recorded and fieldnotes were taken to help document non-verbal forms of communication (e.g., body language, hand gestures, facial expressions). The full protocol for the introductory interview can be found in Appendix B.

_Videotaped Group Work Observations_

Although the focus of the classroom observation was to capture the session of group work, I videotaped the entire class to provide sufficient context and background information for the analysis. The classes generally began with the teacher welcoming the students, explaining the group work task, and assigning the groups. During this time, I stationed the video camera towards a corner of the room that allowed me to unobtrusively capture the focal student’s face as well as the classroom teacher (who she tended to be oriented to during the initial portion of the class; Heath, Hindmarsh & Luff, 2010).

Once the students assembled into their groups, I approached the focal student’s group and asked all the group members for their permission to be videotaped. Following this, the video camera was re-positioned to a location that was proximal to the group, allowing for a view of the group members’ faces (the focal student in particular) and their learning artifacts (Roschelle, 2000). Once the camera was in position, I refrained from panning or zooming so that a full record of the group work interaction was documented (Erickson, 2006; Derry, Pea, Barron, Engle, Erickson, Goldman, & Sherin, 2010). A table microphone was used as the primary audio source (Heath et al., 2010).

Once the session of group work ended, the video camera was repositioned to a corner of the room to capture post-activity whole-group discussions and/or any closing remarks made by the teacher. Throughout the class, I took on an observational role with limited interaction with the students. This allowed me to take fieldnotes to document details that may not have been
captured by the video camera and flag moments of interest for later analysis. It also allowed me to take photographs of the learning artifacts that were used in the task (Pirie, 1996).

The sessions of group work typically endured the majority of the 70-75 minute classes. Two videotaped group work observations were conducted for four of the focal students and in two cases, a single videotaped observation was done. As will be discussed in the analysis, across all cases, only one session of group work was selected for microanalysis.

*Stimulated Recall Interview*

Immediately following each session of group work, the video was processed and a minute-by-minute log of events was created. During this content logging process, moments of interest were flagged. The selection of video footage for the stimulated recall interviews was based upon the research goals and questions (Engle, Conant & Greeno, 2007). Specifically, to address research question #3 (i.e., whether/how do focal students identify, explain, and interpret marginalizing acts of positioning), most of the segments of footage selected depicted instances wherein it appeared the focal student was being marginalized. In the present study, marginalization was used to refer to times in which a person(s) was prevented access to central forms of participation and their contributions to the work were minimized. Drawing from Leander’s (2002b) research investigating the mechanics of silencing in classroom interactions, marginalization was operationalized as being physically blocked from the interactional space, excluded from group conversations, or ignored. For the cases of Valerie and Abida, I also selected a target segment of video wherein the group dynamic appeared particularly cohesive and collaborative. (These were the only two cases wherein such a dynamic appeared evident). In addition, across all the participants, I selected about one to two target segments of video wherein the nature of the group interaction was ambiguous and I wanted to obtain additional information
from the focal student. After a second pass of preliminary video analysis, approximately 5-10 target segments of video were selected ranging in 30 seconds to 2 minutes and 30 seconds in length. These were to be used as a prompt during the stimulated recall interview. Attempts were made to select segments of video from various points in the session of group work to ensure they were representative of the overall event and the patterns of positioning observed.

Within 24 hours of the session of group work (following the preliminary analysis of video), each focal student engaged in the stimulated recall interview. These interviews were conducted outside of class, in a private, quiet room at a time and location (within the school) convenient to the focal student.

To begin, the focal student was asked to state the goals of the group work task. Following this, they were told that they were going to watch segments of video from the session of group work and would be using the footage as a prompt to recall their feelings, interpretations, reactions, insights and so forth. The video was displayed on a laptop and the focal student was invited to select a part of the video that they were interested in watching first. Because none of the students indicated a preference, they all watched the pre-selected target segments of video in chronological order. They were invited to stop the video (by pressing the spacebar key) on their own at any time to share their responses and, in the event that they did not stop the video, I stopped it at the end each target segment and prompted them to share their thoughts, reactions, feelings, insights and so forth. In most cases, the focal students watched the segments of video in their full duration before responding. After all the target segments of video were played, the focal students were once again asked if there were any other parts of the video that they wanted to see and, across all cases, the focal students declined the offer. They were then asked to share their global impressions of the group work, whether and how the experience could have been improved, and any further reflections. (See Appendix C for the stimulated recall interview protocol.)
The interviews were audio recorded and fieldnotes were taken to document non-verbal forms of communication. Throughout the interview, I both wrote and verbally indicated the video timestamps corresponding with the focal students’ responses to facilitate an integrated analysis of the video and stimulated recall interviews. In the analysis, the fieldnotes primarily served to pinpoint the sections of video that were being referred to, however, on several occasions across cases, the non-verbal forms of communication captured in the fieldnotes were embedded in the interview transcripts to add further nuance (Heath et al., 2010). For instance, although tones and expressions were captured from the audio records, the fieldnotes were used to capture hand gestures, facial expressions, and eye rolling, for example, and were included in parentheses in the interview transcript.

Overall, the stimulated recall interviews tended to last around 45 minutes. Four of the focal students engaged in two stimulated recall interviews (corresponding with their 2 videotaped sessions of group work) while the other two focal students engaged in one stimulated recall interview. Only one stimulated recall interview (and its corresponding videotaped session of group work) was analyzed for the purposes of this dissertation. Based on the research goals and questions, in the cases with more than one session of group work, the selection was determined by the degree to which marginalization was evident (i.e., with more evident acts of positioning being prioritized) and/or whether the focal student lacked critical mass (i.e., the focal students lacked critical mass in all of the selected sessions of group work).

Final Interview

The final interview was administered within one week from the focal student’s stimulated recall interview. The main goal of the final interview was to gain more direct insight into the focal students’ perceptions about achievement stereotypes and whether and how they
perceived social identity as having an influence on group work interactions (and vice versa). A secondary goal of the final interview was to elicit further insight into the focal students’ emerging mathematics identities and figured worlds of group work.

The first question asked students to describe how their fellow classmates and teacher would characterize them as mathematics students. This question was intended to further elucidate the focal students’ mathematics identities and tap into their perceptions about how they are positioned and viewed by others. The second and third questions encouraged the focal students to reflect on their school year and share examples of positive and negative group work experiences. These questions were intended to reveal whether the observed segment of group work was representative of their overall experiences in mathematical group work. The fourth question prompted the focal participants to describe any changes that they would make to the way group work was structured and/or implemented in their mathematics class while the fifth question prompted them to state the degree to which they envisioned mathematics as part of their future. The main intent of these questions was to elicit further information about the focal students’ figured worlds of group work and emerging mathematics identities.

The final two questions in the interview explicitly prompted students to think and talk about social identity and achievement stereotypes. These questions were intentionally kept to the very end so as not to lead the focal students and to facilitate an investigation of whether and how students discussed these issues in an unsolicited manner. The sixth question prompted the focal students to share any mathematical achievement stereotypes that they knew about. The last question asked the focal students to share whether they had ever witnessed or experienced a time when a person’s race, gender (or any aspect of their social identity) affected their experience in mathematical group work. They were invited to elaborate on their responses by providing examples and, in all cases, I asked the focal students to think specifically about the observed session of group work. (See Appendix D for the Final Student Interview Protocol.)
The final interview was audio recorded and endured approximately 15 minutes. The interview was conducted outside of the mathematics class in a private, quiet room at a time and location (within the school) that was convenient to the focal student. Fieldnotes were taken to augment the audio record to capture non-verbal forms of communication.

Classroom Teacher Interviews

The classroom teachers were interviewed at the end of the study to gain additional background information about the classroom contexts. Specifically, they were asked about their mathematics program, teaching priorities, how group work was incorporated into their program, and about the student relations in the class. These interviews were audio recorded and supplemented by fieldnotes. (See Appendix E for the Teacher Interview Protocol7.)

Analysis

In the sections that follow, I will the present the process of analysis for the video and then the interview data. I will end with a description of how the analysis of video and interview was integrated as a means to investigate my professional vision as the researcher versus the perspectives of the focal students.

Part I. Microanalysis of Video
Overview of the Analytic Process and Framework

A context analysis (Erickson, 2006) focusing on talk, gesture, body positioning, and artifacts (e.g., the shared worksheets, response sheets, whiteboard) was conducted on the target

7 The teacher interviews were strictly used to provide supplementary information about the classroom context (i.e., about the school and classroom setting and student relations) and are presented as such within the individual case descriptions.
video segments of interest for each case using Studiocode video analysis software. These segments ranged in length from 30 seconds to 2 minutes and 30 seconds. The segments of video pertaining to each case are presented in the Results in the form of vignettes. The use of vignettes allowed for a detailed representation of the group work context, dialogue, and major physical positioning moves (Derry et al., 2010). These vignettes were intended to capture the observable interactional dynamics displayed in the video footage and set the stage for the microanalysis of social positioning.

Drawing from Erickson’s (2006) whole-to-part procedure for analyzing video, each segment of interest was played in its entirety, multiple times with and without sound. The first round of coding involved the marking of interesting instances on the video of timeline. The interesting code was used to capture any aspects of positioning (including marginalization) observed. Following this, a system of codes was gradually developed capturing, at a micro-level, both verbal and physical forms of positioning. The development of this coding system was an iterative process involving repeated viewing of the video segments, multiple passes of coding, and the refinement of codes (Angelillo, Rogoff, & Chavajay, 2007; Jacobs, Kawanaka, & Stigler, 1999; Erickson, 2006). Using the terminology of Studiocode, codes were marked on a video timeline and referred to as instances and these instances were further characterized through the use of labels. Text boxes associated with each instance were used to capture the rationale and justification for each coding decision, which in turn guided subsequent development or redefinition of codes and labels. The various components of the Studiocode video timeline are identified in Figure 6, below.
Figure 6. Example of Studiocode timeline

Example of a Studiocode timeline, depicting various codes, instances, labels, and the video timestamp (displayed in the top left corner). The video timeline is represented horizontally, across the top of the Studiocode Timeline window. Each of the different coloured rows represents a separate code (e.g., Physical Block Evelyn) and looking along a row, you can see the instances or moments in the video wherein the code was applied. The text displayed in some of the instances represent the labels that are used to further characterize the instance (e.g., classifying the physical block of Evelyn as sustained versus momentary). The text boxes, not illustrated in the figure above, are separate application windows that appear when an instance is selected.

It should be noted here that the general purpose of this coding was to identify broader patterns of social positioning. The development of a rigorous set of codes was not intended to replace or reduce the powerful video data, but to instead highlight patterns of social interaction.

Similar to Esmonde and Dookie (2012; under review), the present study considered various aspects of Engle and colleagues’ Differential Influence framework (Engle et al., 2014)
to analyze the ways in which various members of the group positioned and were positioned by others. Engle and her colleagues developed the Differential Influence framework to investigate how students become influential, or “the degree to which the participant’s argument is socially positioned as being of high quality, whether or not this corresponds with normative standards of quality” (p. 252), during classroom discussions. Specifically, they demonstrated how the development of a student’s influence is related to (1) the perceived merit of their ideas (i.e., “the degree to which the participant’s argument is socially positioned as being of high quality, whether or not this corresponds with normative standards of quality” (p. 252), (2) their intellectual authority (i.e., “the degree to which the participant is evaluated, acts, or is treated as a credible source of information” (p. 252), (3) their access to the conversational floor (i.e., “the degree to which the participant can initiate turns when desired, complete them without interruption, and control who else has access to the floor” (p. 252), and (4) their access to the interactional space (i.e., “the degree to which the participant is visually attended to and physically oriented to by others when speaking or listening and is able to affect the spatial access of others” (p. 252).

Engle and her colleagues argued that each of these components of the framework is socially negotiated and constructed through interaction. Further to this, they demonstrated that influence is constructed and negotiated between students and is strongly affected by the other 4 components of the framework. Esmonde and Dookie (under review) and Dookie and Esmonde (2012) added an additional component to the Differential Influence framework, demonstrating that students’ access to shared learning artifacts (e.g., shared worksheets) was another key mediator in the development of influence (or lack thereof).

The present study draws on Esmonde and Dookie’s (in progress) adaptation of the Differential Influence framework to investigate marginalizing acts of positioning within the context of mathematical group work. As such, although it considers some of the components of
the Differential Influence framework (i.e., access to: the conversational floor, interactional space, and shared learning artifacts) to investigate moment-to-moment acts of positioning, it does not apply the rigorous discourse and conversation analysis employed by Engle and her colleagues. Like Esmonde and Dookie (under review) the present study is rooted in sociocultural theories of learning and identity and incorporates the Differential Influence framework with positioning theory as an analytic framework.

To guide the initial analysis of positioning, I drew from Davies and Harré’s (1990) notion of interactive positioning and reflexive positioning. Interactive positioning refers to the ways that people position one another through interaction. For example, when a person directs their eye gaze towards a speaker and nods their head to demonstrate agreement, they position the speaker as meritorious and as making an important contribution. In contrast, when a person does not direct their body or eye gaze towards a speaker and, instead, appears to engage in another activity, they position the speaker as unimportant and marginalize their contribution (e.g., Leander, 2002b). Drawing from the Differential Influence framework, an act as simple as asking a person a question can serve to position that person as an authority. On the contrary, not asking a person in a group a question (and instead consulting others) can position that person as lacking authority. The interactive positioning code was used to examine the ways in which the non-focal group members positioned one another as well as how they positioned the focal students through verbal and non-verbal means.

Reflexive positioning refers to the ways in which a person positions themselves through interaction. For example, by speaking assertively, loudly, or by repeating a contribution, a person positions themselves as an authority. The reflexive positioning of the focal students was coded relative to their interactions with their group members. The non-focal students’ subsequent responses to these reflexive positioning moves was captured using the interactive positioning code. Over multiple iterations of coding and methods of constant comparison
(Glaser & Strauss, 1967), the broad interactive and reflexive positioning codes were further refined and will be described in greater detail below. An analysis of the frequency of these codes was used to help characterize patterns of social positioning.

Drawing from the analysis of Esmonde and Dookie (2012, under review), particular attention was paid to the students’ bodily orientations and movements in space relative to one another and whether/how they impacted one another’s access to the interactional space and learning artifacts (e.g., shared worksheets). For example, the code access was used to assess the extent to which each student in the group could access (i.e., see and/or physically grasp) shared learning artifacts as well as their access to the interactional space. Student access was assessed every 10 seconds during the target segments of video and was labeled as either high (i.e., the student could readily and easily see and/or grasp the learning artifact), moderate (i.e., the student would have to strain and/or lean their head and/or torso in some way to see and/or grasp the learning artifact) or low/no (i.e., the student had no access from their current physical position and had to engage in a gross body movement, such as standing and/or walking to a new spatial location in the group, to see and/or grasp the learning artifact). Other codes that were used to characterize student access included writing (i.e., identifying which of the students in the group was writing on a shared learning artifact and for how long) and exclusive use of artifact (i.e., identifying which member of the group held or maintained access to a shared learning artifact and for how long). Bodily movement and orientation was the main form of positioning that impacted students’ access to the learning artifacts and interactional space.

I will now elaborate on the codes and labels use to capture the various forms of interactive and reflexive positioning. It should be noted that given the research question and goals, the codes most commonly used in the study were used to capture marginalizing acts of positioning.
Microanalysis of Social Positioning

(i) Interactive positioning. Both verbal and non-verbal forms of interactive positioning were coded. It should be noted that the analysis was particularly focused on the interactive acts of positioning relative to the focal student. However, the ways in which non-focal students positioned one another was also considered, particularly during the examination of gendered and/or racialized patterns of positioning.

Non-verbal forms of interactive positioning included body positioning, physical blocks, gestures, and facial expressions. For example, a physical block was defined as any movement or bodily orientation that served to prevent another member of the group access to the interactional space and/or shared learning artifacts. These blocks were further characterized (using labels) as either momentary (i.e., a shift in a person’s bodily orientation that temporarily blocked another’s access to the shared learning artifacts and/or interactional space) or sustained (i.e., an enduring bodily orientation that served to block another’s access to the interactional space and/or shared learning artifact for more than 15 seconds). When a student engaged in a physical block, labels were used to indicate both who conducted the block as well as who was being blocked. As previously indicated, there was a strong association between the physical block code and students’ respective access to the shared learning artifacts and/or interactional space. That is, during times in which students’ had moderate to low/no access, they were also often being blocked. The temporal association between these codes was noted and although they were coded separately, they are more broadly understood as being closely related and difficult to distinguish.

Verbal forms of interactive positioning included an examination of whether and how various members of the group were integrated and granted access to the conversational floor. The main code generated from the data that was used to capture verbal interactive positioning was exclusive talk. Exclusive talk was defined as “talk that served to explicitly invite certain
members of the group to the conversation and/or talk that served to explicitly prevent one or more people from contributing.” Evidence of exclusivity included bodily orientation (i.e., when certain members of the group were facing one another and away from others), eye gaze (i.e., directed towards one another), and explicitly addressing a particular member of the group (e.g., “what do you think?” or “Chloe, what do you think about this…?”). Labels were used to identify the students taking part in the exclusive conversation, including who was the instigator. The length of an instance of exclusive talk was variable. Some instances involved a single adjacency pair (i.e., two utterances spoken by two different speakers, one after the other, considered to be the smallest unit of conversational turn-taking e.g., Schegloff, 2007) for example:

Speaker 1: Monica⁸, what did you get for question two?

Speaker 2 (Monica): I’m glad you [speaker 1] asked! I’m still struggling with it. I’ll let you [speaker 1] know when I’m finished.

Other instances of exclusive talk were more lengthy and consisted of a series of back-and-forth utterances between members of the group.

(ii) Reflexive positioning. Drawing from the analysis of Esmonde and Dookie (2012, in progress), every utterance and non-verbal form of communication made by the focal students was coded and characterized as either a verbal or non-verbal act of reflexive positioning. Codes generated from the data pertaining to non-verbal acts of reflexive positioning included, gross motor movements, fine motor movements, expression of negative emotion, and expression of positive emotion. The code gross motor movement was defined as “a physical act made by a

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⁸ Note that the use of italics here is to highlight the specific words spoken that suggest exclusivity.
focal student that involved the movement of the trunk of the body, to a new spatial location in the group.” For example, this code was applied if a focal student walked to a new spatial location in the group work configuration. The code fine motor movement was defined as “a physical act that did not involve the movement of the trunk of the focal student’s body that appeared to increase their access to the interactional space and/or learning artifacts.” Examples included straining of the neck, turning of the head, leaning and so forth. The codes expression of negative emotion and expression of positive emotion are self explanatory and examples of the former included rolling of the eyes or furrowing of the brow while examples of the latter included, smiling or laughing.

Only the onset of the physical moves or facial expressions was coded and so it was the frequency of instances rather than their length that was of interest in the analysis. After these instances were marked on the video timeline, an analysis of their temporal relationship with the other acts of positioning was done. For example, whether the focal students’ gross or fine motor moves temporally corresponded with the physical blocks and/or exclusive conversations of their group members was examined. Based on the principles of an adjacency pair analysis and the notion of turn-taking (e.g., Schegloff, 2007), if the onset of the focal students’ physical moves and/or facial expressions immediately followed or occurred during marginalizing acts of positioning (i.e., physical blocks and/or exclusive talk), these reflexive acts of positioning could conceivably be interpreted as the focal students’ responses to such forms of marginalization.

The main code generated from the data pertaining to verbal acts of reflexive positioning was intellectual contribution. An intellectual contribution was defined as “any utterance related to the mathematical task, including ideas, questions, strategies and so forth.” For example, when a focal student asked for clarification, restated the task expectations, or proposed a method to solve a problem, these were coded as intellectual contributions. Drawing from the analysis of Esmonde and Dookie (2012; under review), the code bid to change work practice was intended
to capture any verbal requests made by the focal students to change the norms of the group activity (e.g., requesting to have a turn writing or to ask group members to physically reposition themselves so they weren’t in the way of a learning artifact etc.). However, this code was never applied.

Table 2. Analysis of Interactive and Reflexive Positioning

Summary of Main Codes Applied in the Analysis of Interactive and Reflexive Positioning

<table>
<thead>
<tr>
<th>Type of Positioning</th>
<th>Verbal or Nonverbal?</th>
<th>Main codes applied</th>
<th>Associated Labels</th>
</tr>
</thead>
<tbody>
<tr>
<td>interactive</td>
<td>verbal</td>
<td>‘exclusive talk’</td>
<td>• identifying students involved</td>
</tr>
</tbody>
</table>
|                     | nonverbal            | ‘physical block’   | • identifying students involved  
|                     |                      |                    | • ‘momentary’  
|                     |                      |                    | • ‘sustained’  |
| reflexive           | verbal               | ‘intellectual contribution’ | • non-focal student response |
|                     | nonverbal            | ‘gross motor move’  |  
|                     |                      | ‘fine motor move’   |  
|                     |                      | ‘expression of negative emotion’ |  
|                     |                      | ‘expression of positive emotion’ |  |

Applying the analysis of Esmonde and Dookie (2012, under review), the responses (or lack thereof) of the non-focal students to each of the focal students’ reflexive acts of positioning was characterized using labels. The labels applied in the analysis included: ignored, explicit disagreement/challenge, explicit agreement, acceptance without comment, and acknowledged with minimal engagement. (See Table 3 for their full definitions.) Like the previously described interactive and reflexive positioning codes, the response labels grew out of the data and were
used to identify general patterns in the non-focal students’ responses to the focal students’ contributions. In reality, the students’ responses were idiosyncratic. The intent here was not to essentialize student responses, but to instead pull out some of the broader commonalities across cases and identify some of the characteristics of the marginalizing acts of positioning. It is also important to note that the present study does not make any claims about students’ intentions. The non-focal students may or may not have intended or even been aware of the marginalizing nature of some of their positioning moves.

Table 3. Labels characterizing non-focal students’ responses

<table>
<thead>
<tr>
<th>Label</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignored</td>
<td>Contribution is not acknowledged, verbally or non-verbally</td>
</tr>
<tr>
<td>Disagreement/challenge</td>
<td>Disagreement with focal student’s contribution. Can be verbal or non-verbal (e.g., shaking head to indicate disagreement) and implicit or explicit.</td>
</tr>
<tr>
<td>Agreement</td>
<td>Focal student’s contribution is agreed with. Could involve further conversation, but not necessarily. Could be verbal or non-verbal (e.g., nodding head to indicate agreement) and explicit or implied.</td>
</tr>
<tr>
<td>Acknowledged with minimal engagement</td>
<td>Acknowledgement of focal student’s verbal contribution or physical act of positioning (e.g., looking towards focal student and adjusting one’s body). Only used when agreement/disagreement don’t apply to the conversation.</td>
</tr>
<tr>
<td>Acceptance without comment</td>
<td>Focal student’s contribution is taken up, without comment. Can be taken up explicitly or implicitly and verbally or non-verbally.</td>
</tr>
</tbody>
</table>

Analysis of Positioning using Microaggression Theory and Stereotype Threat Theory as Interpretive Lenses
(i) Identifying racialized and/or gendered patterns of positioning. The next phase of analysis involved examining the coding to determine patterns in social positioning. Referring to research question 1(b), I was interested in investigating whether and how social identity was involved in the acts of positioning observed. Using microaggression theory as an interpretive lens, attempts to look for racialized and/or gendered patterns of social positioning were made. To find these patterns, I considered each students’ access to the interactional space and shared learning artifacts as well as: the marginalizing acts of acts of positioning, who conducted these acts of positioning, and who tended to be on the receiving end of them. An examination of the frequency with which the codes were applied (or with some codes, the length of time the code was applied) as well as who performed the acts of positioning was done. If in a particular case, for example, all or most of the physical blocks were conducted by the boys in the group and each time they served to block a girl, a gendered pattern of positioning was proposed. In another group, if all the Asian students in the group maintained high access to the interactional space and/or shared learning artifacts and the non-Asian students in the group maintained only moderate or low/no access, a racialized pattern of positioning was proposed. Similarly with talk, if exclusive conversations tended to occur between the boys in the group, a gendered pattern was proposed and so on. Despite this systematic procedure for analyzing code frequencies, the spirit of the analysis remained qualitative. The quantitative examination of coding frequencies was used only to highlight patterns in social positioning and served to ground claims of racialized and/or gendered patterns.

The intent of the study was not to disentangle racialized versus gendered patterns in positioning. Instead, the study was rooted in the belief that these, and a great many other, components of identity are inextricably linked (McCready, 2004; Collins, 1990). Hence, I intentionally used “and/or” language as opposed to “and” or “or” to emphasize the intersectionality of race and gender. For example, if the one Asian girl in a group tended to be
blocked by the White boys in the group, a racialized and/or gendered pattern of positioning was proposed. Based on the principles of intersectionality, it is important to note that there are a great many dimensions of identity that were not considered in this analysis (e.g., class, sexual orientation, religion and so forth) that undoubtedly operated in concert to affect the social positioning observed. These aspects of identity are not any less relevant or important to consider, but there are logistical constraints in the scope of data collection and analysis. Given the data collected, the study’s interest in race and gender stereotypes in mathematics education, and the goal to apply the established principles of stereotype threat theory, the study sought to focus on race and gender and their intersectional nature. It should be noted that if the focal students did discuss other aspects of identity on their own accord, this was incorporated into the analysis and will become evident in the case of Valerie (who independently brought up grade level as having a significant influence on social positioning). Taken together, the reduction and compartmentalization of social identity into race and/or gender categories alone is a recognized (and inevitable) limitation of the present study.

(ii) Applying microaggression theory and/or stereotype threat theory. After examining whether racialized and/or gendered patterns of positioning were observed, this as well as the entire data corpus for each case was interpreted using the lenses of microaggression theory and/or stereotype threat theory. For example, if racialized and/or gendered patterns of positioning were observed, a discussion of how the acts of positioning could be interpreted as microaggressions was offered. Similarly, depending on the type and patterns of positioning observed, attempts to apply the principles of stereotype threat theory were made. This was one of the main ways in which the present study linked stereotype threat to real-world phenomena. This phase of the analysis was more speculative in nature, but was grounded in the data as well as previous empirical work.
Memo Writing

For each case, following the microanalysis of positioning and the interpretation using stereotype threat theory and microaggression theory, analytic memos were written. These memos included a detailed, code-by-code description of the social positioning analysis with many embedded examples. Summaries highlighting the major patterns of findings were included as well as the interpretation of the findings using microaggression theory and stereotype threat theory.

Figure 7. Overview of video data analysis events

Part II. Analysis of Interviews

Overview

Together, the interviews and video data informed one another. In addition to providing the participant perspective and voice, the interviews provided further context to the focal episodes of group work. Drawing from Anderson (2009), a limitation of traditional analyses of positioning is that they employ an imminentist ontology (i.e., “the premise that positioning is contextually tied to the moment of interaction in which it occurs and not across interactions or scales of activity”; p. 292) and she calls for the need to consider meso-level influences (i.e., “neither from a solely micro- nor a solely macro-social perspective”; p. 293). As such, in addition to considering the moment-to-moment acts of positioning and broad sociohistorical forces such as race and gender, this study used the interview data to facilitate the investigation of some the meso-level influences (e.g., the focal students’ relationships with the group members and perceptions about group work) that came to bear on the episodes of group work.
In general, the interviews were transcribed and exposed to descriptive followed by thematic passes of coding. While talk involving or implicating social identity, mathematics identity, marginalization, stereotypes, and perceptions about group work was a primary focus, themes (e.g., friendship, dispositional characteristics of group members, collegiality, and pressure) also emerged from constant comparison between data and the gradual elaboration of open codes (Glaser & Strauss, 1967). An analytic memo representing the interview data for each case was written and, similar to the analysis of video data, stereotype threat theory and microaggression theory were incorporated as interpretive lenses. Specific attempts were made to build on the stereotype threat theory and/or microaggression theory connections made in the video analysis.

As will be demonstrated in the sections below, the interview analysis was separated into two parts. The first involved the data obtained from the introductory and final interviews that captured discourse pertaining to more meso- (e.g., friendships, perceptions about group work) and macro-level (e.g., perceptions about achievement stereotypes, issues of race and/or gender) while the second part of the interview analysis centered on the stimulated recall data which captured discourse on more micro-level information (e.g., moment-to-moment group work interactions). The accompanying memos maintained the two-part organization and this format also guided the presentation of the results. In the following sections, I will elaborate on the analysis of the introductory and final interviews; the stimulated recall interviews; and the teacher interviews. It should be noted here that fieldnotes supplementing the interviews were analyzed alongside the interview transcripts and the same system of coding was applied. The fieldnotes were very brief in nature and were mainly used to capture non-verbal forms of communication such as facial expressions and hand gestures to supplement the audio data.

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9 In some cases, the focal students provided meso-level information in the stimulated recall interviews stimulated recall interview and this data was lumped into the other meso- and macro-level data.
**Introductory and Final Interviews**

The interviews were transcribed and the initial passes of coding were descriptive in nature, grounded in the data. The descriptive coding brought to light a host of themes that were independent of the pre-determined themes of interest. For example, the code capturing the theme of *pressure* grew out of the data and included any utterances about mathematics and stress, anxiety, competence, and/or achievement. It should be noted here that in the event that codes with a negative valence such as *pressure* grew out of the data, attempts to look for the opposite valence (e.g., *community/support*) were made to help mitigate researcher bias. The code capturing the theme of *friendship* also grew out of the data and included any utterances describing the nature of friendships in the classroom or school.

Other themes were pre-determined and were shaped by the research questions. For example, the code *mathematics identity* was used to capture any references to the focal students’ mathematics ability, feelings about the domain, future involving mathematics, perceptions about how others perceive their mathematics ability, and so forth while the code *stereotypes* was used to capture focal students’ perceptions about achievement stereotypes in mathematics. This code was eventually collapsed with the code for *social identity* to capture both potential and overt utterances about social identity. An example of a potential reference to social identity included when one of the focal students, Hailey, described how two boys in her group benefited from the group work experience because they tended to take charge. Hailey said: “Well, I did not particularly enjoy it [the group work experience], but I think for *people like* [italics added] Allen and Henry, like people who really dominate, that was helpful for them cause they could like bounce ideas off each other.” Hailey’s use of the words “*people like*...” broadens the
implication of her statement, suggesting that perhaps she was referring to boys more generally (rather than just describing Allen and Henry). Further to this, she described the boys in a manner that was consistent with the gender achievement stereotype in mathematics. On the other hand, a more explicit reference to social identity included the statement made by Abida about the friendship dynamics at her school: “…Nigerians and Asians…we don’t really mix.”

*Perceptions about group work* was a broad code used to capture information about the focal students’ figured worlds of group work, including the roles available to participants, whether and how available roles afforded learning, group work norms, and so forth. Any reference to a focal student’s perceptions about mathematical group work was used to construct their figured world of group work. Table 4, below, depicts the main broad codes applied during the analysis of the introductory and final interviews.

Table 4. Main codes applied in the analysis of introductory and final interviews

*Main Codes Applied in the Analysis of Introductory and Final Interviews*

<table>
<thead>
<tr>
<th>Code</th>
<th>Definition</th>
<th>Example from the data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal characteristics</td>
<td>References about focal students own personal characteristics, likes, values, priorities, interests, etc.</td>
<td>“I’m more of an artsy person”</td>
</tr>
<tr>
<td>Math Identity</td>
<td>Reference to focal student’s mathematics ability, feelings towards the domain, future involving math, and perceptions of how others perceive their math ability.</td>
<td>“I am a weak math student”</td>
</tr>
<tr>
<td>General group work perceptions</td>
<td>Reference to feelings about group work, what makes it work, challenges associated with it, things to expect or that happen regularly, ways to improve it, the roles available to participants etc.</td>
<td>“In group work, one person tends to dominate and take over”</td>
</tr>
<tr>
<td>Friendship</td>
<td>Any description of the nature of friendships in the school/classroom or relationships with other students.</td>
<td>“Most people in our class are friends.”</td>
</tr>
<tr>
<td>School and/or classroom climate/culture</td>
<td>Any reference to a school or classroom norm, practice, custom, common practice</td>
<td>“It’s a super competitive place”</td>
</tr>
<tr>
<td>Pressure</td>
<td>References related to mathematics or group work associated with stress, anxiety, pressure, achievement, and/or competition.</td>
<td>“In groups, everyone is always racing to get done and I have to try to keep up”</td>
</tr>
<tr>
<td>Community</td>
<td>Any reference to social cohesion or support pertaining to the school in general or the classroom environment.</td>
<td>“I like group work because we can help each other out”</td>
</tr>
<tr>
<td>Social Identity and/or Stereotype</td>
<td>Any reference to social identity, either implicitly or explicitly, including a description of a stereotype. This includes the focal student’s perception about the stereotype (i.e., whether they believe it to be true).</td>
<td>“Everyone knows the stereotype that Asians are good at math” “People like Allen and Henry enjoy taking charge in group work”</td>
</tr>
</tbody>
</table>

Following multiple passes of coding, analytic memos were written to represent the introductory and final interviews. At this time, several codes were collapsed into broader themes and the overlap between codes was elaborated. It was at this point that stereotype threat theory and microaggression theory were incorporated as interpretive lenses. For example, the focal students’ mathematics identities and figured worlds of group work were used to provide evidence that the conditions necessary to trigger stereotype threat were present (e.g., salience of mathematics achievement stereotypes, high pressure for achievement in group work, high value for performance in the domain etc.).

*Stimulated Recall Interviews*

The stimulated recall interviews were transcribed and annotated with information pertaining to the associated video segments of interest. Specifically, when a reference to a particular moment in the video was made, the video timestamp as well as a brief description of the associated footage was indicated in parentheses.

The responses to each of the target video segments were analyzed separately. The same codes that were applied to the introductory and final interviews were applied to the stimulated
recall interviews except they were specifically related to the session of group work. For example, the *friendship* code was used to capture information presented about the relationship dynamics within the group. The *pressure* code was used to capture any pressures the focal students described about achievement, the work pace, appearing competent and so forth, within the group work context. The *social identity* and *stereotypes* code was used to capture any mention of social identity and stereotypes, either explicitly or implicitly, within the group work context. For example, this code was applied if a focal student described herself or the qualities of the boys in her group in way that was consistent with gender roles or gender achievement stereotypes specifically. The principles of stereotype threat theory were used to help define and inform these codes.

