The Journal of Educational Research

ISSN: 0022-0671 (Print) 1940-0675 (Online) Journal homepage: http://www.tandfonline.com/loi/vjer20

The psychosocial experience of high school girls highly susceptible to stereotype threat: A phenomenological study

Katherine Picho

THE JOURNAL OF EDUCATIONAL RESEARCH
2016, VOL. 0, NO. 0, 1–16
http://dx.doi.org/10.1080/00220671.2015.1010192

Routledge
Taylor & Francis Group

The psychosocial experience of high school girls highly susceptible to stereotype threat: A phenomenological study

Katherine Picho

Department of Medicine, Uniformed Services University of the Health Sciences, Bethesda, Maryland, USA

ABSTRACT

The author used phenomenology to explore the subjective experience of ninth-grade girls susceptible to mathematics-related stereotype threat in their authentic learning environments. The sample constituted students categorized as either having low or high susceptibility to stereotype threat (SST) enrolled in Honors mathematics classes at an urban high school in the Northeast United States. Results showed that high-SST students experienced a wide range of negative emotions regarding both mathematics and its learning context. Emotions commonly experienced by this group included low self-efficacy and hopelessness specific to learning mathematics, frustration, and feelings of isolation (both social and intellectual) in their classes. Experiences common to these students were perceived differential teacher treatment, and stereotype endorsement linking mathematics ability to fixed traits such as race or genetics. Low-SST students, on the other hand, experienced positive relationships with their teachers, positive schooling experiences, and a malleable view of intelligence.

ARTICLE HISTORY
Received 25 October 2014
Revised 29 December 2014
Accepted 18 January 2015

KEYWORDS
Emotions; females; high school; mathematics; phenomenology; qualitative research; stereotype threat; stereotypes

In 1992 Mattel sparked controversy when it released *Teen Talk Barbie*—a talking doll that uttered phrases such as "I love shopping!" and "Math class is tough!" At the time, the issue regarding the gender gap in subjects such as mathematics was hardly novel to both the layman and researchers. In fact, decades of research on the topic appeared to have been divided in identifying the key factors that explained these differences. On the one hand there was evidence to suggest biological differences in visuospatial ability (Gur et al., 2000), and sex differences in brain development and hormonal differences (Halpern, 1992; Hyde, 1981; Wilder & Powell, 1989) as key explanatory variables for the gender gap in mathematics and science. On the other hand, there was mounting evidence to support the role of sociocultural factors such as teacher and parental expectations (Baker & Jones, 1993; Lummis & Stevenson, 1990; Hyde et al., 1990) in socializing boys and girls differently toward mathematics. Nevertheless, the Mattel fiasco fueled the public discourse on the potential role of gender stereotypes as one of the key factors contributing to the gender gap in mathematics interest and performance. Three years later, Steele and Aronson (1995) reported results from a series of experiments in which they had found that African Americans tended to underperform on tests of verbal ability when they were made aware of negative stereotypes about their group's ability in academics. The phenomenon, called stereotype threat (ST), has since received more than its fair share of attention as a plausible explanation for the performance gap of girls (Aronson, Quinn, & Spencer, 1998; Keller & Molix, 2008; Schmader, 2002) and non-Asian ethnic minorities (i.e., African Americans [Steele & Aronson, 1995] and Hispanics [Gonzales, Blanton, & Williams, 2002]) in mathematics and academics, respectively.

ST is sociopsychological; it impacts the performance of members of stigmatized groups on difficult tasks in domains where negative ability stereotypes about their groups exist (Steele, 1997). ST does not affect all members of stigmatized groups but rather those who strongly identify with the stereotyped domain and are also aware of the negative stereotype about their group's ability in the domain (e.g., "Women just aren't good with numbers"). For these individuals, susceptibility to the phenomenon is further moderated by individual differences on intrapersonal factors such as group identification (Armenta, 2010; Schmader, Johns, & Barquissau, 2004), stigma consciousness (Brown & Pinel, 2003), stereotype endorsement (Eriksson & Lindholm, 2007; Schmader & Barquissau, 2004), negative affect (Cadinu, Maas, Rosabianca, & Kiesner, 2005; Keller & Dauenheimer, 2003; Osborne, 2001; Oswald & Harvey, 2001) and locus of control (Cadinu, Maas, Rosabianca, Lombardo, & Figerio, 2006). The foregoing studies have linked higher levels of the previous variables to underperformance on tests under ST.

Although empirical research has played a significant role in promoting the collective understanding of ST, the heavy focus on experimental research in this area has shadowed inquiry into social context which, according to stereotype threat theory, serves as the impetus for ST to occur (Steele, 1997). Most ST research has been experimental, conducted in tightly controlled lab settings, usually involving the isolation and manipulation of key variables of interest. This approach, while useful in investigating intrapersonal psychological factors, might not

CONTACT Katherine Picho edpsychresearch@gmail.com Department of Medicine, Uniformed Services University of the Health Sciences, 4301 Jones Bridge Rd., Bethesda, MD, 20814.

necessarily lend itself as useful in investigating social context. Specifically, it is limited in its capacity to provide insight regarding contextual elements that trigger or exacerbate the phenomenon. The approach is also limited in providing a deeper understanding of the subjective experience of ST by susceptible members of these marginalized groups in nonlaboratory or naturalistic learning environments. Understanding the experience of the individual susceptible to the ST could play a significant role in shedding more light on how intrapersonal psychological factors and social context interact to create the ST experience. Ultimately, this knowledge could help inform the design of more inclusive (and less intellectually threatening) learning environments for members of marginalized groups.

The present study sought to understand the lived experience of ninth-grade girls at an urban high school who were enrolled in advanced mathematics classes and also identified as being susceptible to ST (SST). The present study sought to address two key questions. First, what is the experience of girls highly susceptible to ST in Honors mathematics classes? Second, how are these experiences similar to or different from that of students who have low susceptibility to ST? Although ST effects are certainly not limited to girls in mathematics, in the present study I focused on this demography because the gender gap in mathematics and science persists, and mathematics remains the critical component for success in other science, technology, engineering, and mathematics (STEM) domains where women are still significantly underrepresented. First, an overview of phenomenology as a theoretical framework is presented, followed by a description of data collection based on in-class observations and interviews, and finally results and implications for future research are discussed.

Method

The present investigation focused on exploring the lived experience of high school girls susceptible to ST. As such phenomenology was used as both a theoretical framework and the primary mode of data collection. Phenomenology is a qualitative process that gives the researcher insight into the rich experience of a group of individuals who have experienced a particular phenomenon, which results in a deeper understanding of the phenomenon itself (Moustakas, 1994). It is both a theoretical paradigm and mode of data collection. This paradigm of inquiry allows researchers to explore the “meaning, structure, and essence of the lived experience” of a certain phenomenon (Patton, 2002, p. 104) and search for the underlying meaning of an experience from the perspective of the participants who experience the phenomenon being investigated (Creswell, 1998). Thus, to get at the heart of the ST experience in this study, data were collected mainly via qualitative interviews, and supplemented by in-class observations of students in Honors mathematics classes.

Sample

The study was conducted at Mosley High School (not real name), a low-performing urban school in Connecticut with a student population of 2,300, evenly split in thirds by ethnicity (i.e., Black, Hispanic, and White). At Mosley High School, 31% of the students were eligible for free lunch, and an additional 11%, for reduced lunch.

Participants were selected from a pool of Honors students by between-methods triangulation. Triangulation uses multiple methods and measurement procedures in order to increase validity (Ma & Norwich, 2007) and methodological triangulation can be conducted using either between or within methods techniques. In the former, contrasting research methods are used to investigate a phenomenon, for example, using both a questionnaire and observation in a single study (Denzin, 1970). Within methods triangulation, on the other hand, uses varieties of the same method to investigate a research problem such as self-report questionnaires with two contrasting scales to measure a construct (Jick, 1979).

Students who gave informed parental consent and parent permission to access student Connecticut Mastery Test (CMT; Connecticut State Board of Education, 2009) scores formed the pool of potential participants for the phenomenological study (see sampling procedures in Figure 1).

From this pool, high- and low-SST participants were identified using multiple sources of information: (a) class placement in Honors mathematics classes; (b) scores on a stereotype threat susceptibility measure, the Social Identities and Attitudes Scale (SIAS; Picho & Brown, 2011); (c) teacher selection based on criteria delineated by Steele (1997); and (d) the participants' most recent scores on a standardized mathematics test, the CMT.

The Social Identities and Attitudes Scale (SIAS)

The SIAS is a six-factor SST scale that measures individual differences on the factors empirically supported as ST moderators: domain identification, negative affect, group identification (ethnicity and gender), and stigma consciousness of the same (see the Appendix). Items assessing each moderator are anchored on a 7-point Likert-type scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Previous validation studies of the SIAS with high school and college populations have thus far shown strong psychometric properties and reliability for its subscales (Picho & Brown, 2011).

SIAS scaling

Decisions about cutoffs for ST susceptibility were driven by both ST theory and the meaning of the points on the 7-point scale on which the SIAS items were anchored.

