

Racial and Gender Identities of Young  
Mathematically-Successful Latinas

by

Paula Patricia Guerra Lombardi

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Graduate Supervisory Committee

James Middleton, Chair  
Daniel Battey  
Alfinio Flores  
Ann Koblitz

ARIZONA STATE UNIVERSITY

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## ABSTRACT

A fundamental motivation for this study was the underrepresentation of women in Science, Technology, Engineering and Mathematics careers. There is no doubt women and men can achieve at the same level in Mathematics, yet it is not clear why women are opting out. Adding race to the equation makes the underrepresentation more dramatic. Considering the important number of Latinos in the United States, especially in school age, it is relevant to find what reasons could be preventing them from participating in the careers mentioned. This study highlight the experiences young successful Latinas have in school Mathematics and how they shape their identities, to uncover potential conflicts that could later affect their participation in the field.

In order to do so the author utilizes feminist approaches, Latino Critical Theory and Critical Race Theory to analyze the stories compiled. The participants were five successful Latinas in Mathematics, part of the honors track in a school in the Southwest of the United States. The theoretical lenses chosen allowed women of color to tell their story, highlighting the intersection of race, gender and socio-economical status as a factor shaping different schooling experiences.

The author found that the participants distanced themselves from their home culture and from other girls at times to allow themselves to develop and maintain a successful identity as a Mathematics student. When talking about Latinos and their culture, the participants shared a view of themselves as proud Latinas who would prove others what Latinas can do. During other times while discussing the success of Latinos in Mathematics, they manifested Latinos were

lazy and distance themselves from that stereotype. Similar examples about gender and Mathematics can be found in the study. The importance of the family as a motivator for their success was clear, despite the participants' concern that parents cannot offer certain types of help they feel they need. This was manifest in a tension regarding who owns the "right" Mathematics at home. Results showed that successful Latinas in the US may undergo a constant negotiation of conflicting discourses that force them to distance themselves from certain aspects of their culture, gender, and even their families, to maintain an identity of success in mathematics.

I would like to dedicate this work to my parents. Without their vision of education, and their immense love and support, I could have never achieved such milestone.

Mom, thank you for teaching me about patience, pride, fairness and love.

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## **Introduction**

Researchers have studied the gender gap in Mathematics achievement since the 1970's. It has been relevant work for the field, and it has helped us not only to understand the problem better, but also to move forward to a solution. The relevance comes from the fact that those that are proficient in Mathematics and science will be prepared for better-paid jobs and influential positions (Hyde, Fennema, Ryan, Frost and Hopp, 1990). Why aren't women present in these spaces as much as men are? The answers to these questions can come from many different angles. The angle that I will take is the one corresponding to school. In what ways does the schooling that girls go through affect them to the point they choose not to follow this path all the way through? How do school experiences shape the mathematical identity girls form during school years and how does it fit or clash with the construction that they make at home, or that it is expected at home? And finally, if these families are not part of the "majority", and they are instead Latinos, how does that affect the Mathematics school experience and the mathematical identity of these girls?

The conceptions of Mathematics that girls construct in school will shape the uses they give to it in their future. The lack of participation in Science, Technology, Engineering and Mathematics (STEM) fields is a problem. In this case we need to know why Latinas are not choosing a tool for liberation like Mathematics and STEM careers.

By choosing Mathematics as a tool for liberation in Freire's (1970) sense, Latinas will have other means to work towards overcoming oppressive

sociopolitical/economical forces. It is fair to say that the economical and social power as well as liberation and conscientization go hand in hand with Mathematics and science knowledge. By “conscientization” I draw on Freire's work (1970). “Conscientization” is a process that will lead the learner toward “critical consciousness”. Through it, the individual becomes aware of oppression and his or her role in the system of that had worked against him or herself. “Critical consciousness” implies that the man or woman is open to revision of their own world views, being critical of them, and of the part they had to play themselves as actors that may or may not have been reproducing the system that has oppressed them. This also implies a sense of agency on the side of the oppressed, which is often frightening and difficult to assert. It may seem that this consciousness has can lead to a loss of order and stability in the lives of the marginalized person. The response to that is that it can only lead to a new order that is more equitable to more people.

Identifying Latinas in Mathematics as the oppressed calls for a more clear identification of the oppressor as well. It is no longer the case that Freire's focused on, with peasants and the upper class. It is not a matter of women vs. men either, since we have to consider that the education field is mostly populated with women. And we need to be careful when consider Latinos vs. White as well. Latinas are part of a system, and as such, they consolidate its validity, reproducing its results. Freire comes into mind with his idea of the “oppressor inside of the oppressed.” The role Latinas play in that system should be analyzed, and how they perceived the rest of the system should be studied as well. In this study those

two issues will be put under the spot light, and will help better understand the situation a minority group like Latinas experience school Mathematics in the US. Being Mathematics a particularly important tool in today's world, the relevance of this study is clear.