An additional set of codes was used in the stimulated recall interview analysis to facilitate the examination of positioning. These codes were similar in nature to the positioning codes applied to the video microanalysis. Some of these codes were predetermined while others were a result of constant comparison. For example, the code *collegiality* grew out of the data and was used to capture instances wherein the focal students appeared to attempt to maintain a degree of professionalism and respect towards their group members. Like the analysis of the other interviews, in the event that codes with a negative valence such as *pressure* grew out of the data, attempts to look for the opposite valence (e.g., *community/support*) were made to help mitigate researcher bias. Predetermined codes such as *positioning: interactive* and *positioning: reflexive* were used in much the same way as they were in the video microanalysis, except in this phase of the analysis, the application of these codes was dependent upon the focal student narratives (rather than what was apparent in the video to the researcher). The emphasis, here, was to capture the perspectives of the focal students. A list of the main codes used in the stimulated recall interview analysis can be found in Table 5, below.
Table 5. Main codes used in the analysis of stimulated recall interviews

*Main Codes Used in the Analysis of Stimulated Recall Interviews*

<table>
<thead>
<tr>
<th>Code</th>
<th>Definition</th>
<th>Example from the data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>Any reference to the content material involved in the mathematical task. Could include a description of the goals of the activity, an appraisal of the activity, etc.</td>
<td>“The goal was to review for our upcoming unit test.”</td>
</tr>
<tr>
<td>Friendship</td>
<td>Description of the nature of the relationships within the group—both between the focal student and the non-focal students as well as between the non-focal students.</td>
<td>“They were really good friends.”</td>
</tr>
<tr>
<td>Characteristics of group members</td>
<td>Any utterances to describe group members in terms of their disposition, work ethic, personality, qualities and so forth.</td>
<td>“He enjoyed taking charge!”</td>
</tr>
<tr>
<td>Pressure</td>
<td>Explicit or implicit references related to the context of group work and stress, anxiety, achievement, competence, work pace etc.</td>
<td>“I felt like I was holding the others back.”</td>
</tr>
<tr>
<td>Community/support</td>
<td>Any reference to a positive or supportive energy pertaining to the group work.</td>
<td>“We were lost together.”</td>
</tr>
<tr>
<td>Social identity and/or stereotypes</td>
<td>Any reference to social identity, either implicitly or explicitly, including a description of a cultural stereotype.</td>
<td>“They were more comfortable talking to each other because they were both grade 10s.”</td>
</tr>
<tr>
<td>Positioning: interactive</td>
<td>Any acts of positioning that are identified by the focal students, either verbal or non-verbal, performed by the group members. Depending on the focal student’s account, these may be further characterized as ‘marginalizing’ (i.e., the act of positioning serves to restrict the focal student’s participation) or ‘inclusive’ (i.e., the act of positioning serves to grant the focal student access to participation).</td>
<td>“They kept talking to each other.”</td>
</tr>
<tr>
<td>Positioning: reflexive</td>
<td>Any time the focal student describes a way in which she positioned herself, either verbally or non-verbally.</td>
<td>“I moved over here so I could see the board better.”</td>
</tr>
<tr>
<td>Feelings about/insights into GW experience</td>
<td>Any appraisal or reported feelings about the group work experience. Can be tied to a specific moment in the group work (e.g., “I couldn’t see, so I was like, uhh!”) or a more global feeling about the work (e.g., “I didn’t enjoy this activity”). Could also be any comments that provide insight into how the student was feeling or experiencing at the time (e.g., “I felt like they were just working together”)</td>
<td>“I just wanted it to be over.”</td>
</tr>
</tbody>
</table>
Following multiple rounds of coding, a stimulated recall interview analytic memo was written for each case. In addition to summarizing the main findings, the memos served two main purposes: (1) to find connections between the focal student narrative and stereotype threat theory and/or microaggression theory and (2) to compare each stimulated recall response to the researcher’s microanalysis of the accompanying target video segment.

The comparison of the stimulated recall responses to the researcher’s microanalysis of the associated video was intended to address research question #4 (How do focal student perceptions about the observed positioning compare and relate to the researcher’s perceptions?) and facilitate an examination of professional vision. This methodological triangulation further demonstrated how the video and interview data informed one another. Attempts were made to compare the acts of positioning identified by the focal students versus the researcher as well as the similarities and differences across the interpretations and explanations offered.

Attempts to connect the focal student narratives to stereotype threat theory and/or microaggression theory were also made. For example, the types of marginalizing acts of positioning that focal students identified were examined and whether and how they could be connected to triggers documented in the stereotype threat literature was discussed. Similarly, the focal students’ explanations and interpretations of the marginalizing acts of positioning were examined and attempts to connect this and build on existing microaggression theory research was made. For example, if a focal student attributed the fact that they were physically blocked from the interactional space to the fact that they were the only girl in the group, this was
considered an explicit connection to microaggression theory. On the other hand, a potential\textsuperscript{10} connection to microaggression theory was identified if students attributed marginalizing acts of positioning to things like friendship patterns which are, implicitly, racialized, gendered, classed and so forth (Shrum, Cheek, Jr., & Hunter, 1988; Clark & Ayers, 1992). Finally, focal students’ responses to marginalizing acts of positioning and potential stereotype threat were considered with respect to how they related to the body of research examining stereotype threat coping mechanisms.

In general, the analysis of interviews considered whether the connections to microaggression theory and stereotype threat theory made in the researcher’s microanalysis of video could be corroborated and/or expanded. For example, if the researcher proposed a gendered pattern of exclusive talk and the focal student, too, attributed the exclusive conversations between the boys in the group to the fact that they were all boys and she was a girl, this provided compelling evidence of a gendered microaggression. However, differences between the focal student interpretations and explanations and the researcher perspective were also fruitful in that they afforded a further examination of professional vision.

\textit{Teacher Interviews}

The teacher interviews were transcribed and, for the purposes of this study, were coded for background information regarding the school and classroom context. Any information that the teachers provided regarding student relations, school culture (e.g., with respect to race and gender relations, expectations around academic achievement, focus on mathematics and sciences versus the arts, and so forth), as well as general school and classroom norms was used

\textsuperscript{10} The word ‘potential’ is used to highlight that the theoretical connection remains speculative and uncertain.
to help provide underlying background information for each case. Memos summarizing background information were written for each case and incorporated in the Results.

**Methodological Limitations**

There are several limitations to the study’s employed methodology. Firstly, the sample of focal students was small. From a positive research standpoint, a small sample size results in limited generalizability. This limitation is exacerbated by the fact that only one session of group work was investigated for each focal student and, although they reported having a history of negative experiences in group work, the claims made in the present study remain limited. However, in keeping with the principles of an interpretive research paradigm, a small sample size can also be fruitful in that it lends itself to fine-grained analysis and the close consideration of individual experiences (Creswell, 2013).

Further to limitations in sample size and scope of observation, the present study was strictly interested in the experiences of the focal students (i.e., students from non-dominant social groups) and did not consider the perspectives of the other students in the small groups. Given the dialogical nature of social positioning, considering the perspectives of the other students in the small groups could have afforded an additional perspective and furthered our understanding of the microdynamics of social positioning. The present study intentionally foregrounded the voices of students from stereotyped social groups who lacked critical mass and were marginalized during the observed sessions of group work. However, it is important to recognize the limitations of interview techniques and although they give participants the opportunity to share their experiences and perspectives, they do not necessarily represent their internal thoughts and feelings.
A similar limitation with respect to the perspectives captured in the present study is that only a single video camera was employed. As such, many aspects of the interaction taking place at a given moment were not fully captured, including facial expressions, eye gaze, hand gestures, use of learning artifacts, and so forth. Although attempts were made to supplement the video footage with fieldnotes, subtle, non-verbal forms of communication are difficult to document through fieldnotes. Future studies investigating the microdynamics of social positioning are encouraged to employ multiple cameras to capture the various angles required for rigorous microanalyses.

The connections to stereotype threat theory and microaggression theory offered in the present study are interpretative. Microaggressions are subjective experiences that cannot be identified by an outside observer. Without students’ explicit identification of these experiences, connections to microaggression theory are thus based upon the interpretation of the researcher. The present study attempted to address this limitation through the use of stimulated recall interviews and the close consideration of student perspectives in addition to the researcher’s lens of interpretation. Similarly, as previously discussed, without quantitative achievement measures, the use of control groups and experimental manipulation, the present study cannot make positivist claims about the occurrence of stereotype threat. However, the goal of this work was not to create empirical knowledge or prove or disprove a hypothesis using quantitative analyses. Instead, the study investigated marginalizing acts of positioning (or microaggressions) and stereotype threat in real-world contexts and provided rich descriptions of these observed phenomena. Although this analysis is interpretive, its claims are grounded in strong theoretical and empirical evidence and it serves to provoke discussion and point to further research directions. Further to this, although the sample size was small, by honing in on the experiences of students and conducting an in-depth analysis, this study captures the nuances of marginalizing acts of social positioning.
I now present the findings, case\textsuperscript{11} by case, with points of discussion embedded throughout. I conclude the Results and Discussion chapters with a synthesis of findings across cases.

\textsuperscript{11} In the present study, each focal student and the associated session of group work is considered to be a separate case. As such, given that there are six focal students, there are six cases in total.
CHAPTER 4: THE CASE OF HAILEY

Part I: Meet Hailey

Personal information and school context

Hailey was 16 years old and enrolled in an 11th grade Advanced Functions mathematics class at the time of the study. The class consisted of 14 students, 4 girls and 10 boys. With the exception of Hailey and another boy, all students self identified as White. Hailey identified herself as a multiracial (White/Asian) girl. Although she did not indicate her family’s SES in the survey, it is assumed she was medium to high SES given the school’s demographic information and the $27,800 annual tuition rate.

The school was situated in the heart of a large Canadian city and consisted of about 300 students ranging from grade 6 to 12. The school population was predominantly White (approximately 60%) with a relatively large number of East Asian students (approximately 30%) and a very small proportion of Black and Brown students (approximately 10%). When asked about issues of race, gender, or class at the school, Hailey explained that the school was a “nice and diverse place” devoid of such issues.

The school was accredited to offer the International Baccalaureate (IB) program\textsuperscript{12} and, based on Canadian standards for private schools, the school was considered prestigious. The school admission process was relatively competitive and each prospective student was required to submit a written application and undergo an interview.

According to Hailey, the school was comprised of a number of academically driven students who excelled in mathematics. She described a pressure to do well in mathematics, particularly in the grade 11 Advanced Functions course because it would be reflected on her

\textsuperscript{12} The International Baccalaureate diploma is an internationally recognized program, consists of world class standards, and emphasizes critical thinking and inquiry approaches to education.
academic transcript and hence could impact her post-secondary school applications. Hailey explained how her classmates also felt this pressure and that academic success was a hallmark of the school culture.

*Hailey’s Mathematics Identity*

Within the introductory interview as well as the survey, Hailey characterized herself as a weak mathematics student and that it was not one of her favorite subjects. She described herself as a quiet mathematics student who tended to be more of an “observer.” She explained her discomfort with speaking out in class for fear of sharing the “wrong answer.”

When asked how others might describe her as a mathematics student, Hailey stated that “people like Allen” (i.e., one of the outspoken boys that she often worked with) would say that she “doesn’t really do anything.” She explained that this perception occurred because “those people” don’t include her in the work.

Despite her lack of confidence and negative feelings towards mathematics, Hailey recognized the importance of the domain in the real world and indicated that she highly valued her performance in the domain. In the context of this perceived importance, Hailey talked about external pressure from her classmates, parents, and teachers to do well in mathematics. Despite her value for the domain, she described no plans to pursue mathematics in her future career.

When asked to describe her knowledge of achievement stereotypes in mathematics, Hailey immediately described the stereotype that ‘Asians are good at mathematics’. She very quickly discredited the validity of the stereotype, however, arguing that “everyone’s good at math at [my school]” regardless of their race. She also acknowledged the gender achievement stereotype in mathematics, but also dismissed it as having any relevance at her school. Hailey described the stereotype that “Jewish students are good at math” as being particularly salient at
her school and indicated that sometimes people erroneously assumed she was Jewish because of her curly hair. Using the lens of stereotype threat theory, at any given moment, Hailey may have been contending with multiple, conflicting self-relevant stereotypes.

_Hailey’s Group Work Figured World_

Overall, Hailey’s figured world of group work was laden with power. She explained that within group work, one person tended to dominate and deny others (namely herself) the opportunity to contribute:

In groups there will be one person who tends to dominate and try to solve the question for themself before giving the other people in your group a chance to try and solve it. So, I don’t know if it’s always beneficial to do group work, if there’s a person who’s like that and tries to take control and do everything themselves and not really give the other people a chance to sort of see what’s going on.

The characters in her narrative included “leaders” and “observers.” According to Hailey, the leaders tended to be “good at math”, “confident”, “dominating”, and “bossy.” She described how:

It’s not necessarily even one person. It’s a type of person. I think there’s a person like this in probably every math class. Usually it’s the person who’s good at math who gets really good grades so I think they’re confident in math which is why they think they can take over. And so usually it’s the person who’s really good at math and understands what they’re doing and because of this they might, I don’t know, feel superior over other people and they can tend to
also be a little bossy and try to tell you what to do and if your idea is wrong, they can like shut it down really quickly and make you feel like you don’t really want to contribute any more if they’re going to be like that. So they tend to take over the leader position of the group even if there really isn’t supposed to be one.

She also made several implicit statements suggesting these leaders were often boys. For example, when asked to reflect on a group work experience she stated:

…I think for people like [Allen] and [Henry], like people who really dominate, that was helpful for them cause they could like bounce ideas off each other.

Hailey’s statement that “people like Allen and Henry” tend to dominate suggests that she may be generalizing this characteristic to boys given that both Allen and Henry are boys.

According to Hailey, issues of power are exacerbated within larger groups because the dominant members of the group team up and take over. Hailey described her role within the figured world of group work as more of an “observer.” She explained that this was because:

…the dominant person’s usually bossy, so usually I don't speak up, but if I do, then usually it doesn’t really have a good result because they’ll be like, “well, I know how to do this…I'm good at math” and then I can’t argue with them cause they are good at math. So then, I feel like I just shouldn’t have said anything.

Hailey indicated that group work dyads are much more equitable because it is less likely that one person will dominate and take over within this context.
Hailey described group work as being a context driven by pressure. She described pressure to contribute *correct* answers, work quickly, compute answers mentally, and keep up with a fast work pace. As a result, she explained how she often resorted to “following along with group members blindly.”

According to Hailey, group work is best when students are allowed to form their own groups and work with friends. She also emphasized the importance of the physical organization of the group, stressing that circular formations facilitate better collaboration and inclusion. She described how she often sat on top of a desk to better access shared learning resources during group work. As will be presented in the video microanalysis, Hailey’s focus on the importance of the physical organization of the group is apt given the physical nature of her marginalization.

*Summary of Background Information and Connections with Stereotype Threat Theory*

Hailey described herself as a weak mathematics student who does not see mathematics in her future academic and professional trajectory. Despite her negative feelings about the domain, she recognized its real-world importance and generally valued her performance in the domain. Given this appreciation, pressure from her peers, parents, and teachers to excel in mathematics; the high stakes of her performance in the grade 11 mathematics class in terms of its impact on her post-secondary school applications; as well as the elite academic culture of her school; Hailey indicated feeling pressure to do well in her mathematics class. Further to this, Hailey’s figured world of group work demonstrated that this was a power-laden, high pressure learning context.

Using stereotype threat theory as an interpretive lens, the factors described above represent the conditions necessary to trigger stereotype threat (i.e., elite academic context wherein a dominant group largely outnumbers a stereotyped group, pressure to succeed, value
for the domain, salience of stereotypes). Further to this, Hailey’s self-identification (in part) as a member of two commonly stereotyped social groups in mathematics (i.e., ‘Asian’ and ‘girl’) would increase her vulnerability to stereotype threat. However, the conflicting nature of these stereotypes adds a layer of complexity. Stereotype threat theory would predict that Hailey’s vulnerability to stereotype threat would depend on whether her race or gender identity was salient. Drawing from positioning theory and considering the fluid and intersectional nature of identity, Hailey is constantly positioning and repositioning herself depending on the context and thus her race and/or her gender salience would shift from moment-to-moment. Thus, at any given moment she could feel pressure to live up to the stereotype that “Asians are good at math” or experience anxiety about confirming the stereotype that “girls are bad at math”.

Under certain circumstances (e.g., group work) with the appropriate triggers (e.g., working with “dominating” boys and gendered and/or racialized acts of positioning) Hailey would be vulnerable to stereotype threat. Given her narrative about the dominating boys in group work and its consistency with achievement stereotypes in mathematics, simply being grouped with boys may be sufficient to trigger stereotype threat (e.g., Inzlicht & Ben-Zeev, 2000). With this in mind, I turn to a case of group work wherein Hailey worked with three White boys and, using stereotype threat theory and microaggression theory as interpretive lenses, take a closer look at the microdynamics of positioning.

**Part II. Microanalysis of a Case of Group Work**

*Meso-Level Information: Setting the Stage*

(i) *The Group*

Hailey worked with three White boys: Allen, Henry, and Jacob. Hailey explained that the boys were friends both in and outside of the classroom but that she wouldn’t consider herself
to be friends with any of them. Hailey also described how she had worked with these same boys in the past and had not enjoyed the experience.

When characterizing her group members, Hailey described all three boys as being people who like to dominate and “enjoy taking charge.” She explained that Allen, in particular, “thinks he’s fabulous” at mathematics, took on the lead role in the group, and exuded a great deal of confidence. She indicated that these negative characteristics seemed only to surface in mathematics class:

It’s not that I dislike [Allen]. He’s a nice person. But when it’s math, cause he’s…yeah…Well not that I don’t get along with him. He’s just like very controlling with math. And I just like to let him do his own thing!

When describing some of the roles that the various group members took on, she indicated that Jacob was “like [Allen’s] scribe” while the other two boys took turns leading the discussion. She characterized herself as an observer. Interestingly, Jacob self-identified as an “alpha male” next to the ‘gender’ category in the survey.

(ii) The Mathematics Task

The goal of the group work activity was to review the course material in preparation for an approaching cumulative Advanced Functions exam. The teacher evenly divided the class into three groups and each group received a shared worksheet containing three word problems. Each group was instructed to solve an assigned problem, demonstrating their process and solution on a shared whiteboard space. Once they finished, the groups were invited to move around the room to check over one another’s work. The microanalysis described below focuses in on the
first portion of the task wherein Hailey and her group members were working through their assigned word problem (see Figure 8, below).

![Hailey's shared worksheet](image)

Figure 8. Hailey's shared worksheet

The shared worksheet given to Hailey’s group depicting their assigned word problem.

*Microanalysis of a Segment of Group Work*

In what follows I present a vignette description of a 2-minute segment of Hailey’s group work interaction. Using stereotype threat theory and microaggression theory as interpretive lenses, a microanalysis of the selected video segment is presented and subsequently juxtaposed with the narrative interpretation of the experience provided by Hailey after she viewed the same segment of video during the stimulated recall interview. In other words, the analysis begins with the consideration of the researcher’s lens and then Hailey’s narrative is incorporated afterward to provide further insight into the experience and to afford an examination of professional vision. Consistencies and inconsistencies between the researcher’s microanalysis and Hailey’s narrative description will be discussed. The clip was selected because of the apparent physical means of marginalization observed.
Vignette 1: “I Couldn’t See Anything”

To begin, Allen held the worksheet and he and the other members of the group physically oriented themselves towards the shared worksheet as well as the whiteboard (see Figure 9, image on the left). The initial configuration of the group was semi-circular with Hailey slightly on the outskirts. This physical position left her with only moderate access to the worksheet meaning she would have had to significantly lean and contort herself to read the word problem. She had relatively clear access to the whiteboard space wherein the problem was being solved.

Allen initiated the discussion by reading the word problem aloud. He and Henry discussed the given information and how they would construct the Venn diagram while Jacob and Hailey watched on. Allen instructed Jacob to begin drawing the Venn diagram and from this moment onward, each time Jacob went to write something on the whiteboard, he created a physical barrier that made it more challenging for Hailey to access the whiteboard (i.e., the central space for the group work activity; see Figure 9, image on the right).

Figure 9. Group configuration

*Figure 9.* The left image illustrates the original configuration of the group. The right image illustrates how Jacob blocks Hailey each time he writes on the board.
Allen and Henry continued to reread the problem aloud as Jacob filled in the given information on the Venn diagram. Once the given information was plotted and the discussion about how to solve the problem became the focus, Henry gradually positioned himself more directly in front of the whiteboard and thereby further blocked Hailey from the center of the group work activity. Together, the body positioning and physical movements of Jacob and Henry served to physically box Hailey out of the activity (see Figure 10, below, the image on the left).

Towards the latter half of the video segment, once the physical blocking became most prominent, Hailey appeared to strain herself (i.e., lean in, angle her head) to better see the worksheet and what was being written on the board. After a few moments, Hailey walked to a new position in the group wherein she was closer to the whiteboard yet further from the worksheet and the intermittent discussion between Allen and Henry (see Figure 10, below, the image on the right).

Figure 10. Blocking and spatial positioning

*Figure 10.* The image on the left depicts the physical blocking by both Henry and Jacob. The image on the right depicts Hailey’s new spatial position in the group.
(i) Interactive Positioning

(a) Use of and access to shared learning artifacts. Use and access was examined with respect to the shared worksheet and the shared whiteboard space. For the most part, Hailey had moderate access to the whiteboard (i.e., 11/19 instances), but towards the mid to endpoint of the segment, Hailey had very low access to the whiteboard (because her visual access was blocked by the boys) and when she subsequently moved to the new physical location in the group, she had high access to the whiteboard, but virtually no access to the shared worksheet or interactional space. The boys monopolized the shared whiteboard space and used it in an exclusive manner. In the six instances of ‘writing’ on the whiteboard space that were coded, Jacob was the only member of the group who had this opportunity.

Throughout the segment of video, Hailey had low/no access to the shared worksheet. Allen held the worksheet for the entire segment of interaction, was positioned furthest away from Hailey, and he held it towards himself and Henry. This is notable given that it was the group’s shared document. Even though Allen did read the word problem aloud and although some of the vital information pertaining to the problem was displayed on the whiteboard, Allen and Henry were in positions of power and advantaged because they could refer to the worksheet whenever they needed to. Although Jacob too had low access to the shared worksheet, when he required information about the problem, he asked that Allen re-read the problem aloud. Critics may argue that Hailey, too, could have simply asked for the problem to be re-read aloud, however, as will be demonstrated in the section on verbal interactive positioning below, Hailey did not appear to have the same access to the conversational floor as the boys.

Taken together, Hailey had very limited access to the group’s shared learning resources and the boys used them in an exclusive manner. A racialized and/or gendered pattern of access and use of shared resources was observed in that the three boys generally had high access to the
resources and when they didn’t (i.e., the instance when Jacob had low access to the shared worksheet), they had the access to the conversational space to request it.

(b) Physical interactive positioning. The case of Hailey provides a compelling example of the power of physical positioning. Hailey’s marginalization was evident when the video was played without sound. Throughout, she was visibly boxed out of the interactional space and left to the periphery with limited access to shared learning resources.

Allen engaged in one sustained block that endured the length of the video segment. He was constantly oriented towards Henry, Jacob, and the whiteboard and left only his side profile (and at times his back) towards Hailey. At no time did he attempt to position his body towards her.

Henry engaged in the greatest number of physical blocks (i.e., seven), with three of these being momentary blocks (i.e., turning towards Allen during their exclusive conversations) and four being sustained blocks (i.e., Henry was mostly oriented towards Allen and the whiteboard with his back and side profile towards Hailey). Although he engaged in the greatest number of physical blocks, the sum of the duration of each of Henry’s blocks was still less than the duration of Allen’s sustained block.

Jacob engaged in four physical blocks with three of these being momentary (i.e., each time he leaned to write on the whiteboard) and one sustained postural block that endured about one minute. As will be discussed in the section on Hailey’s reflexive positioning, it was this sustained block that appeared to prompt Hailey’s move to the new spatial location in the group.

There was one instance in which Henry leaned to point to something on the whiteboard and momentarily blocked Jacob from accessing the interactional space and shared worksheet, but this was brief (i.e., 4 seconds in length). Otherwise, all of the blocks that occurred served to restrict Hailey’s access to the activity. Thus, given that the non-White girl of the group was the only person to be blocked, a gendered and/or racialized pattern in physical blocks was observed.
(c) Verbal interactive positioning. Six clusters of exclusive talk were coded during the video. The boys tended to orient to one another, suggesting that they were speaking directly to each other (and not including Hailey). For example, Henry and Allen engaged in a lengthy back-and-forth exchange and throughout, their bodies were oriented to one another and opened slightly to face the whiteboard from time-to-time. Further evidence of exclusive talk occurred when Allen instructed Jacob what to write on the whiteboard and also when Jacob asked Allen to re-read the word problem aloud. Once again, a gendered and/or racialized pattern of interactive positioning was observed here given that all instances of exclusive talk occurred between the White boys.

(ii) Hailey’s Reflexive Positioning

(a) Non-verbal reflexive positioning. Hailey made a number of physical moves in what appeared to be attempts to overcome the boys’ blocks and increase her access to the interactional space and shared resources. She made a few subtle moves (i.e., straining her neck and tilting her head towards the shared learning resources) and following these, she made one gross motor move (i.e., moving to a new spatial location in the group). The temporal analysis of these moves demonstrated that they occurred during or immediately following the onset of a physical block (see Figure 11, below.)
Figure 11. Studiocode timeline

Studiocode timeline depicting the temporal relationship between Hailey’s physical moves (both fine and gross) as well as the boys’ physical blocks (both sustained and momentary). (The other codes used in the analysis of positioning have been removed from the above timeline to make clear the relationship between the physical positioning codes).

For example, Figure 11 illustrates how Hailey’s gross motor move occurred moments after the onset of Henry’s sustained physical block, which occurred at the same time as Jacob’s sustained block and Allen’s segment-long sustained block. Drawing from CA and the principles of an adjacency pair analysis (Schegloff, 2007), the timing of Hailey’s moves can be interpreted as bids to overcome these blocks and gain access to the activity. For instance, as Figure 11 demonstrates, at approximately 15:31 in the video, about four seconds after Henry joined Jacob and Allen in a sustained block, Hailey moved to a new spatial location in the group.

I now shift back to the interactive positioning perspective for a moment. All four physical moves made by Hailey appeared to be ignored by the boys. That is, the boys did not appear to readjust their bodies to accommodate her into the space nor did they verbally acknowledge her physical bids.

(b) Verbal reflexive positioning. During this segment of video, Hailey did not make any verbal utterances. In fact, throughout the entire session of group work, Hailey said very little. This finding is significant as it demonstrates how the various forms of interactive positioning
not only restricted her access to the interactional space and learning artifacts, but they also appeared to indirectly restrict her access to the conversational floor.

Summary of Positioning and Use of Stereotype Threat Theory and Microaggression Theory as Interpretive Lenses

From the beginning, this group work context was vulnerable to stereotype threat. To add to this underlying vulnerability, the boys positioned Hailey as a marginal member of the group through their exclusive talk, their physical blocks, and their exclusive use of the shared learning resources. Each of these marginalizing acts of positioning were conducted by the boys and suggested a gendered and/or racialized pattern of positioning. Given the empirical work documenting gendered microaggressions, it is reasonable to suggest that each of these acts of positioning could have been experienced as such. This speculation is further supported by stereotype threat theory and the notorious gender achievement stereotype in mathematics. However, given the intersectional nature of identity, we cannot remove race (and a great many other aspects of social identity) from the discussion. Identities are in constant flux and although under these particular circumstances gender may have been particularly salient for Hailey, various aspects of her social identity may have been threatened during this interaction. These social identity threats operate in concert. Here, for example, Hailey may also have been contending with pressure to live up to the stereotype that ‘Asians are good at math’ (Cheryan & Bodenhausen, 2000). However, this is further complicated by the fact that she self-identifies as biracial, White-Asian.

Although Hailey refrained from verbally positioning herself during this segment of interaction, she made a number of physical bids to be included in the work. As will be elaborated on in the Further Discussion Chapter, Hailey’s silence is a documented coping response to stereotype threat (e.g., Davies et al., 2005) and marginalization in classroom
contexts (e.g., Ha & Li, 2014) and her physical bids can be interpreted as a form of resistance to marginalization (Esmonde & Dookie, under review).

The connections to stereotype threat theory and microaggression theory above remain speculative and the question remains as to whether Hailey experienced the acts of positioning as such and whether the physical blocks, exclusive conversation, and exclusive use of the learning artifacts were a salient part of the experience for Hailey. I now turn to the interview data to investigate whether and how Hailey identified, interpreted, and explained these acts of positioning.

What did Hailey Have to Say?: Juxtaposing the Analyses of Video and Interview Data

(i) Identifying Acts of Positioning

After viewing the video segment that was analyzed above and described in Vignette 1, Hailey was asked to share her thoughts, feelings, and reactions to the footage. She began by explaining that she did not enjoy the group work because the people in her group were “taking charge”. She went on to describe how she was physically blocked and had difficulty seeing the worksheet and the whiteboard:

They didn’t- I couldn’t really see the question, so I didn’t really know what was happening and then I was trying to look at the board and then [Jacob] decides to like stand right there in front of me. So I'm like, “oh, ok!”

A few moments later, she went on to say:

Well also like, [Jacob] is like blocking my view so I can’t really see what’s going on. And
they’re just like...and those- [Allen] and [Henry] or- those people, they like-they like taking charge and that’s what they’re doing! …And also like, I didn’t know what the question was cause I couldn’t see it cause they’re holding it [the worksheet] like that, so I didn’t- couldn’t really contribute anything.

Similar to the researcher’s microanalysis, Hailey’s narrative illustrates the impact of physical marginalization. Here and throughout the stimulated recall interview, she repeated the fact that she was being physically blocked by Jacob. In contrast, the researcher focused on the physical blocks of all three boys, but particularly those of Henry, while Hailey solely focused on the blocking moves of Jacob.

To further build on the findings of the video microanalysis, Hailey attributed her inability to access the worksheet as a result of the way in which Allen was holding the paper and angling it towards himself:

Hailey: Just like- I don’t really know what’s going on cause I haven’t heard the question.

Researcher: Yeah. Cause you didn’t hear the question being read?

Hailey: Yeah and like, he’s [pointing to Allen on the computer screen] hoarding the question.

As a result of this limited access to the shared learning resources, Hailey indicated that she “couldn’t really contribute anything”. She went on to explain her movement to the new spatial location in the group as “an attempt to see the board” as a result of being blocked by Jacob.

Consistent with the video microanalysis, Hailey indicated that although the move allowed her to see the board better, “that was about it” and it did not increase her participation in the group activity.
In addition to discussing the physical aspect of the marginalization, Hailey acknowledged the way Allen and Henry dominated the discussion and essentially took charge of the group work. She also noted that Jacob did the writing for the group and served as the “scribe” for Allen and Henry. Taken together, Hailey’s narrative points to the subtle ways in which marginalization occurred through verbal and nonverbal means and provides further nuance into the experience of this marginalization.

(ii) Interpreting and Explaining Acts of Positioning

At the end of the stimulated recall interview, when Hailey was asked to describe her general feelings about the session of group work, she said:

Well, I did not particularly enjoy it, but I think for people like [Allen] and [Henry]- like people who really dominate- that was helpful for them cause they could like bounce ideas off each other. But personally, I did not really benefit from that cause I couldn’t see the questions
and then I didn’t really know what was going on and then…yeah.

Based on Hailey’s appraisal, the physical marginalization seemed to be a salient aspect of the overall group work experience. When asked how this group work experience could have been improved, Hailey suggested having the group “work in a circle instead of a line” so that all members could see the worksheet and the whiteboard. Hailey also advocated having students select their own group members:

I know like you’re not supposed to work with your friends, but I actually would prefer
working with my friends cause then they would actually let me see the question and then I could actually find out what’s going on.

Taken together, the importance of the physical dimension of the collaborative activity was emphasized throughout Hailey’s narrative description of the experience.

Although Hailey identified various forms of marginalization and provided insight into how it made her feel, she did not offer as many clear explanations to account for these actions. During the stimulated recall interview, she did, however, use the dispositional characteristics of her group members to account for their actions. For example, with respect to Allen “hoarding” the worksheet she stated that, “he loves his paper” and described him as being “controlling with math”. She also indicated that Allen and Henry were, “people who really dominate” and “enjoy taking charge” and so they tended to do so during the activity. Her characterization of the boys is consistent with the gender achievement stereotype in mathematics.

The previous sections of analysis pointed to Hailey’s vulnerability to stereotype threat, highlighted the gendered and/or racialized patterns of positioning, and suggested that these acts may have been experienced as microaggressions. During the final interview, when asked about whether race and/or gender and/or any other aspect of social identity had an impact on the group work dynamic, Hailey stated:

I don’t think race comes into play. Especially not at [my school] cause [my school] is a very nice and diverse school. But maybe gender a little bit.

Hailey’s immediate dismissal of race coming into play is interesting given her previous narrative on the salience of racial stereotypes in mathematics (i.e., the ‘Asian students’ and the ‘Jewish students’). As previously speculated, it is reasonable to suggest that Hailey may have
felt some pressure to live up to the achievement stereotype that ‘Asian students’ and the more locally constructed stereotype that ‘Jewish students’ at her school are strong in mathematics, especially given that she was working with a group of White boys. However, there are a host of explanations to account for why Hailey may have refrained from discussing race (and this will be addressed in the Further Discussion chapter). One evident explanation includes the school culture as being “nice and diverse” devoid of such issues.

Hailey did, however, tentatively acknowledge the influence of gender. Using the language of stereotype threat theory and thinking about the pattern of positioning observed, it is possible that this aspect of her social identity was particularly threatened. The stereotype threat corpus suggests the differential impact of self-relevant stereotypes depending on which aspects of identity are salient in a given situation (Shih et al., 1999). That is, Shih and colleagues found that when Asian women were given a mathematics test to write under controlled laboratory conditions, they performed better on the test when their racial identity was salient than when their gender identity was made salient. Given the above excerpt, Hailey’s negative experience with the group of dominant boys, and the fluid nature of identity, perhaps her gender identity was particularly salient during this session of group work. This further supports the speculation that the observed marginalizing acts of positioning were experienced as gendered microaggressions.

Throughout the interviews, Hailey emphasized the influence of friendships in group work interactions and argued that it was the most important factor that shaped the group dynamic. Given the data presented here as well as a large body of other research investigating social identity and friendship (e.g., Shrum et al., 1988; Clark & Ayers, 1992), we know that friendships are gendered, racialized, classed, and so forth. Rather than being explicit, here Hailey adopted a more implicit discourse about the role of social identity in group work. This
finding was common across the cases and will be elaborated on in the Further Discussion chapter.
CHAPTER 5: THE CASE OF ABIDA

Part I: Meet Abida

Personal Information and School Context

Abida self-identified as a Nigerian girl. She was born in Nigeria, was 16 years old, and at the time of the study had been in Canada for just over a year. Although English was not her first language, Abida had studied and practiced it in Nigeria and was quite proficient. Her family lived in Nigeria and she described them as being of medium level SES.

Abida was enrolled in a 12th grade Advanced Functions mathematics class at the time of the study. The class consisted of 17 students, eight girls and nine boys. The school was an international private preparatory school composed mainly of students from China and Nigeria. A comparably small proportion of students came from Vietnam, Japan, and various parts of South America. Within Abida’s mathematics class, of the eight girls, four were Nigerian, three were Chinese, and one was Argentinian. Of the boys, five were Nigerian and the remaining four were Chinese. All students were born and raised outside of Canada with English being their second language.

The school was situated in a large Canadian city and included grades 10-12. It presented itself (within the school website) as a ‘transition’ school designed to prepare international students for Canadian and American post-secondary education. The school included boarding facilities and the majority of students, including Abida, resided on the school campus. Tuition was $13,500 per year plus an additional $1000 per month for room and board. The admission procedure included a written application, demonstration of English language proficiency, as well as an academic transcript.

Given the school’s emphasis on preparing students for post-secondary school, academic achievement and a high work load were hallmarks of the school culture. My interviews with the
classroom teacher and Abida, as well as student surveys revealed the strong academic rigor of the school as well as the explicit goal of academic excellence. Abida and the classroom teacher described the pressure that many students experienced to succeed at the school. This pressure came from the students’ overseas families, the school culture, as well as friends:

Sometimes it’s kind of like overwhelming. It’s…like, there’s just this pressure on you like to do well cause you want to get good grades to get into university. Like, you don’t, you don’t want to leave your- you don’t want your friends to leave you behind…

Abida’s Mathematics Identity

Abida characterized herself as a “terrible” mathematics student relative to her classmates and stated on multiple occasions that she did not like the subject. Instead, she said that she favoured classes in political sciences. Abida described herself as “lazy” when it came to completing her work in mathematics. When asked to share her perception of how others viewed her in mathematics, she indicated that she felt that they viewed her as a “horrible” and “lazy” student.

Although she strongly disliked the subject, Abida indicated on her survey that mathematics is one of the most important subjects in school. She indicated valuing her performance in the domain and recognized its importance in the real world.

Abida described feeling pressure from her parents to pursue mathematics and study economics. She explained that she did not like economics because of the heavy reliance on mathematics, but she felt she had to continue studying it in her post-secondary education to appease her parents. For Abida, mathematics was something that she had to do. She also talked
about feeling pressure to keep up with her friends and not wanting to be “left behind” by friends who would go on to post-secondary school.