ST theory posits that domain identification and group stigma consciousness as prerequisites for ST (Steele, 1997). Empirical research further demonstrates that high levels of negative affect (Cadinu et al., 2005), group identification (Armenta, 2010; Schmader, 2002) are positively associated with ST. As such, two mean scores created from the SIAS subscales were used to categorize students as either high or low SST: (a) a mean score of mathematics identification and (b) a new composite score named moderators which was a sum of the mean subscale scores of the remaining five factors assessed by the SIAS.

Ratings of high or low on the SIAS were interpreted as such based on the 7-point Likert scale. For instance, scores above 5.5 on any subscale denoted that on average a participant responded with either 6 (*agree*) or 7 (*strongly agree*) to the

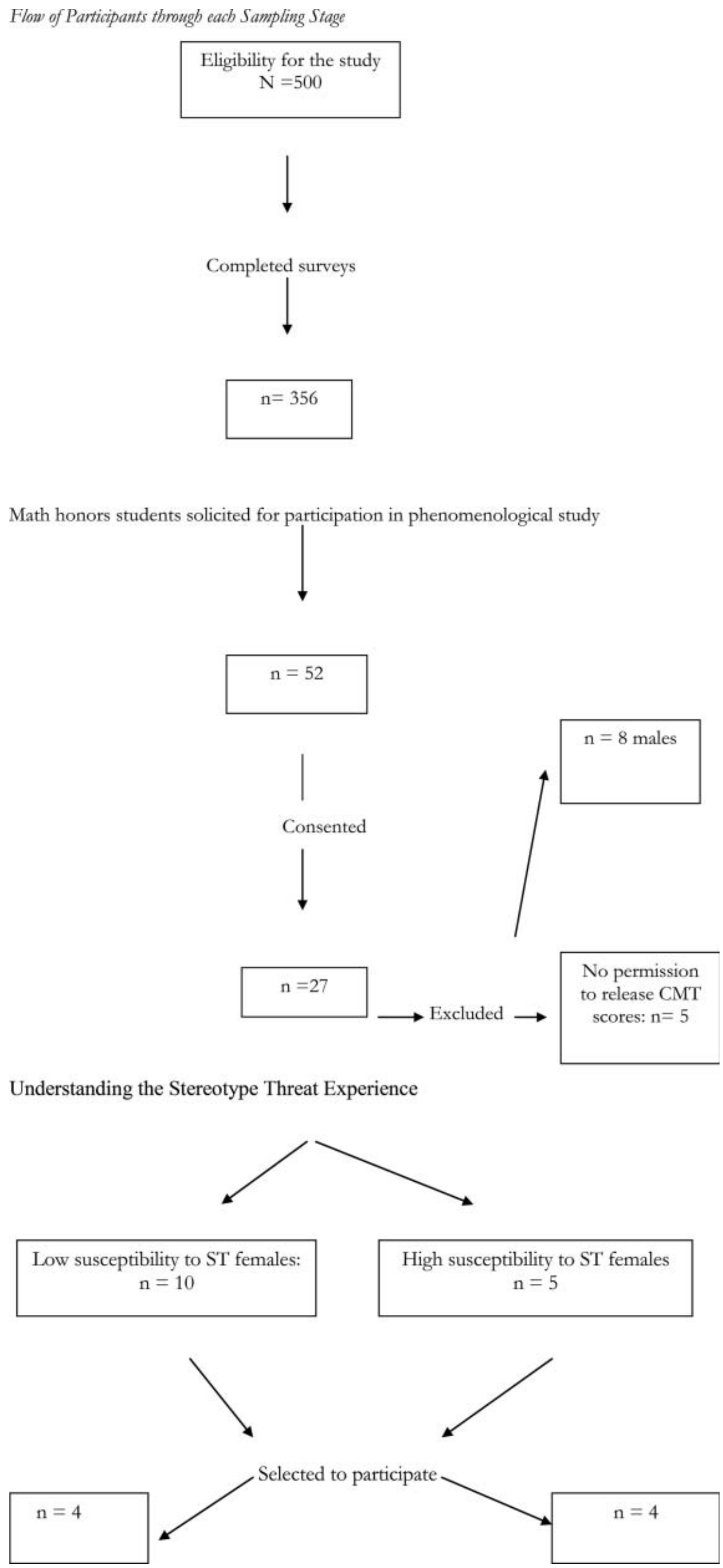

Figure 1. Flow of participants through each sampling stage.

items measuring a given factor. Similarly, scores of 3 and below (i.e., corresponding to *somewhat disagree* to *strongly disagree* on the scale) implied low ratings on SIAS subscales. Thus girls were categorized as having low SST if they scored above 5.5 on mathematics identification but lower mean scores on the other moderators (mean scores less than 27.5 on the composite score for all moderators). Girls were categorized in the high-SST group if they scored above 5.5 on mathematics identification and high mean scores on the other five ST moderators (mean scores equal to and above 27.5).

Class selection and CMT

Participant selection was limited to those enrolled in the more challenging mathematics classes (i.e., Honors or advanced placement) because task difficulty is a key ingredient to activating ST (Steele, 1997). CMT mathematics scores were also used in the selection process, which was in line with most ST studies that have used quantitative sections of standardized tests to assess the performance of girls under ST conditions.

CMT scores

The CMT is a criterion referenced, standardized test assessing how students perform on skills and content identified by experts as important for mastery within a particular domain. For mathematics, raw scores range from 100 to 400 and are transformed to scale scores ranging from 1 (*below basic*) to 5 (*advanced*; Connecticut State Board of Education, 2009).

The CMT scores were used in conjunction with previously mentioned selection criteria to identify high and low risk for ST susceptibility as follows: Students with scores denoting below basic, basic and proficient skills in mathematics on the CMT were eligible for classification in the high SST, and those scoring at goal or advanced were eligible for low SST classification contingent on whether they met eligibility criteria (i.e., SIAS scores and teacher selection). 19 female students in Honors classes granted a release of CMT scores, and thus met eligibility criteria for participation in the phenomenological study. A list of these students, along with corresponding CMT scores was compiled and provided to teachers for the final stage of the sample selection triangulation process.

Teacher selection

ST occurs in contexts where negative stereotypes about a group's ability in a given domain are salient (Steele, 1997). The phenomenon is likely to impact individuals who not only (a) strongly identify with the domain, but also (b) perceive it as valuable to their future careers and (c) have the skills necessary to be successful in it (Steele, 1997). For this subgroup of individuals, those impacted by ST are differentiated from those who are not by performance on difficult domain-related tasks. That is, women susceptible to ST tend to underperform on standardized tests of quantitative ability, and vice versa. Theoretically then, high-SST students were expected to have scores on a standardized mathematics test that underrated their potential in mathematics, while low-SST students' scores were expected to be an accurate reflection of their aptitude in mathematics.

The previous criteria were presented to two teachers (blind to the purpose of the study), who taught four advanced Grade 9 mathematics classes at Mosley High. The teachers were provided with a list of female students in their classes who had met high- and low-SST criteria based on the SIAS and CMT scores, and asked to classify them based on ST theory criteria for these groups. They put a check mark corresponding to the student's name in one of two columns: column 1a if the student met high-SST criteria and 1b if the student met low-SST criteria. Teachers used the CMT scores to evaluate whether the scores had been an accurate reflection of what they perceived to be the students' mathematics ability.

Consequently, girls in Honors classes were categorized as high SST if they (a) scored below basic, basic, or proficient on the CMT; (b) scored above 5.5 on the mathematics identification subscale of the SIAS and had combined mean scores equal to or above 27.5 on the remaining SIAS subscales; and (c) were categorized by teachers as high SST using the criteria delineated by Steele (1997). Low-SST students were classified as such if they (a) scored at goal or advanced on the CMT; (b) scored above 5.5 on the mathematics identification subscale of the SIAS and had combined mean scores less than 27.5 on the remaining SIAS subscales; and (c) were categorized by teachers as low SST (based on Steele's SST criteria). Based on triangulation methods described above, eight girls were selected for in-depth interviews. Four were identified as high SST and the other half as low SST.

Procedure

Prior to the phenomenological study, in-class observations were conducted to provide a general understanding of the mathematics learning environment in the urban high school, and the participants' experience within this specific context.

Classroom observations

Three different Honors classes taught by Ms. Klein and Ms. Caffrey (pseudonyms) were observed during the month of May 2010. Six observations took place. Observations lasted one hour each and the researcher took on a complete observer role, writing field notes regarding classroom context with a specific focus on the physical setting, teacher–student interactions, student interactions and teacher instruction.