The importance of being involved and proficient in Mathematics today is understood by Bob Moses' (2001, pg. 6) words: "A great technological shift has occurred that places the need for math literacy front and center." Being proficient in Mathematics is imperative for success (Hart & Stanic, 1988). If someone knows how to use a tool but chooses to avoid using it, then it is no different, from a societal sense, than if that person did not know how to use the tool to start with. In this case, despite girls' relatively equivalent academic achievement compared to men in Mathematics, they appear to choose not to use this tool and opt out of higher-level courses and later on, they opt out of careers in Mathematics (Nelson, 2007).

The problem of the "gender gap" has reinvented itself as researchers have studied it and found partial explanations and solutions as to why achievement of girls and boys was not at the same level. At the beginning the problem was explained as girls being naturally disadvantaged biologically. Benbow and Stanley (1980) favored the hypotheses of sex differences in achievement and in attitude towards Mathematics as a result of superior male mathematical ability. These trends were also used to explain male superiority in spatial tasks. It is important to note that we don't need to go back a lot in time to find those that support these ideas. For example Nuttal, Casey and Pezaris (2005) endorse the idea of a

biological advantage in favor of boys when it comes to spatial thinking tasks. They use the same data that Kaiser and Steisel (2000) analyzed, TIMSS data, but found different results. How could this be? The 2005 paper focused on US students, and the 2000 paper focused on 12 different countries. Kaiser and Steisel for the particular case of Germany said: “It is striking that in Germany boys are not better in the area of geometry in contrasts to what is frequently stated in literature, specially for items that require spatial ability.” (pg. 23) It is clear at this point that those perspectives that consider biology as the primary reason for gender differences in the US won't stand. But this was just one way the study of women and Mathematics took course. In this review of the literature I will be focusing on the pieces that shaped the field over time, and that led us where we stand today. In the next sections I review the literature that explains “the gender gap” taking different stands: test taking comparisons; the comparisons of outcomes in Mathematics for boys and girls; Mathematics as a male domain; influence of important actors in the life of girls as teachers, parents and peers; and the attitudes developed by girls towards Mathematics.

Today's participation of women in STEM fields remains unequal to the participation of men (Clark, 2005; Table 8, NSF, 2006). This is still a problem that needs to be solved; women are supposed to have the same ostensible opportunities men have. It is a clear problem from an equity standpoint, as well as from a perspective of “a human capital development”, as Epstein, Thomas and Trautmann (2003) state. Not utilizing the potential women have for STEM appears as a matter of negligence. In the world today, in countries like the Unites

States (US), being educated and participating in these fields means having power. It goes beyond an issue of money, although this is part of it too. In Gutstein's (2006) work we can see Mathematics is critical for reading and re-writing the world (Freire, 1970) through that praxis we mentioned before, in order to make it more equitable, where all the voices are heard. With the power to do these two important tasks underrepresented people can start the end of the oppression. It will reduce class, race and gender oppression, or more rightly, the combination of these factors, because it is almost impossible to talk today about one of those "markers" without thinking about the others.

### **What happens when we consider race and ethnicity?**

If we refine our observation, and we add the lens of race and ethnicity<sup>1</sup>, the situation shows that the field of Mathematics is populated mostly by Whites, more specifically, White men. Let's start by considering Latinos in general using data from the NSF (table 14 and 8, 2006), only 3% of all the doctoral scientists employed in the Mathematics and Statistics sector are Latinos. When we consider the kind of institution they are employed in, only 3.5% of Mathematics and

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1 When mentioning the terms "race", the author would like to acknowledge what other authors have to say about the term and the use of it. It is clear that the concept of "race" has no relationship with any biological explanation that once was try to be given to it. Omi (1997) puts it very clear: "Biologists, geneticists, and physical anthropologists, among others, long ago reached a common understanding that race is not a 'scientific' concept rooted in discernible biological differences." (pg 243) Disregarding that, we still keep using the term "race" to categorize people according to (for example), they way they look based on biological facts: hair color, eye color, among other physical attributes. The author of this paper accepts that race is socially constructed, but also observes that, like Winant (2000) mentions: "Although abstractly acknowledge to be sociohistorical construct, race *in practice* is often treated as an objective fact: one simply *is* one's race; in the contemporary United States, if we discard euphemisms, we have five color-based racial categories: black, white, brown, yellow and red." (pg. 185, italics in the original). Because of racism being a reality today, this way of categorizing people by their race, becomes problematic. It is in this problematic that the research in this paper is allocated.

science employees in 4-year educational institutions are Latinos. Similarly for engineering, only 3.1% are Latinos. The situation is worse for Latinas. In 2006, the NSF reported that 160 Hispanic females total were employed in Mathematics and statistics out of 5,110 females, compared to 3,420 White females. That is 0.5% of the total of population employed in the field. For engineering, we find that only 3.5% of females employed are Hispanic, 0.3% of the total population employed in engineering.