When asked to state any achievement stereotypes in mathematics that she knew about, Abida immediately identified the ‘Asian’ stereotype, stating, “Yeah that Asians are smarter like, the smartest race. Cause they’re really good at calculations. Actually they are- but still.” Using the lens of stereotype threat theory, the salience of the ‘Asian’ stereotype is notable in this particular case because Abida was in a group with two Asian girls. It is also interesting to note that Abida did not mention any negative stereotypes about Black student intellectual ability. She did, however, acknowledge the gender stereotype and explained its prominence in Nigeria and her uncertainty about its salience in Canada: “In Nigeria, like, they usually believe like boys are like better at calculations than girls… I don’t know about here? It’s obviously not as strong as in Nigeria?”

*Abida’s Group Work Figured World*

Abida’s figured world of group work was unique from the other cases in that she primarily described it as a learning context that helped to lighten the work load. She explained that working in groups helps to alleviate some of the pressure she feels in mathematics class because her group members can help carry the work load and “we’re always going to get the same score”. In other words, group work was somewhat of an escape from the competitive nature of mathematics class because all group members were assigned the same evaluation for the work.

Based on Abida’s comments, there are multiple interpretations that we can make in regards to her mathematical figured world of group work. On the one hand, for Abida, group work ‘lightens the load’ and distributes the work across group members. When she talked about
how all the group members “get the same score”, this could suggest that she typically scores better when she works in groups versus when she works on her own or, it could also mean that she does not like it when people have to compete for marks. Regardless of the interpretation, Abida’s figured world of group work aligned with the school’s focus on achievement.

Despite the merits of group work, Abida explained that she typically did not enjoy it and that the experience was strongly shaped by who she was working with. She emphasized the importance of working with people she felt “comfortable” with and indicated that group work goes well when students are allowed to select their own group members. Abida also explained the importance of understanding the material so that contributions to the group work can be made. She indicated that when she couldn’t manage the material, she does not like working in groups. Here, Abida seemed to be implying that one must understand the mathematical material beforehand to be able to contribute to the group work. Perhaps then, when Abida talked about how group work ‘lightens the load’, she meant that, assuming group members already understand the material, the task can be split across members. This runs counter to the other possible interpretation that by sharing the load, Abida meant that groups work collaboratively to build a shared understanding of the mathematical concepts.

*Summary of background information and connections with Stereotype Threat Theory*

Like Hailey, although Abida had negative feelings towards the mathematics domain, she recognized its real-world importance and valued her performance in the domain. She described a tremendous amount of pressure to succeed in her mathematics class. This was evidenced through her talk about the school’s culture of academic excellence and rigorous work load as well as the pressure she described feeling from her parents to pursue a mathematics-related career.
Using stereotype threat theory as an interpretive lens, the factors described above represent the conditions necessary to trigger stereotype threat (i.e., pressure to succeed, valuing the domain, and valuing one’s performance in the domain). Further to this, Abida self-identified as a Black girl and was therefore part of two social groups that are negatively stereotyped in the mathematics domain. As such, Abida was particularly vulnerable to social identity threats (Branscombe et al., 1999; Steele, 1997). Although she did not talk about Black student achievement stereotypes, Abida described the salience of the ‘Asian’ and ‘gender’ mathematics achievement stereotypes and in the case of group work I will be presenting in the next section, Abida was working with two Asian girls. Abida stressed the importance of being “comfortable” with group members and feeling confident with the mathematical material. Working with two students who are not members of her racial in-group and who were stereotypically positioned as strong in mathematics compounded by underlying pressure for high achievement, Abida may have been vulnerable to stereotype threat during her session of group work. With this in mind, I turn to the microanalysis of the session of group work and using stereotype threat theory and microaggression theory as interpretive lenses, take a closer look at the microdynamics of positioning.

**Part II. Microanalysis of a case of group work**

**Meso-Level Information: Setting the Stage**

(i) **The Group**

In this session of group work, Abida worked with two students, Mabel and Veronica, who self-identified as Asian (Chinese) girls. Abida indicated that Mabel and Veronica were “really, really close” friends but that they were not friends with her. She explained that she did not really know or talk to the girls at all. Abida described Mabel as being the group leader and
having a tendency to “take over”. She also noted that Mabel and Veronica had a tendency to “work alone” and leave her out.

(ii) The Mathematics Task

The task was part of a unit in Advanced Functions. The girls were given a set of 100 coins and told to toss them, remove the coins that turned up heads, and record in a table of values the number of coins remaining. They were to repeat the process until there were no coins left. Following this, they were required to construct a scatterplot of the data and determine an equation of best fit. The details regarding the assignment are depicted in Figure 12. The group was assigned by the classroom teacher and they were encouraged to work together. (In fact, the teacher warned students that they would be penalized in their evaluations if they did not work together). The microanalysis below is based on a segment of the interaction taken from when the girls were doing the coin tossing and then beginning to construct the scatterplot.
Part II. Microanalysis of a Segment of Group Work

Below is a vignette description of a 2-minute and 10-second segment of Abida’s group work interaction. The clip was selected because it appeared to contain observable forms of marginalization.
Vignette 2. “Every Task, They’re Doing it Alone”

The girls were seated in a triangular formation with the coins directly in front of Mabel, in reach of Abida. After tossing a handful of coins, Mabel instructed Abida to count the number of ‘heads’ that were turned up. Following this, Mabel and Veronica repeated the process of tossing, sorting, and counting the coins. Mabel and Veronica appeared to be working together and occasionally engaging in off-task chatter. Meanwhile, Abida remained silent and leaned in to watch (see Figure 13, below).

Figure 13. Mabel and Veronica working together to toss, sort, and count the coins while Abida watched intently.

After each round of tossing, sorting, and counting, Mabel recorded the number of ‘heads’ rolled on the group’s shared response sheet that was angled towards herself and Veronica.

After three rounds of tossing, sorting, and counting coins, Veronica took the lead in being the tosser and counter, while Mabel recorded the data and Abida leaned her head in her hand and watched the coins and her group members silently. After the final coin was tossed and the data recorded, Mabel turned to Veronica and said they were ready to move on and began
reading the next segment of the activity aloud. At this point, Abida picked up her own worksheet and appeared to read and follow along (see Figure 14, below).

Figure 14. Mabel reading the next portion of the task aloud and Abida following along.

A few moments, later, Mabel leaned in towards the shared response sheet and began constructing the scatterplot of the data. Veronica and Abida angled their bodies towards Mabel and the response sheet and watched Mabel as she wrote. A couple of times, Mabel looked up towards Veronica and smiled (see Figure 15, image on the left), but otherwise maintained her gaze on the response sheet, counted points on the graph paper aloud, and drew the graph (see Figure 15, image on the right).

Figure 15. The image on the left depicts a playful interaction between Veronica and Mabel while the image on the right illustrates Mabel working independently and the other girls watching on.
(i) Interactive Positioning

(a) Use of and access to shared learning artifacts. Mabel maintained primary access to the shared response sheet during this segment of the group work and was the only person to write on it. With the exception of a few brief interactions with Veronica, Mabel worked independently while she constructed the graph and recorded the data on the shared response sheet. Throughout this time, Abida had virtually no access to the shared response sheet. That is, the sheet was always directly in front of Mabel and at times, slightly oriented towards Veronica.

With respect to the shared set of coins, Abida had moderate access during the first portion of the video segment when she was instructed by Mabel to count the number of 'heads' turned up and then more limited access when Mabel and Veronica were working exclusively.

In sum, Abida’s access to the shared resources was constrained. There was a racialized pattern of access in that both Mabel and Veronica, the two Asian girls of the group, maintained moderate to high access throughout the video segment while Abida, the one Black girl in the group, generally had low access.

(b) Physical interactive positioning. Although Mabel angled her body toward Veronica from time to time and leaned over the shared response sheet while writing, no physical blocks were coded during this segment of interaction. This finding suggests that the triangular configuration of the group seemed to prevent physical exclusion and blocking of group members.

(c) Verbal interactive positioning. One instance of exclusive talk was coded between Mabel and Abida. This occurred when Mabel instructed Abida to count the number of ‘heads’ that turned up following the first coin toss. Following this, four instances of ‘exclusive talk’ between Mabel and Veronica were coded. The first two were brief, consisted of only a couple of utterances, and were evidenced by Mabel’s bodily orientation and eye gaze towards Veronica. The third instance occurred when they were tossing, sorting, and counting the coins and
speaking softly to one another. Their talk was inaudible and this was further evidence of exclusivity (i.e., they were speaking so softly that it seemed to be intended only for one another to hear). Throughout this exchange, Abida watched on. The last instance occurred when Mabel had begun to construct the scatterplot and turned to Veronica to celebrate an accomplishment she had made on the task. The softness of her voice and orientation of her head and eye gaze suggested that these comments were intended for Veronica. A racialized pattern of exclusive talk was observed here in that four out of the five instances involved Mabel and Veronica.

(ii) Abida’s Reflexive Positioning

(a) Non-verbal reflexive positioning. As Mabel and Veronica tossed, sorted, and counted the coins, Abida oriented her body towards Mabel and leaned in several times to better see what was going on. She also leaned in towards the shared response sheet and Mabel when Mabel was constructing the scatterplot.

During the first portion of the video segment, Abida made a few facial expressions demonstrating her engagement in the task. For example, after Veronica said, “seriously?!...bad luck! ” to communicate her surprise with the outcome of the coin toss, Abida smiled. Following the more extended instance of exclusive talk between Mabel and Veronica, Abida frowned and furrowed her brow suggesting that she was confused. Abida’s subtle leans and facial expressions appeared to go unnoticed by her group members.

Although it was not depicted in the segments of video selected for the microanalysis, towards the end of the session of group work, Abida resorted to working on her own. This non-verbal act of reflexive positioning can be seen as form of resistance to marginalization and was a common finding across the cases. I will elaborate on this finding in the Further Discussion section.
(b) Verbal reflexive positioning. With the exception of saying, “twenty” to indicate the number of ‘heads’ she counted after being instructed by Mabel, Abida made no utterances during this segment of interaction. Like Hailey, Abida actually said very little throughout the entire session of group work. This finding is significant as it demonstrates how the various forms of interactive positioning not only restricted her access to the learning resources, but they also appeared to indirectly restrict her access to the conversational floor.

Summary of Positioning and use of Stereotype Threat Theory and Microaggression Theory as Interpretive Lenses

Abida was marginalized in this session of group work through the exclusive use of artifacts and manner of talk that Mabel and Veronica engaged in. The microanalysis of video revealed racialized patterns in this interactive positioning and, as such, the acts of positioning may have been experienced as racial microaggressions that elicited stereotype threat. Aronson and his colleagues (1999) demonstrated that White men underperformed on a mathematics task when the Asian achievement stereotype was made salient. Applying these principles to the given case of group work, in addition to possibly contending with self-relevant stereotypes about Black student inferiority, Abida may have experienced stereotype threat as a result of the fact that she was working with two Asian girls. This speculation is further supported by Abida’s discourse on the Asian achievement stereotype.

Like Hailey, Abida made almost no verbal acts of reflexive positioning. As will be elaborated in the Further Discussion, this silence can be seen as a form of resistance and response to marginalization. Further to this, her subtle facial expressions and body movements can be viewed as other forms of Abida’s persistence and resistance.

The preceding discussion and connections to stereotype threat theory and microaggression theory remain speculative. I now turn to the interview data to further
investigate these issues and consider whether and how Abida identified, interpreted, and explained these acts of positioning.

What did Abida Have to Say?: Juxtaposing the Analyses of Video and Interview Data

(i) Identifying Acts of Positioning

After viewing the segment of video analyzed above, Abida began by explaining how she felt “left out” of the group work. She indicated that, “They kept leaving me out of the group work.” When asked to elaborate, Abida explained that Mabel was “doing it all” and then went on to include Veronica, stating that, “every task, they’re [Mabel and Veronica] doing it alone.”

Unlike the researcher’s microanalysis, which highlighted Abida’s limited access to the shared learning artifacts, Abida did not talk about access except to say that she could only see the shared response sheet “a bit.” She downplayed the significance of this, however, because she said she knew what was being written (i.e., the scatterplot). It appeared that Abida valued having a general sense of what was going on and was not too concerned by whether or not she could clearly see or access the shared response sheet. Similarly, although the researcher’s microanalysis revealed her limited access to the shared coins for a large segment of the interaction, Abida did not mention this in her interview. It could be that Abida recognized that the coin tossing was peripheral to the actual mathematical task that was to come.

Like the researcher’s microanalysis, Abida identified and described the exclusive nature of Mabel and Veronica’s interactions:

If she [pointing to Mabel] wanted to solve something… like when she couldn’t solve it, she would give it to her [pointing to Veronica] instead of me.
Consistent with the researcher’s microanalysis, Mabel’s orientation and talk directed towards Veronica were salient parts of the experience for Abida.

(ii) Interpreting and Explaining Acts of Positioning

When asked about her global impression of the group work experience, Abida indicated that she would not want to work with Mabel and Veronica again. She explained that although there were times when the group seemed to be “lost together”, for the most part she did not feel like a member of the group. To improve future group work experiences, Abida advocated that the teacher allow the students to form their own groups.

Similar to the case of Hailey, Abida used Mabel and Veronica’s friendship with one another to explain and interpret the exclusive nature of their talk:

I was just like [shakes her head to show frustration]…cause they kept talking, yeah? And then I was like [shakes her head again to show frustration]… Cause they’re friends. Like they’re really, really close and I’m just like ‘wow’ [italics added]!

As was mentioned earlier, Abida did not consider herself to be friends with Mabel and Veronica but described them as being very close with one another. She went on to describe the racialized pattern of friendships at the school and used this to account for the friendship dynamic in the observed group work:

Abida: I think, umm…OK, Nigerians hang out with everybody. Like, like…like it’s Nigerians, Asians… like we don’t really mix.

Researcher: They don’t mix really?
Abida: Not really. We’re like... Like, everybody is nice. Like everybody will talk with everybody, yeah? But then, like, it’s just like Nigerians, Asians [makes hand gesture to signify one group as being separate from the other]. It’s there but it’s not there.

Race was an integral component of Abida’s final interview. It was here that she shared her knowledge and endorsement of the stereotype that Asians are strong in mathematics, stating her belief that Asian are “the smartest” race because they are “good at calculations.” When I asked whether this impacted her experience working with Mabel and Veronica, Abida explained, “Yeah. When I was...Cause I had two Asian people in my group, yeah? I...Everybody was like, you can leave the work to them, they are smart they will figure it out. Yeah.” Abida did not talk about the negative achievement stereotypes about Black students, but alluded to the fact that she and others in the class (“everybody”) made the assumption that the Asian students were more capable in mathematics. She went on to describe feeling some pressure to perform well when working with Mabel and Veronica and wanting to show them that she “could actually do it.” Towards the end of the session of group work, Abida actually took out her textbook and appeared to be trying to solve the problem on her own. She explained in the final interview that this was an attempt to “see if I could actually do it.”

Race and associated achievement stereotypes were a salient part of Abida’s narrative. Unlike previous empirical work on racial microaggressions, Abida did not explicitly use race to account for the interactive positioning observed. She did, however, indirectly incorporate race into her narrative by talking about friendship. That is, she likened the tendency of Mabel and Veronica to work exclusively to the fact that they were friends and then went on to describe the racialized friendship patterns that characterized the school. The salience of race and associated mathematics achievement stereotypes in addition to the pressure to perform well and prove to her group members that she “could actually do” the work further suggests Abida’s vulnerability
to stereotype threat in the group work context. Although race appeared to be a salient aspect of social identity in Abida’s narrative, this does not dismiss the cumulative impact of the other intersecting components of her identity, such as her social class, gender, first language, and so forth.
CHAPTER 6. THE CASE OF JACKIE

Part I: Meet Jackie

Personal information and school context

Jackie was 16 years old, self-identified as a medium level SES Asian (Chinese) girl, and was enrolled in a 10th grade advanced Mathematics Studies class at the time of the study. The class was racially diverse and consisted of 14 students, six girls and eight boys (see Table 6, below).

Table 6. Students self-identification in Jackie’s mathematics class

<table>
<thead>
<tr>
<th></th>
<th>White</th>
<th>East Asian</th>
<th>Lebanese/White</th>
<th>Brown</th>
<th>Iranian</th>
<th>Multi-racial (White/African American)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Boys</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

With respect to the physical set-up of the classroom, the desks were arranged in two long rows, with the girls all sitting in the front row and the boys all seated in the back row. The students self-selected this seating arrangement.

Jackie attended the same school as Hailey. Situated in the heart of a large Canadian city, the school consisted of 300 students ranging from grade 6 to 12, was accredited to offer the IB program, and was considered prestigious. The annual rate of tuition was $27,800 and the admission process was relatively competitive.

Jackie described the school as academically rigorous. She specifically talked about the mathematics classes at her school and how they were far more challenging than the classes her friends from other schools were enrolled in. Like Hailey, Jackie described the school culture as
being competitive with high pressure for academic success. At the same time, however, she said it was a relatively “friendly” place.

Jackie characterized herself as a shy person. She talked about how she joined the school “late” in grade 7 and by this time, most of the social groups and friendships were tightly formed. She explained feeling like an outcast and having a tough time fitting into any one social group at the school. Jackie shared that her friendships were primarily with students in younger grades because she tended not to “open up to classmates that much”. She explained that this tendency to be shy cut across both social and academic spaces and she was often encouraged by teachers to “speak up” more. Although Jackie did not elaborate on the composition of the social groups, the gendered nature of friendships was evidenced by the seating pattern described above.

Jackie’s Mathematics Identity

Jackie described herself as being “behind” her classmates in mathematics and as a result, she indicated that it’s harder for her to learn the material. She attributed her weakness in mathematics to two main external factors. Firstly, she explained that she joined the school later on in her life and was not as academically privileged as her classmates. Secondly, she talked about having “bad math teachers” in her past:

I’ve had some bad teachers in the past or some of them just weren’t good at explaining. They knew what they were doing they just weren’t good at explaining. Others just didn’t know what they were doing at all. And so, because of that, I’m a bit behind

When asked how others might describe her as a mathematics student, Jackie indicated that others would say that she is disorganized and needs to “speak out more”. She elaborated that
she did not enjoy speaking out because she worried about “getting the wrong answer” and what others would think about her. She described how “it’s awkward speaking out in front of the class when you’re falling behind”. She also explained the social impact of doing poorly in mathematics:

If you don’t do well in one test in math then you’re automatically not good at math at all-which isn’t really the case. It’s just really annoying. It’s quite frustrating actually because if you’re falling behind just a tiny bit, people will notice this and that could be really, really disastrous- especially socially wise. Which is a big problem.

Taken together, Jackie put a great deal of emphasis on the high stakes of her performance in mathematics class and this included both on tests and in classroom interactions.

Because of her experiences with “bad math teachers” and being behind, Jackie described her negative feelings towards the subject. She shared her preference for the visual arts and sciences and hoped to go into visual arts in her future. For Jackie, mathematics was a subject that she had to take to keep doors open in her future and she described a great deal of pressure to do well in it. Like the other focal students, Jackie did not like mathematics but recognized its value in the real world. She viewed it as one of the most important subjects in school and valued her performance in it.

When asked to describe her knowledge of achievement stereotypes in mathematics, like the other focal students, Jackie immediately identified the stereotype that “Asians are good at math” and explained how she considered herself to be an exception to this stereotype: “One obvious [stereotype] that a lot of people know about is that all Asians are good at math. Clearly, I’m not very good at math but that’s because of falling behind and stuff.” Here, she again drew on external factors to account for her mathematical performance. Jackie also identified the
gender achievement stereotype, but dismissed it: “I mean some people might say that males are better at math than girls just cause they’re smarter, but that’s not really something I see.”

*Jackie’s Group Work Figured World*

Like the other focal students, Jackie described group work as being heavily shaped by social dynamics of the group. She explained that it went well when she had the opportunity to work with friends or at least, people she had a positive social history with. When asked to elaborate on the challenges of working in groups, Jackie talked at length about the tight social groups at the school and how she did not see herself fitting into any of these groups. She described feeling uncomfortable working with the most of the people in her class. Jackie went on to explain that group work is “really hard” because different groups of people “don’t work the same way or they do things differently and it gets quite frustrating.”

According to Jackie, in group work, certain people have greater influence and clout than others. She described instances in which her voice was not heard and described her frustration with working in groups wherein people ignored her contributions. She shared past experiences wherein she shared an idea and her group members ignored her and sought the contributions of other classmates.

Overall, Jackie indicated that she would prefer to work on her own as a result of the people that she’s had to work with in the past. She also indicated that in group work, students have a tendency to work on their own even when they are told to collaborate.

*Summary of Background Information and Connections with stereotype threat theory*

Jackie emphasized the high pressure for achievement in mathematics. Not only did this pressure arise from the underlying elite school culture, but she also described feeling pressure
during everyday interactions in mathematics class and stressed the social repercussions of doing poorly. She described a perpetual feeling that she was “behind” in mathematics relative to her peers. This pressure coupled with her value for the domain and overall performance served as sufficient factors to set the stage for stereotype threat.

Given Jackie’s figured world of group work and its inherent power dynamics, this appeared to be a context particularly vulnerable to stereotype threat for her. She emphasized feeling detached from the “tight social groups” in the school, feeling uncomfortable working with most of the people in her class, and described how these social dynamics served as a challenge for her during group work.

When asked about achievement stereotypes in mathematics, Jackie identified both the Asian and gender stereotype and described how they were well known. Although she dismissed the gender stereotype as being true, she seemed to perceive some truth to the ‘Asian’ stereotype by stating that she was an exception to the stereotype because she was a weak mathematics student. Regardless of whether a person endorses a self-relevant stereotype, mere knowledge of it is sufficient for stereotype threat to take place (Steele, 1997; Steele & Aronson, 1995). As mentioned in the case of Hailey, empirical work investigating stereotype threat demonstrates the impact of pressure to live up to self-relevant stereotypes, particularly with respect to the stereotype that Asians are good at mathematics (Cheryan & Bodenhausen, 1999). This pressure to confirm a self-relevant stereotype has been shown to negatively impact the performance of Asian women on mathematical tasks. These findings add a layer of complexity for Jackie who identified as Asian and being a weak mathematics student. With these ideas in mind, I now turn to a case of group work wherein Jackie worked with two White boys and, using stereotype threat theory and microaggression theory as interpretive lenses, take a closer look at the microdynamics of positioning.
Part II. Microanalysis of a Case of Group Work

Meso-level information: Setting the stage

(i) The Group

Jackie worked with two White boys, Travis and Nathan. When asked about her friendship with the boys, she explained that she wouldn’t consider herself to be friends with them. Jackie characterized Travis as being “loud and obnoxious” when he worked with his other friends like Nathan. The group was randomly assigned by the classroom teacher and they were given explicit instructions and reminders to work collaboratively.

(ii) The Mathematics Task

Prior to beginning the group work task, the teacher handed back graded tests that were written the previous week. The students spent the first portion of the class reviewing their grades and annotated work. Following this, the teacher explained that they would be getting into small groups to generate questions for a “friendly competition” of “math jeopardy” that was intended to serve as a review for their upcoming final exam. Specifically, the task was to create six questions (one representing each unit of study covered in the course) and their solutions. Of the six questions, two were to be a “1/2 level of difficulty” (i.e., “simple and straight forward”), two were to be a “3/4 level of difficulty” (i.e., “in-depth with some application”), and two were to be a “5/6 level of difficulty” (i.e., “word problem”). The students were allowed to choose which topics to use for the various levels of difficulty. The teacher explicitly encouraged students to avoid the temptation to “divide and conquer” the task.

Microanalysis of a segment of group work

Below is a vignette description of two, 1-minute segments of Jackie’s group work interaction. These clips were selected because of the overt forms of marginalization observed.
Vignette 3. “It’s Just Kind of Like Me…and Then Them”

The shared handout was in front of Nathan and all three students were huddled close together to see it (see Figure 16, below). Nathan was holding a pen and was marking the level of difficulty that the questions for each unit of study should be.

![Figure 16. Travis (far left), Nathan (middle), and Jackie (far right), oriented towards the shared worksheet.](image)

Jackie leaned in and pointed to one topic and said that she thought it should be a 5/6 level of difficulty. As Nathan started to lean in to mark this contribution on the shared worksheet, Travis interjected with disagreement and suggested another topic of study they could generate a question for. To justify her preceding contribution, Jackie reminded her group members that they had to generate a question for each of the six units of study covered in the course, implying that her suggestion could be used in addition to Travis’. Rather than accept both contributions and move forward, however, Nathan turned his back to Jackie and asked another student in the class if they did in fact have to cover all six units of study. After his first classmate corroborated what Jackie had said, Nathan repeated his question to another student across the room (see Figure 17, below).
In the meantime, Jackie repeated “Yes! [The teacher] said we have to have one for each subject!” Despite her repeated responses, Nathan continued to consult with students outside of the group but eventually agreed with Jackie.

Once they had assigned a level of difficulty for the questions pertaining to each unit of study, they moved on to actually generating the questions. Nathan handed a sheet of paper to Travis and the boys proceeded to speak exclusively to one another as they generated the question. During this time, Jackie looked towards the boys and attempted to see what Travis was writing. After some time, Jackie proceeded to flip through her notes to find material for another question. Appearing to have found something, she showed Nathan a sample problem and suggested that they use it to generate a question to cover the ‘linear programming’ unit of study. In response, Nathan said that the problem that she had found was “too easy”. Jackie then retorted that it was supposed to be relatively easy because the group had decided that the ‘linear programming’ question should be a “3/4 level of difficulty.” Nathan then turned his head away and muttered that they would get to it later. Jackie then shook her head in apparent frustration and continued to flip through her notes.

Nathan and Travis proceeded to engage in exclusive talk with Nathan’s body being completely turned away from Jackie, blocking her from the interactional space (see Figure 18).
Figure 18. Nathan leaning towards Travis and blocking Jackie as he and Travis discuss the problem they are working on exclusively.

Jackie leaned in to see what was being written on a couple of occasions (see Figure 19, below) and even asked, repeatedly, what they were drawing, but she was met with very little engagement. She then frowned and shook her head (in what appeared to be frustration) and continued to leaf through her notes.

Figure 19. Jackie leaning in to see what Travis and Nathan were working on.

(i) Interactive Positioning

(a) Use of and access to shared learning artifacts. During the first portion of the activity, the group referred to a shared handout that listed the various units of study that were covered in the course. During this time, Nathan held the handout and marked the level of difficulty for the questions pertaining to each unit of study. He angled the handout so that it was directly in front of him and slightly towards Travis. Throughout this segment of interaction, Jackie had moderate access to the shared handout (i.e., moderate access in 4/4 instances). That is, she could read what was on the handout if she leaned and turned her head.
Once they had assigned levels of difficulty for the questions pertaining to each unit of study, they wrote each question and its accompanying solution on a separate sheet of paper that was shared across the group. During the second segment of interaction, Travis had the shared response sheet directly in front of him and he was doing the writing, leaving Jackie with virtually no access (i.e., no access in 10/10 instances). Her access became even more limited when Nathan leaned his body in towards Travis and blocked Jackie.

During the second segment of interaction, the shared handout was used as a point of reference so the group could track which questions they had completed. Jackie had moderate access to it for the first portion of this segment (i.e., 5/10 instances), but once Nathan turned his body towards Travis and rested his arm on his desk, he blocked Jackie’s access to the shared handout leaving her with low/no access (i.e., 5/10 instances, see Figure 18, above). Note that this physical block prevented Jackie from accessing both of the shared learning artifacts at this particular time. A racialized and/or gendered pattern of access and use of shared learning artifacts was observed in that the White boys generally had high access to the resources whereas Jackie, an Asian girl, did not.

(b) Physical interactive positioning. During the first portion of the video, there was one momentary block that took place when Nathan consulted with students outside of the group (see Figure 16, above). During the second segment of the video, when the students had started to write out a question, Jackie was blocked three times. Importantly, during 1 minute of this 1 minute and 30 second segment of video, Jackie was being blocked by Nathan. The first two blocks were ‘momentary’ and occurred when Nathan put his arm up on the desk thereby blocking Jackie from the interactional space and the shared response sheet. Following the brief engagement between Nathan and Jackie (as described in Vignette 3), Nathan engaged in a sustained block, wherein his body was completely turned towards Travis (see Figure 19, above).
Again, a racialized and/or gendered pattern of physical blocking was observed in the case of Jackie. That is, across both segments of video, Jackie, an Asian girl, was blocked by Nathan, a White boy, four times. Neither Nathan nor Travis were blocked throughout.

\textit{c) Verbal interactive positioning:} During the first segment of interaction, three instances of exclusive talk between Travis and Nathan were coded. Referring back to Vignette 3, the first example occurred when Travis implicitly disagreed with Jackie’s contribution and addressed Nathan directly before sharing his thoughts. The second and third examples occurred when Nathan consulted with classmates outside the group.

During the second segment of the video, there was a sustained example of exclusive talk between Travis and Nathan as they generated a question. This was primarily evidenced by the fact that their bodies were oriented toward one another and Nathan’s back was to Jackie.

Unlike the other cases, three instances of exclusive talk were coded involving Jackie. The first example occurred during the first portion of the activity when Jackie told Nathan what level of difficulty one of the questions ought to be (see Vignette 3). The second instance of exclusive talk occurred when Jackie showed Nathan a sample problem she had found in her binder and suggested that they use it to generate a question to cover the ‘liner programming’ unit of study (see Vignette 3). In this instance, she may have been speaking directly to Nathan because Travis was fully engaged in writing and the material she referred to was out of his view. It’s important to note that Jackie was at least partly in control of whether Travis could see what she was talking about. That is, she could have called for his attention or put the artifact she was referring to out in front of him. This is not to place blame on Jackie because as will be discussed in the next section on reflexive positioning, her ideas were generally not taken up by the group despite her efforts. The third instance of exclusive talk occurred when Jackie asked Travis what he was writing.
Although a racialized and/or gendered pattern of exclusive talk cannot be clearly identified here, it is important to contrast the nature of the exclusive talk that occurred between the boys versus between Nathan and Jackie. That is, even when Jackie and Nathan spoke directly to one another, Nathan still oriented his body towards Travis and simply turned his head in Jackie’s direction (see Figure 20). Similarly, in the other two instances of exclusive talk involving Jackie, the boys did not orient their bodies towards her when she spoke to them.

*Figure 20.* Example of exclusive talk between Jackie and Nathan (person in the middle position) demonstrating how Nathan maintained his bodily orientation towards Travis and only turned his head towards Jackie.

In contrast, in the instances of exclusive talk that occurred between the boys, they oriented their bodies towards one another and away from Jackie (e.g., Figure 18, above).

(ii) Jackie’s Reflexive Positioning

(a) Non-verbal reflexive positioning: Throughout this session of group work, Jackie did not make any gross motor movements, but she did engage in four fine motor moves to better access the interactional space and shared learning artifacts. During the first segment of interaction, Jackie maintained a sustained lean-in position when the shared handout was in front of Nathan, slightly angled towards Travis. Towards the end of this segment of the video, when
Nathan leaned his body in to consult with someone outside of the group, Jackie too leaned her body inward (to better access the interactional space).

During the second segment of interaction, Jackie made two noticeable physical movements to better access the interactional space and shared response sheet. The first was quite subtle and occurred a few moments after Nathan assumed a sustained block position with his back completely to her. Jackie’s second noticeable body strain occurred immediately after the exchange of exclusive talk between the boys and corresponded with her intellectual contribution of asking Travis what he was doing. After this physical bid was ignored and her intellectual contribution only minimally engaged, she made a visible expression of frustration. Jackie made another non-verbal communication of her frustration after Nathan minimized her contribution regarding the material for the ‘linear programming’ question. That is, she rolled her eyes, shook her head, and waved her hand. Neither Travis nor Nathan appeared to notice or respond to any of these forms of non-verbal reflexive positioning.

As with the case of Hailey, Jackie’s non-verbal forms of reflexive positioning appeared to correspond with Nathan’s physical blocks and/or the exclusive talk between Nathan and Travis. Her frustrated facial expressions and leans appeared to occur at the same time or immediately following the marginalizing acts of interactive positioning (see Figure 21, below). For example, one her most obvious leans occurred during a sustained block by Nathan and immediately following an extended instance of exclusive talk between the boys.

Figure 21. Studioocode timeline illustrating the temporal relationship between the marginalizing acts of interactive positioning (i.e., exclusive talk and physical blocks) and Jackie’s
corresponding leans and physical expressions of frustration. (Note that the other codes have been removed from the Studiocode timeline to clearly demonstrate the temporal relationship between the various physical acts of positioning.)

Like Abida, after being faced with ongoing marginalizing acts of positioning, Jackie resorted to working independently. This non-verbal act of reflexive positioning can be seen as form of resistance to marginalization.

(b) verbal reflexive positioning: During the first segment of interaction, Jackie made four intellectual contributions. The first was her suggestion that they make the Venn diagram problem a “5/6 level of difficulty”. As described in the vignette, Trevor responded to this with disagreement and suggested they focus on a different set of units of study. Jackie’s subsequent contribution was reminding the boys about the guidelines of their task and thereby justifying her previous contribution. In response, Nathan demonstrated his skepticism by clarifying the guidelines of the assignment with classmates outside of the group. Jackie’s third and fourth contributions during this segment of interaction were to repeat the guidelines. Nathan ignored the first two attempts and then eventually accepted her contribution. Taken together, out of the four contributions she made, Jackie was implicitly disagreed with and challenged three times and eventually her idea was accepted with minimal engagement.

During the second segment of interaction, Jackie again made four intellectual contributions. The first was her suggestion related to the question they were to generate for the topic of ‘linear programming’. As described in Vignette 3, this contribution was first challenged by Nathan, suggesting his implicit disagreement with the idea. After Jackie justified her contribution, Nathan turned his head away from Jackie and muttered that they would “get to it later”, thus minimizing her idea and denying her participation. Later, during an instance of exclusive talk between the boys, Jackie began to inquire about what the boys were doing, but
there was no response from the boys. Her final contribution occurred when she asked Travis what he was drawing and Nathan provided a curt response and again, minimized her involvement:

Jackie: What are you…?

Nathan and Travis: [silence]

Jackie [to Travis]: Are you trying to make a rhombus or like a…?

Nathan: [answers for Travis]…a square [says this with his back still completely turned towards Travis and away from Jackie]

Jackie: [facial expression of frustration]

Taken together, in response to all eight intellectual contributions made during this 2-minute segment of interaction, Jackie was either challenged, ignored, or acknowledged with minimal engagement. It is worth noting that all of the contributions Jackie made during the analyzed segment of group work were pertaining to the task (i.e., the expectations) rather than the mathematical concepts themselves. So the disagreement she met from the boys was not necessarily intellectually based, but more to do with the task expectations.\footnote{Recall that for the purpose of coding and analysis, ‘intellectual contributions’ were defined as “any utterance related to the mathematical task, including ideas, questions, strategies and so forth”}

A racialized and/or gendered pattern of how contributions were taken up can be seen given the way Jackie’s contributions were responded to. In contrast, the analysis of the
interactive positioning between the boys during their exclusive talk revealed that they generally attended to one another’s contributions. For example, at time 42:15, Noah turned to Trevor and asked him what he was trying to figure out and Trevor responded, explaining that he was trying to “complete the square”. A few seconds later at time 42:23, Jackie too asked Trevor what he is doing and she was met with no response until she later repeated the question and was curtly answered by Noah, who maintained his bodily orientation completely away from her and towards Trevor (see Figure 20, above)

*Summary of positioning and use of Stereotype Threat Theory and Microaggression Theory as interpretive lenses*

The boys positioned Jackie as a marginal member of the group through their physical blocks, exclusive talk and use of the shared learning artifacts, and by minimizing and challenging her many contributions. Jackie responded to these forms of marginalization in a more explicit and vocal way than Hailey and Abida. When her ideas were challenged, Jackie pushed back with further justification. When she was being boxed out of the interactional space and from the shared learning artifacts, she not only leaned, but asked the boys, repeatedly, what they were doing. When they still only offered her minimal engagement, she resorted to working on her own.