Phenomenological study

Interviewing is the primary mode of data collection in phenomenology (Creswell, 2002). I, a Black woman pursuing a doctoral degree at a northeastern university at the time, conducted interviews with high- and low-SST participants. Interviews with high- and low-SST participants were conducted using Seidman's (1991) three-pronged approach, which fosters trust in interracial interviewing. Each student participated in three rounds of in-depth, face-to-face, semistructured interviews (see the Appendix). The first round of interviews concentrated on the participant's life history, with special attention to schooling experiences. The second and third interviews delved deeper into how the participant made meaning of and responded to learning mathematics, her own identities, and the broader picture of pursuing STEM related careers. Each interview lasted 60 min, resulting in 24 audio hours of interview material, which was subsequently transcribed and analyzed. Participants spent a total of 3 hr in interviews over a period of six weeks and were each paid a total of $30.00 ($10.00 per interview) for their participation. Participants were paid immediately after each interview. Data were transcribed and analyzed by phenomenological reduction (Lincoln & Guba, 1985).

Phenomenological reduction

Themes emerging from the transcribed data were analyzed and coded inductively (Lincoln & Guba, 1985) through phenomenological reduction. Phenomenological reduction uses "textural language" to describe both the actual experience of the participant, as well as the researcher's thought events, feelings, and intuition about the phenomenon being explored (Moustakas, 1994, p. 118).

A list of nonrepetitive, nonoverlapping statements was generated (Creswell, 1998) and recorded as meaning units of the experience (Moustakas, 1994). The data was indexed and grouped into categories based on similarities on the emerging themes on contextual factors. Interviews, the coding guide, and the meaning units were analyzed and used to form a broad framework to guide a holistic view of the data collected. Then concepts describing environmental cues in classrooms by high- and low-SST girls were identified and examined for any language, symbols, or words that ST girls use to describe their experiences of stigma in the environment. These concepts were combined to form indigenous typologies—special language given by a group to identify their experiences (Patton, 2002). The themes derived from indigenous concepts and typologies were used to construct individual and composite textural descriptions. The former are written accounts of the individual participant in a phenomenological study while the latter (composite textural descriptions) are written accounts of how a group of participants experience a phenomenon (Moustakas, 1994). Individual structural descriptions, describing and highlighting emerging themes about contextual cues that trigger a stigma experience for individual participants were also created. Next, composite structural descriptions of all the participants' experience of ST context or environment were created to illustrate the shared experience of high-SST girls. Finally, a synthesis of the textural and structural descriptions of the experience of stigma by ST girls was developed to provide a gestalt view of the essence of ST environments as experienced by ST girls in mathematics and science classes. A test for completeness of the study was conducted by checking whether themes identified were expressly mentioned in the transcripts.

Data collected from low-SST girls were analyzed separately from and compared to data collected from high-SST girls. Information obtained from the former was used to guide the researcher's understanding of what constituted common, shared experiences among ninth-grade girls in Honors mathematics classes at this school and what could be attributed more strongly to experiences common among high-SST individuals.

Results

For purposes of confidentiality and the protection of privacy, all names of participants, places, and other identifying information have been changed. An account of the observational study is presented first, followed by a description of results from the phenomenological study.

Honors mathematics classroom observations

Four observations, each lasting 1 hr, were conducted over the period of one month in the Honors mathematics classrooms where the participants for the phenomenological study were selected. The purpose of the observations was threefold: (a) to obtain a third-party perspective of the learning context in which the participants were immersed, (b) to facilitate a deeper understanding of participants' descriptions of their contexts, and (c) to provide me with more information that could be used to facilitate the interviews regarding the participants' experience in their classrooms. I took on a complete observer role, and wrote field notes regarding classroom context, focusing particularly on portraits of the informant, physical setting, as well as classroom interactions between teacher and students, and among the students themselves.

Portrait of Ms. Caffrey's college prep class

The Grade 9 college prep class was taught by Ms. Caffrey, a middle-aged Caucasian woman. Class was held at 7:30 a.m. every morning in a brightly lit room, with sunshine streaming through the open blinds. Seats were arranged in clusters of six, with three desks clamped together. There were nine students in the class, all of who were minorities (three African Americans, two Africans, and four Hispanics). Four of these students were girls. Overall, the students were quiet, attentive, and engaged. They often asked questions to check for understanding, which were answered by other students.

Teacher instruction

The lesson began with a review of a previous class assignment on binomials. Afterward, students individually completed an exercise on the new topic that had been introduced before solutions to these problems were discussed as a group. Students solved problems on the blackboard and the teacher used probes and prompts to facilitate the mastery of difficult material.

Navigating difficult material

When students struggled with difficult material, Ms. Caffrey used prompts to help them derive the correct answer for themselves. Her questions were mostly process oriented, challenging students to articulate the processes by which they had arrived at their solutions. Discussions about right and wrong methods to problem solving were conducted as a class based on the work of students who had volunteered to solve problems on the blackboard, and she consistently asked students to provide a rationale or theory to support their answers.

Teacher–student interactions

Students (mostly boys) appeared comfortable asking the teacher to review questions in the assignment that they did not understand. There were no differences between male and female students in asking the teacher questions (a 1:1 ratio) but boys volunteered answers to questions more frequently than did girls (a 5:3 response ratio). The teacher actively engaged unresponsive girls in her classroom, and actively selected more girls than boys to respond to questions (a 3:1 ratio). She also moderated responses and gave girls more opportunities to answer questions when they volunteered to do so.

Portrait of Ms. Klein's Geometry Honors B class

Geometry Honors B was taught by Ms. Klein, a middle-aged Caucasian woman. The class, which was held daily at 9:00 a.m, comprised 20 students of diverse ethnicity: 11 African Americans, one Hispanic, six Caucasians, and two Asians; 65% of the class was female.

The classroom was poorly lit, owing to the window blinds, which were kept shut. There was a projector overhead, which the teacher used for notes. The notes projected on the overhead were hard to read from a distance, especially for students at the back of the class. This was exacerbated by poor lighting conditions in the room. As such, students found it difficult to see the problems that they were required to solve.

Seating arrangements in the class were standard, arranged in rows with individual desks facing the teacher. Despite the ethnic diversity in the Honors B class, student seating was self-segregated, with Caucasian and Asian students seated to the right side of the teacher, and Black and Hispanic students to the left. Compared to Ms. Caffrey's college prep class, the Honors B class was extremely noisy, chaotic, and less on task. The chaos stemmed from the left side of the classroom, while students at the opposite end of the classroom were extremely quiet and appeared to always be taking notes.

Teacher instruction

The primary mode of instruction in this classroom was product orientated with a drill instruction focus. The teacher began by reviewing homework. Questions that she asked about the homework were product oriented (i.e., they focused on what the correct answer was but not on how to get there). When students provided the correct answer to the first question, Ms. Klein went on to ask for the answer to the next question, and so forth; explanations and details regarding mathematics problems were curt and students who asked questions were frequently asked to consult their notes.

In comparison with Ms. Caffrey's class, Ms. Klein's classroom was overly disruptive. The chaos and misconduct by students seated to the left of the teacher escalated as the lesson went on. On the first day of in-class observations, disruptive behavior in this section of the classroom was marked by students laughing, playing, and engaging in social conversations as the lesson progressed. The following day, student misconduct worsened: Students sang loudly, laughed, and threw pieces of paper across and to the front of the classroom. As a result, students at the opposite end of the classroom found it difficult to hear the teacher. Ms. Klein always responded to the chaos by saying "shush" before continuing with the lesson, to no avail. The next day, Ms. Klein informed me that she had moved Carlos and Antonio (both minority students) to the front of the class so that they could "improve their grade." She handed out worksheets after the lecture on inscribed angles, and promised to show the class how to solve the problems. She started by asking students to identify the different types of geometry problems provided on the work sheet but the bell rang before she could teach the process(es) related to solving the mathematics problems.

Navigating difficult material

Lectures in Honors B were nonlinear and the teacher moved from one topic to another quite fast. Students appeared to be very concerned about whether what she was teaching would be on the upcoming test, and they asked questions along these lines. A good number of minority students expressed having a difficult time understanding word problems. Antonio, for example, had difficulty understanding that "twice 60" was the same as 2×60 even after repeated explanations from the teacher. There were continuous requests to these students that they explain what terms such as *equidistant*, and *congruent*, meant. When students were given problems to solve, the teacher directed them to check their answers against the correct answers found at the back of the textbook. Ms. Klein appeared uncomfortable working through mathematics problems with the students, and addressing student questions that could not be directly answered by the textbook. Each time students asked questions that required her to go beyond the text her primary response was "Don't worry about it. It's not going to be on the test."

Teacher–student interaction in Honors B

Boys and girls were equally chosen (1:1 ratio) to answer questions. There were also no gender differences in the frequency with which male and female students asked questions (a ratio of 1:1). However, boys volunteered answers to questions more than girls did (2:1 ratio). These trends remained consistent over subsequent observations.

Portrait of Ms. Klein's G-period class

Honors G and Honors B lessons were taught by the same teacher and held in the same classroom. Prior to observing Ms. Klein's Honors G class, she notified me that the students in that class were "not bright mathematically" and technically ought not to be in Honors but were there because "they are good kids, but not necessarily mathematically apt." The Honors G class met after lunch. There were 23 students in this class, which consisted of 20 Caucasians, two Hispanics, and one African American student. Seventy percent of the students in this class were girls.