Considering the numbers on the previous paragraph, it is hard to imagine that the field of Mathematics is benefiting from what Hispanic women have to offer. At the same time, it is not hard to imagine that this under representation will also affect the ways in which the field covers the needs of these populations in particular, making it harder for Latinas to break the barriers surrounding the field. They have been deprived of their word and voice like the peasants Freire (1970) talked about. The lack of voice of Latinas in the field is clear, and because of this, there is an interference with the production of culture, that is, everything that is “humanly fabricated, endowed, designed, articulated, conceived or directed” (McLaren, n.d.). This limits the power of the oppressed to know the world, and to rewrite it: that is, to change it for their own good. The oppressed undervalue themselves, and one of their longings is to be like the oppressors. That is why Freire says, oppressed have a dual nature, because they carry the oppressor on themselves. The moment that they seek freedom without that longing as a goal, is the moment they will walk towards regaining their humanity. Question the systems that they participate and the kinds of participation they engage in, are

ways that today, Latinas can start being more critical about the oppressors in themselves, and therefore, give one step towards liberation, that in this case, would be gaining control over their word and potential contributions in the Mathematics field.

According to Gutstein (2006), the kind of workers that industry needs today, does not require the skills promoted by the National Council of Teachers of Mathematics (NCTM) and its view of Mathematics education. Instead, corporations need workers that pretty much resemble that idea of the oppressed discussed before. That author describes what the industry needs as follows: "... an ever growing army of low-skilled, compliant, docile, pleasant, obedient service sector workers..." (pg. 10). This description fits the idea of the oppressed that was introduced before by Freire's hands. These people could be anyone, but Gutstein continues: "Labor force indicators all suggest that the service sector workers not only do not need the same knowledge, skills, and dispositions that highly technologically trained knowledge workers do, but in addition, they will overwhelmingly be low-income, people of color, immigrants, and often women (Paral, 2002)" (pg. 10). The group that this paper is interested in, falls into the category just described by Gutstein twice: as people of color, and as women.

Women need to find ways to gain the power lost or that was taken away. Maybe today, they don't recognize this power as rightfully theirs anymore. The oppressor within the oppressed (Freire, 1970), in this case, the oppressor inside women is preventing their ability to see that some spaces occupied mostly by men today, could be spaces for women as well. Spaces where not only they can

complete the job, but also excel at it. And because they can excel at it, if women are actually “choosing” to avoid Science, Technology, Engineering and Mathematics (STEM) careers, and considering the power that comes with them, we could ask ourselves what are the reasons for such choices. What should change for Latinas or any women to choose STEM careers?

This paper was generated as a way to respond to some of the questions the field has not dealt with. It will focus on the way young Latinas have overcome the struggles on their path negotiating school Mathematics with cultural norms and expectations, and become successful students as defined by the US educational system. In particular, this paper examines how success in school Mathematics in the US shaped their mathematical identity, and how that fits with their Latina identity. The author asks the fundamental questions: Who do the participants think they are? Why do they think that way? And, how does school Mathematics play out in the middle? Holland et al. (1998) states that people not only tell others who they are, but they also tell themselves. In this paper, we hear the voices of Latinas talking about themselves, but as Holland et al. (1998) and Bakhtin (1982) state, we will be hearing the voices all of those who have had any contact and influence over these girls. In the process of “authoring themselves”, people take an outside position and talk about who they are as if they could see themselves from the outside, highlighting the way others sees us (Holland et al., 1998). In this way, identity is “internalized” from outside in. The authors say that this internalization process “reproduces the collective upon the individual” and “the social upon the body” (pg. 169). There is one more interesting thing about this work of Holland



for this study: the position or identity that one takes when interacting with others, especially others that have more power. The authors say that “Relational identities have to do with behaviors as indexical of claims to social relationships with others” (pp 127). In this study the author will investigate which are (if any), the social status claims Latinas do, that are not recognized by those holding the power, like for example, the school system. This study will investigate the price or/and prize Latinas get or pay along their way to be successful in school Mathematics. With this kind of information, school Mathematics can be modified to reach more students at a lower human cost on both sides: school and students. This cost mentioned, the possible price Latinas may have to pay, it is not just a matter of material resources. It is also the price that Latinas may be needing to pay in loss of culture and identity. This is why at the same time these changes mentioned should help school bring Latinas' identity to the field to enrich it instead of having them losing who they are and their culture.