As described in part I of the analysis, there was an underlying vulnerability to stereotype threat when Jackie worked with Nathan and Travis. This vulnerability may have been exacerbated by the fact that at the outset of the class, the students were given feedback on a test. The stereotype threat literature would suggest that this feedback, particularly if it was negative, could serve as a trigger of stereotype threat by increasing the salience of achievement. When investigating the legacy of stereotypes in mathematics classrooms, Nasir and her colleagues (2009) demonstrated how one African American boy was studious and on-task until he received
negative feedback on an assignment and then engaged in racialized behaviours (e.g., making reference to a song about drug dealing and a promiscuous mother). Nasir et al. argued that these racialized behaviours helped the boy to “manage the fear of failing or the potential stigma of not being smart in math” (Nasir et al., 2009, p. 243).

The feedback on the test may have increased the salience of achievement and related stereotypes for Jackie. This heightened awareness combined with the fact that she was working with two White boys who engaged in a host of marginalizing acts of interactive positioning may well have triggered stereotype threat. For example, if she had received a low grade on the test and was then put in a group with Nathan and Travis (two White boys who seemed confident and outspoken in mathematics), the gender stereotype about mathematical achievement may have been salient and/or Jackie may have felt some pressure to live up to the stereotype that ‘Asians are good at math’.

Using microaggression theory as an interpretive lens and given the racialized and/or gendered patterns of interactive positioning observed, it is reasonable to suggest that these were microaggressive acts. I now turn to Jackie’s interviews to examine whether and how she identified, described, and explained these marginalizing acts of positioning.

*What did Jackie Have to Say? Juxtaposing the Analyses of Video and Interview Data*

(i) *Identifying Acts of Positioning*

After watching the first portion of the video, Jackie described feeling frustrated by the fact that Nathan was not listening to her:

at this point I’m kind of getting frustrated because I heard him [the teacher] say loud and clear that we have to do one for each subject and it’s like [Nathan] asked me and I said, ‘yes’ and then [he] asked her [student outside of group] and she said ‘yes’ and [he] still didn’t believe either of us!
She went on to describe how this was a common pattern of interaction for her:

> It happens a lot where someone will ask you a question and then you’ll say ‘yes’ and then he’ll just go and ask another person and they’ll just say the same thing and then he’ll ask another person and they’ll be like… these 4 people have just said the same thing as me.

Jackie’s use of the pronoun ‘he’ in the above excerpt suggests that she was either referring to her previous experiences working with Nathan or more generally, to her experiences working with boys. Taken together, being ignored by Nathan seemed to be a salient part of the experience for her and this corroborates the findings of the researcher’s microanalysis.

However, in contrast to the researcher’s microanalysis, which also highlights how Travis disagreed with her contribution, Jackie did not identify or discuss this act of positioning.

After watching the second segment of the video when the boys were generating a question, Jackie described how she didn’t know what they were doing (because she couldn’t see) and decided to look through her notes to see if she could find some material to contribute to the work. She then explained how she found some material that would be helpful for a question on ‘linear programming’ but when she shared it with Nathan, he ignored her:

> what happened was I said, ‘yeah we should do this… like why don’t we do this?’…I’m not even sure what they’re doing here, and I kind of just [thought] well, ‘whatever! You’re not listening so whatever, I’ll just go back to doing whatever I was doing before’.

In the video microanalysis, I highlighted the manner in which Nathan challenged and minimized Jackie’s contribution. In contrast, Jackie’s interpretation was that Nathan was simply ignoring
her. She then went on to explain her gesturing and facial expression. She said that when she shook her head, she was frustrated and “was like, ‘okay, sure, whatever!’” She then described how she felt disconnected from the group: “At this point it’s just kind of like me… and then them [uses hands to gesture two distinct groups]. It’s there.” Jackie then talked about her persistence in trying to figure out what the boys were doing:

…and then I heard them doing something so I looked over and kind of asked them a question and they were kind of-they said something that was really, really short and so I was like, ‘ok, I’ll go back and do whatever I was doing before’.

Like the researcher’s microanalysis, Jackie identified the curtness in Nathan’s response to her question. She detected the fact that she was being minimally engaged with and denied participation and resorted to going through her notes. When I asked Jackie to elaborate on her decision to work on her own, she replied: “I was like, ‘OK, I guess I’m not really doing anything, OK. Whatever, tell me when you’re actually going to talk to me.’” She ended by pointing to the computer screen depicting the group configuration in Figure 19 (above) and said that it was indicative of the group dynamic. With Nathan’s back completely towards her as he and Travis working exclusively, Jackie indicated that she was “sitting here just looking through stuff cause I honestly have given up with the group work.”

Taken together, Jackie’s account of the experience adds further nuance to the group dynamic and highlights the fact that she was excluded. She corroborated the video microanalysis by emphasizing the marginalizing moves of Nathan and added the feeling that he was ignoring her. Unlike the video microanalysis, Jackie did not mention the interactive positioning moves of Travis. There are a host of potential explanations to account for why Jackie centered on Nathan. One speculation is his proximity to her during the group work activity and his physical blocks.
(ii) Interpreting and Explaining Acts of Positioning

When asked about her overall impression of the group work, Jackie said that it was a waste of time because her group did not collaborate. Like Hailey, she attributed some of the lack of cohesion to the dispositional qualities of her group members, stating that they were dominant, loud, and obnoxious when they worked together. These dispositional qualities are consistent with gender achievement stereotypes in mathematics and provide further support for the claim that there was a threat in the air.

For Jackie, being ignored by boys (whether it be Nathan or other boys in the class) during group work was a common occurrence. Her explicit use of the pronoun “he” in the excerpt: “It happens a lot where someone will ask you a question and then you’ll say ‘yes’ and then he’ll just go and ask another person…” links gender to these marginalizing acts of positioning. However, when she was later asked about whether she thought race and/or gender impacted the group dynamic, Jackie explained that the lack of collaboration within the group was due to the fact that Travis and Nathan were part of the same clique. Similar to the other cases, Jackie did not explicitly describe the marginalizing acts of interactive positioning as being gendered and/or racialized, but instead talked about “cliques”. She described how in general, the boys interacted more and that she tended not to talk to them. Given the racialized, gendered (and so forth) nature of cliques, Jackie made an implicit connection between the marginalizing acts of positioning and social identity. Like the other focal students, Jackie used the language of cliques/friendship to describe a pattern that was also racialized and gendered.

Jackie explained that the session of group work would have been better if she had been allowed to choose her own group and work with a friend. She added that there was one girl in the class that she worked well with. This finding connects with stereotype threat theory by suggesting that critical mass can serve as a buffer against stereotype threat. Like some of the
other focal students, Jackie perceived some value in allowing students to form their own groups and advocated that group work is best when there are just two people working together so that “no one gets left out.” She used this as another explanation to account for why her group work experience with Nathan and Trevor was negative.
CHAPTER 7: THE CASE OF ARIANA

Part I: Meet Ariana

Personal Information and School Context

Ariana was 16 years old, self identified as a medium level SES, and was enrolled in a
12th grade Advanced Functions mathematics class at the time of the study. The class consisted
of 17 students, 11 girls and 6 boys (see Table 7, below).

Table 7. Students’ self-identification in Ariana’s mathematics class

<table>
<thead>
<tr>
<th></th>
<th>White</th>
<th>East Asian</th>
<th>Iranian</th>
<th>Multi-racial (South Asian/African)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls</td>
<td>0</td>
<td>9</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Boys</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Ariana self-identified as South Asian/African, but indicated that most people perceived her as
South Asian.

The school was situated in the outskirts of a large Canadian city and consisted of 750
students from grades JK-12. The school population was predominantly White and East Asian.
The school had an annual tuition rate of $23,000 and administered a rigorous admission process
involving interviews and assessment of applicants’: writing ability; previous academic reports;
teacher recommendations; and test scores. Further to this, applicants to the senior school (i.e.,
grades 9-12) were required to write the Secondary School Admissions Test (SSAT).

Ariana described the school as having an “intense” work ethic and tremendous amount
of pressure for academic excellence. She explained that her mathematics class was particularly
elite because it was a ‘pre-advanced placement’\textsuperscript{14} class. Ariana described her classmates as having an “intense work ethic”, being very strong in mathematics, and having ample external support (e.g., tutors). Like the other focal students, Ariana talked about a general pressure to get good grades.

\textit{Ariana’s Mathematics Identity}

Ariana reported that she was “OK in math”. She described how she was not a “creative thinker in math” and that it took her more time to solve mathematics problems than other people. She talked about how she had a tendency to not do her mathematics homework because she found it repetitive and uninteresting. She explained that she often pushed the subject to the side because she said she always knew enough to “get by”. She attributed this to the fact that she took supplementary courses in mathematics outside of school. When it came to preparing for tests, Ariana described how she could effectively study at the last minute but explained how, as a result, she felt others perceived her as having a weak work ethic in mathematics.

Ariana indicated that, in general, she did not enjoy mathematics and characterized it as her least favourite subject in school. However, like the other focal students, she regarded mathematics as one of the most important subjects in school. She talked about highly valuing her performance in the domain and feeling a great deal of pressure to do well in it. She recognized its value in the real world and viewed her success in it as a gateway to “success in other areas”. Ariana indicated that she wanted to pursue sciences in her future and viewed mathematics as “a necessity” in this endeavor.

\begin{flushright}
\textsuperscript{14} Canadian advanced placement (AP) courses are designed to prepare secondary school students for post-secondary education with respect to content, pedagogy, and rigor. The AP courses are internationally recognized and are a considered part of the admission process in many post-secondary institutions.
\end{flushright}
When asked about mathematics achievement stereotypes, Ariana very quickly identified the stereotype that “Asians are good at math”\textsuperscript{15}. She went to say that this did “not help” the challenges she experienced in her mathematics class given that most of her classmates were Asian (i.e., 14/17 students). She appeared to endorse the stereotype by reifying that “Asians are smart at mathematics” and how this increased the pressure to do well in class.

**Ariana’s Group Work Figured World**

In general, Ariana reported that she did not enjoy small group work. Her main reason for disliking group work was that people were strong in mathematics, worked too quickly, and ended up working on their own, leaving her behind:

I don’t know exactly what it is, but they are very- when we’re in small groups, they kind of just start doing it on their own. We don’t really do the group work aspect of it. And I’m the one who’s kind of like, “ok, this is advanced stuff and I don’t know it.” But everyone else is kind of already finished the question. And then it’s like, “oh, ok.”

The experience of getting left behind was a common one for Ariana. She wondered why other groups appeared to collaborate effectively and whether it had something to do with her:

It doesn’t matter who I’m with. But I- I don’t know what it is, but whenever I’m put in a group, I’m with the people who just do it on their own and then we’ll go back to our seats.

\textsuperscript{15}It should be noted that Ariana did not appear to include ‘South Asians’ within her conception of ‘Asians’ because, in various points of the interview, she distinguished herself (i.e., her race and ethnicity) from her East Asian peers. For instance, she talked about how the Asian students tended to be friends with one another and excluded herself from this social group. Thus, her conception of ‘Asian’ seemed to be specific to East Asians. This will be demonstrated below.
Like I see the other groups and they actually talk about the question. So I don’t know if it’s just who I'm with every time or… what.

She also talked about time constraints in group work and how they contributed to the pressure to maintain a fast work pace. The main goal driving the work, Ariana explained, was “getting work done” as opposed to, say, learning mathematics.

Ariana also said that she took on a more passive role in group work. She explained that although she was invested in learning the material, “there comes a point where it’s like, ‘okay, they just want to work on it’… so I just… leave it.” She said she often resorts to working on her own.

The success of group work, according to Ariana, depended not only on who she worked with, but also on the nature of the task. She elaborated that tasks involving word problems tended to work better than “compiling study notes.”

Summary of Background Information and Connections with Stereotype Threat Theory

Like the other focal students, Ariana highly valued her performance in mathematics and recognized its real-world importance. Although she did not like the subject or feel particularly strong in it, she viewed it as a necessity.

Ariana’s narrative centered around pressure. Like the other focal students, she described the high pressure for achievement that characterized the school culture and also stressed the importance of her performance in her elite, advanced placement mathematics class. She quickly identified the stereotype that Asians are good math and then talked about how this added to her pressure to do well in her class because it was comprised mostly of Asian students: “Asians are good at math! Which doesn’t help me that about almost all my classmates are Asian.” This
comment and her intonation when she said “me” implies that Ariana did not consider herself to be part of the “Asians are good at math!” stereotyped social group.

Ariana self-identified, in part, as South Asian and believed that others perceived her as such. The case of Ariana is unique in that achievement stereotypes specifically about South Asian students are less researched, understood, and known than the mathematics achievement stereotypes about East Asians (Ngo, 2006). Although South Asians are often lumped into the general ethnic category of Asian, the image of Asians as the *model minority* (i.e., a social group that is perceived to obtain higher educational and socioeconomic success than other social groups) does not accurately represent the economic, social, and cultural challenges experienced by South Asians as well as their experiences of racism (Ngo, 2006). Nevertheless, there are some contemporary stereotypes about South Asian individuals and achievement that suggest that they are intelligent, highly educated, and often found in highly respected professions such as medical doctors. An article written in *Forbes* magazine suggested that South Asians are the “new model minority” and described stereotypes about this group to be similar to those pertaining to East Asians (Richwine, 2009).

Regardless of whether there is any validity to the South Asian model minority stereotype and whether or not Ariana endorses it, she may still be affected by it. Using a similar line of reasoning as the “choking under pressure” phenomenon that East Asian students encounter as they strive to live up to the stereotype that they are skilled at mathematics (Cheryan & Bodenhausen, 2000), it is possible that Ariana would feel a similar pressure to do well. However, given that the South Asian model minority stereotype is relatively new (Richwine, 2009; Ngo, 2006), not as widely known, and that Ariana herself did not mention it in any of her interviews, it may not impact Ariana in the way traditional stereotype threat theory would predict. Further to this, although the present study acknowledges the various perspectives about South Asian stereotypes, it centres the analysis on Ariana’s racial discourse and her
representation of the Asian stereotype. As such, given that Ariana distinguished herself from her Asian classmates and appeared to believe the Asians are good at math stereotype is specific to East Asians, I suggest that she may experience pressure to keep up with her (East Asian) model minority classmates which too could elicit stereotype threat and impede her performance on a task (Aronson, et al., 1999). This interpretation is in line with Shah’s (2013) research investigating racial-mathematical discourse wherein he found that the “Asians are good at math” stereotype to be specific to East (and Southeast) Asians and not including South Asians.

Ariana’s figured world of group work revealed this to be a high pressure learning context due to its fast pace. She also described how this pressure was exacerbated when she worked with Asian students because of their superior skills in mathematics. Taken together, these sources of pressure suggest that group work may have been particularly challenging for Ariana.

With these ideas in mind, I turn to a case of group work wherein Ariana worked with two (East) Asian girls and, using stereotype threat theory and microaggression theory as interpretive lenses, take a closer look at the microdynamics of positioning.

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**Part II. Microanalysis of a Case of Group Work**

**Meso-Level Information: Setting the Stage**

*(i) The Group*

Ariana worked with two East Asian girls, Claire and Evelyn. Unlike the other cases, Ariana talked about how she was friends with Claire outside of class and that she was somewhat confused as to why they did not work together during the group work task. She went on to explain that Claire and Evelyn were friends outside of class but that she did not interact with Evelyn very much and wouldn’t consider her a friend. Ariana indicated that both Claire and
Evelyn were strong mathematics students that “figure stuff out quickly”. She went on to say that Claire was diligent about doing her homework and really “knows her stuff”. She continued describing Claire as very studious and knowing “everything beforehand”. The group was assigned by the teacher and they were encouraged to collaborate.

(ii) The Mathematics Task

The girls were given the gross income of a hypothetical family looking to purchase a home and their task was to (1) determine how much the family could spend on a house, (2) use a real estate website to find a potential home, (3) use a given formula (see Figure 22, below) to determine their weekly mortgage payments, (4) calculate how much they would owe on the house over the next 25 years, (5) use mathematical reasoning to determine how much they should be saving monthly for maintenance costs; and (6) how much they would have saved (for maintenance costs) in 10 years. This information was presented on a single handout that was to be shared by the group (see Figure 22, below). The girls all had laptops (although they most often referred to the information displayed on Claire’s screen) with wireless internet connection and they were given a suggested bank website to use as a resource about mortgages. The group was expected to submit one Google doc by the end of the subsequent class to reflect their collaborative work.
Figure 22. The group’s shared handout depicting the task.

Microanalysis of a Segment of Group Work

In what follows is an analysis of 2 minutes of video taken from two separate points in the session of group work. The first minute was near the beginning of the task when the girls were determining how much they could spend on the house while the second segment of video was near the middle of the session of the group work when the girls were calculating the weekly mortgage payments. The segments of video were selected because of the marginalizing acts of positioning observed.
Vignette 4: “I was annoyed. I was very, very annoyed”

The girls were oriented towards the shared handout that was in front of Evelyn, trying to figure out how much they could hypothetically spend on a house (see Figure 23, below).

Figure 23. Ariana (left), Evelyn (centre), and Claire (right), leaning in towards the shared handout trying to determine how much they could hypothetically spend on a house.

Ariana suggested that with the given income information, if they randomly selected one of the interest rates displayed on the website, they could work backwards to determine how much the house should cost. In response, Claire told Ariana to “wait” and suggested they revisit the formula they were given to calculate the weekly payments. Ariana then began to explain the variables in the formula but was interrupted by Claire who said, “are you sure?” and then proceeded to stand up to retrieve her notes. As Claire walked away from the group, Ariana indicated that she was fairly certain that her interpretation of the formula was correct and then repeated, “why don’t we just choose an interest rate and figure out how much we should spend on our house?” Claire did not respond and continued to look for her notes while Evelyn, after a
moment’s delay, said, “but how do you know which interest rate to pick?” Ariana then repeated her suggestion that they simply choose an interest rate from the website, but this idea was not taken up.

Moments later, Claire returned to the group with her notes and said to Ariana, “I’m pretty sure you’re interpreting the formula wrong” to which Ariana replied, “Okay, then check”. Claire then began to think aloud about the formula as she read through her notes. When Ariana asked her what she had discovered, Claire reached for the shared handout and continued to think aloud. Following this, Claire and Evelyn engaged in several instances of exclusive talk while Ariana appeared to do some work on her own (see Figure 24).

Figure 24. Exclusive talk between Claire and Evelyn as they struggled to interpret the formula and determine how much to spend on the house while Ariana consulted her textbook and worked on her own.

About 20 minutes later, Claire and Evelyn sought the teacher’s assistance to clarify their questions about the formula as well as the information given on the website about the interest rates. After the teacher left, Evelyn leaned in and oriented herself towards Claire and Claire’s laptop screen and the two began to engage in exclusive talk. Ariana, from the outside of the interactional space, asked what the interest rate was, but the girls continued to discuss the problem exclusively. Following this period of exclusive talk, Claire began to dictate information as she read off of her laptop screen and she and Evelyn wrote on their own pieces of paper. In
the meantime, after her question about the interest rate was ignored, Ariana turned to her own laptop and appeared to continue her search for the interest rate\(^\text{16}\) (see Figure 25).

\[ \text{Figure 25. Ariana working independently on her laptop while Evelyn, with her back to Ariana, and Claire appeared to work exclusively.} \]

This pattern of interaction continued until Ariana turned towards the girls and repeated her question, “what’s the rate?” in an exasperated tone. Claire then looked up from her work and said, “three point one percent” and then returned to her own calculations.

\(i\) Interactive Positioning

\(a\) Use of and access to shared learning artifacts. Ariana’s access was assessed with respect to the shared handout as well as the laptop screens. Although each girl had her own laptop, at times, there was information on Claire’s laptop that was being discussed and was thus a shared learning artifact.

During the first segment of video, Ariana had high access to the shared handout in the first 3 out of 6 instances. Although it was not directly in front of her, it was within her reach and line of vision. For the next two instances in this segment of video, Ariana had moderate access to the shared handout because Evelyn’s arm blocked it whenever she typed on her computer. In

\(^{16}\) The camera angle did not capture Ariana’s laptop screen and so it was unclear as to what Ariana was doing at this point. However, the group had not produced their Google document at this point and so we know she was not contributing to this shared document.
the last portion of this video segment (i.e., 1/6 instances), Ariana had no access to the handout because at this point, Claire had taken the shared handout to refer to as she searched her notes for information about the formula. Ariana would have had to stand up and move closer to Claire in order to access the shared handout at this point. Throughout this segment of video, both Claire and Evelyn maintained high access to the shared handout.

During the second segment of video, the shared handout was not as central because the girls had written the vital information on their respective response sheets. However, Ariana had moderate access to it for the first half of the video segment but virtually no access during the second half because Evelyn placed her calculator and response sheet over top of it as she worked. During this segment of video, the girls had also begun to use the laptops and after interacting with the teacher, Claire had vital information displayed on her screen, which served as a shared resource for the group. Ariana, being in the physical position furthest from Claire, had only moderate access to Claire’s laptop and had to significantly lean in order to see the screen. In the meantime, both Claire and Evelyn maintained high access to Claire’s laptop during this segment of video.

A racialized pattern of access was observed here in that the two East Asian girls of the group, Claire and Evelyn, maintained high access to the shared learning artifacts at all times whereas Ariana, the South Asian girl of the group, had low/no access to the shared handout half of the time and only moderate access to Claire’s laptop.

(b) Physical interactive positioning. Although there were times in which Evelyn was oriented towards Claire (and slightly away from Ariana), there were no physical blocks coded during the first segment of the video.

During the second segment of interaction, Evelyn engaged in two sustained physical blocks when she turned her body towards Claire and away from Ariana. The first instance occurred when Evelyn leaned in to see the information displayed on Claire’s laptop screen. Her
back was completely to Ariana at this point, thus blocking her from the interactional space and from shared learning artifacts (see Figure 26).

*Figure 26.* Evelyn leaning in to access information displayed on Claire’s laptop screen, blocking Ariana from the shared learning resources and interactional space.

The second sustained block occurred moments later when Evelyn began to use the information displayed on Claire’s screen to calculate the mortgage rate. She was in a seated position with her body oriented towards Claire and Clarie’s laptop, again with her back to Ariana (see Figure 27).

*Figure 27.* Evelyn with her back to Ariana, leaning towards Claire’s laptop screen.

A racialized pattern of physical blocking was observed given that Ariana was the only person to be blocked.

*(c) Verbal interactive positioning.* During the first segment of video, there were five instances of exclusive talk between Ariana and her group members. The first example occurred when Ariana was explaining her interpretation of the formula and Evelyn looked at her when
asking a clarifying question. The second example occurred when Claire asked Ariana if she was certain about her interpretation and the third happened a moment later when Evelyn further challenged Ariana’s interpretation of the formula. After Ariana pushed back and restated her idea of working backwards Evelyn again challenged her contribution with a line a questioning. The final instance of exclusive talk occurred after Claire had obtained her notes and she said to Ariana, “I’m pretty sure you’re interpreting the formula wrong” and Ariana responded by curtly telling her to “check” it. Although each of these instances of exclusive talk involved Ariana, similar to the case of Jackie, they all involved her being challenged and having to justify her contributions and restate her ideas.

During the second segment of video, there was one lengthy instance of exclusive talk between Claire and Evelyn. Not only was Evelyn oriented towards Claire and sitting very close to her (see Figure 27 above), but Claire was speaking quite softly, implying that she was speaking to Evelyn and not Ariana (who was seated further away). Further evidence of exclusivity was that Claire referred to information displayed on her laptop screen, which, only Evelyn could see.

(ii) Ariana’s Reflexive Positioning:

(a) Non-verbal reflexive positioning: There were no gross or fine motor moves coded during the first segment of video. However, Ariana communicated her frustration with the girls through the tone of her voice. That is, she used a frustrated tone when she had to repeat her idea or defend her contributions.

During the second segment of video, Ariana engaged in two subtle strains. The first occurred moments after the teacher left the interaction (after providing information about the interest rate the girls should be using) and Ariana leaned towards Claire and Evelyn to ask what the interest rate was. A short while later, following the period in which Ariana was working
independently and the other girls were engaged in exclusive talk, Ariana again leaned towards the girls and repeated her question about the interest rate. When she repeated her question, her tone sounded quite frustrated and impatient. Neither of the strains appeared to be detected by Claire or Evelyn, however, they did respond (albeit with minimal engagement) to her repeated question. As with the other cases, the focal student’s physical strains occurred either during or immediately following periods of exclusive talk between the other group members or physical blocks (see Figure 28, below).

Figure 28. StudioCode timeline depicting the temporal relationship between the exclusive talk between Claire and Evelyn, Evelyn’s sustained blocks, and Ariana’s (corresponding) physical strains.

Like Jackie and Abida, Ariana resorted to working on her own in the face of the repeated marginalizing acts of positioning of her group members. This non-verbal act of reflexive positioning can be seen as form of resistance to marginalization.

(b) Verbal reflexive positioning. Ariana made a total of eight intellectual contributions throughout the selected video segments. During the first segment of video, she made six contributions. Referring back to Vignette 4, some examples include: her suggestion to select an interest rate and work backwards to determine how much they could spend on a house and her interpretation of the formula to determine weekly payments. Both of these contributions were repeated. Three of Ariana’s contributions were challenged, two of them were ignored, and one
of them appeared to be accepted without comment. Taken together, Evelyn and Claire exhibited skepticism in Ariana’s contributions and made this quite clear.

During the second segment of interaction, Ariana made two intellectual contributions. She asked Claire and Evelyn twice to indicate the interest rate they were using. The first time she asked the question she was ignored and the second time, after employing a frustrated and impatient sounding tone, Claire provided minimal engagement and replied, “three point one percent.” A racialized pattern of how contributions got taken up was observed in that Ariana’s contributions tended to be met with skepticism or were ignored, while Claire and Evelyn tended to acknowledge one another’s contributions and provide more visible engagement (i.e., evidenced by exclusive talk during the second segment of video).

**Summary of Positioning and use of Stereotype Threat Theory and Microaggression Theory as Interpretive Lenses**

Claire and Evelyn positioned Ariana as a marginal member of the group through their exclusive talk and use of the shared learning artifacts, as well as their physical orientation towards one another and away from Ariana. The most prominent form of marginalization displayed in this case was the manner in which Ariana’s intellectual contributions were challenged, minimized, or ignored. Like Jackie, Ariana pushed back by justifying and repeating her contributions and she repeated her unanswered question. In the end, like Jackie and Abida, Ariana resorted to working on the problem on her own.

A racialized pattern of physical blocks and exclusive talk was observed. Ariana (the only South Asian person in the group) was the only one to be blocked from the interactional space and shared learning artifacts. Although Ariana was involved in various instances of exclusive talk, this was mainly when her ideas were being challenged. In contrast, when Claire and Evelyn...
(the two East Asian people in the group) engaged in exclusive talk, they collaboratively discussed the mathematics and oriented towards one another and away from Ariana.

Connections to stereotype threat theory and microaggression theory are especially speculative in this case given the lack of research investigating stereotype threat and South Asians and further to this, the type of threats that may be experienced when members of two Asian groups (i.e., South and East Asian) work together. That is, both South and East Asian students (albeit to different degrees) tend to be positively stereotyped in the mathematics domain (Ngo, 2006; Richwine, 2009).

As previously mentioned, one possible application of stereotype threat within this group work context is the notion of choking under pressure (Cheryan & Bodenhausen, 2000). Ariana’s heightened pressure to do well may have been associated with the self-relevant stereotype that South Asian students are highly intelligent. On the other hand, research investigating how South Asian Canadian undergraduate students experience racial microaggressions suggests that these students tend to be: perceived as fresh off the boat, excluded from social life, stereotyped as being tied to terrorism, compelled to be cultural experts, and generally treated as invisible (Poolokasingham, Spanierman, Kleiman, & Houshmand, 2014). Poolokasingham et al. concluded that the notion of being Brown is often viewed as a liability for students who identify as such. The theme of invisibility was indeed evidenced in the present study and corroborates the findings of Poolokasingham et al. (2014). That is, when her contributions were ignored and challenged and her group members left her out of the group discussion, Ariana was treated as through she was an invisible member of the group. Taken together, future research is needed to investigate South Asian stereotypes and to identify whether and how South Asians contend with self-relevant achievement stereotypes.

Ariana was working with two East Asian girls who she described in ways that were consistent with the Asians are strong in math stereotype. Ariana did not describe this stereotype
as being self-relevant and instead reported feeling pressure to keep up with Claire and Evelyn. Her reports of pressure to keep up suggest that she may have experienced stereotype threat. This argument is line with the work of Aronson and his colleagues (1999) who demonstrated how White men could experience stereotype threat and underperform on a mathematics task when the Asian achievement stereotype was made salient. Applying the principles of stereotype threat, Ariana’s fear of underperforming relative to her highly skilled East Asian group members may have impacted her behavior, performance and so forth. The fact that Ariana described pressure to keep up with her Asian classmates because they worked quickly and competently as well as the fact that she lacked critical mass in the group work context further corroborates this assertion. I now turn to the interview data to examine whether and how Ariana identified, interpreted, and explained these acts of positioning.

What did Ariana Have to Say?: Juxtaposing the Analyses of Video and Interview Data

(i) Identifying Acts of Positioning

Overall, Ariana described the session of group work as a negative experience. She indicated that she was “in a bad mood by the end” and was not happy. When I asked her to elaborate on what made the experience negative she described the marginalizing acts of positioning that were identified in the video microanalysis:

Being left out of the decisions or when they kind of just- I don’t know they just kind of realized something at the same time and then it wasn’t explained to me or I wasn’t listened to and then…kind of…it just kept happening over and over.
After watching the first segment of video described in Vignette 4, like the researcher’s microanalysis, Ariana focused on how she was not being listened to:

I was annoyed. I was very, very annoyed. Cause we had done some homework with a different formula in it and this activity was something new. She [the teacher] had given us a formula and no one wanted to listen to me that the formula was for weekly payments even though it said right there! And then we wasted another 40 minutes or something…like another 30 minutes after this and we ended up doing exactly what I just said.

As the above excerpt demonstrates, Ariana was frustrated that not only were her group members not listening, but that later, the group eventually employing the very strategy she suggested at the outset of the session. She elaborated on this point later on in the interview:

Cause [Claire] suggested pretty much what I had said 30 minutes ago or like 20 minutes ago or whatever but they just spent the last 20 minutes convincing me that that I was wrong, so then I was confused- like, “what do you mean, I thought you said we needed the amount of the house first?” So…they pretty much said no to what I had originally said and then they decided to go with it and I was confused because I was like, “but I thought that was wrong?” And then they just kind of went off on their own and did it.

After watching the second segment of video, similar to the video microanalysis, Ariana explained how she could not see the shared laptop nor what the girls were writing: “…they were discussing together and I couldn’t see her screen or see her work whereas Evelyn could see what she was doing.” Consistent with the researcher’s microanalysis, Ariana noted that both girls had high access to the shared learning artifact (i.e., Claire’s laptop). Although she did not mention
the physical blocks of Evelyn per se, Ariana did elaborate on the fact that she couldn’t see what the girls were doing.

Taken together, Ariana identified the marginalizing acts of positioning that were highlighted in the researcher’s microanalysis. She mentioned the exclusive talk, the way they challenged her contributions, and the way they used the shared learning artifacts in an exclusive way. Ariana did not mention the physical blocks by Evelyn during the second segment of video, however, she did emphasize the fact that she could not see what the girls were doing.

(ii) Interpreting and Explaining Acts of Positioning:

One of the main explanations that Ariana provided to account for the observed interactive positioning was that Evelyn and Claire were superior to her in terms of their mathematical ability. She explained that because they were strong in mathematics, they could work quickly and together, move ahead without her: “I guess they picked things up a bit faster than I do. Like, I can figure it out, I just take a bit longer. And they just went off and I was just trying to figure out…” Ariana described how Claire “studies it all so she knows everything beforehand” and was very “focused” during the session of group work. Ariana’s focus on the superior mathematics ability of her group members is interesting in light of the fact that she also said that she had figured out how to solve the problem from the beginning, long before Claire and Evelyn. The inconsistency in her narrative raises a number of questions and possible interpretations. It is possible that Ariana was describing more general characteristics of Claire and Evelyn based on previous group work experiences. It also raises questions about whether the Asian mathematics achievement stereotype played a role in constructing her narrative, interpreting the marginalizing acts of positioning, and downplaying her own mathematical competence. In any case, Ariana described Claire and Evelyn in ways that were consistent with the Asian mathematics achievement stereotype. This, in conjunction with her narrative about
feeling pressure to keep up with her group members, as well as her mathematically competent (East) Asian classmates in general, provides support for the claim that she experienced stereotype threat (Aronson et al., 1999).

Ariana also attributed some of the interactive positioning moves to the physical set-up of the group. That is, she suggested that the group work would have been better had they been given a “circular table” and described the linear configuration of the group as not conducive to collaborative group work. Because of her inability to see what the girls were doing (as well as the other forms of interactive positioning), Ariana explained her decision to work on her own:

I was like, “let me just try and figure it out on my own.” I wasn’t really too big on solving the problem [with Claire and Evelyn] anymore. I was like, “as long as I [italics added] understand what’s going on, I don’t really care”.

When asked about whether race, gender, and associated achievement stereotypes came into play during the session of group work, Ariana talked about how most of the students in the class were (East) Asian and often times spoke in another language: “Literally everyone, but maybe me, my friend Monica, and one other guy, are Asian. I think sometimes a lot of them [the East Asian students] like speak in Korean sometimes to each other. Or like, different languages.” She went on to explain that if she was shy and less persistent in the group work, it would have been problematic.

Like the other focal students, Ariana also talked about the role of friendship patterns in shaping the group work dynamic. Her narrative demonstrated the racialized nature of friendship patterns. For example, Ariana explained that although she and Claire were friends outside of the classroom, because she was not (East) Asian, their friendship was somewhat superficial: “Me
and [Claire] are friends. We eat lunch together every day. But when it comes to…she has more
Asian interests sometimes, but she doesn’t talk about them when she talks with me.” Again, we
see Ariana’s use of the term Asian to identify the East Asian students in her school because she
does not include herself in the ethnic category. Ariana went on to describe how Claire’s
friendship with other (East) Asians like Evelyn was different from their friendship because of
their common “Asian interests”:

[Claire] talks to like [Evelyn] and the people [Evelyn] hangs out with more about that kind of
stuff. So they know each other in a different way than me and [Claire] do. So that might have
had a bit of an effect in our group because they’re more comfortable with each other in a
different type of way.

According to Ariana, because Claire and Evelyn were both Asian, they were more comfortable
working with each other (rather than with her). Further evidence for the implicitly racialized
nature of friendships came from the fact that when Ariana indicated that there was only one
other South Asian person in the class (i.e., Monica) she also added that she was her friend.
Taken together, Ariana’s narrative points to the tendency for same-race friendships in her
school. Racialized friendship dynamics can contribute to hovering identity threats and,
depending on intergroup relations, may increase the likelihood that marginalizing acts of
positioning are experienced as racial microaggressions. Although race appeared to be a salient
aspect of identity in Ariana’s narrative, this does not dismiss the fact that gender, class, and
many other aspects of identity may have been operating in concert during the session of group
work.
CHAPTER 8: THE CASE OF KATHRYN

Part I: Meet Kathryn

Personal Information and School Context

Kathryn was 15 years old, self identified as a high SES, White girl, and was enrolled in a 10th grade advanced mathematics class at the time of the study. The class consisted of 21 students, 11 girls and 10 boys (see Table 8, below).

Table 8. Students’ self-identification in Kathryn's mathematics class

<table>
<thead>
<tr>
<th></th>
<th>White</th>
<th>East Asian</th>
<th>South Asian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls</td>
<td>8</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Boys</td>
<td>5</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

Kathryn attended the same school as Ariana. Situated in the outskirts of a large Canadian city, the school population was predominantly White and East Asian. The school had a high annual rate of tuition (i.e., $23,000) and the admission process was rigorous.