Teacher instruction

Unlike the Honors B class, the Honors G students were quiet and orderly. Lessons were conducted in a lecture format where the teacher did most of the talking. Ms. Klein began the lesson by reading correct answers to the previous assignment. This was followed by a review of a new set of questions geared toward preparing students for the upcoming test on circles. The review was begun by categorizing or identifying types of problems in geometry (i.e., arc vs. length), and a significant amount of time was spent explaining the processes involved at deriving the correct answer. Students in this class were readily provided with answers to mathematics problems. Ms. Klein also provided the class with the answers to identifying the types of problems in geometry whereas in the Honors B class, she had prodded students to identify these problems on their own. Compared to the Honors B class, instruction was much more simplified; mathematical concepts were also explained more slowly and in greater detail.

In this class, Ms. Klein did most of the work and engaged students less. She solved all the problems on the blackboard, and students copied the answers into their notebooks. Similar to what had been observed in the Honors B class, most minority students seemed to have difficulty with word problems (a theme that also recurred in subsequent interviews with some of the high-SST students in the phenomenological study). As was the case in the Honors B class, both Ms. Klein's focus on teaching to the test, and her discomfort in explaining concepts or steering away from examples that were not covered in the textbook were also evident in this class. When students asked questions for clarification of content material, her response was the same: "It's not going to be on the test, don't worry about it."

Teacher–student interaction in Honors G

Only boys volunteered to answer questions and the teacher actively selected more girls than boys to answer questions (i.e., a 1:2 ratio). However, more girls than boys took the initiative to ask the teacher questions (a 1:2 ratio).

Phenomenological study: The lived experience of girls in Honors mathematics class

Eight students participated in the phenomenological study, which constituted interviews. At the onset, there appeared to be demographic differences between low- and high-SST girls (see Table 1).

All low-SST participants were from two parent households with both parents pursuing careers in science fields. Most participants in this group spent plenty of time highly engaged in competitive sports such as soccer, and basketball, and enjoyed spending time with their fathers performing stereotypically masculine household chores such as changing engine oil and fixing structures around the house. High-SST students, by contrast, were from low SES, blue-collar households, with parents or guardians that had no more than a high school education. The key themes that emerged from interviews with the high- and low-SST girls were related to negative emotions associated with learning mathematics, and differential teacher-student interactions and expectations.

Emotions associated with learning mathematics

Low-SST students

All low-SST students came from Ms. Klein's Honors B class. They reported experiencing boredom in the mathematics classroom, which they attributed to lags in instruction caused by disruptive students. Boredom in mathematics classrooms for most of these students was hardly a foreign concept, however. Experiences of boredom reportedly dated back to middle school and, as such, the majority of these students had adopted strategies to effectively deal with this emotional state. Examples of such strategies included finding alternative ways to simplify difficult mathematics concepts, self-teaching ahead of the curriculum, or simply using lags in instruction as an opportunity to work out more difficult mathematics problems on their own.

> [In sixth grade] me and about four other people in our class were at a higher level than the rest of the class. We had our own math group where we basically went like to the corner of the room or to the different room and we all sat and we discussed the work, we discussed the next section, we talked about it for like 5 minutes, did some problems to make sure we all got it, we assigned like five problems for homework and then we would just do nothing. For like the rest of the day.
>
> —*Kayla, Honors B class*

The participants attributed success in mathematics to effort, focus, and hard work. They also described strong mathematics students as hard workers who were not necessarily complete geniuses at mathematics but were interested in learning new

Table 1. Student profiles.

	High SST			
	Danielle	Olivia	Karen	Jessica
CMT score	266 (goal)	271 (goal)	248 (goal)	n/a
SIAS score	25	27	26	27
Age (years)	14	14	15	16
Ethnicity	Hispanic	Black	Black	Black
Neighborhood	Suburb	Elderly homes	Violent	Predominantly Black
Parent occupation	Sales manager father, social worker mother	Unemployed father, nursing home mother	Retail (McDonald's)	Service (UPS mailman)
Siblings' education level	High school	n/a	n/a	Some high school
Achievement goal	College graduate	College graduate, major in medicine	College graduate	Pharmacist
	Low SST			
	Alana	**Kayla**	**Sheila**	**Renee**
CMT score	277 (goal)	313 (advanced)	302 (advanced)	345 (advanced)
SIAS score	20	20	19	23
Age (years)	15	15	14	15
Ethnicity	Biracial (Black)	Caucasian	Caucasian	Caucasian
Neighborhood	"Ghetto," violent	Suburb	Suburb	Suburb
Parent occupation	Father, KFC; mother, housewife	Mother, researcher; father, engineer	Mother, biologist; father, financial analyst	Mother, chemist; father, engineer.
Siblings' education level	Some high school, currently in jail	College, major in STEM discipline	Currently in high school	Junior in college
Achievement goal	College graduate with a major in education	College graduate with a major in STEM discipline	College, major in medicine	College graduate with a major in STEM discipline

Note. CMT = Connecticut Mastery Test; SIAS = Social Identities and Attitudes Scale; SST = susceptibility to stereotype threat; STEM = science, technology, engineering, and mathematics.

things, and capable of asking for help when it was needed. Collectively, students in this group referenced help-seeking behaviors (e.g., seeking direct help from the teacher) when they encountered difficulty in mathematics.

> I would definitely go to my teacher and you know, say can I take a look at my exam [with you]? Can I see… you know, where I messed up…? I would definitely go for help…
>
> —*Renee, Honors B class*

High-SST students

All high-SST students were non-Asian ethnic minorities. Two high-SST students came from Ms. Caffrey's college prep class, and the other two from Ms. Klein's Honors B class. High-SST participants experienced an array of negative emotions pertaining to mathematics itself, and the context in which it was being learned. Emotions common amongst high-SST students in the study included feelings of inadequacy, frustration, and isolation. These emotions were also intrinsically linked to intrapersonal psychological factors such as stigma consciousness, and stereotype endorsement, which appeared to fortify the negative emotions experienced by members of this group.

Stereotype endorsement among high-SST students

Strong stereotype endorsement appeared to play a major role in the psychological alienation experienced by high-SST students. Evidence of this psychological divide emerged through symbolic language commonly used by the high-SST students to describe Caucasian students; they constantly referred to their Caucasian counterparts as "the others," "the White kids," or "the smart kids." This psychological alienation also manifested physically through self-segregated seating arrangements divided along ethnic and ability lines in the Honors B and college-prep classes, respectively. Students from Ms. Klein's class attributed the ethnic divide in class seating arrangements partially to minority students feeling intimidated by the others at the opposite end of the classroom. With regard to the latter, students expressed reluctance to mix with the others because they felt that the frustrations and difficulties that they were already presently experiencing in learning would only be exacerbated by sitting next to and being surrounded by a group of the other (White) students who seemed to be flourishing despite the negative learning environment.

> …They're smarter than us so why would you sit with them? I don't think I would understand what they were saying… like their talking, or understand what they were doing and stuff so… I would kind of feel like I'm not as smart as them so why am I over here, like, they just get it like that and I'm just here discouraged, not getting it. Yea, I [would] feel stupid [sitting with the White students].
>
> —*Karen, Honors B class*

In addition to anticipating more anxiety in class while sitting next to their Caucasian counterparts, most of these students also expressed feeling afraid that the White students would not accept them.

> Probably because of stereotypes. … probably if some White people don't like Black people or Black people don't like White people.- They will choose to not socialize. Like there're a lot of stereotypes. Like Black people are ghetto—they're loud, but that White people they're just… stuck up. Like about my race [Hispanics], the stereotype is that the women are prostitutes… that prolly they're whores and they get pregnant a lot.
>
> —*Danielle, Honors B class*

For those in Ms. Caffrey's college prep, all-minority classroom, the self-segregation in seating arrangements was based on ability. These students reported that the smart kids not only kept to themselves, but also tended to poke fun at the rest of the students for not being smart (in mathematics). Subsequently, high-SST participants acknowledged feeling stupid and more reluctant to ask either the teacher or more capable students for help in times of mathematics difficulty.

> They make you feel … stupid. Because I had this friend… he's smart … he would sit with us and he would just be like, how do you guys not get it? I'm going to sit with the smart people.
>
> —*Olivia, 16, college prep class*

Isolation among high-SST students

High-SST students reported feeling alienated in their mathematics classes. This alienation was partly psychological and strongly tied to their own strong endorsements of racial stereotypes related to mathematical ability: High-SST students perceived their Caucasian counterparts as being different and separate from them. They also associated mathematics ability with Whiteness. Unlike their low-SST counterparts, high-SST students described strong mathematics students along dimensions of race (i.e., being White) and genetics. They believed that strong mathematics students were strong in all other classes and that this was largely because they were born smart. The connection of mathematics ability to Whiteness was a general perception that was strongly held by most of the high-SST participants and referenced numerous times throughout the interviews. For these students, the ideal Honors mathematics-learning context was one where white students formed the majority.