In the coming sections the reader will find a review of the literature in gender equity and Mathematics, with no particular attention to race. Then we will progress to Mathematics and Latinos, and specifically Latinas. The literature in these latter areas is not abundant, which manifest the importance of projects like this one. After the review of the literature, in chapter two, I present what theoretical backgrounds were favored in this research: LatCrit<sup>2</sup>, Critical Race Theory, and feminist approaches and the reasons why these lenses are appropriate for this particular endeavor. After that I review the design for this project

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2 LatCrit is a term used for the theory that examines critically the social positioning of Latinos, hoping to improve the social and legal conditions of them specially in the US (Valdes, 1997).

highlighting the participants, why they were chosen, and the data collection methods. Following this, I present the results of this study. Three cases are discussed, and a general case is generated based on the analysis of the stories shared by the girls in the study. Lastly those results are tied to the literature and suggestions for new researched are proposed.

## Literature Review

Reviewing the literature trying to answer some of the questions that come to mind regarding girls and Mathematics, one find different struggles that girls have had and still have to deal with in Mathematics education. The literature also informs us about those issues change over time, and how overcoming or explaining one issue has lead the field to study others. When we do not focus on girls in general, but on those that are part of any racial minority in the US, the challenges continue to add up, making the situation for these girls that much harder. In this chapter I review the most salient issues for girls and Mathematics education in the US, and then in a later section, I examine the situations for Latinas and Mathematics.

If we could begin from a point where all boys and all girls achieve at the same level, we wouldn't have to answer questions like some that had arise in this paper already. Historically, a gender gap in Mathematics achievement has been a problem that has clarified issues of equity. Sometimes some theories proved to be less accurate than others. One way or another, the information gathered in national and international research helped educators find ways to help teachers and girls to shorten that gap to the point where today it is no longer an issue in terms of academic achievement as measured by tests of performance.

Even though there is no gap in Mathematics achievement today as measured by standardized tests like the National Assessment of Educational Progress (NAEP) (Campbell, 1995, 1997), where for example for Latinos, we find girls outperform boys (Riegle-Crumb, 2006), but there are still many

questions to be answered. For example, why is the achievement between White girls and non-White girls different? Or why do women participate at such a lower rate in STEM careers? This paper expects to contribute to that area of scholarship.

### **Do girls perform lower than boys in school Mathematics?**

As mentioned above, there is, if any, a small gender gap today in terms of achievement on standardized tests. But earlier research reached various conclusions that positioned girls better or worse when it came to Mathematics. Depending on the test items, boys or girls tended to achieve differentially (Kaiser & Steisel, 2000). It won't be the same to test the Mathematics by items that are appealing to girls, more or less grounded in their previous experiences, than if those items are set in a time restricted form, or with questions that are not gender neutral and do not appeal to girls (Forbes, 1996). According to Clewell and Campbell (2002), studying the tests by item showed that girls could perform at the same level with boys, or even better than them, depending on the type of item:

A variety of studies have shown that girls score better on items dealing with algebra and boys on those dealing with geometry. Girls tend to score higher on more abstract items and those more directly related to the textbook or "school-based knowledge," while boys tend to do better on visual spatial items and those "real-life" items dealing with problem solving and reasoning (i.e.: Bielinsky & Davidson, 1998; Burton, 1996; Garner & Engelhard, 1999; Hamilton, 1998). (pg. 265)

Depending on the type of Mathematics tested, and what kind of representation

was required in the test, boys or girls tend to do better. That doesn't mean their mathematical skills are higher overall, but only that the type of Mathematics favored on the test was the type of Mathematics where either one group or another did well in general. International studies also conveyed what girls could do, and the results were again promising.

These studies corroborated that one can obtain different results depending on where one is conducting the testing. The influence of the country where girls were tested as well as their cultural and socio-economic backgrounds affect their responses on Mathematics tests. Different items were solved successfully by different girls in different countries (Hanna, 1986, 2003, Kaiser & Steisel, 2000).