Like Ariana, Kathryn described the school as having a strong academic focus with pressure for high grades. At the same time, however, she characterized the school as being very harmonious in terms of student relations. She explained that “people are generally friendly” and that it was a very “comfortable environment”. According to Kathryn, students generally respected one another and there was “no racial stereotyping” or bullying at the school.

Throughout the interviews, Kathryn talked about how she liked to help others. Because of the fast pace of her mathematics class, she indicated that this was problematic at times
because sometimes it left her “behind” in the work. She also described herself as a “quiet” person.

*Kathryn’s Mathematics Identity*

Kathryn described herself as a strong mathematics student; however, she also indicated that she wasn’t always “that confident with math”. She described her weakness as being her tendency to work at a slower pace than others, particularly on tests. She went on to explain her preference to work on her own because it allowed her to concentrate and also her desire to use a calculator to allow her to work more quickly and “correctly.” Kathryn indicated that her classmates would also perceive her as a strong mathematics student as a result of her tendency to “get the right answers.”

Unlike the other focal students, mathematics was one of Kathryn’s favourite school subjects. She also suggested that the domain of mathematics is important to learn. To Kathryn, mathematics learning was an important “life skill” with great significance in the real world. She indicated that she very strongly valued her performance in mathematics and felt a great deal of pressure to achieve high grades. Further to this, Kathryn indicated her desire to continue studying mathematics and claimed that it would be vital to her desired career in accounting.

*Kathryn’s Group Work Figured World*

Although at times she described her preference to work independently, Kathryn also described group work as having the potential to be a supportive learning context. She indicated her belief that working in groups can be helpful because people can lend support to one another. However, according to Kathryn, in reality, people often get ignored when they work in groups. She explained how this can often lead to confusion and frustration for some people, including
herself. She elaborated that it was particularly challenging when the groups were made of students with differing levels of mathematical ability:

I’ve been in a couple different groups and sometimes I’ve been with people that aren’t necessarily at the same level as me and so it can be, like, I don’t know- it can be hard if they tell me I’m wrong or like…or even if they’re like at a higher level than me, I feel like I can’t really contribute anything…

Although Kathryn described herself as a strong mathematics student, the above excerpt demonstrates the challenges she encountered when working with other strong students. Another challenge of group work for Kathryn is the fast pace and pressure to keep up with those leading the group. She described how she tended to help members of the group who struggled with the material but that this often caused her to fall behind the leaders of the group. Within the context of heterogeneous-ability groupings, Kathryn explained that there was pressure not only for her to work quickly and keep up with the group leaders, but also to help those in the group who were falling behind. When grouped with students she characterized as high achieving, Kathryn explained that she felt pressure to do well and would feel guilty if she had questions and so often refrained from asking for help. In group work, according to Kathryn, there were the “leaders”, the “helpers” and the “strugglers”, and she characterized herself as a “helper.”

According to Kathryn, group work is optimal when students are permitted to choose their groups. She described an occasion in which she chose to work with another girl in the class and explained that it went well because they were at the same ability level and they were friends. The physical set-up of the group is also an important dimension for Kathryn. She explained how group work is optimal when the students are arranged in such a way that they can
all see the blackboard\textsuperscript{17}: “I prefer it when like the groups are put so that like everyone just has to turn their head like one way instead of sometimes likes having to turn their chair all the way around.”

When asked whether and how issues of race or gender (or any aspect of a person’s identity) comes into play during group work, Kathryn talked about the tendency for certain students to feel as though they don’t “fit in” when they are in mixed-gender groups. She explained how she is generally not comfortable working with boys and that it in these heterogeneous groups, there are often obstacles to communication as a result of people not feeling comfortable:

I mean, whether it be like I’m in a group with 2 other girls and there’s a boy there, depending on just how he is, he may not want to like, talk to the 3 of us girls. I mean that could get in the way of some communication. I know I’ve been in groups before in other years where I’ve been put with like a group of people, like usually boys I’m not comfortable with- like that I don’t usually see or talk to. And then just being in a group with them is kind of uncomfortable when I don’t have anyone else with me. I mean, it could be girls as well, but I’m usually fine with girls.

Kathryn dismissed issues of race as having any impact on group work. She explained that there were not issues of race at the school and that people were generally quite respectful of each other:

I mean...there’s not too much like racial like stereotyping or just- there’s not too much

\textsuperscript{17} During the observed session of group work, the questions were periodically taken up as a class on the blackboard. This appears to be a common practice and explains why, for Kathryn, it is important to be able to see the blackboard when working in groups.
bullying that goes on in this school. I mean there is, but just people are usually respectful of each other. I mean, if they’re going to say something, they’re going to say it to your face and I mean at least…try and make you fit in.

When asked to share her knowledge of mathematical achievement stereotypes, she immediately identified the Asian achievement stereotype stating:

I mean the first thing that pops into my head is like, Asians being really good at math…and I think most people would say that.

She then went on to describe the gender achievement stereotype in mathematics and stated that there was some truth to it given the predominance of men in mathematics-centred careers. She then added that girls can be “good at math as well so it’s not as common as people would say that Asians are good at math.” It was not clear as to whether Kathryn, herself, believed the race or gender stereotypes about mathematics achievement to be true. By saying “people would say that…” Kathryn may have been validating the race and gender stereotypes or she could have been simply implying that many people believe them (regardless of whether they are true).

Summary of Background Information and Connections with Microaggression Theory and Stereotype Threat Theory

Kathryn described herself as a strong mathematics student who highly values the domain as well as her performance in it. Unlike the other focal students, Kathryn enjoyed mathematics and even viewed it as a central component of her future career. Taken together, more than any of the focal students, it appeared that Kathryn was very highly invested in the mathematics
domain. This investment is one of the main triggers of stereotype threat and thus placed Kathryn in a particularly vulnerable position.

In addition to having the necessary background requirements to elicit stereotype threat, Kathryn described a number of situational factors that could further elicit stereotype threat. For example, she not only acknowledged and endorsed the gender achievement stereotype, she also stated her general discomfort with working with boys when in small groups. Using the language of stereotype threat theory, Kathryn shared her preference for working with girls and thus having critical mass when in small groups. Although it did not appear to have relevance in this particular session of group work, Kathryn also mentioned the salience of the Asian achievement stereotype in mathematics. This has relevance in the larger context of Kathryn’s classroom given the large population of Asian students in her mathematics class and the school in general.

Like the other focal students, Kathryn’s figured world of group work suggested that this learning context was highly susceptible to stereotype threat. For example, she stated that many voices (including her own) tend to be ignored in group work and there is a great deal of pressure to perform well and work quickly when working with higher-achieving students. She described group work as being a context wherein she often felt reluctant to ask questions in fear of holding other members of the group back. Drawing from stereotype threat theory and given her preference for working with girls and her general discomfort with working with boys, it is expected that in a group work context wherein Kathryn worked with boys who were strong in mathematics, she would be particularly vulnerable to stereotype threat. With this in mind, I now turn to a case of group work wherein Kathryn was grouped with two boys that were the top mathematics students in the class.
Part II. Microanalysis of a Case of Group Work

Meso-Level Information: Setting the Stage

(i) The Group

Kathryn was assigned to work with two White boys, Luther and Collin. According to the classroom teacher, Luther and Collin were the strongest mathematics students in the class. The teacher also shared that her rationale for grouping Kathryn with Luther and Collin was that she also viewed Kathryn as a strong student and believed they would work well together.

Kathryn indicated that Collin and Luther were not really her friends and they were more her acquaintances. She went on to describe Collin as being “naturally strong at math” and both boys as being highly confident in mathematics. She explained that they were the students in the class that most people consulted for help. After describing her belief that both boys were strong in mathematics, she added that she viewed herself as being “at the same level”. Kathryn also commented on the tendency for Collin and Luther to “get loud and competitive” when they worked together.

(ii) The Mathematics Task

The goal of the task was to prepare for an upcoming unit test on analytic geometry. The teacher assigned the groups, reminded the students that they should be familiar with all of the material (e.g., geometric principles), and assigned them review questions to collaboratively solve. The teacher indicated that she would stop the groups periodically to solve problems as a class and so there was some implied pressure for the groups to maintain a steady work pace. In the segment of video analyzed below, the group was working on drawing a right bisector for a triangle and determining the equation for the right bisector (see question 4 (d) in Figure 29, below).
Figure 29. Textbook page demonstrating a sample of the review questions that the students were assigned. In the segment of video analyzed below, the students were solving question 4 (d).

**Part II. Microanalysis of a Segment of Group Work**

Below is a vignette description of two, 1-minute segments of Kathryn’s group work interaction. These clips were selected because they included times wherein the boys finished a problem and were waiting for Kathryn, who appeared to be struggling through the work. These dynamics appeared to set the stage for stereotype threat (i.e., pressure for Kathryn to keep up with the boys) and the footage was thus chosen for closer analysis.
Vignette 5: “I felt Like I was Slowing Them Down”

The teacher finished discussing a question with the class and then told them that she would be discussing the next portion of the question in 10 minutes time. Collin and Luther were ahead of Kathryn (as well as the other groups) in their work. Luther began the small group discussion by asking Kathryn to share a solution. Kathryn indicated that she was still working through the problem and Luther agreed that he too was experiencing some difficulty with it. Kathryn then jovially remarked that “only Collin knows!”

After Kathryn prompted Collin with a series of questions about how he had solved the problem (e.g., how to find the point of intersection between the right bisector and the line segment), Collin explained his process. Luther interjected to share his method and then indicated that he had figured out where he went wrong. The boys then laughed together at Luther’s mistake and then Luther appeared to write a correction on his paper. In the meantime, Kathryn flipped through her notes, put her hand on her face as if to gesture that she was tired and/or frustrated, and returned to solving the problem on her own (see Figure 30, below).

Figure 30. Luther correcting his work while Kathryn still appeared frustrated and perplexed.

A few minutes later, Collin and Luther were engaged in off-task conversation when Luther returned to the work at hand and said, “so we’re done, right?” It was evident at this point
that both Collin and Luther were done the problem and ready to move ahead. Luther yawned and checked his watch from time to time and Collin looked around the room. Kathryn, on the other hand, still appeared to be working on the problem they had been previously discussing (i.e., problem 4 (d)). She continued to write and use her calculator while Luther watched on and Collin hummed a song and bobbed his head, appearing impatient and fidgety (see Figure 31, below).

Figure 31. Kathryn continuing to work on the problem while Collin and Luther appear impatiently waiting, Collin fidgeting while Luther checks the time on his watch.

After appearing to work for a couple of additional minutes, Kathryn looked towards the boys (and perhaps realized they were still waiting for her), looked at her watch, and then sighed. Luther then glanced at his watch and softly mumbled something to Collin about the time and the fact that they should be moving on. A moment later Kathryn said, “k wait, what was the equation for ‘d’?” Luther then stated the equation and then yawned. Kathryn again sighed as if to indicate that she was perplexed. She then began erasing her work (see Figure 32, below).
Figure 32. After asking the boys to share the solution, Kathryn appears to erase her work. The boys still appear to be waiting for Kathryn to move on to the next problem and Luther yawns and Collin looks around the room and taps his pencil.

(i) Interactive Positioning

(a) Use of and access to shared learning artifacts. In this case of group work, there were no shared learning artifacts. Each student in the group had their own paper to write out their solutions, textbook containing the problems, calculators and so forth. There was one instance, however, when the boys were discussing a problem and referring to one another’s work and Kathryn was unable to see the work they were referring to. Because the boys were seated directly beside one another and Kathryn was across from them, they had the advantage of seeing one another’s work.

(b) Physical interactive positioning. The group was arranged in a triangular formation with Collin and Luther sitting side-by-side and Kathryn seated across from them both. For the most part, all members of the group had high access to the interactional space. There were no blocks coded throughout the segments of interaction. When one person spoke, the other members of the group tended to look towards them and appear attentive.

(c) Verbal interactive positioning. During the first segment of video, 4 instances of exclusive talk were coded. The first was between Kathryn and Luther when he directly asked her to share her solution and she indicated that she was still working it out. The next instance was between Luther and Chris when Luther asked him to share his solution. Kathryn then joined the conversation by directly asking Chris specific questions about how he solved the problem, for example, “How did you know that like that intersected? Did you measure it?” and “…but how did you know it was a 90 degree angle?” The last instance of exclusive talk during the first segment of video was more extended and occurred between Luther and Collin as they discussed
how to solve the problem. This conversation was exclusive in nature given that Kathryn was still working on the problem and that the boys were looking directly at one another, pointing to one another’s work (in a manner that prevented Kathryn from being able to see given her spatial location in the group), and addressing questions to one another specifically.

During the second segment of interaction there were two instances of exclusive talk. The first took place as Kathryn was still solving the problem and Luther glanced at his watch and then mumbled softly to Collin something about the time and moving on. The second instance was between Kathryn and Collin when she asked him to share a solution. Luther joined the conversation shortly after and the boys explained their answers after which Kathryn began erasing her work.

Although Kathryn was involved in three out of the six instances of exclusive talk, it is interesting to note that in two of the instances that she was a part of, she was asking Collin for help and thus positioning him as a mathematically competent authority in the group. In contrast, the instances of exclusive talk between the boys involved them discussing work that Kathryn had not yet completed and referring to one another’s work when Kathryn could not see what they were referring to. Although it was not the focus of this particular analysis, the boys served to position one another as authorities by the way they engaged with one another’s contributions.

(ii) Kathryn’s Reflexive Positioning

(a) Non-verbal reflexive positioning. As previously mentioned, there were no physical blocks coded during either segment of video, however, because the boys were sitting beside one another, they had greater access to one another’s work versus Kathryn who sat across the table. During the first segment of video, when asking Collin specific questions about how he solved the problem, there was one instance in which she leaned forward, reached her arm across the
desks, and pointed to his work (see Figure 33, below). By moving into the interactional space and pointing to Collin’s learning artifact, Kathryn was making a bid for his attention and engagement and positioning herself as having something important to contribute (i.e., asking a question).

![Image: Kathryn leaning across her desk to refer to Collin’s work.]

*Figure 33. Kathryn leaning across her desk to refer to Collin’s work.*

In response, Collin engaged with her and replied to her question. Towards the end of the first segment of video, after the boys had engaged in a period of exclusive conversation and Luther had determined his mistake, Kathryn momentarily covered her face with her hand and displayed frustration. The boys did not appear to notice this gesture.

During the second segment of video, although Kathryn did not make any observable physical moves to position herself in the group, she sighed twice and checked her watch to display her awareness of the time and frustration with the work. The boys did not appear to respond to either of these moves.

*(b) Verbal reflexive positioning:* During the first segment of interaction, Kathryn made four intellectual contributions. The first took place after Luther asked her to share her solution and she shared her insights although she had not yet solved the problem. Following this, Kathryn prompted Collin with a number of questions about how he solved the work.

During the second segment of interaction, Kathryn made one intellectual contribution and that was to ask the boys to share their solution, once more. In four out of the five
contributions that Kathryn made, she was asking the boys questions and thereby positioning them as being competent and having authority. In all of these instances, Kathryn was acknowledged with engagement.

Summary of Positioning and use of Stereotype Threat Theory and Microaggression Theory as Interpretive Lenses

As previously mentioned, Kathryn had an underlying vulnerability to stereotype threat given her high competence in mathematics; her investment in her performance in the domain; the pressure she described as being inherent to mathematics class and group work more specifically; as well as her general discomfort with working with boys and the fact that she was working with two White boys who were known to be the strongest mathematics students in the class. Although there were no physical blocks coded, it was noted, that Kathryn had more limited access to the boys’ work given her physical position in the group. Although she engaged in exclusive talk with both boys, this was generally to ask them questions. The nature of the exclusive talk that took place between the boys was characteristically different in that they tended to refer to work that Kathryn had not yet done nor could she access. Although she would direct her questions towards one of the boys, both boys had the opportunity to respond (given their competence with the material, the fact that they had done the work, and their access to one another’s solutions) and in fact, they both tended to do so. Kathryn’s contributions tended to be in the form of questions and in doing so, she further positioned the boys as the competent mathematical authorities of the group.

Using stereotype threat theory as an interpretive lens, there are a number of factors that may have made this a particularly threatening learning context for Kathryn. At the beginning of the class, the teacher reminded the students of their upcoming test in analytic geometry and framed the group activity as a review, implying that the students should have been competent
with the material. These underlying conditions likely increased Kathryn’s pressure to appear competent and her vulnerability to stereotype threat. The fact that she was grouped with two boys who were known to be the strongest mathematics students in the class likely only served to exacerbate stereotype threat and the pressure that she was under to perform well (e.g., Inzlicht & Ben Zeev, 2000).

The boys lived up to their reputations during the session of group work by working quickly and appearing competent with the material. Unlike the other cases, there were no instances of physical blocks or direct challenges to the focal student’s contributions, however, the boys engaged in more implicit and subtle acts of marginalization that may have created pressure for Kathryn to work quickly and served to trigger stereotype threat. For example, they tried to maintain a fast work pace and, overall, they acted in ways that were consistent with the gender achievement stereotype in mathematics (e.g., appeared mathematically competent and confident). Once the boys had established that they solved the problem and reached agreement, they began to engage in subtle moves and mannerisms to indicate that they were ready to move on. Their relative positions as the authorities in the group was perpetuated by Kathryn’s repeated questioning. Using the lens of stereotype threat, this pattern of interactive and reflexive positioning was consistent with the gender achievement stereotype in mathematics. That is, the boys positioned themselves as being confident and competent authorities over the mathematical work while the only girl in the group, who lacked critical mass, deferred to the boys’ authority over the material (by asking them questions) and appeared less competent.

Kathryn may have experienced each of the subtle acts of positioning that indicated that the boys were ready to move on (e.g., checking the time, yawning, fidgeting) as gendered microaggressions. I now turn to Kathryn’s interviews to examine whether and how she identified, interpreted, and explained these acts of positioning.
What did Kathryn Have to Say?: Juxtaposing the Analyses of Video and Interview Data

(i) Identifying acts of Positioning

After watching the first segment of video analyzed above, Kathryn described how she felt that she was slowing the boys down and that they were moving on without her.

At some points I felt that like they were kind of moving on without me. And, I mean like, it was just a couple points and not like that much, but I felt like I was like kind of slowing them down because I didn’t understand certain parts of it.

Similarly, after watching the second segment of video, she explained how Collin and Luther had determined the solution, compared their answers without her, and had confirmed by consulting the solution printed in the textbook. Towards the end of the stimulated recall interview, Kathryn indicated that there were a number of occasions wherein Collin and Luther moved ahead without her and discussed the work in an exclusive way. She described how she resorted to just listening to them even though she was often working on the same problem as the boys:

I’m just kind of listening. Cause if they’re already discussing it then…I was just basically at the same question that they were but I was just listening. You know? Yeah. Then I would be able to solve it like myself, like just by listening to… hearing what [Collin] had to say.

According to Kathryn, her technique of “just listening” to the boys discuss the problems was strategic and helped her to solve the problems on her own. Like the other focal students, Kathryn ended up working independently.
When asked to reflect on her overall group work experience, Kathryn stated that, “it just kind of reminded me that sometimes people do move on without me.” She also stated that she constantly felt like she was the last one in the group to finish. She explained that by the end of the group work session, she was simply asking the boys for the answers and showing agreement so that she didn’t hold them up and they could keep moving on.

Like the researcher’s perspective, Kathryn identified the exclusive talk that took place between Collin and Luther. Unlike the researcher’s perspective, however, Kathryn’s narrative focused on the fact that the boys were moving ahead without her. The sections of video analyzed above centered on the fact that the boys were impatiently waiting for Kathryn to finish and they demonstrated this through various acts of positioning (e.g., checking the time). However, these moves did not seem to be salient to Kathryn. Rather than perceive the boys to be impatiently waiting, Kathryn described her sense that they were moving ahead without her and based this on their exclusive conversations. Even though the boys had not actually moved on to another word problem, to Kathryn, the fact that they were discussing the solution to the problem that she continued to grapple with was an indication that they were moving on. It is also possible that when Kathryn talked about how the boys moved ahead with her, she was thinking about other moments in the session of group work (not analyzed here).

(ii) Interpreting and Explaining Acts of Positioning

Kathryn had a number of explanations to account for the exclusive talk between the boys and their tendency to work ahead. First and foremost, she explained that they were strong in mathematics. She recognized that she too was strong in mathematics, but reasoned that they had different areas of expertise:

I would say that they are strong math students. I mean I think we’re on the same level, but
certain things like…we’re each good at certain like things like better than others. I mean I’m not sure what my strong suit is, but I mean, we’re each able to like help each other out.

It is also important to note that Kathryn recognized that she had been grouped with the strongest mathematics students in the class and she felt that this was because she too was a strong student and thought that this was a strategic move by the teacher. Drawing on stereotype threat theory, this awareness that she was intentionally grouped with boys who were known to be strong in mathematics and that she was expected to also perform well likely increased the salience of achievement and could have served as a stereotype threat trigger.

Kathryn also attributed the boys’ tendency to work ahead of her to the fact that they were more confident than she was:

Yeah, I mean they’re both pretty confident in themselves. Like they…you know, like, that they’ll like be able to solve a problem like relatively easily. And so like, for me- I mean like I don’t always have the same confidence. Like even if I think I know, I’m worried that you know, I’m doing it wrong…

Similarly, she explained that compared to the boys, she worked more slowly:

Because I find that they [the boys] I mean especially [Collin] like he works quickly and like pretty much without any errors. Like he just doesn’t have to- I mean, like for him it doesn’t take as long for him to do questions. I mean, whether that means he understands them better or just uhh…and he just likes them, I’m not sure. But, yeah. I find like…I think I work at a slower pace than he does and like well, I don’t think I work at a slow pace, they just work really fast. And so compared to that I’m slow.
Another explanation that Kathryn used to account for the boys’ tendency to work exclusively was that they “really liked math” and had a tendency to “get competitive when grouped together.”

Using stereotype threat theory as an interpretive lens, Kathryn’s emphasis on the boys’ strong mathematical competence and their ability to work quickly and confidently is consistent with the mathematics achievement stereotype that boys are more competent than girls. Because the boys’ actions and talk could be seen as confirming the gender stereotype, this further suggests the possibility that there was a threat in the air.

Kathryn also described feeling pressure to work quickly and keep up with her group members: “I was feeling a little bit of pressure because I just wanted to like move on and like finish everything by the time class ended. And so, just kind of wanting to be all done.” She also described her reluctance to ask questions when she did not understand the material because she did not want to further hold the group back:

…and I feel like I can’t ask them for help because they’re already finished the question and I don’t want to bother them or… I kind of get behind and frustrated that I can’t figure it out myself. Cause I don’t really want to ask for help cause if you’re like- I would be bothering them.

The above quote presents another gendered expectation, that girls should be polite and not bother people. Kathryn added that she tended not to ask for help because of her fear of looking stupid: “I was just like frustrated and I just didn’t want to ask because I felt like it was going to make me look stupid if I asked.” Drawing from the stereotype threat framework, the pressure that Kathryn described to keep up with the boys may have served as an additional stereotype
threat trigger. Her reluctance to ask for help for fear of looking stupid or further holding her group members back provides evidence of how stereotype threat might play out in a classroom setting and impact student interactions, learning, performance and so forth.

Further support for the assertion that there was a threat in the air comes from the finding that Kathryn made a number of “slip-ups” and was not performing at her best in the session of group work. Recall that the teacher placed Kathryn in the group because she perceived her to be as mathematically competent as Luther and Collin and Kathryn, herself, believed she was strong in mathematics. However, in this session of group work, she continuously found herself struggling to keep up and making mistakes:

I just made so many mistakes that I was just like, “ok, what’s the answer?”. Because, I mean, I knew how to do it afterwards, but then I was just like, “I don’t want them to be waiting for me.” So I mean, I probably should have done it on my own but I just like they were waiting for me to finish and so I just kind of wanted to get it down and then…And I felt like I just made some stupid mistakes and I did know how to solve it afterwards.

The fact that she explained that she could “solve it afterwards” further supports the idea that she was under threat during the session of group work. She was capable of solving the problem, but had two mathematically strong boys obviously waiting for her and putting pressure on her to maintain their fast work pace. These circumstances likely served to exacerbate the hovering threat.

Kathryn repeated the fact that she kept making “stupid mistakes” throughout the stimulated recall interview. After watching another segment of video, she seemed surprised by her actions and said that she “wasn’t even sure why” she had said and done certain things. In another example from the stimulated recall interview, she said:
It was just kind of a dumb mistake. Like I had added them or subtracted…like I had done the opposite of what I was supposed to do…so it was not like me to do that! So I was just kind of like, “that’s so dumb! I shouldn’t have done that!”

As the above quote demonstrates, these slip-ups appeared to be frustrating for Kathryn. Unlike the other cases discussed thus far, Kathryn was well aware of her slip-ups and was frustrated because she knew she could do the work. This finding suggests that stereotype threat might play out differently for people, like Kathryn, who are highly competent and identified with the domain. Based on the principles of stereotype threat, no matter how mathematically competent a person is, under the right circumstances, stereotype threat can impede performance. This pattern of findings aligns with seminal stereotype threat research investigating the gender achievement stereotype in mathematics (e.g., Spencer, Steele, & Quinn, 1999; Inzlicht & Ben Zeev, 2000). Although I do not have the data to conclusively discern whether or not Kathryn experienced stereotype threat, the findings of this case point to some evidence of how stereotype threat may be elicited and impact learning and performance in a real-world group work setting.

When asked whether and how issues of race or gender impacted her group work experience, Kathryn indicated that although she felt comfortable working with Luther and Collin, she generally feels some discomfort when working with boys, especially when she lacks critical mass and prefers to work with girls. She explained that there are often communication issues when either a girl or a boy lacks critical mass in a group. After describing how gender plays out in group work, Kathryn dismissed the idea of race playing any role explaining that people are generally respectful of one another.

Despite the fact that she admitted sometimes feeling uncomfortable working with boys, it was interesting that at times Kathryn contradicted herself in the interview by downplaying the
marginalizing moves of the boys, maintaining that she felt comfortable working with them. In fact, she maintained a high level of collegiality towards her group members in her interpretation and explanation of their actions. For example, although she focused on the fact that they worked exclusively and moved on without her, she placed blame on herself in perpetuating this pattern of positioning:

I was just wasting time trying to figure it out myself. So maybe if I had been a little bit more, like, if I had spoken a little bit more- that way we could have moved on faster instead of me getting like upset and not wanting to like communicate.

It is interesting to note that Kathryn was the only focal student to suggest that she should have been more vocal during the session of group work.

There were several other moments across the interviews wherein Kathryn downplayed the marginalizing moves of her group members. She also described feeling comfortable working with Collin and Luther even though in other parts of the interview, she described the pressure they placed on her and her general discomfort with working with boys. I cannot make claims about whether she did or did not feel comfortable working with the boys, however, there are a number of arguments to support why Kathryn may have avoided disclosing her discomfort. For instance, she did not know me (the researcher) very well and she may have had the desire to appear egalitarian, especially given the influence of the ‘egalitarian’ school culture. Furthermore, stereotype threat operates outside of a person’s awareness (Aronson, 2002) and Kathryn may have been unaware of its (potential) impact. The pattern of collegiality observed in this case connects to the theme of colourmute (i.e., the tendency to avoid talking about social identity, namely race, despite its salience; Pollock, 2004) and will be elaborated on in the Further Discussion section.
CHAPTER 9. THE CASE OF VALERIE

Part I: Meet Valerie

Personal Information and School Context

Valerie was 17 years old, self-identified as a medium to high SES, Asian (Chinese) Canadian girl, and was enrolled in a grade 11 Advanced Functions mathematics class at the time of the study. Valerie attended an all-girls school and her mathematics class consisted of 15 students of whom, 4 were East Asian, 1 was South Asian, and 10 were White. Although it was a grade 11 class, five of the students were actually in the 10th grade but had been accelerated into the grade 11 class. As will be elaborated below, it was a common practice at the school for high achieving students to be accelerated to higher grade levels. Accelerated students were known to be at the top of the class.

The school was situated in the heart of a large Canadian city, was comprised of mostly White and some Asian students. The annual rate of tuition was about $28,000 and the school consisted of grades 1 through 12. The admission process was fairly rigorous, involving an online application, in-person interview, and consideration of academic reports from three previous years.

Valerie emphasized the elite nature of the school and its focus on academic excellence. She described the heavy work load and the constant pressure to “work ahead and get high grades.” At one point she referred to the school as a “total jail cell” because of its competitive nature: “From my other friends who are in public schools, our school sounds, sorry, but it sounds like a total jail cell. It is very competitive, I find.” She talked about how the competition between students was exacerbated by the fact that student achievements were publicly celebrated at their weekly school-wide assemblies. She said that she often left the assemblies
feeling as though she needed to “step it up a bit.” According to Valerie, it was more about “how much you do more than what you do” at her school. In addition, the school had a well-known mission to prepare its girls to be confident and courageous leaders in the world.

Valerie indicated that the school had a focus on mathematics and the sciences, which was less than ideal for her given her preference for the arts: “The school’s science oriented and math oriented. And just being an art student doesn’t really help either. So it kind of puts this whole pressure on me.” She elaborated on the fact that she felt out of place at the school because of her artsy nature and lack of interest in mathematics and sciences. Valerie also explained that she felt that she had to work a lot harder than other people because of the school’s emphasis on domains that she did not feel represented her strengths. She added that she also felt like “the black sheep” of her family because they too put pressure on her to pursue mathematics and they underappreciated her interests in the arts.

Another source of pressure that Valerie described at the school was its celebrated practice of accelerating students to higher grade levels:

The one thing I have a little bit of an issue with in this school is that they excel a lot of the students. And because of that, because they give you this opportunity of working ahead, there’s this huge pressure of doing…like becoming like, the smartest in your grade or something like that. Working with the older grades is something that you have to achieve and it’s something that really reflects like, “if you get up here that’s really good.”

She explained that the process of being advanced to higher grade levels was talked about by not only her teachers but the students. Valerie talked about a great deal of pressure to get good grades so that you could be advanced to a higher grade level. Given that she was in grade 11, Valerie also mentioned the added pressure of getting into post-secondary school. Taken
together, Valerie felt a tremendous amount of pressure to do well at her school and felt that relative to her classmates, she was not as successful academically:

This school…they really excel the girls and there’s a lot of pressure to do well. Plus, there’s a lot of pressure to get into universities which is even worse. And um…I mean, I feel like, half of it is to, like, it’s for the name of the school. We produce these really elite girls and they do great things in this world. And…being not up to that accelerated standard, I feel like I’m below the bar, below the expectations of the school.

Although she emphasized the competitive nature of the school, Valerie explained that most students tended to get along and she indicated that there were no issues of race, gender, class, or so forth at the school. There were, however, some problems associated with split-grade classes. Valerie explained that within these classes, there was a tendency for students to be friends with their same-grade level peers. These students tended to sit together, work together, and socialize more exclusively. She described a local stereotype, or as Wortham (2006) would say, a *local metapragmatic model*, of the girls who had been accelerated. According to Valerie, accelerated students were seen as “elite overachievers” who were highly intelligent, competitive, hard workers. She presented these students in a more negative light and spoke about how non-accelerated students tended not to associate with the accelerated students in mixed-grade classes because they made the non-accelerated students (including Valerie) feel uncomfortable, “subpar”, and pressured to do well. Within her mathematics class, Valerie described a hovering tension in the room between the grade 10 and 11 students and described how the grade 11 students felt as though they *should* be smarter than the grade 10s because they were older, but because the grade 10s were so strong in mathematics, they often tended to be the top achievers in the class:
...And when I’m working with these younger students, I feel a little bit, I guess, I don't fit in that criteria, I don’t fit in that umm...you know, overachieving category? And when I work with these grade 10s, it’s comparing myself to like, I’d say an overachiever and a normal person. ‘Cause, like this class is like a normal class for us but for them it’s like, like you’re in the next level. You’re above your own grade...Working with them, I have a little...it’s a little

bit off for me.

In her interview, the classroom teacher described this inter-grade dynamic in a similar way and explained how she was aware of the issue and took strides to try to foster greater cohesion between the girls.

Valerie’s Mathematics Identity

According to Valerie, she had to work very hard in mathematics because it does not come “naturally” to her. She explained that with a lot of hard work, she could be quite strong in mathematics, but she believed it required more effort than that required by the average person. She indicated that her classmates and teachers would also perceive her as “hard working”.

Valerie indicated that she did not enjoy mathematics and that it was one of her least favorite subjects. She did, however, recognize its importance in the real world. Like the other focal students, Valerie viewed mathematics as one of the most important subjects in school and saw it as a gatekeeper to other things in life, including her potential future career in business. She highly valued her mathematical performance and described a great deal of pressure to get high grades.
When asked about her knowledge of achievement stereotypes in mathematics, Valerie immediately acknowledged the Asian achievement stereotype. She explained that this was a salient stereotype that everyone knew about it. Valerie explained her belief that “now-a-days, people understand that not all Asians are strong at math” but added “it’s still there. That stereotype is still there!” She explained that stereotypes are a normal part of society but that she tries not to let them impact her: “Stereotypes don’t really get me down. It’s just…I guess, normal society things. It happens. It’s there. You can’t hate it forever.”

Valerie’s Group Work Figured World

According to Valerie, the main advantage to working in small groups is the opportunity for people to “bounce ideas off one another.” However, she went on to say that this was a real challenge because in her mathematics class “you have to keep up the pace of the others” and there was a real pressure to work quickly. Although she stressed the importance of helping those that struggled with the material, she recognized that this was a challenge given the fast pace of group work. She indicated that overall, the people in her class had a reluctance to stop and help others:

I know that in group work, you try to get things done a lot faster…I’ve noticed that a lot of times, people don’t wait. People don’t stop and help. Which is kind of weird, cause, your gut reaction is you have to stop and help people if they are in trouble. But when it comes to getting stuff done, whether it’s last period or like third period in the middle of the day, they just want to keep on working. Work, work, work. And leave everyone in the dust. Which is really strange. That’s the whole mentality of this school that I…I feel sometimes. When I’m the one being left in [the dust]… behind. Or helping someone who’s being left behind. It’s
kind of a shame that no one stops and helps.

Valerie repeated the importance of helping those in need regardless of whether it slowed the group down because she believed group work was ideal when everyone was on “the same page”. However, she recognized that this was seldom a reality in her mathematics class.

In addition to describing the pressure to work quickly in group work, Valerie described a pressure to do well, particularly when she was grouped with strong mathematics students. Within group work, according to Valerie, there were people who tended to lead, people who tended to fall behind, and people who tried to bridge this gap. She positioned herself as either one of the people who tried to help others or one of the people who got “left in the dust”. When she was grouped with strong mathematics students, Valerie described her tendency to refrain from sharing her ideas: “I find that when I’m with people who I guess are more, work well in math, I just tend to sit back and I don’t really put out my ideas.” It was evident that Valerie did not feel comfortable working with people who were strong in mathematics because of the pressure it put on her to perform well and work quickly. She also indicated having a preference for working with her same-grade peers (rather than the “overachieving” 10th graders).

According to Valerie, group work is ideal when there is an even number of students in the group: “It’s always better to have even numbers so that you can divide the group evenly and not have one sole person be left out.” Like many of the other focal students, she also suggested that group work was best when the students were arranged in a circular configuration rather than sitting at their desks in a straight line.

Summary of Background Information and Connections with Microaggression Theory and Stereotype Threat Theory
Valerie emphasized the high pressure for achievement in mathematics at her school and within her class. This pressure for high achievement not only came from the elite school culture and competition amongst students, but also from her family. Despite her preference for the arts, she valued her performance in mathematics and viewed it as one of the most important subjects in school.