> The perfect geometry classroom…has to be [like] the other side of the room from where I sit … no offense, but where the White people are at. Yah like probably a classroom full of those kinds of people… smart and they pay attention. And then I walk in as the colored person and am like … [nervous laughter]. I'd feel awkward.
>
> —*Danielle, Honors B class*

For some participants such as Danielle—a Hispanic, originally from Peru—the mathematics ability equaling White association was strongly vocalized, and was perhaps steeped in her awareness of the stigma that women from her ethnic group were expected to get pregnant by the time they were 16 years old. Danielle described feeling slow in her Honors mathematics class because White students (who she consistently labeled as the others) seemed to know the answers right away. She reported feeling frustrated over this because in comparison, she did not grasp the material as quickly as they did. She expressed a lot of doubt about Honors classes having a representative number of Hispanics such as herself. She also asserted that while she would not question the authenticity of an Honors class full of White students, she would do so if she found herself in an Honors class with a large representation of Hispanics such as herself.

> Cuz I'll ask myself if they're smart or not. I'll be like 'are they [the Hispanic students in Honors math class] smart?' Cuz I don't wanna be in a dumb classroom cuz I know that am smart and I just have to put more effort into it… like I've been doing now.
>
> —*Danielle, Honors B class*

Danielle's perceptions were based on her strong beliefs that White students were smarter than and different from her and people such as her. Not only did most of the high-SST participants connect doing well in mathematics as a characteristic of White students, but they also generally conceded that boys and girls excelled in mathematics for different reasons. That is, male interest and excellence in mathematics had to do with the fact that they would be using mathematics in their future careers, unlike girls who excelled in mathematics because they were simply interested in it.

> Females who are good in math are smart, and they pay attention [because] they are actually interested in it. But males are probably gonna end up using math in their future, so they really pay attention to it so they can know how to apply it when the time comes.
>
> —*Danielle, Honors B class*

> Females who do well in math are respected because they can't do athletic things apparently so I guess all they have is… like smart stuff … like grades and stuff. So, if they do good in math which is generally the hardest subject in the school then they [people in general] are like you [the good math female student] are doing great! But it is expected that males do well in math, it is not made into like such an accomplishment for them as it is for females.
>
> — *Alana, Honors B class*

> A+ math students are helpful, pay attention in class, ask and answer lots of questions, raise hands in class but the males don't do as much work and they still get it.
>
> —*Karen, Honors B class*

Overall, high-SST students responded to the negative emotions they experienced with resilience. They reported not being able to share their experiences with their family or teachers. Instead, they had a tendency to suppress their emotions and focus on working harder at mathematics despite the feelings of isolation and frustration that they were experiencing, sometimes to their detriment in tests and exams, which were marked by characteristics akin to stereotype threat.

> I feel that I need to do more than the others, that am not as smart as they are because it comes effortlessly for them but I have to struggle to get it. Also feel confused, frustrated, angry a little bit. But I tell myself to calm down. I have not talked to anyone about it.
>
> —*Karen, Honors B class*

> I have had this problem [difficulty with math] the entire year. I try hard but when I'm taking a test come, I blank out. Usually the questions are much harder… I sit there blank. Usually the first question is hard and you get stuck and think this is how the rest of the test is gonna be. I feel like am gonna fail, I feel like a failure overall but I tell myself not to give up because any grade is better than a 0.
>
> —*Danielle, Honors B class*

Social experience related to mathematics

Low-SST students

The social experience of these participants as it related to mathematics was characterized by positive relationships with mathematics teachers who, they reported, not only had high expectations of them, but also constantly encouraged them to pursue mathematics-related careers. These expectations were often communicated both implicitly when teachers relied on them to solve problems that the rest of their peers in class could not, and explicitly by statements such as, "You should pursue a career in math or related to math." Teachers also expressed disappointment if they performed below what had been expected of them. These high expectations in mathematics were not only expressed by teachers but also by their friends and parents.

> They [teachers] think highly of me or they always expect me to [do well]. …They're always like, good job Sheila, good job! And they always tend to rely on me in a way, like if nobody knows the answer or something, for me to just figure it out. Usually all my assignments are like As or like ten out of ten or something. So if I turned in an assignment that [was] like a two, one or something then they'd know something's up, and they'd all just like re-check [my work] and stuff because it just doesn't like happen like that I guess …
>
> —*Sheila, Honors B class*

High-SST students

For the most part high-SST students had negative attitudes toward their mathematics teachers with whom they reported having no real connections. They reported being dissatisfied and discontented with both teacher pedagogy and what they perceived to be differential treatment of students by the teachers. The common perception among these students was that Caucasian students benefited more from one-on-one teacher–student interactions when the class was having difficulty solving mathematics problems. They reported that when minority students asked questions, the teacher told them to refer to their notes, but she was quick to respond to Caucasian students when they needed help or asked questions.

> Like every day, right? We're asking for help, like we always ask for help and they [the White students] always get stuff, so when they're asking for help, she goes over there first and we have to like raise our hands a whole bunch of times. … Maybe because we ask for her help a lot and they just get stuff and so when they don't know this right now, she has to, I guess get them knowing it first or something. I don't know what it is.
>
> —*Karen, Honors B class*

While all low-SST students recognized and mentioned seeking help after school from a teacher as a solution to mastering difficult mathematics material, this was neither mentioned nor recognized as a possibility for high-SST students. This was probably because high-SST students perceived their teachers as inaccessible and unapproachable. High-SST students in the (all-minority) college prep class described their teacher as such, and shared that this unapproachability made it difficult for them to ask questions regarding difficult material. They felt particularly discouraged from doing so because of overt behavioral cues that indicated the teacher's low expectations of them. For instance, Ms. Caffrey tended to sigh and roll her eyes when they asked what she thought were easy questions, or shake her head in resignation when returning poorly done assignments.

> They [the teachers] yell at you for everything, and then they make you feel really low about yourself. Because some kids just didn't get it, so they…. would just have this attitude toward you, like you're so stupid. You ask a question and they look at you funny or when they pass out the grades they look at the grade and then look at you and just be like, I give up.
>
> —*Olivia, college prep class*

High-SST students responded to perceived differential teacher interactions and feedback by shutting down emotionally, keeping a distance from their teachers, and not seeking help from either their teachers or their more capable peers. Thus it appears that the primary response for high-SST students' experiences in the mathematics-learning context was self-isolation or withdrawal in the face of difficulty in mathematics. In some cases, these students established solidarity with other peers who shared similar experiences. High-SST students who participated in this study appeared to be on the brink of disengagement: they reported not putting in as much effort as they should on the assignments (i.e., either not doing homework or copying the answers to the homework from their more capable peers). These behaviors appeared to be in reaction to the hopelessness and frustration that they felt regarding the support (or lack thereof) that they needed to learn mathematics effectively. Hence where high-SST students responded to the context by disengaging, low-SST students responded by persevering in the face of difficulty and actively seeking out help to resolve any areas of misunderstanding related to mathematics content.

Discussion

The aim of the present study was to explore the experience of high-SST high school girls, how their experiences greatly differed from their low-SST counterparts, and also to examine the elements of social context central to the ST experience in authentic learning environments. Findings from this study indicated differences in the personal and academic experiences of low- and high-SST students. Low-SST students in the study came from middle class, two parent households with strong STEM backgrounds: one or both parents, as well as extended family members, had prestigious vocations in STEM fields. They also had siblings pursuing STEM related majors at four-year universities. By contrast, all the high-SST students were from low socioeconomic status backgrounds, with no role models in STEM, and, for the most part, had guardians who had not been educated beyond high school.

Although members of both groups experienced negative emotions in their mathematics classrooms, the nature of these emotions varied by group. Low-SST girls experienced boredom compared to their high-SST counterparts who experienced feelings of inadequacy, frustration, and isolation. Additionally, low-SST students appeared to espouse a malleable view of intelligence, attributing ability and success in mathematics to effort and hard work. This was in stark contrast to high-SST students who not only strongly endorsed stereotypes regarding mathematical ability, but also associated mathematics ability with fixed factors such as race and genetics. Finally, low-SST students enjoyed positive, warm relationships with teachers who consistently communicated high expectations to them, unlike high-SST students who had no relationships with their teachers outside the classroom.

In-class observations and participants' characterizations of their mathematics classrooms converged and diverged at certain points. Observer portraits of the mathematics classrooms and high-SST students' depiction of the same diverged when it came to differential teacher treatment. That is, while high-SST students reported differential teacher treatment in terms of which types of students were selected to ask questions during lessons, I noted no gender or ethnic bias in student selection was noted. However, in-class observations and participant reports both corroborated the existence of suboptimal learning contexts marked by strong intergroup boundaries, blatant disrespect of teachers (in Ms. Klein's Honors B class), and students' self-segregated seating along ability and ethnicity lines.

Findings from this study indicate that intrapersonal and contextual factors interact to create the subjective experience of young high-SST high-school girls. Regarding the former, high stigma consciousness, stereotype endorsement and a fixed view of intelligence were the most common factors shared by high-SST individuals. These findings corroborate extant experimental research which shows negative links between implicit stereotype endorsement of mathematics as a masculine subject and girls' identification to mathematics (Nosek, Banaji, & Greenwald, 2002); stronger ST effects for individuals with high levels of stigma consciousness (Brown & Pinel, 2003); and fixed views of intelligence (Aronson, Fried, & Good, 2002). The use of emotion suppression as a form emotion regulation, and the experience of going "blank" while taking difficult exams, combined with other negative states of being reported by high-SST students (e.g., disengagement or giving up), in this study is also consistent with and also validates the ST experience as posited in ST theory (Steele, 1997).

At a contextual level, classroom interactions with teachers and peers not only contributed significantly to the suboptimal learning context, but also to the experience of high-SST girls. It is possible that the negative history and experiences tied to learning mathematics common amongst high-SST students might have contributed to shaping student views on malleability of intelligence or other stereotypes related to ability in the given domain. It is also possible that the emotional and psychological baggage related to these negative histories of learning mathematics might have been uncovered and exacerbated by suboptimal learning environments such as those experienced by students in the study. Further, the perceived lack of support from teachers, and strong intergroup boundaries that prevented high-SST students from interacting with or seeking help from their more capable peers might have also contributed to the students' experience of strife, and a sense of isolation—going it alone—when it came to learning mathematics. Indeed, empirical studies show a direct relationship between teachers' support and social isolation at school (Harvey, 2010); students who perceive negative teacher–student relationships adjust to school poorly, and also report having less of a sense of belonging and negative attitudes toward school (Harvey, 2010).

Teachers are a critical component of the learning environment and their impact on student achievement has been well documented: Teacher beliefs significantly influence student achievement, (Eccles, 1993; Good & Brophy, 2000; Trouilloud, Sarrazin, Martinek, & Guillet, 2002), and the effects of teacher bias and low teacher expectations on performance are especially exaggerated for minorities and students from low socioeconomic status backgrounds (Trouilloud et al., 2002). Although teacher expectations and behaviors might have played a role in high-SST students' perceived perception of bias, it is also quite possible that teachers' own perceptions and self-efficacy about teaching mathematics might have inadvertently contributed to the experience of high-SST individuals. After all, teacher mathematics efficacy impacts students' mathematics efficacy and performance expectancies (Midgey, Feldlaufer, & Eccles, 1989), and student mathematics anxiety levels (Vinson, 2001). Ms. Klein's explicit discomfort at addressing questions that could not directly be answered by the textbook indicated a relatively weak teacher self-efficacy in mathematics. This low efficacy might have indirectly influenced how female students thought about mathematics. It is likely that high-SST girls exposed to teachers with low mathematics efficacy might have been most impacted in their own mathematics efficacy especially because they, unlike their low-SST counterparts, did not have strong, positive role models in STEM. By contrast these negative teacher effects might have been buffered and counteracted by the presence of strong role models for the low-SST girls in this study.

In sum, based on the results presented and present literature on the topic, I surmise that students with negative mathematics learning histories are more likely to be predisposed to higher levels of stereotype endorsement, stigma consciousness and fixed views of intelligence. These factors, combined with new frustrations experienced in the present suboptimal learning environment (e.g., low teacher expectations and support), and the difficulty level of the mathematics class, might exacerbate and reinforce existing negative emotions related to learning mathematics. In the study and perhaps more generally, high stigma consciousness might not only serve to create the filter through which contextual interactions are interpreted (e.g., perceived differential teacher treatment by high-SST girls in the study), but also strengthen individual's own endorsements of negative ability stereotypes regarding his or her group in the stereotyped domain, consequently fortifying intergroup boundaries in the process. These intergroup boundaries (such as those observed in the study) based on negative stereotypes of out-group members highlight group differences and form a basis for stereotyping and prejudice, which, when tied to academic ability, could only serve to heighten stigma consciousness among members belonging to the stereotyped group. The strong intergroup boundaries noted during class observations and referenced by the high-SST participants, coupled with the behavioral misconduct by minority students could have, in concert, reinforced negative stereotypes about minorities with respect to academics. This could have strengthened intergroup boundaries further and also heightened stigma consciousness for minorities related to their academic standing, subsequently increasing an individual's susceptibility to ST.

The present study showed that the experience of high-SST girls was marked by the interaction of several contextual elements, such as low teacher expectations as well as suboptimal teacher–student and peer-to-peer interactions. Also, strong intergroup boundaries and the strong endorsement of stereotypes associated with these groups appeared to be one of the common threads binding the experience of high-SST girls in the study together. To that end, the negative elements of these interactions could have been mitigated by simple and effective strategies grounded in intergroup theory.

Using intergroup theory to reduce ST at a contextual level

According to intergroup theory, cooperation and interaction between groups (Aronson, Blaney, Stephan, Sikes, & Snapp, 1978; Gaertner, Dovidio, Murrell, & Pomare, 1990) gives individuals the opportunity to gain information about in-group and out-group members (Gaertner et al., 1999), which process facilitates the development of more differentiated (i.e., less stereotypical), personalized perceptions of out-group members. Because group identities associated with limiting stereotypes create intergroup boundaries (i.e., us vs. them), adopting superordinate identities might be able to generate more favorable attitudes toward out-group members (Anastasio, Bachman, Gaertner, & Dovidio, 1997). Superordinate identities transcend group identities steeped in negative stereotypes. They also transform the way in-group members think about out-groups by producing more favorable attitudes toward former out-group members, which subsequently reduces bias (Anastasio et al., 1997). As such, intergroup bias could effectively be reduced through intergroup interaction and superordinate identities (common fate) because both alter and subsequently blur members' perceptions of the intergroup boundary (Gaertner, Mann, Murrell, & Dovidio, 1989).

Blurring group boundaries through interaction and superordinate identity formation might reduce stereotyping and prejudice which tend to strengthen SST factors such as stigma consciousness. Reducing stigma consciousness could minimize the interpretive relevance of negative group ability stereotypes related to mathematics among high-SST individuals, consequently reducing ST. In the present study, activating superordinate identities could have simultaneously targeted three or more ST contextual factors effectively: student endorsement of negative limiting stereotypes tied to race and ability, teacher expectations, and the experience of social and intellectual isolation in the mathematics context. Therefore, it might be worthwhile for teachers to use these principles to promote cooperation between groups. A direct application for teachers would be to (a) create a classroom culture that activates superordinate identities and (b) make a conscious effort to form heterogeneous (i.e., gender or ethnically diverse) groups that engage in collaborative mathematics-related projects which provide myriad opportunities for intergroup interaction and cooperation. For instance, in this study, a simple remedy for segregated seating in Ms. Klein's class would have been to seat students by last name.

Limitations and recommendations for future research

The present study was exploratory in nature so the findings presented here are tempered by several limitations. First, the study focused on ST as it relates to mathematics so findings from this study pertain to this specific context. Also, ST susceptibility profiles were created based on the meaning of points on the Likert-type scale. Stringent mean cutoff scores of 5.5 were used to denote high ranking on the SIAS subscales, and therefore identify individuals highly susceptible to ST. While careful consideration was taken to ensure that the cut scores used in this study most closely selected individuals who identified with mathematics and who ranked high or low on all other moderators, a change in the cut score (e.g., using a mean score of 4.5 rather than 5.5) would certainly change the number of students in each SST category.

There were also baseline differences between high- and low-SST groups. The high-SST group comprised all minorities, while the low-SST group constituted Caucasians and one biracial student. Students in the high-SST group came from primarily low SES homes, compared to their low-SST counterparts. Between methods triangulation was used in the selection process, which was appropriate. The intended goal of this study was to compare low- and high-SST Caucasians as well as minorities of the same category. Comparative analyses of high- and low-SST groups for minorities and Caucasians would have been ideal but this was precluded by low sample size resulting from an insufficient number of parental consent. Such a design would have provided more insight to within and between race differences with respect to the experiences and perceptions of high- and low-SST susceptible groups in their mathematics classrooms. Future researchers should therefore take this into account and attempt to modify the study this way. Finally, although the results presented here offer new insight into potential issues that could exacerbate ST within academic contexts, given the exploratory nature of the study, more work needs to be done to explore these themes and patterns. Finally, the findings are limited to SST individuals in urban high schools. Further research might reveal differences in the experience of girls in suburban or rural high schools.

Conclusion

Earlier in this article it was pointed out that the literature on stereotype threat (ST) was lopsided because it concentrated almost exclusively on experimental studies as a mode of inquiry into the workings of the phenomenon. Further, I argued that the focus on experiments might be useful in investigating psychological factors related to ST, but probably not as successful as other qualitative modes of inquiry in advancing our understanding of the day to day ST experience from the perspective of those highly susceptible to the phenomenon in authentic learning contexts where ST is likely to occur. To my knowledge, this is the first study to explore ST through phenomenology. As such, it extends the literature in a number of ways.