Like many of the other focal students, Valerie’s figured world of group work suggested that there was often added pressure to maintain a fast work pace especially when she was grouped with top mathematics students. Based on the principles of stereotype threat, it seems likely that when the stakes are high and there is a great amount of pressure for success (and to work quickly etc.), the likelihood that a stereotyped individual would experience stereotype threat would increase (e.g., Steele & Aronson, 1995). Valerie described an element of discomfort when she was grouped with 10th grade students who had been accelerated. She described the local metapragmatic model of the grade 10 students being “elite overachievers” and the pressure that she felt to perform as well or better than her 10th grade classmates. Given the salience of this metapragmatic model at the school and its relevance to academic achievement, it is reasonable to apply the principles of stereotype threat to it.

According to Valerie, the stereotype that Asians are good at math was widely known in society and salient in her school. Given that she self-identified as Asian, like the cases of Jackie and Hailey, it is possible that Valerie felt some pressure to live up to the stereotype (Cheryan & Bodenhausen, 2000) and/or expected that others would judge her based on the stereotype.

Valerie’s narrative provides an illustrative example of how multiple stereotypes, operating at different timescales, play out within real-world classroom settings. That is, at any given moment, Valerie may have been contending with the stereotype that Asians are good at math and/or the stereotype that students in higher grades should know more than students in lower grades and/or the local metapragmatic model about the grade 10 elite overachievers (and
how relatively, Valerie, as a grade 11 student, would be considered intellectually inferior). In addition, although she did not mention the gender stereotype and it was an all-girls school, issues of gender were certainly in the air given the school’s feminist ideological underpinning and explicit goal of preparing its girls to be leaders and innovators in the world. Similar to the other cases, there are a host of other aspects of identity that may have been involved in Valerie’s moment-to-moment experiences in group work, I have merely highlighted the aspects of identity that came up Valerie’s the interviews.

Although Valerie valued her performance in mathematics, she was not highly identified with the domain and preferred the arts. This may have made her generally less susceptible to stereotype threat than someone like Kathryn who was highly identified with mathematics (e.g., Aronson et al., 1999). Nevertheless, based on Valerie’s narrative, stereotype threat would be particularly likely if she was working with 10th grade students and lacked critical mass. In such a situation, she could be contending with the pressures associated with working with elite 10th graders and struggling to live up to the stereotypes that Asians are good at math (Cheryan & Bodenhausen, 2000) and that grade 11 students should be smarter than grade 10 students (and possibly more). Applying the principles of stereotype threat, a group work situation wherein Valerie lacked critical mass or there was an increase in the salience of grade level, age, race, or even achievement could elicit stereotype threat. With this in mind, I turn to a case of group work wherein Valerie was assigned to work with two, White, 10th grade girls.

Part II. Microanalysis of a Case of Group Work

Meso-Level Information: Setting the Stage

(i) The Group
Valerie was assigned to work with two 10th grade, White girls, Chloe and Edith. According to Valerie, Chloe was the leader of the group for the most part, but there were times in which the leadership role shifted to Edith. She explained her tendency to “sit back” as Chloe and Edith took turns leading the group. Referring back to the inter-grade dynamic previously described, Valerie did not consider herself to be friends with Chloe and Edith. She explained that she did not know them very well and rarely interacted with them in class. She indicated that because they were both grade 10 students, they were friends with one another.

(ii) The Mathematics Task

The goal of the activity was for the girls to practice the concepts that they had covered the previous day on trigonometric functions by collaboratively completing a series of questions from their textbook. They all referred to Chloe’s textbook throughout the session of group work. They were accustomed to working with sine and cosine graphs in radians. The assigned word problems found in the textbook presented the graphs in degrees. As a result, the teacher provided every student with an accompanying slip of paper presenting the same graphs in radians. Each student also received a copy of the solutions so they could check their work along the way.

During the first segment of video, the girls were analyzing two graphs depicting the speed of two paddlewheels and discussing how they differed (see Figure 34, below).
2. Marianna collected some data on two paddle wheels on two different boats and constructed two graphs. Analyze the graphs, and explain how the wheels differ. Refer to the radius of each wheel, the height of the axle reset to the water, the time taken to complete one revolution, and the speed of each wheel.

Figure 34. Textbook image illustrating the word problem the girls were working on during the first segment of video.

The second segment of video occurred about 10 minutes later when the girls had moved on to the next question in the series. For this question, they were given a graph to understand the speed at which a tooth on a saw blade traveled. Their task was to determine the period of the function, the amplitude of the function, and how fast the tooth on the circular cutting blade travelled in inches per second (see Figure 35 below).

Figure 35. Textbook image depicting the second problem the girls worked on as a group.

The third segment of video occurred about 3 minutes later when the girls moved on to the last question in the series. For this question, they were asked to sketch a height-versus-time graph of two sinusoidal functions (see Figure 36, below).
Figure 36. An image from the textbook depicting the third problem the girls worked on as a group. The girls were assigned to work on questions 6 (a) and (d) depicted above.

The groups were assigned by the classroom teacher. She indicated in her interview that she purposefully integrated the grade 10s with the grade 11s and attempted to group girls with similar levels of mathematical competence.

**Microanalysis of a Segment of Group Work**

The following analysis is based on two minutes and 15 seconds of video taken from three separate points in the session of group work. The first segment of video was just over a minute in length and is based on the girls’ interaction when they were comparing two graphs (see Figure 34, above). The second segment of video was about 30 seconds and was based on their interaction when they were determining how fast the tooth on a saw blade travelled (see Figure 35, above). The third segment of video occurred about 3 minutes later, was about 45 seconds in length, and was based on their interaction when they were sketching a height-versus-time graph of a sinusoidal function (see Figure 36, above). The clips were selected because they depicted moments of marginalization as well as what appeared to be group cohesion. The moments of cohesion were interesting in light of the neighboring moments of marginalization and thus, they were selected to gain further insight from Kathryn.
Vignette 6: “I just Pretended to Actually Understand what was Happening”

The girls were comparing graphs depicting the speeds of two paddle wheels. Chloe thought aloud, posing and answering her own questions as Valerie and Edith worked silently. Moments later, Edith joined the conversation and, referring to her graph, indicated the points on the graph that they could use to calculate the time taken for the smaller paddle wheel to complete one revolution. As Edith spoke, Valerie leaned in to see what she was referring to.

![Figure 37. Valerie leaning towards Edith and the graph she was referring to.](image)

A few moments of silence then followed as the girls appeared to work independently. After determining the solution, Edith looked to Chloe and said, “so, would you say 12 seconds?” A series of back and forth utterances then ensued as Chloe and Edith discussed the problem and Chloe eventually stated her agreement. In the meantime, Valerie, looked towards Edith’s work, watched the girls interact, and wrote her own calculations. After the girls had already voiced their consensus, Valerie chimed in that she agreed that it would take “12 seconds” for the small paddle wheel to complete one revolution. Edith and Chloe went on to discuss the time taken for the larger paddle wheel to complete one revolution.

Ten minutes later, the girls had moved on to the next question in the series. They were determining the amplitude of a graph depicting the speed of a saw. Like the previous question,
Chloe was thinking aloud as she wrote and exchanging ideas with Edith who was also writing. Valerie, on the other hand, remained quiet and looked towards the girls and their work from time to time (see Figure 38, below).

![Figure 38](image)

*Figure 38.* Valerie appearing confused while the Edith and Chloe worked through the problem.

After she had determined the solution, Chloe asked Edith whether the amplitude was “2 pi over 0.04?” Edith, who was aware that Chloe was looking towards her, nodded yes as she continued to write. Valerie then quickly chimed in, “yup” to demonstrate her shared agreement. Edith then reached for her calculator to further simplify the solution and Chloe joked that it would be an “ugly number” and told her not to bother with the simplification. The girls laughed and then returned to working independently, with Valerie glancing towards Edith’s work from time to time (see Figure 39, below).

![Figure 39](image)

*Figure 39.* Valerie glancing towards Edith’s work as Edith and Chloe continued to work independently.
A few moments later, Edith, who had carried out the simplification despite Chloe’s reservations, said, “[Chloe], if you just do two divided by point zero four and keep the pi, it’s just 50 pi” to which Chloe replied, “Oh! Good call. I was right, it’s huge” and the girls proceeded to write. During this exchange between Chloe and Edith, Valerie watched on and continued to work independently.

Figure 40. Exclusive conversation taking place between Edith and Chloe and Valerie worked independently.

A few minutes later, the girls moved on to the next question in the series wherein they had to sketch a height-versus-time graph of two sinusoidal functions. As Chloe began to share an idea, her voice trailed off and she appeared to be doing a calculation in her head. Valerie then continued to develop Chloe’s idea. Chloe agreed with Valerie’s chain of thought and finished sharing her idea. When she finished, Valerie nodded her head in agreement and said, “yeah…makes sense, yeah!” However, Chloe quickly interjected with a “no!” explaining that they had misinterpreted the problem. By this point, Edith stopped writing and appeared to be attending to the conversation. As Chloe explained an alternate method to move forward, she pointed to her work, which was angled towards Edith, and Edith nodded her head in agreement (see Figure 41, below). Valerie continued to watch the girls and verbally indicated her
agreement once Chloe finished sharing her ideas.

Figure 41. Chloe referring to her work as she presented her ideas while Edith followed along closely and Valerie watched on.

(i) Interactive Positioning

(a) Use of and access to shared learning artifacts: The girls each had their own sheet of paper to write out their calculations and solutions. They also each had a handout depicting supplementary information about the word problems assigned from the textbook. The girls were sharing Chloe’s textbook throughout the session of group work. Valerie maintained high access to the textbook throughout given that it was placed directly in front of her, however, there were times when Chloe and Edith had to lean and contort their heads to better access it.

With respect to the other learning artifacts, although they were not shared, there were times during their exclusive conversations wherein Chloe and Edith referred to one another’s work and angled their work towards each another (see Figure 41, above). This made it difficult for Valerie to see what they were referring to and she resorted to leaning in at times to access the information. A pattern was observed in that neither Chloe nor Edith had to lean to access one another’s work and this appeared to be because they verbally exchanged information and/or angled their learning artifacts towards one another when necessary.

(b) Physical interactive positioning: The girls were seated in a triangular formation with Valerie and Edith sitting side-by-side and Chloe seated directly across from them. In general, all girls had high access to the interactional space and there were no physical blocks coded.
(c) Verbal interactive positioning: Chloe positioned herself as an authority in the group by thinking aloud and thereby monopolizing the conversational floor and exerting control over the ideas that got taken up in the group work. In turn, this served to position Valerie (as well as Edith) as having less authority and power in the group. When she was not thinking aloud, Chloe was often engaged in exclusive conversations.

Overall there were four instances of exclusive talk coded. During the first segment of video, there was one extended instance of exclusive talk between Edith and Chloe as they calculated the time it would take for a paddle wheel to complete one revolution. The exclusive nature of this exchange was marked by Edith pointing her question directly to Chloe followed by a steady back-and-forth exchange between the girls, including the periodic exchange of glances towards one another.

During the second segment of video, there were two additional instances of exclusive talk. In the first instance, Chloe looked towards Edith and asked her to confirm the amplitude of the function. The girls then had an extended back-and-forth exchange about whether or not Edith should further simplify the solution. After a moment of independent work, Edith then explicitly addressed Chloe again, stating the simplified solution and the girls had another back-and-forth exchange as Valerie watched on.

During the third segment of video, there was an extended instance of exclusive talk between Chloe and Valerie as they discussed how to sketch the graph for a given function. Half way through this exchange, however, Chloe voiced her disagreement and recommended a different approach to graphing the function. While she provided her justification, although she looked towards Valerie from time-to-time, she referred to her work and angled it towards Edith, thus incorporating her into the discussion.

Taken together, three out of the four instances of exclusive talk occurred between Chloe and Edith. In the one instance in which Valerie was part of the exclusive talk, her idea was
challenged and she had limited access to the learning artifact that Chloe was using to justify her contribution. A pattern of marginalization was thus observed (i.e., exclusive talk between Chloe and Edith) and this, at least in part, may have been associated with race and/or grade level.

(ii) Valerie’s Reflexive Positioning

(a) Non-verbal reflexive positioning. There were two instances wherein Valerie leaned to better access Edith’s work. Both of these leans occurred while Edith was making reference to her work and in the second instance, Valerie’s lean took place while Edith and Chloe were engaged in exclusive talk. Neither Chloe nor Edith responded to either of these subtle leans. Although no other leans were coded, it should be noted that Valerie looked towards the work of Edith a number of times and looked towards Chloe when she thought aloud and shared ideas.

There were two instances in which Valerie non-verbally communicated positive engagement. During the second segment of video, Valerie smiled during a back-and-forth exchange between Chloe and Edith wherein Chloe suggested that Edith refrain from further simplifying the solution because it would be “an ugly number.” This suggests that although Valerie was not involved in the conversation, she remained attentive to what was being discussed. In the third segment of video, after Chloe voiced her sudden change of mind about how they should go about constructing their graph, Valerie smiled and laughed:

Valerie: So, 20 seconds, it goes over half and then down…

Chloe: Yeah. It’s gonna be…it’s gonna be…it starts here [pointing to a point on the graph]

it’s gonna be 10, 20, 30, 40…[counting points on the graph]

Valerie: [interjecting and nodding in agreement] Yeah. That makes sense. Yeah!

Chloe: No!

Valerie: No?
Chloe: No!

Valerie: [laugher]

Chloe: No. ‘Cause it’s gonna be [again referring to points on the graph] 5, 10, 15, 20, 25…cause it has to go down and up.

Valerie: Right [nodding head to indicate agreement and understanding]

Here, although her previous contributed was being challenged, Valerie appeared to be having a positive interaction with Chloe.

During the second segment of interaction, there was one instance in which Valerie appeared to be unhappy and/or frustrated. Following a brief period of independent work, Valerie looked up from her work and towards the girls and sighed deeply. Moments after this, Chloe and Edith began their exclusive discussion about how to calculate the amplitude of the function.

(b) Verbal reflexive positioning. Valerie made five intellectual contributions across the three segments of interaction. In the first segment, she indicated her agreement with Edith’s calculation that it would take “12 seconds” for the smaller paddle wheel to complete one revolution. It is important to note that this contribution was made during a back-and-forth exchange between Chloe and Edith. The girls did not appear to respond to this contribution and this was perhaps because they had already reached a consensus and had begun to move on. Similarly, during the second segment of interaction, when Chloe asked Edith to confirm her calculation of the amplitude of a function, Valerie inserted herself and responded, “yup”. Again, the girls did not appear to respond to this agreement.

During the third segment of interaction, Valerie made three intellectual contributions to the discussion around graphing a particular function. Her first contribution was the further development of an idea presented by Chloe and this was acknowledged with engagement by Chloe. Chloe then proceeded to elaborate on her thinking and Valerie contributed to the
conversation by stating her agreement, “yeah that makes sense.” Chloe responded to this with explicit disagreement and changed her suggested approach for graphing the function. While Chloe shared her revised plan, she referred to her work which was angled towards Edith and out of Valerie’s field of view. Nevertheless, Valerie appeared to follow along with Chloe’s justification and expressed her agreement. This appeared to be accepted by Chloe, albeit without comment.

Taken together, four out of the five contributions that Valerie made were to express her agreement with her group members and in one of the instances, she was further developing an idea presented by Chloe. Three of her contributions occurred during periods of exclusive talk between Chloe and Edith and this demonstrates her persistence in contributing to the task. Three of her contributions appeared to be ignored (i.e., neither girl physically oriented or looked towards Valerie nor did they verbally acknowledge her agreement), one was explicitly challenged, and one (wherein she expanded on Chloe’s idea) was met with minimal positive engagement (i.e., Chloe said “OK”).

Summary of Positioning and use of Stereotype Threat Theory and Microaggression Theory as Interpretive Lenses

From the outset of the activity, this group work context was vulnerable to stereotype threat. To add to the underlying vulnerability, the girls positioned Valerie as a marginal member of the group through their exclusive talk, exclusive use of learning artifacts, and minimal engagement with her contributions. Despite this pattern of interactive positioning, Valerie persistently made a number of intellectual contributions, even during periods of exclusive talk between Edith and Chloe. Her contributions mainly served to show agreement with the ideas presented by the others.
Using the lens of microaggression theory and considering Valerie’s narrative about the “elite overachieving 10th grade girls”, it is possible that Valerie would attribute the marginalizing acts of positioning to the fact that she was an 11th grader (and not part of the elite group of accelerated 10th graders).

Drawing on the principles of stereotype threat theory and the finding that stereotype threat can be triggered (and performance hindered) when a person is working with people who are known to be superior in a particular domain (Aronson et al., 1999), Valerie may have experienced stereotype threat and the associated consequences because she was working with the elite 10th graders. Further to this, she may have experienced pressure to live up the stereotype that “Asians are good at math” as well as the stereotype that “students in older grades should know more than students in lower grades.” These claims remain speculative and I now turn to the interview data to investigate whether and how Valerie identified, interpreted, and explained these acts of positioning.

What did Valerie Have to Say?: Juxtaposing the Analyses of Video and Interview Data

(i) Identifying acts of Positioning

Like the researcher’s microanalysis, Valerie identified the exclusive conversations that took place between Edith and Chloe. For example, she pinpointed the moment in which Edith addressed Chloe specifically when making a comment and explained how it made her question whether she was even part of the group: “When she only addressed [Chloe], I felt like, “oh, am I part of this group too? Like, is it just you and her?” Valerie also spoke about Chloe’s tendency to think aloud while she worked and this seemed to be a very salient act of positioning to Valerie:
[Chloe] was basically the leader for the whole entire group. And, the fact that she was speaking out loud, I guess I just followed those instructions so I didn’t really talk a whole lot. I just listened and I did it and that was it.

It appeared that Valerie interpreted Chloe’s think-alouds as implied instructions for the group. Although Chloe’s tendency to think aloud was noted in the researcher’s microanalysis, Valerie’s narrative highlighted it much more. Valerie’s narrative brings to light how significant this was for her in shaping the group dynamic and implied available roles in her figured world of group work. By thinking aloud, Chloe was able to maintain the conversational floor and exert control over the ideas that got taken up.

After watching the segments of video above, Valerie also talked about the way the power, or in Valerie’s words, “leadership”, shifted back-and-forth between Edith and Chloe. She did, however, seem to focus on Chloe’s marginalizing acts of positioning. In addition to the “think aloud” example described above, Valerie spoke at length about the moment in which Chloe voiced her sudden dissent from the agreed upon approach to graphing the function:

So we were discussing the scale, I remember that, and then umm, Chloe said something about like going up by 10s. So I was like, “oh yeah sure, that’s…yeah, that sounds good to me.” And then she’s like, “nooo!” and I’m like, “oh, that’s awkward”…But that was the main thing I remember during the group work. It was that little “no, that’s wrong” I was like “oh! Mmmm” A little uncertain. So… I remembered that! That stuck in my head.

Although this moment was coded in the researcher’s microanalysis, it was not highlighted to the extent that Valerie did. To her, this was the most memorable moment of the session of group work. From the researcher’s standpoint, Valerie appeared to amicably move on and even voiced
her agreement with Chloe. In the next section I will elaborate on how her tendency to agree with
Chloe and Edith was a strategic move and that, according to Valerie, the group dynamic was not
as amicable as it seemed.

(ii) Interpreting and Explaining Acts of Positioning

This case provides an example of how salient local stereotypes, or metapragmatic
models, can impact learning, performance, interactions and so forth through a process that is
akin to the stereotype threat phenomenon. That is, Valerie indicated that from the moment the
groups were assigned, she felt “psyched out” because she was grouped with two 10th graders.
She described how, as a result, her confidence and focus was compromised:

When [the teacher] put the groups down, I was a bit intimid[ed], I was like, “oh, oh gosh.”
‘Cause those two grade 10s are actually known to be really good at math. And so that kind of
psyched me out. So I didn’t really focus a whole lot.

Using stereotype threat theory as an interpretative lens, it appears that the threat was triggered
from the moment the teacher assigned the groups. Marginalizing acts of positioning aside,
merely knowing she would be working with the elite 10th graders was enough to “psych”
Valerie out and subsequently impede her ability to focus and perform the task. What is
interesting from the above excerpt is that, without solicitation, Valerie demonstrated
attributional awareness. That is, she attributed her feeling of intimidation and her perceived lack
of focus to the fact that she was grouped with two “elite overachievers”. Unlike any of the other
focal students, Valerie explicitly attributed her perceived shortcomings in the group work to the
characteristics of the people she was working with. This counters pervious empirical work
investigating stereotype threat, which predicts that it is unlikely for people to attribute their underperformance to identity threats (Aronson, 2002).

Valerie reported a great deal of discomfort and pressure to “perform well” when working with the 10th graders: “I had this pressure to perform well. Also because, I was older, I felt like I needed to be at the same level, maybe even higher than them. Yeah. Working in this group wasn’t- I wasn’t the most comfortable.” Here, Valerie described the pressure she felt to live up to the stereotype that “older students should be smarter than younger students.” She described her perception that the grade 10 students could sometimes be judgmental because, contrary to the norm, they were younger yet working at the same level as the 11th graders: “…There’s some times where I feel like they are a little bit judgmental cause like ‘yeah, I’m younger than you and I’m working at the same level’ like, ‘you should be a little bit smarter.’” This finding aligns with stereotype threat theory in that it demonstrates that individuals can feel pressure to live up to self-relevant stereotypes (e.g., Cheryan & Bodenhausen, 2000), in this case, that older students should be smarter than younger students. It also provides narrative evidence of how stereotyped individuals are aware that they might be judged by self-relevant stereotypes. The current study builds on the stereotype threat theory corpus by providing a narrative account of the experience of pressure rather than relying solely on achievement data to investigate stereotype threat. This will be elaborated on in the Further Discussion chapter.

According to Valerie, the fact that her grade 10 classmates appeared more competent with the material reduced her confidence in her mathematical ability made her feel awkward: I didn’t really take anything because I was just following them. And I wasn’t really too confident with the material. Plus, they also seem like they, umm, understand it a lot more than me. So, a grade 11 who’s, I guess, in this case, not smarter than a grade 10, it kind of feels a bit awkward.
She also explained how her “confidence was down” because she did not have her fellow grade 11 peers in the group:

I guess you can say that my confidence there was a little bit, like on the down side…The fact that I wasn’t with any grade 11s, I was with two grade 10s that I didn’t know that well because they sit on the other side of the classroom. Umm…it was different and I kind of- it was, I felt a little bit challenged…

She later went on to say that the group work would have been a better experience for her if she “had one other grade 11 there”. This finding aligns with stereotype threat theory which predicts that stereotype threat is more likely to occur in situations wherein individuals from stereotyped social groups lack critical mass and are working with individuals from dominant groups. In this context, Valerie lacks critical mass in that she is the only Asian member of the group, she is lower-achieving compared to Chloe and Edith, and she is the only 11th grader in the group.

When asked whether and/or how race, gender, or other aspects of identity come into play during her group work experiences, Valerie reported that her school generally “doesn’t have any issues.” She then hedged this claim by explaining that sometimes in group work, when working with new people, she perceived that they had high expectations for her mathematical performance simply because she was Asian:

I still think that whenever I go into group work with new people that I don’t know there’s this subtle- there’s this little thought that, “oh, she’s Asian, she might be good at math, so I might not have to work that much”. And sometimes when she…and when they have to explain something a lot more than they first thought then it was like “ohhh”…[disappointed sound effect that she makes at 08:59] “yeah, sorry, I’m not that good at math”.

Valerie went on to explain that she believed that this is what happened during her group work experience with Chloe and Edith.
I felt like when… there was probably some hint of, “well, she might be good at math…like we don’t really know for sure until she actually works hard at it”. There might be some like, I guess, stereotype there. I felt like... I kind of felt that.

This provides further support for the claim that Valerie felt she was being judged by the stereotype that “Asians are strong in math”. Stereotype threat theory would predict that this pressure to live up to the stereotype likely interfered with her performance on the task by, as Valerie described, compromising her ability to “focus” on the task. These feelings of intimidation, lack of “focus”, and pressure to live up to certain stereotypes, not only shaped Valerie’s performance on the task but also likely interfered with her learning. I will elaborate on this point in the Further Discussion section.

Like the other focal students, Valerie attributed Chloe and Edith’s exclusive conversations and use of learning artifacts to the fact that they were friends. However, unlike the other focal students, she explicitly tied their friendship to the fact that they were both 10th graders. For example, when speaking about Chloe’s bodily orientation towards Edith, Valerie said:

I feel like it’s more like- it’s pretty understandable that [Chloe] is facing more towards her classmate, well, I guess her grade 10 classmate rather than me because she knows her more.

And, I guess she also feels a bit awkward talking to me. I wouldn’t be surprised!

Again, Valerie highlighted the friendship dynamics of the class and how the students tended to segregate according to grade level. Towards the end of the interview, Valerie indicated that she would have felt much more comfortable and enjoyed the group work if she had been able to work with one of her (11th grader) friends, again highlighting the need for critical mass.

It was previously speculated that Valerie’s tendency to agree with Chloe and Edith may have been a strategic move to avoid disagreement and appear competent. In her interview, Valerie provided further support for this claim. Firstly, she described her general tendency to
refrain from sharing her ideas when she worked with strong mathematics students: “I find that when I’m with people who I guess are more, work well in math, I just tend to sit back and I don’t really put out my ideas.” She went on to refer more specifically to her experience working with Edith and Chloe and described her tendency to “agree with everything” and “pretend” to understand what was happening:

There’s some cases where I felt a bit awkward and I just pretended to actually understand what was happening...I mean, when they said something like, “this is the scale”, I’d be like, “yeah, that’s it! Yeah!” [laughing]. I just agreed with everything. I’m like, “ok!”.

Valerie’s narrative revealed that although the group dynamic appeared amicable and cohesive, particularly when she repeatedly voiced her agreement, this was not a reflection of how she experienced the interaction. Valerie indicated her strategy of following along, even when she disagreed, in fear of making the interaction uncomfortable. For example, after viewing the video footage of when Chloe indicated her sudden dissent from the agreed upon approach for graphing the function, Valerie explained:

..But then I thought about it and then I was like, “but wait, doesn’t it work though?” So, I thought that and I’m like, “but it does work”. But then I, I guess I was a little too…I was worried that like if it was actually wrong, if I actually pushed it, then, it would make me feel even more awkward. So I just left it alone. I’m like, “ok, it’s wrong”. Like…yeah. I won’t say anything.

This finding adds to the stereotype threat theory corpus in that it provides a real-world example of the way that students may find ways to cope with microaggressions and stereotype threat in interaction. The stereotype threat literature suggests other coping mechanisms such as avoiding the limelight and potentially threatening situations (Davies et al., 2005). Valerie’s strategy of agreeing with her group members allowed her to avoid the limelight and potential disagreement (i.e., a threatening situation).
Valerie maintained this collegiality during the interviews. That is, when sharing any kind of negative impression of the experience or her group members, she was quick to use adjectives and add phrases to downplay the impact of her impressions. For example, the following set of utterances (pulled from previously presented excerpts) all contain forms of hedging:

So, a grade 11 who’s, I guess, in this case, not smarter than a grade 10, it *kind of feels a bit* [Italics added] awkward.

There’s some cases where *I felt a bit* [italics added] awkward and I just pretended to actually understand what was happening…

I felt like when… there was *probably some hint of* [italics added], “well, she might be good at math…like we don’t really know for sure until she actually works hard at it”. *There might be some* [italics added] like, I guess, stereotype there.

Working in this group wasn’t- *I wasn’t the most* [italics added] comfortable.

When [the teacher] put the groups down, *I was a bit* [italics added] intimidated

As previously mentioned, Valerie indicated that some of Edith and Chloe’s exclusive conversations and marginalizing acts of positioning were reasonable given that they were both 10th graders. She even stated that she did not “blame” them. The principles of Pollock’s (2004) notion of colormute (i.e., the tendency to avoid talking about race despite its salience) can be applied here. Valerie may have opted to use egalitarian discourse in her account of the group work. She presented the school as being devoid of issues of race and indicated that students tended to be respectful of one another. Although she did discuss the social tensions within the
split-grade classes as well as the culture of competition that existed between many students, at various other points in the interview, she contradicted herself stating that these issues were minor and that overall, there was intergroup harmony. She even indicated that despite her negative group work experience with Edith and Chloe, she felt that it was a good idea to have mixed-grade groupings so that students could get to know one another. Valerie may have believed that there was intergroup harmony at her school or it is possible that her collegial narrative was influenced by the ‘egalitarian’ school culture. It is also possible that Valerie believed and supported both sides of the contradiction (i.e., that there were social tensions but that there was also intergroup harmony). I do not have the data to make a definitive claim one way or another.
CHAPTER 10. SYNTHESIS OF FINDINGS ACROSS CASES

School Culture: Social Cohesion and High Pressure for Academic Achievement

All the private schools in this study were considered prestigious and, based on the student narratives, exuded an elitist culture. That is, the students were nurtured to be the best and brightest “leaders of tomorrow”. The annual rate of tuition ranged between $13,500 and $27,800 and all schools maintained a competitive admission process. The schools shared an explicit focus on academic excellence and most prioritized success in the mathematics and science domains. The girls’ narratives captured the pressure they felt to obtain high grades and some (i.e., Valerie and Hailey) even spoke about the competition between students. The girls enrolled in the 12th grade mathematics classes described their additional pressure for achievement because they were in pursuit of post-secondary school acceptances.

Across all cases, the girls described the schools to be “nice” and “friendly” places with strong social cohesion, devoid of racism and sexism. The only exception was the case of Valerie, wherein she described the tension that existed between 11th graders and accelerated 10th graders in split-grade classes. Although the teacher interviews were not a focal component of this analysis, it should be noted that the teachers, too, described the schools as being harmonious, committed to equity, and devoid of issues of race, gender, and bullying in general. The mission statements of the schools themselves highlighted their commitment to equity and the celebration of all forms of diversity.
Mathematics Identities of the Focal Students: High Investment in Mathematics Achievement

It can be assumed that all the girls in the study were skilled mathematics students given their enrollment in advanced level mathematics classes and the mere fact that they attended elite secondary schools. However, the girls’ narratives presented a range of abilities, with Kathryn describing herself as a strong student, Jackie and Ariana describing themselves as average, and Valerie, Abida, and Hailey describing themselves as weaker mathematics students (relative to their classmates). With the exception of Kathryn who indicated that mathematics was one of her favourite subjects, the girls’ disliked the domain. Valerie and Jackie repeatedly described their preference for the arts. Nevertheless, across all cases, the girls indicated that mathematics was one of the most important school subjects and reported highly valuing their performance in the domain. The girls acknowledged the real-world importance of mathematics and described it as a gatekeeper subject that was integral to their future career success (regardless of how mathematics-centric their envisioned careers were). Taken together, the girls were highly invested in their mathematics achievement.

Mathematical Group Work: A Context Vulnerable to Stereotype Threat

The figured world of group work was laden with power and high pressure for achievement for all the focal students. They described a pressure to perform well, appear competent, and to maintain a fast work pace. Aligning with Sekaquaptewa and Thompson’s (2003) work investigating stereotype threat and solo status, for all the girls in the present study, the pressure was particularly high when they lacked critical mass and worked with certain people from dominant social groups. For example, Valerie, who was enrolled in a split-grade class, described her preference to work with her same-grade peers, Kathryn described her
general discomfort working with boys, and Hailey, Jackie, Kathryn, and Ariana all indicated a preference to work with girls.

The focal students’ figured worlds of group work contained several characters and associated roles that were rooted in a hierarchy of power. In some form or another, the girls described: the “leaders” of the group who tended to wield the most power, dominate the work and take control; the “helpers” of the group who tended to assist the struggling members of the group; and the “followers” of the group who tended to follow along and lack power in the group. The girls described their tendency to take on the roles of “follower” and/or “helper” in group work. For example, Valerie and Kathryn explained the challenges of being the “helper” and how it inevitably led to becoming a “follower” who lagged behind the leaders. Hailey, Jackie, and Ariana described themselves as followers and explained how the voices of the “followers” were often ignored by the “leaders” in the group.

According to the girls, there were some logistical factors that could improve the group work conditions. They advocated that smaller groups composed of even numbers of students was ideal so that no student was left to work on their own. They also stated their preference to be able to work with friends and select their own groups. In all the cases analyzed in this study, however, the groups were assigned and the girls lacked critical mass. The girls also spoke about the significance of the physical organization of the group. Specifically, almost all of the girls advocated that group work be conducted in a circular formation (e.g., having students seated at a round table). Interestingly, the three girls who had been arranged in a linear configuration for their session of group work (i.e., Hailey, Jackie, and Ariana) talked about the importance of having students arranged in a circular formation to promote equal access to the learning artifacts and interactional space when they reflected on their experience.

Taken together, there were many commonalities across the focal students’ figured worlds of group work. This is not surprising given that they were intentionally chosen because
of their reported mixed feelings about group work as well as the fact that they all came from stereotyped social groups. The description of group work as being a high-pressure situation with inherent power dynamics between group members suggests that this learning context is particularly prone to stereotype threat.

**Interactive Positioning within Group Work: Marginalization of the Focal Students**

In addition to the underlying vulnerability to stereotype threat, the sessions of group work analyzed in the present study included times when the focal students lacked critical mass and worked with students from dominant social groups. Furthermore, the moments of group work analyzed were specifically chosen because they depicted observable forms of marginalization.

Within each case of group work, the focal students were positioned as marginal members of the group. Through moment-to-moment instances of exclusive talk, physical bocks, exclusive use of shared learning artifacts, and the minimization or challenging of the focal students’ contributions, the focal students were left with limited authority and access to the conversational floor, interactional space, and shared learning artifacts. This analysis of moment-to-moment acts of positioning traced the manner in which the focal students became marginal members of the group. Although some marginalizing acts of positioning were quite subtle (e.g., momentary physical blocks) others were overt (e.g., the sustained physical blocks in the case of Hailey and the lengthy instances of exclusive talk in the case of Jackie).

Across all cases, racialized and/or gendered acts of positioning were observed. That is, based on an analysis of the frequency of instances as well as who engaged in these acts of positioning, it was found that the focal students tended to be the ones who were physically blocked, challenged, ignored, excluded from conversations, and denied access to shared learning
artifacts. In the case of Valerie, her narrative explicitly centered around grade level and so this aspect of social identity was an integral part of her case. The analysis of Valerie’s case of group work revealed how marginalizing acts of positioning observed could be associated with grade level or age as well as race.

Considering microagression theory, the patterns of positioning observed, and the links made to race, gender, and grade level, these acts of positioning can be interpreted as various types of microaggressions. Within each case of group work, the group members who tended to engage in the marginalizing acts of positioning were from dominant social groups and the acts of positioning were directed towards to the focal students, who were from stereotyped social groups (i.e., stereotyped within the context of mathematics)\textsuperscript{18}. Applying the principles of microaggression theory and the deep-rooted, subtle, seemingly innocuous nature of microaggressions, these acts of positioning resemble the microaggressions documented in the literature.

Looking across cases, there was also a clear pattern with respect to the nature of marginalization observed and the physical configurations of the groups. Specifically, the physical forms of marginalization mainly occurred in the groups that were organized in a linear configuration (i.e., the cases of Hailey, Jackie, and Ariana; see Figure 42, below).

\textsuperscript{18} Based on the principles of intersectionality, it should be noted that each of the focal students were from a combination of both marginalized as well as dominant social groups, but the present analysis was most interested in the aspects of the focal student identities that were being threatened within the sessions of group work.
Figure 42. Linear group work configurations for the cases of Hailey (far left), Jackie (centre), and Ariana (far right), demonstrating the physical blocking and constrained access to shared learning artifacts.