First, it fills the gap and attempts to remedy the paucity of research on contextual factors related to ST in educational settings. Being the first study to explore the lived experiences of high-SST ninth-grade girls in urban schools, it has provided rich, thick descriptions of the ST experience, as well as the comparative analysis of the experiences of high- and low-SST girls, which could be beneficial to future researchers—especially those geared toward ST interventions.

This study adds to the small but emerging body of ST research on K-12 students (e.g., Ambady, Shih, Stephanie, & Pittinsky, 2001; Cadinu et al., 2006; Huguet & Regner, 2007; Picho & Stephens, 2012). It also sets the stage for more in-depth qualitative or mixed methods research to examine the experiences of ST students in K–12 settings, which is important because they are where interventions to increase the flow of girls and ethnic minorities in the STEM pipeline are most needed.

Finally, ST interventions have thus far focused mostly on reducing ST at the student level (see Aronson et al., 2002; Good, Aronson, & Inzlicht, 2003). However, findings from this study indicate that changing key elements of the classroom context (e.g., teacher expectations, intergroup bias) might be instrumental to alleviating the situational threats experienced by high-SST students. The study has shown that ST is complex and catalyzed by several contextual elements and as such, highlights the importance of simultaneously tackling both contextual and intrapersonal psychological elements in effective ST interventions. Accordingly, future ST interventions should expand to also include ST reduction strategies that teachers could use (e.g., building self-efficacy and promoting a malleable view of intelligence) to reduce the threat in the air and promote learning for all students.

References

Ambady, N., Shih, M., Stephanie, A., & Pittinsky, T. L. (2001). Stereotype susceptibility in children: effects of identity activation on quantitative performance. *Psychological Science*, *12*, 385–390.

Anastasio, P. A., Bachman, B. A., Gaertner, S. L., & Dovidio, J. F. (1997). Categorization and re-categorization, and a common group identity. In R. Spears, P. J. Oakes, N. Ellemers, & S. A. Haslam (Eds.), *The social psychology of stereotyping and group life* (pp. 236–256). Oxford, England: Blackwell.

Armenta, B. (2010). Stereotype boost and stereotype threat effects: The moderating role of ethnic identification. *Cultural Diversity and Ethnic Minority Psychology*, *16*, 94–98. doi:10.1037/a0017564

Aronson, E., Blaney, N., Stephan, C., Sikes, J., & Snapp, M. (1978). *The jigsaw classroom*. Beverly Hills, CA: Sage.

Aronson, J., Fried, C. B. & Good, C. (2002). Reducing the effects of stereotype threat on African American college students by shaping theories of intelligence. *Journal of Experimental Social Psychology*, *38*, 113–125.

Aronson, J., Quinn, D. M., & Spencer, S. J. (1998). Stereotype threat and the academic underperformance of minorities and women. In J. K. Swim & C. Stangor (Eds.), *Prejudice: The target's perspective* (pp. 83–103). San Diego, CA: Academic Press.

Baker, D. P., & Jones, D. P. (1993). Creating gender equality: Cross-national gender stratification and mathematical performance. *Sociology of Education*, *66*, 91–103.

Brown, R. P., & Pinel, E. C. (2003). Stigma on my mind: Individual differences in the experience of stereotype threat. *Journal of Experimental Social Psychology*, *39*, 626–633.

Cadinu, M., Maas, A., Rosabianca, A., & Kiesner, J. (2005). Why do women underperform under stereotype threat? Evidence for the role of negative thinking. *Psychological Science*, *16*, 572–578.

Cadinu, M., Maas, A., Rosabianca, A., Lombardo, M., & Figerio, S. (2006). Stereotype Threat: the moderating role of locus of control beliefs. *European Journal of Social Psychology*, *36*, 183–197.

Connecticut State Board of Education. (2009). *2009 Interpretive guide.* Retrieved from http://www.sde.ct.gov/sde/lib/sde/pdf/student_assessment/cmt/2009_cmt_interpretive_guide.pdf

Creswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. Thousand Oaks, CA: Sage.

Creswell, J. W. (2002). *Educational research: Planning, conducting, and evaluating quantitative and qualitative approaches to research*. Upper Saddle River, NJ: Merrill/Pearson Education.

Denzin, N. K. (1970). *The Research act in sociology*. Chicago, IL: Aldine.

Eccles, J. S. (1993). School and family effects on the ontogeny of children's interests, self perceptions, and activity choice. In J. Jacobs (Ed.), *Nebraska Symposium on Motivation: Vol. 40. Developmental perspectives on motivation* (pp. 145–208). Lincoln, NE: University of Nebraska Press.

Eriksson, K., & Lindholm, T. (2007). Making gender matter: The role of gender-based expectancies and gender identification on women and men's math performance in Sweden. *Scandinavian Journal of Psychology*, *48*, 329–338.

Gaertner, S. L., Dovidio, J. F., Murrell, A. J., & Pomare, M. (1990). How does cooperation reduce intergroup bias? *Journal of Personality and Social Psychology*, *59*, 692–704.

Gaertner, S. L., Dovidio, J. F., Rust, M. C., Nier, J. A., Banker, B. S., Ward, C. M., … Houlette, M. (1999). Reducing intergroup bias: elements of intergroup cooperation. *Journal of Personality and Social Psychology*, *76*, 388–402.

Gaertner, S. L., Mann, J. A., Murrell, A. J., & Dovidio, J. F. (1989). Reduction of intergroup bias: The benefits of re-categorization. *Journal of Personality and Social Psychology*, *57*, 239–249.

Gonzales, P. M., Blanton, H., & Williams, K. J. (2002). The effects of stereotype threat and double-minority status on the test performance of Latino women. *Personality and Social Psychology Bulletin*, *28*, 659–670.

Good, C., Aronson, J., & Inzlicht, M. (2003). Improving adolescents' standardized test performance: An intervention to reduce the effects of stereotype threat. *Applied Developmental Psychology*, *24*, 645–662.

Good, T., & Brophy, J. (2000). *Looking in classrooms, 8th ed*. New York, Longman.

Gur, R. C., Alsop, D., Glahn, D., Petty, R., Swanson, C. L., Maldjian, J. A., Turetsky, B. I., Detre, J. A., Gee, J., & Gur, R. E. (2000). An fMRI study of sex differences in regional activation to a verbal and spatial task. *Brain and Language*, *74*(2), 157–170.

Halpern, D. F. (1992). *Sex differences in cognitive abilities* (2nd ed.). Hillsdale, NJ: Erlbaum.

Harvey-Murray, R. (2010). Relationship influences on students' academic achievement, psychological health and well being at school. *Educational and Child Psychology*, *27*, 104–115.

Huguet, P., & Regner, I. (2007). Stereotype Threat among school girls in quasi-ordinary classroom circumstances. *Journal of Educational Psychology*, *99*, 545–560.

Hyde, J. (1981). How large are cognitive gender differences? a meta-analysis using c2 and d. *American Psychologist*, *36*, 892–901. http://dx.doi.org/10.1037/0003–066X.36.8.892.

Hyde, J. S., Fennema, E., & Lamon, S. (1990). Gender differences in mathematics: A meta-analysis. *Psychological Bulletin*. *107*(2), 139–155.

Jick, T. D. (1979). Mixing qualitative and quantitative methods: Triangulation in action. *Administrative Science Quarterly*, *24*, 602–611.

Keller, J., & Dauenheimer, D. (2003). Stereotype threat in the classroom: dejection mediates the disrupting effect on women's math performance. *Personality and Social Psychology Bulletin*, *29*, 371–381.

Keller, J., & Molix, L. (2008). When women can't do math: The interplay of self-construal, gender identification, and stereotypic performance standards. *Journal of Experimental Social Psychology*, *44*, 437–444.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic Inquiry*. Beverly Hills, CA: Sage.

Lummis, M., & Stevenson, H. W. (1990). Gender differences in beliefs and achievement: A cross cultural study. *Developmental Psychology*, *26*(2), 254–263.

Ma, A., & Norwich, B. (2007). Triangulation and theoretical understanding. *International Journal of Social Research Methodology*, *10*, 3, 211–226.

Midgley, C., Feldlaufer, H., & Eccles, J. (1989). Change in teacher-efficacy and student self- and task- related beliefs in mathematics during the transition to junior high school. *Journal of Educational Psychology*, *81*, 247–258.

Moustakas, C. (1994). *Phenomenological research methods*. Thousand Oaks, CA: Sage Publications.

Nosek, B. A., Banaji, M. R., & Greenwald, A. G. (2002). Math = male, me = female, therefore math≠me. *Journal of Personality and Social Psychology Bulletin*, *29*,782–789.

Osborne, J. W. (2001). Testing stereotype threat: Does anxiety explain race and sex differences in achievement? *Contemporary Educational Psychology*, *26*, 291–310. doi:10.1006/ceps.2000.1052

Oswald, D. L., & Harvey, R. D. (2001). Hostile environments, stereotype threat, and math performance among undergraduate women. *Current Psychology*, *19*, 338–356.

Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage Publications.

Picho, K., & Brown, S. W. (2011). Can stereotype threat be measured? A validation of the social identities and attitudes scale (SIAS). *Journal of Advanced Academics*, *22*, 374–411.

Picho, K., & Stephens, J. M. (2012). Culture, context and stereotype threat: A comparative analysis of young Ugandan women in single-sex and coed schools. *Journal of Educational Research*. *105*, 52–63.

Schmader, T. (2002). Gender identification moderates stereotype threat effects on women's math performance. *Journal of Experimental Social Psychology*, *38*,194–201.

Schmader, T., Johns, M. & Barquissau, M. (2004). The cost of accepting gender differences: The role of stereotype endorsement in women's experience in math domains. *Sex Roles*, *50*, 835–850.

Seidman, I. (1991). *Interviewing as qualitative research: A guide for researchers in education and the social sciences* (3rd ed.). New York, NY: Teachers College Press.

Steele, C. M. (1997) A threat in the air: how stereotypes shape intellectual identity and performance. *American Psychologist*, *52*, 613–629.

Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African-Americans. *Journal of Personality and Social Psychology*, *68*, 797–811.

Trouilloud, D., Sarrazin, P., Martinek, T., & Guillet, E. (2002). The influence of teacher expectations on students' achievement in physical education classes: Pygmalion revisited. *European Journal of Social Psychology*, *32*, 591–607.

Vinson, B. M. (2001). A comparison of pre-teachers' mathematics anxiety before and after a methods class emphasizing manipulatives. *Early Childhood Education Journal*, *29*, 89–94.

Watkins, D. (1989). The role of confirmatory factor analysis in cross-cultural research. *International Journal of Psychology*, *24*, 685–701.

Wilder, G., & Powell, K. (1989). *Sex differences in test performance: A survey of the literature*. New York, NY: College Board.

Appendix A: The Social Identities and Attitudes Scale (SIAS)

SOCIAL IDENTITY ATTITUDES SCALE. © 2009.

Katherine Picho Scott W. Brown

This survey should take approximately 5 minutes to complete. Circle your response to the statements provided below.

Please rate how strongly you agree or disagree with the following statements. In answering each question, use a range from (1) to (7) where (**1**) stands for **strongly disagree** and (7) stands for **strongly agree**. Please circle only one response choice per question.

STATEMENTS	Strongly disagree	Disagree	Somewhat disagree	Undecided	Somewhat agree	Agree	Strongly agree
1. My gender influences how I feel about myself	1	2	3	4	5	6	7
2. Math is important to me	1	2	3	4	5	6	7
3. My gender contributes to my self confidence	1	2	3	4	5	6	7
4. My gender influences how teachers interpret my behavior	1	2	3	4	5	6	7
5. I value my ethnic background	1	2	3	4	5	6	7
6. Most people judge me on the basis of my ethnicity	1	2	3	4	5	6	7
7. My gender is central in defining who I am	1	2	3	4	5	6	7
8. Being good at math will be useful to me in my future career	1	2	3	4	5	6	7
9. Most people judge me on the basis of my gender	1	2	3	4	5	6	7
10. My identity is strongly tied to my gender	1	2	3	4	5	6	7
11. I feel a strong attachment to my ethnicity	1	2	3	4	5	6	7
12. My gender affects how people treat me	1	2	3	4	5	6	7
13. My ethnicity is an important reflection of who I am	1	2	3	4	5	6	7
14. I am connected to my ethnic heritage	1	2	3	4	5	6	7
15. My gender affects how people act toward me	1	2	3	4	5	6	7
16. My math abilities are important to my academic success	1	2	3	4	5	6	7
17. My ethnicity affects how my peers interact with me	1	2	3	4	5	6	7
18. Doing well in math matters to me	1	2	3	4	5	6	7
19. Members of the opposite sex interpret my behavior based on my gender	1	2	3	4	5	6	7
20. My ethnicity influences how teachers interact with me	1	2	3	4	5	6	7
21. I value math	1	2	3	4	5	6	7
22. My ethnicity affects how I interact with people of other ethnicities	1	2	3	4	5	6	7
23. Doing well in math is critical to my future success	1	2	3	4	5	6	7
24. People from other ethnic groups interpret my behavior based on my ethnicity	1	2	3	4	5	6	7
When doing difficult math problems on a test I…							
25. Experience doubt about my math abilities	1	2	3	4	5	6	7
26. Feel like I'm letting myself down	1	2	3	4	5	6	7
27. Start to lose confidence in my abilities	1	2	3	4	5	6	7
28. Feel like a failure	1	2	3	4	5	6	7
29. Feel hopeless	1	2	3	4	5	6	7
30. Feel like giving up	1	2	3	4	5	6	7

Key:
Math identification: 2, 8, 16, 18, 21, & 23.
Ethnic identification: 5, 11, 13 & 14.
Gender identification: 1, 7, & 10.
Gender stigma consciousness: 4, 9, 12, 15, & 19.
Ethnic stigma consciousness: 6, 17, 20, 22, & 24.
Negative affect: 25–30

Appendix B: Interview protocols

Time of interview:
Date:
Place:
Interviewer:
Interviewee:
Questions: Interview protocol # 1—Background information

Demographics

1. Demographics: age, racial/ethnic background
2. Where were you born and how long have you and/or your parents been here?
3. ESL? If yes, what is your first language? What languages are spoken in your home?
4. Where do you live & who do you live with?
5. What do your parents/guardians do for work? (parents' level of education)
6. How long have you been going to this school? Which school did you attend prior to coming to this school?
7. How would you describe the community in which you live?
8. Do you plan to graduate from high school? If yes, what do you plan to do afterwards? (If no, why not? What do you plan to do instead?)
9. How do you describe yourself as a person?
10. How would others (teachers, friends, peers, parents) describe you as a person?

Schooling experiences

1. How do you feel about school?
2. What is your favorite/least favorite school subject? What do you like/dislike about it?
3. What do you think you are good at/challenged by at school?
4. How would you describe yourself as a student?
5. How do you think teachers would describe you as a student?
6. How would you describe this school? (How would you describe this school relative to other schools)?
7. How would you describe teachers at this school?
8. Describe what a typical day is like for you in school

* Is there anything else I haven't asked you that you would like to add about your experiences at school now or in the past?

Time of interview:
Date:
Place:
Interviewer:
Interviewee:
Questions: Interview Protocol # 2—ST Conducive environments

RQ1: How does participant experience learning in a math classroom?

1. What is your favorite subject? Why is it your favorite subject?
2. How do you feel about math? (I like/dislike it because…) Have you always felt this way about it? (tell me more)
3. Can you picture in your mind the ideal 'A' math student. Describe them. What are they like outside class? Would you like this person? Why or why not? Why do you suppose they like math?
4. (If participant describes male, repeat above but also have them describe ideal female math student)
5. Tell me about (or describe) your favorite math teacher. What about him or her did you like? What was their teaching like? How did this teacher treat students? Did you interact with this teacher a lot? Can you describe your relationship with this teacher? What's the one thing about this teacher that you will always remember? Do you think your relationship with this teacher influenced how you perceive math? How? In which school was this?
6. Tell me about (or describe) your worst math teacher. What about him or her did you like? What was their teaching like? How did this teacher treat students? Did you interact with this teacher a lot? Can you describe your relationship with this teacher? What's the one thing about this teacher that you will always remember? Do you think your relationship with this teacher influenced how you perceive math? How? In which school was this?
7. Do you remember finding difficulty understanding a particular topic in math? Describe how that made you feel. (How do you feel in these situations? What did you do about it?)
8. Complete the following sentences:

Regarding my ability to succeed in math and science,

9. I think….
10. My teachers think….
11. My parents/siblings think….
12. My friends think….
13. My guidance counselor thinks…
14. Females who do well in math are….
15. Most math teachers in this school…
16. If I were a math teacher I would…

* Is there anything else I haven't asked you that you would like to add to this conversation?

Time of interview:
Date:
Place:
Interviewer:
Interviewee:
Questions: Interview Protocol # 3—Factors propagating ST contexts & individual responses to these elements

1. If you chose to pursue a related to math or science at college, what do you think that your:
   teachers
   peers
   family and
   guidance counselor would think/feel about that?
2. How do you know this? Have any of them expressed their feelings verbally (if not, how do you know this?) How does it make you feel?
3. Complete the following sentences:
   If I got a perfect grade in math,
   I would…
   My math teacher would…

My siblings would…
My friends would…
My classmates would…
My parents would…
My guidance counselor would…
If I got a failing grade in math,
I would…
My math teacher would…
My siblings would…
My friends would…
My classmates would…
My parents would…
My guidance counselor would…

4. Describe what you think the ideal (perfect) math classroom would look like. Are these qualities present in your current classroom?
5. Describe your current math classroom
6. Describe what a typical day in math class is like for you? What are your favorites parts? Least favorite parts?
7. How does it feel to be a part of it (math classroom).
8. How do you feel about your daily experiences in this class setting?