Hailey, Jackie, and Ariana all spoke about their limited access to the interactional space, shared learning artifacts, “not being able to see” and in their overall reflection on the experience, they advocated the importance of having circular configurations during group work. It should be noted that the students did have some agency to reconfigure the physical space but none of them did so. This is not to place blame on the focal students, especially given the fact that most of them who attempted to make physical bids to enter the interactional space were ignored. Any of the members of the groups could have taken the initiative to rearrange the desks, but interestingly, none of them did. In contrast, issues of access and physical restrictions were not mentioned by Abida, Kathryn, or Valerie and their groups were assembled in triangular configurations (see Figure 43, below).
Figure 43. Triangular group work configurations for the cases of Abida (far left), Kathryn (centre), and Valerie (far right), demonstrating more facilitated access to the interactional space and shared learning artifacts.

Although Abida, Kathryn, and Valerie did appear to still have some limitations with respect to access, it was not to the same degree as the girls arranged in the linear group work configurations. This highlights the influence of the physical context and the ways it can facilitate or constrain access to participation and learning.

In addition to the physical forms of marginalization, the focal students were marginalized through verbal means. Instances of exclusive talk between non-focal students were coded across cases to varying degrees. For example, the cases of Hailey and Jackie provided some extreme examples of exclusive talk between the boys in the group (i.e., with respect to the frequency and length of these instances as well as the associated physical blocks that accompanied the talk), while the cases of Kathryn and Ariana demonstrated more brief instances of exclusive talk between their group members.

Across all cases, the instances of exclusive talk were evidenced by: directed bodily orientation and eye gaze; the volume of the speakers’ voices (i.e., in the cases of Ariana and Abida the group members spoke softly to one another suggesting that they were speaking directly to one another); and by specifically addressing a person prior to making a contribution. The instances of exclusive talk that involved the focal students were qualitatively different from the instances of exclusive talk between the non-focal students. That is, they tended not to be as substantive, lengthy, or obvious with respect to bodily orientation. In the case of Kathryn, for example, her exclusive talk with Collin was mainly to ask for assistance. In the case of Jackie, during her exclusive talk with Travis, he maintained his bodily orientation towards Nathan throughout, offered only minimal engagement, and he ended up rejecting her contribution.
Another pattern of marginalization was observed in the cases of Ariana and Jackie and was related to the negative ways in which their intellectual contributions were taken up. Both girls made a number of intellectual contributions during the focal segments of video and these contributions tended to be ignored or challenged. Both Ariana and Jackie pushed back against this resistance. With these patterns of marginalization in mind, I now turn to the focal students’ acts of reflexive positioning and highlight the way the girls demonstrated resistance to marginalization.

**Reflexive Positioning: Responding to Marginalization**

Across all cases, the girls attempted to position themselves as competent and eager to participate. They did so by demonstrating engagement through eye gaze, bodily orientation, facial expressions, intellectual contributions, and physical movements that better positioned them to access the interactional space and shared learning artifacts. Furthermore, in the face of repeated acts of marginalization by the non-focal students, almost all of the girls resorted to working on their own, again demonstrating their investment and commitment to the task.

The analysis of reflexive positioning revealed that there were some commonalities in the ways the focal students coped with and responded to marginalizing acts of positioning. They appeared to push back against marginalization in many ways, but the three main coping strategies observed included: (1) silent resistance; (2) outspoken resistance; and (3) pretending to agree, understand, and get along. It is important to note that these patterns do not represent absolute, mutually exclusive categories. Although I describe each focal student as adopting one of the three patterns coping strategies, it does not mean that they refrained from engaging in the other types of responses to marginalization. Furthermore, this does not represent an exhaustive list of response strategies. These are merely interpretations of the general patterns of reflexive
positioning observed within the six cases studied here. Another interpretation of the focal students’ ‘silence’, for example, could be that this was a form of acquiescence.

(i) Silent Resistance

Hailey and Abida appeared to engage in a silent form of resistance to marginalization. That is, they remained virtually silent during the focal segments of video (and throughout the session of group work as whole). Their silence can be attributed to their restricted access to the conversational floor. Hailey elaborated on how she couldn’t see and therefore “couldn’t contribute anything” while Abida elaborated on how her group members explicitly consulted one another about the work rather than ask her. Another possible interpretation is that Hailey and Abida chose to remain silent as a way to cope with marginalization. Traditionally, students tend to be branded as lazy, disengaged, and incompetent when they do not verbally contribute during group work (e.g., Reda, 2009), however, more recent work provides evidence to the contrary. For example, Ha and Li (2014), demonstrated that students chose to remain silent in class even though they knew they were expected to verbally contribute because: they did not enjoy the classroom atmosphere; they felt their voices were not valued; and they did not want to stand out and be isolated by peers. The researchers demonstrated that silence was a choice and means of protest for the students in their study.

Similar work argues that Asians, who are often stereotyped as being quiet, intentionally use silence as “a means to combat social invisibility” (Cheung, 1993, p. 9). Specifically, Cheung (1993) discusses the use of silence in fiction by three second-generation Asian women who, through their writing, demonstrate how silence, in itself, is articulate. Cheung interrogates Eurocentric views of silence and speech as being polarized and instead, like Ha and Li (2014)
argues that silence is purposeful, strategic, and substantive. She problematizes Western views of silence and calls for the understanding that it can be used as a means of coping with racism:

The negative social assessment of silence isolates and baffles many an Asian American. Verbal restraint, often inculcated in both Chinese and Japanese cultures and reinforced as a survival strategy in the face of racism in the corresponding immigrant communities, hardly prepares a child for vocal assertion, especially when she is perceived as the Other (Cheung, 1993, p. 6)

In a similar vein of research, Goldstein (2003) conducted a critical ethnographic study in a Canadian high school investigating how students born in Hong Kong strategically used language to achieve academic and social success in a school where English was the language of instruction. Goldstein’s findings, in part, demonstrate how Canadian Cantonese-speaking students chose to engage in ethnic forms of solidarity (e.g., strategically choosing when to speak in Cantonese versus English) as a means to develop their academic competence. Taken together, the aforementioned studies suggest that choosing when and when not to speak, what language to use, and so forth can all be ways in which students resist being marginalized by the dominant culture and push back against marginalization.

Given their perceived marginalization and drawing from Cheung (1993) and Ha and Li (2014), Hailey and Abida’s silence can be seen as a strategic choice (rather than a sign of disengagement or incompetence). In addition, Hailey made several physical bids to be included in the work (e.g., physically repositioning herself in the group configuration to gain access to the interactional space and shared learning artifacts) while Abida resorted to working on her own to prove to her group members that she “could actually do it”. Both of these acts of reflexive positioning can be seen as silent efforts to push back against marginalization.

A question that surfaces in discussions about students who remain silent in the face of marginalization is whether they are somehow complicit in the construction of their marginal
positional identities. For instance, why didn’t Hailey simply tell the boys in her group that she couldn’t see? Firstly, the focal students were up against a hierarchy of power that was deeply engrained in the group work and broader context of the classroom and school (Gutiérrez, Bay-Williams, & Kanold, 2008). In addition, in the face of marginalization, why would or should a person speak out? As the next section will highlight, even the more explicit forms of resistance taken up by the girls in this study were met with repeated resistance. The present study argues that the focal students engaged in their own methods of agency and that silence can be just as agentic and articulate (Cheung, 1993) as outspoken contestation.

(ii) Outspoken Resistance

Jackie and Ariana appeared to engage in a more outspoken form of resistance to marginalization. That is, despite being blocked from the interactional space and shared learning artifacts, both Jackie and Ariana made a number of substantive intellectual contributions. When these contributions were ignored, Ariana and Jackie repeated themselves and when they were challenged, the girls rebutted and provided further justification. Further to this, both Jackie and Ariana explicitly expressed their frustration and pushed-back through their facial expressions and intonation. Following these repeated acts of resistance, both girls resorted to working on their own. Often times, students who position themselves in these bold, more outspoken ways are viewed as bossy, confrontational, or oppositional (Hand, 2010), get positioned as such, and are ostracized from group work (e.g., Langer-Osuna, 2011). Their fellow group members or passersby may have viewed them as bossy or oppositional rather than understanding that these girls were responding to marginalizing acts of positioning and (potentially) coping with stereotype threat.
(iii) Pretending to Understand, Agree, and Get Along

Kathryn and Valerie appeared to engage in a more covert response to marginalization. That is, rather than remaining silent or explicitly pushing back against marginalization, they tended to pretend to agree, understand, and get along with their group members. During their stimulated recall interviews, however, they privately voiced their perceptions of marginalization, frustrations with the group, and strategy of pretending.

Kathryn described her reluctance to ask questions in fear of further slowing her group down and appearing incompetent even when she did not understand the material. Similarly, Valerie talked about how she pretended to understand the mathematics and agree with her group members to avoid making the situation more “awkward”. In the end, both girls ended up working independently and the only contributions they made were to either pose questions or voice their agreement with group members. I argue that both likely had more substantive contributions to make, but they appeared to intentionally adopt the strategy of pretending. By ostensibly agreeing with their group members and appearing amicable, Kathryn and Valerie were able to maintain group harmony and avoid confrontation and, possibly, further stereotype threat. These cases provide a compelling example of how things aren’t always what they seem in group work interactions.

Connections to Stereotype Threat Theory

The principles of stereotype threat theory were applied in different ways across cases as a means for interpretation. Three main bodies of stereotype threat research were particularly relevant in this study, namely, stereotype threat being induced as a result of: (1) girls working with boys and the hovering gender achievement stereotypes in mathematics (e.g., Inzlicht & Ben Zeev, 2000; Spencer et al., 1999); (2) comparing oneself to a group that is positively stereotyped
in the domain (Aronson et al., 1999); and (3) pressure to live up to self-relevant stereotypes (Cheryan & Bodenhausen, 2000). I would like to emphasize that there were likely a number of intersecting identity threats at play within each case of group work and my attempt in this section is to simply highlight what appeared to be the most relevant and prominent stereotype threat pattern to each case based on the video microanalysis as well as the student narratives.

(i) Stereotype Threat and Hovering Gender Achievement Stereotypes

Issues of gender appeared prominent in the cases of Kathryn, Hailey, and Jackie. In addition to the fact that the girls were paired with boys (which, alone, can be sufficient to trigger stereotype threat; Inzlicht & Ben Zeev, 2000), the girls were grouped with boys who positioned themselves in ways that were consistent with the gender achievement stereotype (i.e., they were outspoken, confident, visibly competent). Further to this, the boys engaged in overt marginalizing acts of positioning. For example, in the cases of Jackie and Hailey, the boys physically blocked the girls from the interactional space and shared learning artifacts (see Figure 44, below).

*Figure 44.* Hailey (image on the left) and Jackie (image on the right) being physically blocked by one or more of the boys in their group.
In the case of Jackie, each of her intellectual contributions were challenged and/or ignored. In the case of Kathryn, although the acts of positioning were not as evident, she perceived the boys as moving ahead without her and described feeling a great deal of pressure to keep up and appear competent. Kathryn also identified her tendency to make “stupid mistakes” and “slip-ups” during the session of group work. This tendency to make “stupid mistakes” despite the fact that she: (1) was a strong mathematics student and (2) explained that she could effectively do the work later, in the absence of the boys, directly aligns with what the traditional stereotype threat paradigm would predict (i.e., that regardless of how competent a person is, stereotype threat is a situational predicament resulting from a person’s fear of confirming a self-relevant stereotype and leads to performance decrements).

(ii) Stereotype Threat and Comparing Oneself to Positively Stereotyped Groups

Across all student narratives, the stereotype that “Asians are strong in math” was the most salient. Regardless of their self-identification, each focal student quickly identified the Asian achievement stereotype and most elaborated on its prevalence. For the cases of Abida and Ariana, the stereotype was of particular relevance because, although they did not self identify as Asian, they described the significant number of Asian students in their mathematics classes. Both Abida and Ariana also appeared to endorse the stereotype, describing their East Asian classmates as being highly competent in mathematics and feeling some pressure to keep up with their East Asian group members. In both analyzed cases of group work, Abida and Ariana were grouped with two East Asian girls, whom they described as strong in mathematics. Both girls also highlighted the racialized pattern of friendships at the school and used this as the basis of their argument to account for why their group members engaged in marginalizing acts of positioning. Aronson et al.’s (1999) work investigating stereotype threat effects elicited by
comparing oneself to model minority students would predict that both Abida and Ariana may have experienced stereotype threat simply because they were grouped with two East Asian girls. Using this line of reasoning, Abida may have been particularly susceptible to stereotype threat given that she self-identified as Nigerian and may have been contending with negative stigma around race and achievement (among other likely hovering identity threats).

The findings of Aronson et al (1999) were also applied to the case of Valerie as she contended with the local metapragmatic model of the elite, overachieving 10th grade girls. The metapragmatic model of the elite 10th graders was extremely salient at the school and was woven throughout Valerie’s narrative. As such, when Valerie, an 11th grader, was grouped with two of the elite 10th graders, she likely experienced some form of threat.

(iii) Stereotype Threat and Pressure to Live up to Self-Relevant Stereotypes

Jackie, Hailey, and Valerie self-identified, at least in part, as East Asian girls. Based on the findings of Cheryan and Bodenhausen (2000), they likely experienced some pressure to live up to the stereotype that Asians are good at math, particularly because they all worked with non-Asian students. In fact, Valerie admitted that she did feel that her group members assumed that she would be “good at math” because she was Asian, especially because they didn’t know her very well (and were thus even more prone to apply the stereotype). Further to this, being an 11th grader working with two elite 10th graders, Valerie may have also experienced some pressure to live up to the stereotype that students in higher grade levels should be smarter than students in lower grade levels.

Jackie talked about how she represented an exception to the Asian stereotype because she was not particularly strong in mathematics. This as well as knowing that she would be judged according to the model minority stereotype may have further increased her vulnerability
to stereotype threat as she worked with two White boys. Similarly, although Hailey did not make much mention of the Asian achievement stereotype, I suspect that the pressure to ‘live up to’ the Asian stereotype as well as knowing that she might be judged according to the model minority stereotype would have created threat when she worked with a group of White boys.

Explaining and Interpreting Acts of Positioning: Competency, Disposition, and Friendship

The focal students provided a range of responses when they were asked to share their interpretations and explanations for the acts of positioning that took place during the focal video segments. Overall, most of the girls attributed the marginalizing acts of positioning to: (1) the superior mathematical competency of their group members, (2) the dispositional qualities of their group members, and (3) friendship patterns and relations within the group.

(i) Superior Mathematical Competency of Group Members

Many of the focal students (i.e., Abida, Ariana, Kathryn, and Valerie) attributed the exclusive talk and tendency for their group members to work ahead to the fact that they were stronger (than the focal students) in mathematics. Even Kathryn, who self-identified as a strong mathematics student, indicated that the exclusive moves of her group members, Chris and Luther, were because they were superior in mathematics.

(ii) Disposition of Group Members

Many of the focal students (i.e., Hailey, Jackie, Kathryn, and Ariana) attributed the marginalizing acts of positioning to the dispositional qualities of their group members. They tended to describe their group members as having a dominating nature about them and the
qualities of outspoken leaders. Hailey, Jackie, and Kathryn used terms like “loud”, “obnoxious”, “bossy”, and “dominant” to characterize the boys they worked with. Taken together, the focal students characterized the boys in ways that were consistent with the gender achievement stereotype. At the same time, Valerie and Kathryn worked to save face with their group members and described how they pretended to understand rather than to ask questions and interrupt their group members. This politeness and collegiality is consistent with normative gender expectations for women. With respect to racial stereotypes, Ariana characterized Claire, her Asian group member, in ways that were consistent with the Asian achievement stereotyped, describing her as a “focused” and “studious” person.

(iii) Friendship Dynamics within the Groups

Across all six cases of group work, the focal students attributed the marginalizing acts of positioning to the friendship dynamics within the group. That is, the focal students explained that their group members tended to work and discuss exclusively because they were friends with one another. With the exception of Ariana, none of the focal students indicated being friends with their group members outside of class.

Ample research demonstrates that friendships are gendered, racialized, classed and shaped by a host of other aspects of social identity (e.g., Shrum et al., 1988; Clark & Ayers, 1992). As such, the present study interprets the focal students’ narrative on friendship patterns to be a connection to social identity.

To build on the implicit connections to social identity, some of the focal students spoke explicitly about the racialized and gendered nature of friendships. For example, Abida described how the Nigerian and Asian students tended to form same-race-based cliques and although they got along on a superficial level, they did not “mix.” Similarly, Ariana talked about how although
she and her group member Claire were friends, it was at a more superficial level because she (Ariana) was not Asian. Ariana described how the Asian students tended to be friends with one another so that they could talk about their “Asian interests.”

With respect to gender, Kathryn, Jackie, and Hailey indicated that the boys in their groups were all friends with one another (thus accounting for their exclusivity) and the girls also stated their preference to work with other girls in the class who they described as their friends. Further to these examples, the case of Valerie demonstrated how friendship patterns can also be based on students’ grade level and/or age. Within her split-grade class, Valerie explained how the 10th graders tended to be friends with their 10th grade peers while the 11th graders also tended to be friends with one another.

Analyses of Video versus Interviews: An Investigation of Professional Vision

Across each case, the microanalyses of video were juxtaposed with the analyses of focal student interviews. Specifically, the identification, explanation, and interpretation of positioning that the students provided was compared to the video microanalysis, or the researcher lens. In essence, my way of seeing and understanding the session of group work (gleaned from my analysis of the video) was compared to the responses provided by the focal students. Referring back to Goodwin’s (1994) notion of professional vision, it comes as no surprise that there were inconsistencies between what I, the researcher, centered on in my analysis versus what the focal students brought to the floor. I come to this research with a host of experiences, perspectives, and positions that impacted my ways of viewing and interpreting the cases of group work. I am a multiracial woman who seeks to investigate learning, identity, intersectionality, marginalization, and issues of equity within mathematical group work. In addition to this, I seek to incorporate microaggression theory and stereotype threat theory as interpretive lenses. The
focal students have a range of histories with mathematical group work (and mathematics and school in general) and an assortment of intersecting identities (i.e., social, practice-linked and so forth) that would facilitate alternate ways of explaining, interpreting, and experiencing the cases of group work. Further to this, I was an outside observer whereas the focal students experienced the group work. These differences in positions would greatly come to bear on our respective ways of seeing and interpreting the event. With these differences in perspective in mind, it comes as no surprise that there were inconsistencies between the video microanalysis and the analysis of interviews.

One of the inconsistencies that arose was with respect to the identification of marginalizing acts of positioning. In some cases, the focal students did not mention the marginalizing moves that were highlighted by myself, the researcher, and instead they focused on marginalizing moves that were not highlighted by the researcher. For example, in the case of Hailey, the researcher perspective centred on the physical blocks of all three boys, but particularly those of Henry (the boy in the central position) while Hailey’s narrative emphasized the physical blocks of Jacob and she did not specifically mention being blocked by Henry. Similarly, in the case of Jackie, the researcher perspective highlighted the marginalizing acts of positioning of both Travis and Nathan, but Jackie’s narrative emphasized the marginalizing moves of Nathan, the boy who was seated immediately beside her.

It is possible that in the cases of Jackie and Hailey, the girls focused on the marginalizing moves of those who were physically most proximal to them. As an outside observer, the moves of all participants were more equally apparent but for someone experiencing the interaction, it is possible that the actions of those physically close may have been more salient and memorable. It’s also possible that the focal students had particular histories with certain members of the group that may have impacted their interpretation and
experience in general. There are a host of possible explanations to account for these differences in perspective.

Across cases, there were also a number of differences in the ways in which the marginalizing acts of positioning were interpreted and explained. For example, in the case of Kathryn, she perceived the boys to be working ahead of her whereas the researcher perspective interpreted their actions to indicate that they were impatiently waiting, but not necessarily working ahead. With the case of Jackie, the researcher perspective pointed to how the boys repeatedly challenged her intellectual contributions while she instead described them as “ignoring” her. Although these acts of positioning may have had the same affect, they were interpreted in different ways.

Within the case of Valerie, the researcher perspective acknowledged that Chloe engaged in thinking-aloud as she worked and suggested that this was an act of positioning in that it allowed her to maintain control over the conversational floor. Valerie centred on this act of positioning a great deal more than the researcher perspective and she demonstrated that this was a very memorable act of positioning for her. Further to this, the case of Valerie provided a compelling example of how when observing the group work dynamic ‘things are not always what they seem’. That is, one of the segments of video was selected because it appeared that the group was getting along well based on the fact that Valerie made intellectual contributions and smiled and even laughed at one point. In her stimulated recall interview, however, Valerie revealed her real frustrations with her group members and indicated that her pleasant demeanor was merely a strategy to get through the work without confrontation. Valerie’s experience with the local metapragmatic of the elite 10th graders indeed shaped her interpretation of positioning and my lack of understanding of the metapragmatic model rendered me blind to this underlying tension during the preliminary video analysis and selection of the focal video segments.
Racialized and/or gendered patterns of positioning were identified by the researcher across all cases. As was made evident in the previous section, however, the focal students’ explanations of the marginalizing acts of positioning were relatively colourblind and the only connections to social identity that I could make was through the focal students’ narrative about friendship patterns. Given my intentional focus on social identity and the application of microaggression theory and stereotype threat theory as interpretive lenses, there was an underlying difference in my own professional vision and the inconsistencies were thus expected.

Despite these differences in the underlying perspectives and positions in the event (i.e., researcher/observer versus active participant), there were a number of notable consistencies between what the researcher highlighted in the video microanalysis and what the focal students highlighted in their stimulated recall interviews. Even the subtle acts of positioning that were discussed in the researcher perspective were identified by the focal students in their stimulated recall interviews. For example, Abida noticed that Mabel turned to Veronica for consultation instead of her, Valerie noticed when her group members explicitly addressed one another before making a contribution, and all the girls who were in the linear group configurations mentioned being physically blocked from the interactional space and shared learning artifacts. Although the researcher perspective referred to many of these as ‘subtle’ acts of positioning, perhaps they were not so ‘subtle’ to the focal students who experienced them.
CHAPTER 11. CONTRIBUTIONS, IMPLICATIONS, AND CONCLUSIONS

The present study provides insight into how students from stereotyped social groups identify, interpret, and explain marginalizing acts of positioning. It adds nuance to our understanding of marginalization in mathematical group work and highlights the involvement of social identity and related achievement stereotypes. In the sections that follow, I will further elaborate on the study’s theoretical and methodological contributions. Embedded throughout is a discussion of the implications for mathematics education as well as directions for future research.

Building on Microaggression Theory and Considering Colourmuteness

Adding Nuance to our Understanding of Microaggressions

Thus far, microaggressions have primarily been investigated using retrospective interview techniques. Although these methods have been valuable in highlighting the voices of those who experience microaggressions, as with all interview techniques, they are limited to what people can recall. The present study builds on the microaggression theory corpus by engaging in a more fine-grained analysis of the microaggression experience. That is, the video recorded sessions of group work were used as a prompt to facilitate the focal students’ identification of marginalizing acts of positioning (or microaggressions). To ensure that the events were fresh in the minds of focal students, the stimulated recall interviews were conducted within 24 hours of the session of group work. To direct the focal student’s attention to moment-to-moment acts of positioning, they were invited to stop the video any time they viewed something they wanted to comment on.
Whether the marginalizing acts of positioning (or microaggressions) occurred through body positioning, gesture, facial expressions, intonation, or talk, the video footage allowed the focal students to pinpoint the precise microaggressive acts they wanted to comment on. For example, in her stimulated recall interview, Hailey was able to point out a moment to demonstrate the way in which Jacob was blocking her and the way that Allen was hoarding the group’s shared worksheet. Similarly, Jackie used the video footage to identify a moment in the group where the boys were physically oriented towards one another, blocking her from the interactional space and, referring to the video screen, said, “At this point, it’s just kind of like me…and then them…” Interviews alone were unlikely to have captured this level of detail and insight into the students’ experiences with marginalizing acts of positioning.

In sum, the video record allowed for the investigation of how micraggressions can unfold through moment-to-moment interactions. The video documentation of these marginalizing acts of positioning supplemented the personal account and allows us to understand microaggressions in a more nuanced way. (More about the methodological contributions of this work will be elaborated in a later section, below).

Characterizing the Focal Students’ Responses to Microaggressions

In addition to providing insight into how microaggressions may be elicited through interaction, the present study offered examples of how students may respond to them in the moment. At times, Jackie and Ariana explicitly contested marginalizing acts of positioning, while Hailey and Abida tended to take up more silent forms of resistance. Kathryn and Valerie
pretended to understand the work, agree with their group members, and get along and then revealed their true frustrations during the stimulated recall interview^{19}.

There was also some overlap with respect to how the focal students interpreted and explained marginalizing acts of positioning. Generally speaking, the girls had a tendency to attribute the marginalizing acts of positioning to: (1) the superior mathematical competency of their group members, (2) the dispositional qualities of their group members, and (3) friendship patterns and relations within the group. These findings run counter to the traditional microaggression literature that documents people’s explicit discourse on racism, sexism, and so forth, and how it explains marginalization. Rather than explicitly attribute their experiences with marginalization to race or gender, the focal students in the present study adopted a colourblind narrative.

Without undermining the focal students’ narratives on social positioning, this does not necessarily mean that race and/or gender were irrelevant in these cases of collaborative group work. There are a number of explanations to account for their colourblind discourse. Firstly, research investigating discrimination suggests that people have a general tendency to deny and/or not perceive discrimination that is directed at themselves (Taylor, Wright, Moghaddam, & Lalonde, 1990). Taylor and his colleagues (1990) contend that the denial of personal discrimination could be the result of an information-processing bias or the exaggeration of group discrimination (i.e., perceiving one’s group, but not oneself, to be a target of discrimination). Further to this, the stereotype threat theory corpus suggests that stereotype threat operates outside of one’s awareness (Aronson, 2002) and, accordingly, would predict that individuals who experience it would not necessarily explicitly talk about social identity or

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^{19} These are general characterizations of the kinds of responses the focal students had to marginalization. They are not meant to be absolute classifications of the focal students’ responses.
stereotypes in a posthoc interview tapping their reflections. Instead, more implicit connections to social identity might be expected.

The focal students tended to attribute the patterns of positioning observed to the friendship dynamics in the group. For instance, after viewing an instance of exclusive talk between non-focal group members, the focal students tended to explain that the group members were friends with one another but not with the focal students themselves. There is ample research to suggest that friendships are often racialized, gendered, classed and so forth (e.g., Shrum, Cheek et al., 1988; Clark & Ayers, 1992) and so these references to friendship can be considered implicit connections to social identity. In other words, although the focal students did not explicitly talk about race or gender when interpreting and explaining the marginalizing acts of social positioning, by talking about ‘friendships’ they were indirectly incorporating race and gender into the discussion because friendships are implicitly racialized and/or gendered (and so forth).

Across all the cases of group work, the focal students lacked critical mass while their group members were from the same dominant race and/or gender social group (e.g., Hailey, an Asian girl, worked with a group of White boys; Jackie, an Asian girl, worked with a group for White boys; Valerie, an Asian girl, worked with a group of White girls; and so forth). Thus, when indicating that the other members of the group were friends with one another (but not with the focal students themselves), the focal students were also providing further evidence of the racialized and/or gendered nature of friendships. Further to this, Abida helped explicitly bring the racialized nature of friendships to light when she talked about how although they generally remained civil to one another, the Asian and Nigerian students within her school tended to form same-race cliques. Similarly, Ariana talked about how the friendships between the East Asians in her school tended to be deeper than the more superficial interracial friendships.
Another example of implicit discourse on race and gender came about when the focal students described the superior competency of their group members and explained their actions in ways that were consistent with race and gender achievement stereotypes in mathematics. For example, when explaining the marginalizing positioning moves of their group members, Hailey described the boys in her group as people who like to dominate and “enjoy taking charge” while Ariana described Claire, one of the Asian girls in her group, as highly competent in mathematics, being “focused”, and “know[ing] everything beforehand.”

It comes as no surprise that the focal students would refrain from bringing up taboo topics such as racism or sexism and instead discussed race and gender in a more implicit manner. In her work examining *colormuteness*, Pollock (2004) demonstrates that, in certain situations, students tend to resist talking directly about race in school, despite its omnipresence. There are a host of factors that may contribute to students’ colormuteness. For instance, in the present study, the focal students (with the exception of Valerie, who described the tensions between grade levels) described their school cultures as being “friendly spaces” where everyone gets along. Even the classroom teachers described the schools as being harmonious, committed to equity, and devoid of tensions related to race or gender. During many conversations with both teachers and administrators, when I expressed my interest in the experiences of students from non-dominant social groups, they were generally very quick to say that their school had no issues with race, gender, or any forms of discrimination. It therefore comes as no surprise that the focal students in this study too adopted this colourblind discourse. Attributing the marginalizing acts of positioning to friendship dynamics or the dispositional qualities of their group members is more politically correct and, potentially, a safer way for students to talk about race and gender. The focal students were likely motivated to appear egalitarian given the deeply entrenched colourblind school culture. This philosophy is particularly troubling within the elite
private school contexts wherein students (and teachers) of colour are few and far between and the curriculum and programs are built upon the dominant culture.

Whether or not this colourblind philosophy actually shaped the focal students’ ways of seeing or whether it simply shaped the way they chose to represent themselves in the interviews is unknown. It is important to recognize that an interview narrative does not necessarily reflect the internal feelings and thoughts of a person. It is possible that the focal students in the study had race and/or gender and/or other aspects of social identity on their minds but refrained from sharing. A limitation of the present study is that although I built some degree of rapport with the focal students, they may not have felt comfortable enough to truly open up to me during our interviews.

Corroborating previous microaggression theory research, the fine-grained analysis of the present study speculates that microaggressions can be subtly triggered through everyday intergroup interactions. Further to this, the present study suggests that microaggressions may be even more common than previously documented because students don’t necessarily talk about their experiences with them in explicit ways. There are a host of reasons to account for why the focal students in the present study refrained from talking about social identity in their interpretations and explanations of marginalization. One of the goals of the present study was to foreground the voices of students from stereotyped social groups and the intent here is not to discount their narratives but to instead draw attention to the subtle ways (e.g., through talk about friendship dynamics and stereotype-consistent discourse on mathematics ability and dispositional qualities of group members) in which students may resort to talk about the taboo issues that affect their daily interactions.
Implications for Educators

Understanding how students talk about their experiences with marginalization as well as how subtly and frequently it can unfold during intergroup interactions is essential to educators who strive to better support their students. If educators can be more attuned to the subtle ways in which students may be communicating their experiences with marginalization as well as the subtle ways in which it is elicited through interaction, they can better detect it during everyday classroom activities, better support students to gain access to central forms of participation, and design more equitable collaborative group work activities. For example, understanding the significant impact of the physical forms of marginalization revealed in the present study can help educators further prioritize the design aspects of group work related to access (e.g., providing students with multiple learning artifacts and/or ensuring all students are physically organized in a way that allows mutual access to shared learning artifacts and the interactional space).

The present study also provides insight into the composition of small groups and how they should be formed. In all of the cases of group work analyzed here, the teachers assigned the groups. When asked how their group work experiences could have been improved, all of the focal students suggested allowing students to choose their own groups. They also indicated in both their surveys and in interviews that the success of group work is highly dependent on who you are working with. The focal students generally reported a preference for working with friends who, in many cases, were from the same race and/or gender social groups. Although educators may have many principled reasons for assigning specific students to certain groups (e.g., promoting intergroup relations or having highly competent students scaffold the learning of students who require additional support), the findings of this study suggest that to foster equitable learning opportunities, students should have the opportunity to assemble their own groups. Even when these design measures are taken, educators cannot prevent marginalizing
acts of positioning from taking place, but it can help to mitigate the extent to which students are left to the margins of the activity.

**Expanding Stereotype Threat Theory and Conceptualizing Resistance as a Response to Identity Threat**

*A Real-World Examination of Stereotype Threat*

The present study offers qualitative insights into how stereotype threat might operate in the real world. Straying from traditional positivist research on stereotype threat, the present study did not aim to prove whether or not stereotype threat was elicited in a given moment and instead was interested in examining the lived experience of stereotype threat. As such, the study did not artificially induce stereotype threat and instead sought out contexts in which the conditions for stereotype threat were met (e.g., high pressure situations, solo status contexts wherein focal students lacked critical mass, focal students reported high value for the domain, etc.), and offered interpretations of how it may have been triggered through student interactions. Other stereotype threat researchers, such as Inzlicht and Ben Zeev (2000) as well as Sekaquaptewa and Thompson (2003) demonstrate that, for example, simply having a woman write a test in the presence of other men can trigger stereotype threat. In the cases of Kathryn, Hailey, and Jackie, they were all working in solo status groups (i.e., working with boys and lacked critical mass). Further to this, the boys engaged in behaviours that were consistent with gender stereotypes in mathematics and they also served to marginalize the focal students. The present study shows that without any experimental manipulation, at any given moment during everyday interactions in mathematics class, the conditions for stereotype threat can be readily met and students from stereotyped social groups may be at risk of experiencing stereotype threat.
The qualitative nature of the present investigation yielded narrative data that is capable of offering further insight into the lived experience of stereotype threat. Although this threat is said to operate outside of a person’s awareness, the interviews in the present study captured the focal students’ feelings, interpretations, and explanations of the moments in group work wherein they appeared to be most vulnerable to stereotype threat. For example, Kathryn described her numerous “slip ups” and indicated her frustration with herself. The traditional stereotype threat corpus documents the fact that stereotyped individuals do demonstrate these types of performance decrements, but the present study offers a first hand account of a person’s experience and awareness that they are having these “slip ups” and the associated feelings of frustration. Similarly, Valerie talked about the pressure to live up to various stereotypes and described feeling “psyched out” at times because of who her group members were. This feeling of being “psyched out” provides narrative evidence that corroborates some of the physiological mediators of stereotype threat (e.g., anxiety, arousal). In sum, the narrative accounts obtained in the present study help us understand how stereotype threat might be experienced by a person and complements positivist stereotype threat research focused on performance outcomes and physiological measures.

The stereotype threat literature suggests that people who are highly identified in the domain and view themselves as competent are more likely to experience stereotype threat (e.g., Aronson et al., 1999). However, with the exception of Kathryn who viewed herself as highly competent in mathematics, the other focal students described themselves as weaker mathematics students (relative to their classmates). The present study provides qualitative evidence to suggest that even the students who did not describe themselves as highly competent discussed the salience of self-relevant stereotypes, described feelings of pressure, engaged in coping responses that align with the stereotype threat literature, and thus, may have experienced stereotype threat. What was common across cases was that the focal students, regardless of competence, highly
valued their performance in the mathematics domain and appreciated its real-world importance. The present study thus offers qualitative evidence to corroborate the stereotype threat theory principle that investment in the domain is a strong moderator of stereotype threat.

The present study’s qualitative findings also suggest the possibility that stereotype threat can be experienced in a variety of ways and have a number of different outcomes, depending on the person. Perhaps, for example, for people who self-identify as high-achieving in the mathematics domain (e.g., Kathryn), stereotype threat is evident mostly as a performance decrement. This assertion is supported by the large body of stereotype threat research that focuses on performance outcomes. For others, however, who don’t self-identify as high-achieving, evidence of stereotype threat may arise through their reported feelings (e.g., Valerie and feeling “psyched out”) or what they choose to do or not do (e.g., Hailey and Abida’s silence). It is also possible that the students in the present study who described themselves as weak mathematics students (relative to their classmates) may be experiencing stereotype threat so often that the performance decrement is always there.

In summary, the qualitative findings from the present study elicit a number of possible interpretations and, most importantly, suggest that there may be individual differences in the experience and impact of stereotype threat. By investigating the lived experience of stereotype threat, this study makes an important contribution to stereotype threat theory and to the field of social psychology more generally. Traditionally, social psychologists have employed positivist research techniques to investigate the stereotype threat phenomenon. The present research, albeit preliminary, raises a number of questions and possibilities about the experience of stereotype threat and how it plays out in the real world.
The Salience of the Asian Mathematics Achievement Stereotype

Consistent with other research investigating racial-mathematical discourse (e.g., Shah, 2013), the focal students in the present study identified the Asian mathematics achievement stereotype as being the most salient and notorious, regardless of their self-identified race. Many of the focal students also spoke about the gender stereotype, but the Asian stereotype was consistently the first identified and most elaborated. There are a host of explanations to account for this salience, including popular culture portrayals of Asians in the media as well as the fact that, second to White students, East Asians made up a large portion of the student population in the elite schools involved in the present study.

What is important to glean from this stereotype salience is that even though the Asian achievement stereotype is considered to be a ‘positive’ stereotype, as the present study demonstrates, it can have a detrimental impact on both Asian and non-Asian students alike. The non-East Asian students in the present study were negatively impacted by their knowledge of the Asian achievement stereotype, particularly when they were grouped with East Asian students. For instance, both Abida and Ariana described feeling additional pressure to do well in their sessions of group work because they were working with East Asian students. On the flip side, the East Asian students in the present study described feeling pressure to live up to the model minority stereotype during collaborative group work. Given the intersectional nature of social identity, these girls were also contending with conflicting, hovering gender stereotypes, particularly in the cases of Hailey and Jackie when they were grouped with White boys.

Within mathematics education, equity-focused research is largely focused on the experiences of students that are historically marginalized, namely, Black and Latino/a students as well as girls. Without downplaying the importance of considering the students who are most often underserved, the findings of the present study suggest that all students who are
stereotyped, whether they be considered positive or negative stereotypes, can benefit from equity-focused initiatives and research aimed at combatting stereotype threat.

The case of Ariana served to provoke discussion about how South Asian students contend with the model minority stereotype. Contrary to claims that South Asians are the new model minority (e.g., Richine, 2009), Ariana, a South Asian student, did not discuss this stereotype nor did she consider herself to be part of the model minority stereotyped group. She distinguished herself from her East Asian classmates, which she described as being studious and highly mathematically competent. Rather than seeing the ‘choking under pressure’ stereotype threat pattern of findings which one would expect to find for individuals from positively stereotyped social groups (Cheryan & Bodenhausen, 2000), the present study found that, in line with the work of Aronson and his colleagues (1999), Ariana appeared to experience pressure because she was working with students who she perceived to be members of a model minority stereotyped group (Aronson et al., 1999). The study also corroborated the findings of Poolokasingham and colleagues (2014) who found that South Asians are often socially excluded and treated as invisible in Canadian education contexts. Future research is needed to further understand how stereotype threat plays out in interactions involving various Asian groups (e.g., East and South Asians) and how, generally, South Asians contend with achievement stereotypes.

Using Positioning Theory and Microaggression Theory to Broaden our Understanding of Stereotype Threat

The theoretical synergy employed in the present study afforded the examination of how broad sociohistorical stereotypes get reinforced and constructed through micro acts of positioning as well as how more locally constructed stereotypes can be threatening for students.
In contrast to the widely known stereotype that Asians are good at math, there are a number of different and conflicting stereotypes about South Asians and there is greater variation in the ways in which they are portrayed. The present study’s findings point to the possibility that stereotypes about South Asians are locally constructed and depend upon the context. For instance, the case of Ariana presented the local stereotype that South Asians are academically inferior to East Asians and was related to how Ariana was socially excluded and treated as invisible by her East Asian group members. Had Ariana been working in a school with a different demographic and with a different group of students (e.g., White or Black students), a different set of South Asian stereotypes may have been salient for her and, depending on the dynamics of the interaction, a very different local stereotype about South Asians may have been constructed.

The local construction of stereotypes was also evidenced in the case of Valerie wherein she contended with the local stereotype about the elite 10th graders as well as broad racial stereotypes about East Asians and mathematics. According to Valerie, the local stereotype about the elite 10th graders was well known and salient across the student body. Thus, the principles of stereotype threat theory could be applied to this locally constructed stereotype. That is, based on the research of Aronson et al. (1999) that demonstrated that stereotype threat can be elicited when one is in the presence of a known ‘superior’, Valerie may have experienced stereotype threat when working with her elite 10th grade peers.

The synergy of stereotype threat theory with positioning theory and microaggression theory allows for a broader understanding of how stereotype threat may be elicited through interaction, how it can influence moment-to-moment acts of positioning, and shape the construction of positional and (potentially over time), practice-linked identities. By examining the reflexive positioning moves of the focal students, the present study also considered some of the ways in which students may respond to potential identity threats.
Potential Stereotype Threat Coping Strategies

As previously described, the study characterized three main types of responses to marginalizing acts of positioning: silent resistance, outspoken resistance, and pretending to understand, agree, and get along. These responses can also be understood as responses to stereotype threat. The stereotype threat corpus documents other responses to threat such as participants’ tendency to retreat from the limelight and avoid taking on roles or tasks wherein they may be at risk of confirming self-relevant stereotypes (Davies et al., 2005). The findings in the present study corroborate and build on this work in a qualitative manner.

It is important to note that the present study investigated student responses to stereotype threat and microaggression in the moment. The coping strategies discussed thus may not reflect how these focal students participate and interact within mathematics classrooms outside of these episodes of marginalization. For instance, McGee and Martin (2011) engaged in a qualitative study investigating how Black post-secondary school students enrolled in mathematics and engineering programs cope with stereotypes and associated threats over time. The authors referred to this long-term coping response as stereotype management. Using life-story interview techniques, McGee and Martin found that the students were motivated to try and disprove negative stereotypes about Black student intellectual inferiority. The students acknowledged that they could not “defy racialized stereotypes” (p. 1373), but they reported experiencing fleeting moments wherein they felt they had reduced the effect of stereotypes (e.g., when teachers publicly recognized their academic talents). The students also discussed how they felt they should focus more on the expectations that they set for themselves rather than dwell on societal expectations (stereotypes). The authors acknowledged that this was not a study of how students may respond to stereotype threat or microaggressions in the moment, but provided a more
positive outlook of how students from stereotyped groups may fare in higher education in the long run. They argued that stereotype threat is not deterministic and that over time, students may come to develop coping mechanisms that allow them to exercise agency and succeed academically. It would be interesting to see whether and how the focal students in the present study worked to manage stereotypes in group work situations wherein they were not being marginalized. Furthermore, future studies should examine whether and how other stereotyped groups (e.g., women in mathematics) enrolled in higher education mathematical programs or mathematics-related careers contend with stereotype threat in the long-term. It would also be interesting to investigate how people who continuously work with individuals from model minority groups manage stereotype threat over time.

Rather than take a student’s silence or outspoken resistance at face value, the present study calls on educators and researchers to appreciate that ‘things are not always what they may seem’. Returning to the earlier discussion on silence and agency, there is a growing body of research examining student resistance that demonstrates that some students choose to remain silent in classrooms (Ha & Li, 2014) and refrain from participation (Moje, Dillon, & O’Brien, 2000) as a means to contest classroom norms because they feel their voices and cultures are not appreciated. The present study builds on these demonstrations of student agency as well as others (e.g., Hand, 2010; Nasir et al., 2009) by drawing attention to the fact that what may appear to be ‘laziness’ or oppositional behaviour may instead be serving a greater purpose for students who are exposed to microaggressions and identity threats.

There are numerous ways that students may try to contend with microaggressions and stereotype threat and the present study only offers a few examples. For instance, Hailey’s silence throughout the session of group work could have been perceived by others (e.g., classmates, the classroom teacher, other researchers) as incompetence. Similarly, Jackie’s eye rolling and decision to work on her own could have simply been perceived as oppositional if
taken out of context. Instead, the positioning moves of Jackie, Hailey, and all the focal students, were provoked responses and, as argued here, their attempts to cope with stereotype threat and/or contest marginalizing acts of positioning.

Other psychological coping mechanisms have been documented in the stereotype threat literature. For instance, *disidentification* is defined as the permanent psychological withdrawal of one’s identity from a domain in which they experience failure or the threat of failure as a means to protect their self-esteem (Crocker et al., 1998; Aronson, 2002; Nussbaum & Steele, 2007). Researchers argue that by chronically devaluing the domain in which they experience failure or the threat of failure, people from stereotyped groups feel that there is less of their ego at stake in the event that they underperform (Crocker et al., 1998; Steele, 1997). In the present study, all of the focal students except Kathryn reported their dislike for the mathematics domain. However, all of the focal students also reported strongly valuing their performance in mathematics and viewed it as having importance in the world. Although this study does not have psychological data to make positivist claims about disidentification, given their discourse on the importance of the mathematics domain, it appears as though the focal students did not withdraw their identities from the domain per se. However, their reported previous experiences with marginalization within mathematical group work suggests a trajectory of negative mathematics identity development.

Permanently devaluing a domain such as mathematics is maladaptive and costly (Nussbaum & Steele, 2007) given the gatekeeping function of mathematics in the world (e.g., in terms of access to higher education, career opportunities and so forth). As such, it comes as no surprise that the focal students in the present study reported their value for the domain despite their negative experiences and feelings towards the subject. Experimental research by Steele, Spencer and Aronson (2002) demonstrated that Black students continue to value school even in light of stereotype threat and persistent negative stereotypes about their academic
underachievement. Studies such as this prompted researchers to examine whether individuals engage in more adaptive responses to stereotype threat. To this end, Nussbaum and Steele (2007) introduced a coping strategy that they called *situational disengagement* which they explained allowed students from stereotyped groups to value the academic domain and disengage themselves (i.e., “[detach] one’s self-esteem from external feedback… so that feelings of self-worth are not dependent on successes or failures in that domain” Major & Schmader, 1998, p. 220) only temporarily, in moments of threat (Nussbaum & Steele, 2007). Although the present study lacks the psychological data to make definitive claims about disengagement, the findings can be aligned with Nussbaum and Steele’s notion of situational disengagement. For instance, both Hailey and Abida reported their strong value for mathematics in general. During the session of group work wherein they were marginalized (and, conceivably, experiencing stereotype threat) Hailey and Abida’s silence can be construed as an observable example of temporary (or situational) disengagement from the mathematics domain. Given that the study only examined the students within one session of group work, it is impossible to make claims about whether this coping strategy was employed across other contexts. Further experimental research is needed to make more definitive positivist assertions about how situational disengagement strategies play out in real world contexts.

Although the aforementioned coping strategies may help to mitigate the experience of stereotype threat, ongoing experiences with microaggressions (Solórzano et al., 2000) and other forms of marginalization in school can lead students from non-dominant social groups to drop out or switch their major areas of study (e.g., Dei, Mazzuca, McIsaac, & Zine, 1997). Research conducted in schools across Ontario documents the forms of inequity that students of colour face and calls for a reconstruction of our understanding of the term ‘dropout’ (Dei et al., 1997; Dei, Holmes, Mazzuca, McIsaac, & Campbell, 1995). Specifically, Dei and his colleagues use the term ‘pushout’ to take the blame off of students (and their families) and hold school systems
accountable for student disengagement and dropout. The present study builds on this work by demonstrating how, despite their best efforts to push back against marginalization, repeated experiences with marginalizing acts of social positioning and stereotype threat can be one of the many factors that contribute to students being pushed out of mathematics and school in general.

This discussion emphasizes the need for educators to be sensitive to the various types of coping strategies that students from stereotyped social groups may employ in the face of stereotype threat and microaggressions. Rather than reprimand students for failing to conform to normative classroom conduct, it is more useful for educators to invest time and effort in identifying the source of the problem. The present study provides further evidence to demonstrate that the ‘problematic’ behaviours, which often draw the most attention in classrooms, are often a symptom of a greater underlying issue. Social positioning is best understood as an interactional dance and each positioning move can only truly be understood in relation to the moves that precede and follow it.

In sum, the present study attempted to take the investigation of stereotype threat outside of controlled experimental settings and into a real-world context. To add complexity to the traditional positivist models of stereotype threat, the present study shifted the unit of analysis from performance outcomes to student interactions, employed qualitative research methods, and offered potential insights into how students from stereotyped social groups might experience and respond to stereotype threat. It also attempted to further broaden the implications of stereotype threat and points to its potential impact on student relations, identity development, and learning. The study provides qualitative evidence to suggest some of the ways that stereotype threat is more than just a momentary phenomenon. Instead the study suggests that stereotype threat can ‘spill over’ (Inzlicht et al., 2011) and negatively impact a person’s interactions with group members and hinder opportunities to learn throughout an entire session.
of group work. Repeated experiences with stereotype threat can also have long-term effects on
learning.

**Implications for Learning Theory**

*Restricted Access and Short-Term Impacts on Learning*

By incorporating a sociocultural perspective on learning, this study offers a theoretical
claim for how microaggressions, stereotype threat, and social positioning operate in concert to
shape learning. When learning is conceptualized as shifts in identity (Lave & Wenger, 1991)
and the notion of becoming (Nasir, 2002), we can see how marginalizing acts of positioning and
associated stereotype threat can negatively shape this identity development. Microaggressions,
stereotype threat, and social positioning can have both momentary and lasting impacts on
identity construction and learning. For instance, drawing from the Differential Influence
framework (Engle et al., 2014), learning was inhibited in the moment for many of the focal
students as they were denied access to central forms of participation including access to shared
learning artifacts, the interactional space, and the conversational floor. Despite their various
methods of resistance to marginalization, none of the girls appeared to be successful in gaining
access to central forms of participation. The girls who chose to remain silent or collegial were
left to peripheral forms of participation, and even the girls who more explicitly contested their
marginalization were met with further marginalizing acts of positioning and restricted access.

*Identity Thickening and Long-Term Impacts on Learning*

Repeated experiences with stereotype threat and marginalizing acts of positioning can
lead negative positional identities to thicken (Holland & Lave, 2001) into more stable negative
practice-linked identities, thus having a more lasting impact on learning. As Kotsopoulos (2014)
suggested in her study of social positioning, the silencing of students within a single session of group work can go on to have lasting impacts on access to learning as a result of its influence on identity development. In addition, most of the focal students reported having a history of marginalizing experiences in group work and marginalization appeared to be part of their mathematical figured worlds of group work. Many focal students also described themselves as weak mathematics students (relative to their highly competent classmates). Although they valued their performance in the domain, most did not like mathematics and they enrolled in it because they felt they had to in order to keep their future career options open.

In sum, the present study provided insights into the focal students’ emerging mathematics identities and, although I do not imply any causal relations, this identity development appeared to be related to their perceptions about and experiences (including stereotype threat and microaggressions) with mathematical group work. Further research, including additional observations and focal student interviews, would be needed to make a more empirical claim about the relationship between the social positioning analyzed here and the focal students’ evolving mathematics identities.

Implications for Mathematics Educators

Understanding the manner through which stereotype threat and marginalizing acts of positioning can impact learning (both in the moment and in the long run) can be critical for educators in their pursuit to address inequity and maximize learning opportunities for all students. In addition to informing the ways in which educators design and implement group work, an awareness of identity threat can help them to better support students to contend with hovering achievement stereotypes. For example, Boaler (2013) and others (e.g., Dweck, 2006) emphasize the importance of instilling a growth mindset (i.e., the understanding that intelligence
is not innate and, instead, can be learned) in shaping student success and achievement. These researchers advocate that when students develop an understanding that the brain can essentially ‘grow’ from exercise, they view themselves as having greater potential and competence. This conceptualization of intelligence has also been found to have buffering impacts on stereotype threat (Aronson, Fried, & Good, 2002). Specifically, in research examining stereotype threat interventions, African American students in an experimental condition were encouraged to view intelligence as a malleable rather than innate capacity. The researchers found that those students who focused on a growth mindset were less vulnerable to stereotype threat (as evidenced by their higher performance on a test) and reported greater enjoyment in the academic tasks.

Although stereotype threat does not occur as a result of the internalization of stereotypes (e.g., Steele, 1997; Aronson et al., 1999), discrediting the validity of achievement stereotypes (and the notion that intelligence is biologically based and related to one’s race or gender) seems to have some protective benefits. Because stereotype threat operates based on one’s awareness that they may be judged by others’ knowledge of stereotypes (e.g., Aronson, 2002; Steele, 1997), it may be particularly useful for educators to encourage growth mindset and discredit achievement stereotypes in the presence of all students (i.e., students from both dominant and non-dominant groups) rather than focus on small-group interventions involving only those who are from stereotyped social groups. Further to this, returning to the work of McGee and Martin (2011), it may also be helpful for educators to support students to manage stereotype threat by encouraging them to focus on the achievement expectations that students set for themselves as oppose to societal expectations/stereotypes.

Classroom discussions that promote sociocultural perspectives on learning can raise awareness that learning and performance on a task is not merely based on what goes on inside the brain. This conceptualization may be fruitful in mitigating hovering identity threats because it places emphasis on the sociocultural mediators of learning and performance thereby reducing
the blame placed on students from stereotyped social groups who may (through no fault of their own) underperform on tasks.

In sum, this study demonstrates how students become marginal members of collaborative group work through repeated, moment-to-moment acts of positioning. This raises important implications for learning theory. Research documenting microaggressions (e.g., Solórzano et al., 2000) and the marginalization of students from non-dominant social groups in mathematics classrooms (e.g., Leander, 2002b; Kotsopoulos, 2014; Langer-Osuna, 2011) suggests that students from non-dominant groups may be more likely to encounter marginalizing acts of positioning in their everyday experiences in mathematics classrooms. Over time, these negative positional identities can thicken into more stable negative mathematics identities and thus hindering learning. The construction of both negative positional and practice-linked identities are shaped by students’ social identities and both can inhibit students’ opportunities to learn. By being mindful of stereotype threat in the design and implementation of group work as well as instilling a growth mindset, teachers may help to mitigate stereotype threat.

Theoretical Considerations of Intersectionality

Multiple Interacting Timescales

This study considered the intersection of macro-, meso-, and micro-level timescales in its analysis and discussion of marginalizing acts of positioning. It considered macro level stereotypes and social identities, meso-level influences such as the school culture, students’ histories of engagement with one another, and focal students’ mathematical figured worlds of group work; as well as micro-level acts of social positioning that played out during a session of group work. Like the work of Wortham (2006), the present study demonstrated that these
timescales do not operate in isolation, but instead mutually influence and shape one another. For instance, the case of Kathryn (a White girl working with a group of White boys) demonstrated how broad gender stereotypes played out and shaped social positioning within a session of group work and, reciprocally, how the moment-to-moment acts of marginalization and the positioning of Kathryn as a peripheral member of the group served to reinforce the broad sociocultural gender stereotype. Similarly, the case of Valerie (an 11th grade Asian girl who worked with two White girls from the 10th grade) highlighted the way macro-level stereotypes about Asians in mathematics (i.e., the pressure Valerie felt to live up to the model minority stereotype) interacted with more locally (meso-level) constructed stereotypes about the elite 10th graders as well as moment-to-moment marginalizing acts of positioning to shape her experience in group work. In addition, the construction of Varlerie’s positional identity as a peripheral member of the group and her 10th grade group members as the leaders served to reinforce the local stereotype about the elite 10th graders. The importance of each of these interacting timescales was reflected throughout Valerie’s narrative. In its consideration of multiple interacting timescales, this study contributes to positioning theory by offering a comprehensive analysis that reflects the complexity of social positioning and how it operates in everyday interactions.

**Multiple Interacting Social Identities**

As we move across contexts and are positioned in certain ways, different components of identity may become salient. This is the fluid nature of identity. Research suggests that despite the fact that every person is composed of a number of intersecting social identities, people often see themselves in terms of the social identity that is most stigmatized in a given situation (Branscombe et al., 1999). The findings of this study build on this idea, suggesting that
marginalizing acts of positioning may further increase the salience of stereotyped social identities and increase a person’s susceptibility to stereotype threat. However, this study draws on intersectionality literature to add complexity, suggesting that at any given moment, a person may be dealing with threats to multiple aspects of their identity. Although we, as researchers, may foreground a particular dimension of social identity for the purpose of our analyses, in reality these identities and associated threats cannot be disentangled. Take, for example, the case of Hailey, an Asian girl working with a group of White boys. As previously described, working with a group of White boys, at any given moment, Hailey may have been contending with racial and/or gender achievement stereotypes. The pressure to live up to the Asian achievement stereotype in addition to the fear of confirming the gender achievement stereotype may have together been plaguing Hailey during the interaction. This argument runs counter to the stereotype threat theory literature that posits an either-or account of how race and gender identity threats operate (e.g., Gonzales, Blanton, & Williams, 2002).

In this study, I drew on the focal student narratives as well as the microaggression theory and stereotype threat theory literature to make some claims about social identity salience, but there is still much to be understood about the experience of microaggressions and stereotype threat when intersectionality is taken into consideration. Qualitative research focused on developing tools and frameworks that facilitate the investigation of intersectionality are needed to help us better understand how microaggressions and stereotype threat operate in the real world.

I limited this study’s focus to race and gender mathematics achievement stereotypes as well as any other aspects of social identity that the focal students independently raised (e.g., grade level), however, it is recognized that other aspects of social identity such as sexual orientation and social class may well have been involved in the observed sessions of group work, despite the fact that the students did not openly discuss them. Future studies should examine how threats to these and other aspects of social identity play out in group work.
Contributions to Positioning Theory: The Affordances of Methodological Triangulation

A Study of Professional Vision

The methodological triangulation employed in the present study facilitated an examination of professional vision. As described earlier, my interpretive lens as a researcher is informed by past experiences, social identity, theoretical orientations, and so forth. Similarly, the focal students each possessed their own ways of seeing and experiencing the observed social positioning based on their: social identities, evolving mathematics identities, mathematical figured worlds of group work, previous experiences in group work, relationships with their group members and so forth. The microanalysis of video, guided by the researcher lens, as well as the stimulated recall interviews, which revealed the experiences and interpretations of the focal students, together afforded a more nuanced understanding of the microdynamics of marginalizing acts of positioning. Together, these complementary sets of data shed light on how students are marginalized both subtly and explicitly through verbal and non-verbal means.

The analysis of video and interview data also highlighted differences in professional vision in that my (i.e., the researcher’s) way of seeing the social positioning was not always consistent with the focal students’ reported ways of seeing and experiencing the events. For instance, some of the focal students were attuned to the marginalizing positioning moves of particular group members more than others (e.g., demonstrated in the cases of Hailey and Jackie) while other focal students described marginalizing events that were not observable or detected in by the researcher (e.g., in the case of Valerie when she explained her strategy to appear amicable despite her feelings of frustration). The video footage alone (and the
constraints associated with using a single video camera) could not provide the kind of detail and nuance that the focal student narratives produced.

Taken together, these findings help to inform future analyses of social positioning. The results discussed here are akin to Leander (2004), who was surprised to find that although his analysis of a video recorded interaction was centered around student-student positioning, a posthoc interview with a focal student, Latanya, instead revealed her focus on her relationship to the classroom teachers (who were not captured in the video footage). Leander (2004, p. 207) stated, “While Latanya and I watched the same videotape of the interaction, she appears to have attended primarily to [the classroom teachers] who were, for the most part, off camera.” These findings point to the potential for misinterpretation when we rely too heavily on the sole perspective of researchers in these microanalyses of social positioning. In these investigations, it is therefore necessary to acknowledge the researcher’s professional vision as well as consider the perspectives of the participants involved.

The differences in perspective revealed in the present study also demonstrate, once again, the importance of considering the broader contexts of interaction rather than only honing in on moment-to-moment acts of positioning. For instance, Hailey and Jackie’s focus on the marginalizing acts of positioning of certain members of the group (over others) may, at least in part, be related to their previous experiences with these individuals. By triangulating the data and considering the cultural climate of the school and classrooms in addition to the focal students’ interpretations of the moment-to-moment acts of positioning as well as their previous group work experiences, mathematical figured worlds of group work, mathematics identities, and other meso-level influences, a more contextualized understanding of the events was afforded.
Implications for Mathematics Education

The ‘surprises’ revealed in the student narratives brought to light aspects of social positioning that are often invisible to researchers and teachers alike. Many dedicated educators monitor mathematical group work by walking around the classroom, observing student discussions, being on the lookout for students requiring support. Based on the findings of the present study as well as other studies of social positioning in group work (e.g., Ritchie, 2002), observational feedback may be limited and, potentially, misleading. Not only is it impossible to monitor all students at a given time, but also, the subtle forms of marginalization depicted in the present study demonstrate how easily it can go unnoticed. The teachers in the present study were all committed to equity and dedicated to creating supportive collaborative learning opportunities. However, despite their best efforts, with the exception of Hailey’s classroom teacher, the teachers did not appear to notice the marginalization taking place nor did they intervene in any way.

Although it was beyond the scope and goals of the present study, it may have been a powerful learning experience for the teachers in the present study to have watched the group work video footage immediately following the event. Sharing findings from video research may help to make educators more sensitive and attuned to issues of equity in group work. Stimulated recall techniques, in other research referred to as video reflexivity techniques (i.e., “a process where ethnographic video footage of clinicians’ practices is played back to the clinicians for review and discussion”, Carroll, 2009, p. 247), employed in other fields such as medicine have shown promise as a method of professional development (e.g., Carroll, 2009). Within mathematics education, research employing video-based teacher professional development has demonstrated that having teachers meet monthly in a video club to watch video excerpts taken from their classrooms facilitated a change in what they noticed about their students and teaching and how they interpreted classroom events (Sherin & van Es, 2005). Video-based teacher
professional development may also prove to be useful for educators who strive to create more equitable collaborative learning opportunities by drawing their attention to (or helping them notice, Sherin & van Es, 2005) the many subtle ways in which students from non-dominant groups get pushed to the margins. By being better able to detect marginalization, teachers may develop strategies for setting up and supporting students in group work to help prevent marginalization.

To make marginalization even harder to detect, dysfunctional groups can often succeed in completing mathematical tasks, thus further increasing the invisibility of marginalization (e.g., Esmonde & Dookie, under review; Ritchie, 2002). Although the present study did not engage in a close examination of the mathematical work produced by the groups, each of the groups were able to make considerable progress on the assigned tasks despite their dysfunctional group work dynamics. To further demonstrate how dysfunctional groups succeed, future analyses should engage in a more fine-grained analysis of the mathematical work completed in this study, with greater attention to the development of mathematical ideas and how they got taken up and represented in the work.

In summary, the present study demonstrated that by employing methodological triangulation and using positioning theory, microaggression theory, and stereotype threat theory as theoretical and analytical frameworks, marginalization could become visible. The triangulation method employed here and the findings it provided related to professional vision have implications for research as well as the teaching profession. The findings support teaching feedback methods that involve listening to students’ feedback (Cook-Sather, 2002) and experiences (e.g., having students engage in an open-ended written response about their collaborative learning experiences as their ‘ticket out the door’) as well as engaging in observation.
Further Directions for Future Research

The present study investigated the marginalizing acts of positioning experienced by six students from stereotyped social groups in single sessions of group work. The students were specifically selected because they self-identified with social groups traditionally stereotyped in the mathematics domain and because they described themselves as having a history of negative experiences with group work. The implications drawn from this study are limited given the small sample and scope of observations. Nonetheless, it raises a number of questions for future research. For example, given that stereotype threat can be elicited in very subtle and implicit ways, further studies should examine how stereotype threat is elicited through interactions when focal students are not being marginalized. For example, if Hailey had not been marginalized in the session of group work consisting of White boys and assuming the mere presence of the boys is enough to trigger stereotype threat, would we have seen a similar response to stereotype threat? What would her participation in the group have looked like?

It is important to note that the present study did not investigate or consider the intentionality of the non-focal students. Given that microaggressions are most often unconsciously and unintentionally delivered, it is quite possible that the non-focal students were completely unaware of their actions. It may be fruitful to investigate, through stimulated recall techniques, whether and how the individuals who deliver microaggressions identify, interpret, and explain their marginalizing acts of positioning. Perhaps video reflexivity techniques in combination with discussions about social positioning can be useful in raising awareness about how everyday, seemingly innocent actions can be received by others and heighten sensitivity towards one’s own conduct in social interactions.

By using stereotype threat theory and microaggression theory as interpretive lenses, the present study was able to theoretically foreground how social identity and associated stereotypes may be involved in marginalizing acts of social positioning. Although attempts were made to
draw attention to implicit forms of racism and sexism, many of these discussions remained at an interpretative level. There is a great need for theoretical frameworks and analytical tools to investigate implicit racism and sexism. They are so deeply engrained in everyday social interactions that they are invisible except to those who fall victim to them. The present study went to great lengths to bring these issues to the floor, but without access to the internal thoughts and feelings of participants, implicit racism and sexism remains very difficult to identify, study, and address.

Conclusions

The present study sought to investigate the microdynamics of marginalizing acts of social positioning within collaborative mathematical group work. The employed methodological triangulation, involving the analysis of both video and stimulated recall interviews, facilitated a fine-grained analysis of marginalization and the employed analytical framework shed light on the ways stereotype threat and microaggressions may unfold during group work interactions.

The researcher’s microanalysis of video revealed gendered and/or racialized patterns in social positioning and demonstrated how six students from stereotyped social groups were marginalized through both verbal and non-verbal means. The analysis of stimulated recall interviews revealed that the focal students, too, identified these marginalizing acts of positioning. However, in contrast to the researcher’s interpretation, which incorporated social identity, stereotypes, and associated threats, the focal student narratives remained colourblind for the most part. Rather than explicitly talking about race and gender, the focal student interpretations instead drew on discourse about friendships, ability levels, and the dispositional qualities of their group members to explain patterns of social positioning within the group work.
The focal students also identified marginalizing acts of positioning that were not apparent to the researcher and/or put emphasis on certain marginalizing acts of positioning in a manner that was quite different from the researcher’s interpretation. In addition to providing a more nuanced understanding of marginalizing acts of social positioning, these findings highlighted the importance of considering the voices of participants and further revealed the potential for misinterpretation and misrepresentation when we solely rely on the professional vision of researchers.

Building on microaggression theory and stereotype threat theory, the study provoked discussion about the various ways in which students from stereotyped social groups may respond to potential microaggressions and/or stereotype threat in real world interactions. Specifically, the study characterized the focal students’ three main types of responses to marginalization: (1) silent resistance; (2) outspoken resistance; and (3) pretending to understand, agree, and get along with group members. Despite their observable differences, I argued that these responses could all be seen as agentic and strategic moves.

By suggesting ways in which students may cope with marginalization and identity threats in the moment, the findings of this study build on both microaggression theory and stereotype threat theory. Further to this, the findings offered qualitative data that (through an interpretive paradigm of knowledge) complement the robust corpus of experimental stereotype threat work. The study extended the stereotype threat literature by qualitatively discussing the lived experience of stereotype threat, how it might unfold through everyday interpersonal interactions, and how it might have a more lasting impact on identity development, student relations, and (thus) learning.

Micro moments of marginalization accumulate through everyday social interactions and can have a macro impact on the lives of those on the receiving end. Developing frameworks to identify and understand implicit racism and sexism is needed not only in research, but also
across front-line fields including education. Bringing discussions about the microdynamics of marginalizing acts of social positioning into mainstream teacher discourse and professional development may be one way to address the everyday inequities that students from stereotyped social groups encounter during their moment-to-moment social interactions in mathematics classrooms.
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APPENDICES

Appendix A. Student Survey

Circle a number to indicate the degree to which you agree or disagree with the following statements:

1. Math is one of the most important subjects in school.

   0  1  2  3  4  5
   strongly disagree disagree somewhat disagree somewhat agree agree strongly agree

2. Math is one of my favourite subjects in school.

   0  1  2  3  4  5
   strongly disagree disagree somewhat disagree somewhat agree agree strongly agree

3. I highly value my performance in math.

   0  1  2  3  4  5
   strongly disagree disagree somewhat disagree somewhat agree agree strongly agree

4. I enjoy small group work activities in math class.

   0  1  2  3  4  5
   strongly disagree disagree somewhat disagree somewhat agree agree strongly agree

5. Math is very useful in the everyday world (outside of school).

   0  1  2  3  4  5
   strongly disagree disagree somewhat disagree somewhat agree agree strongly agree

6. I feel pressure to do well in math class.

   0  1  2  3  4  5
   strongly disagree disagree somewhat disagree somewhat agree agree strongly agree

7. Math is not an important subject in school.

   0  1  2  3  4  5
   strongly disagree disagree somewhat disagree somewhat agree agree strongly agree
In the space provided below, please describe your feelings towards small group work in math class. Elaborate on your feelings by describing examples of times when group work went well and/or didn’t go well and why that was the case.

**Demographic Information**

Name: ____________________________ Age: ______

Gender: ____________________________

Race: ____________________________

If different from above, please indicate the race and/or gender that you believe others perceive you as:

_________________________________________________________________

Family socioeconomic status (e.g., low, medium, high): __________________
Appendix B. Introductory Student Interview Protocol

1. How would you describe yourself as a mathematics student?

2. Relative to other school subjects, describe how you feel about math (Prompts: Do you enjoy it? Do you find it challenging?)

3. Describe your feelings about small group work in math class (Prompt: Compared to working on your own or having direct instruction from your teacher…)

4. Tell me about a time when group work went well and why you think it went well.

5. Tell me about a time when group work went badly and what made it go badly.

6. Reflecting on your previous experiences, describe the major challenges to working in small groups in math class.

7. Is there anything else that you’d like to say about your feelings about math, group work, or your experiences in math class?
Appendix C. Stimulated Recall Interview Protocol

**Italicized text reflects the researcher’s script.**

1. Explain where the video footage is from:
   - *This is video footage from (today’s/yesterday’s) group work activity*
2. Have participant state the goals/purposes of the group work activity:
   - *Describe the group work task and what your major goals as a group were*
3. Explain the stimulated recall process:
   - *As you know, I’m interested in hearing about your experiences in group work. So in this interview, I’d like you to try and share as much of your thoughts, feelings, reactions and interpretations as possible. We’re going to watch some parts of the group work footage together. As we watch, I’d like you to tell me to pause the video at any point that you would like to comment on what is happening. For example, if you want to tell me about the reasons behind some of your actions, how you felt at a particular moment, why you think your group members were saying or behaving in a certain way, unexpected occurrences, things that were beneficial to the group work, things that were detrimental to the group work etc. In case you forget to stop me, I’ll stop the video about every minute so that we can discuss what just happened. This part of the interview will take about 30 minutes or so. I’ve chosen a few parts of the group work activity that I’d like you to comment on. Once we’re done, if there are any other parts that you’d like to watch and/or comment on, please let me know.*
4. Questions to pose after watching the video:
   - *What are your general feelings about this group work experience?* (prompt: do you think it went well? Do you think it went badly?)
   - *What could have made this group work activity have gone better?*
   - *Any other reflections on the footage that we’ve just watched?*
   - *Are there any other parts of the video that you would like to watch and/or comment on?*
Appendix D. Final Student Interview Protocol

1. How do you think your fellow students and teacher would characterize you as a math student? (prompt: what kinds of words do you think they would use to describe you as a student?)

2. Reflecting on the school year, tell me about a time when group work went well and why you think it went well.

3. Reflecting on the school year, tell me about a time when group work did not go well and why you think it went badly. (Probe: Describe the challenges.)

4. Describe any changes you would make to the way group work is structured and/or implemented in your class. (Prompt: If you were the teacher…)

5. How do you see math as being part of your future life – for example, as a student or in your career etc.? (Prompts: do you see yourself continuing to study math in the future? Do you see yourself using math in your career?)

6. Describe any stereotypes about math ability or achievement that you know about.

7. Have you ever witnessed or experienced a time when a person’s race, gender, or socioeconomic status affected their experience in group work in math class? Please explain and feel free to share some experiences.
Appendix E. Teacher Interview Protocol

1. Describe your mathematics program. (Prompts: grade level, course name, units of study, nature of the mathematics content, level of difficulty etc.)

2. Describe your pedagogical priorities. (Prompts: For example, group work? Direct instruction? Etc.)

3. Describe your teaching goals.

4. How do you define and assess mathematical success in your classroom?

5. Describe [the focal participants] in general and as students in your math class.

6. (a) In general, how would you describe the student relationships and dynamics in your classroom? (Prompt: Would you say there is cohesion across all students?)

(b) How would you define [the focal participant’s] relationship with other students in the class? (Prompt: Can you provide some specific examples?)

7. Tell me about how group work is generally structured and implemented in your class? (Additional probe: How often do you employ group work?)