Hanna (1986) analyzed five subtests of the SIMS tool across 20 countries participated. Responses were coded as “correct”, “wrong” or “omitted”, and for each country three p-values were calculated per item also separating boys and girls. Then the mean p-values were averaged for subtest, country and sex. The author explains that the major results found were that “The mean difference between girls and boys (defined as girls minus boys) in the Arithmetic subtest (62 items) was zero.” (p. 6) Second, in the Algebra subtest, there was a small positive difference in favor of girls. The author shares that the mean difference was 0.5. For the Geometry subtest, the boys' success rate was higher than that of girls. In the Statistics subtest, girls were again slightly better than boys, while boys did better in the Measurement subtest. These results show that it is not true that boys always do better than girls, nor the opposite. But the authors didn't stop there, and also compared “sex differences within and between countries” finding that the

behaviors of boys and girls across different countries are not fixed either. In some countries girls were more successful than boys, but in others the story was different. Then for the same test item, one girl may have been successful in country A, but another girl in country B wasn't. There is nothing inherent to girls then, that can predict whether one can or cannot solve a Mathematics task.

### **Can girls problem solve?**

The issue of the kind of Mathematics girls can produce versus the kind of Mathematics boys can produce is one of those problems that girls have had to deal with over the years. We assume now that boys and girls can perform at the same level, but what type of Mathematics are they doing, and which one is favored by school and later on society? According to Fennema et al. (1998), in the elementary grades there were no differences in boys' and girls' performance solving number facts, addition/subtraction, or non-routine problems. Yet there appeared to be a difference regarding the type of Mathematics boys and girls use to solve those problems with boys using more invented algorithms, and girls using more taught algorithms. "Differences have been found in grades 1-3, with girls tending to use observable strategies (such as counting) and boys tending to use mental strategies." (p. 6).

On one hand achievement is no longer a question for girls in Mathematics. On the other hand, the type of Mathematics girls use appears to be different than the one boys choose. Carr and Jessup (1997) explain that even though the computational skills of girls may be even higher than those of boys, girls may not

be reflecting on their strategies as boys do by solving problems. Girls are not asking themselves the “how’s” and why’s” of the solution they use that could help them invent new ways to solve problems. Considering that girls use *taught* strategies, we must consider the ways in which the teaching environment, and particularly the expectations of teachers and their ways of prompting directed at girls impacts the mathematical behaviors they choose to engage in. As a result of the use of that kind of strategy mentioned, girls may not find it easy to move on to higher problem solving. On this issue, M. Carr, D. Jessup, and D. Fuller (1999) stated: “Boys were influenced by the beliefs that adults like strategies indicating ability and by teacher instruction on retrieval. Girls’ strategy use was not related to perceived adults beliefs or actions.” (p. 20). This may make us wonder, if it is that girls cannot problem solve, or it is that girls do not get the message for some reason from adults that this is important. In Carr and Jessup (1997), where children were asked to solve 20 addition and subtraction problems in three individual interviews, where they also had to explain their solution and strategies, boys were interested in the competitive aspect of one strategy over another. They attempted to use more retrieval (answering from memory) than any overt strategy (like using counters or count with their fingers). Girls were more likely to use those overt strategies, but also were also more perfectionist about it. These choice of strategies are both inefficient in terms of cognitive resources, and limited in long term applicability.

If the type of Mathematics learned by girls is preventing them from accessing higher education, certain careers, or positions the job market offers,

then this is an issue that should and still needs further study. Among the factors acting upon this production/reproduction issue, socialization can be counted. The interaction with peers, parents, and teachers, will influence the development of different types of knowledge by boys or girls, as well as the motivation they have to learn different things (Carr, Jessup and Fuller, 1999). Girls do not reproduce (or non-produce) Mathematics in isolation. They do it in classrooms with teachers having different expectations for them and also with boys who have ideas of how “things should be”, and hopefully with the help of parents, who hold ideas regarding Mathematics and women. The next section will go through the literature on those influences just mentioned for girls.

### **Are girls encouraged to do Mathematics?**

Of the issues that girls have to face regarding school Mathematics, one is directly attributable to the classroom and the teacher behavior: whether or not girls are encouraged to do Mathematics. Encouragement to do Mathematics can make a change in the life of girls, placing them in the paths of Mathematics fields and careers. Many programs out there (QUASAR, Project IMPACT, Project Seed, The Algebra Project, EUREKA, EQUALS and MESA among others) show that. But these are not the norm of a girls' life today, but rather the exception. Regularly, female students have to go through school Mathematics receiving a different message, one of discouragement.

What are the messages girls receive from parents, teachers, and peers in general? Clewell and Campbell (2002) state, “Girls and boys receive difference



messages from peers, parents, teachers, and society in general about appropriate roles in society and definitions of success.” (p. 271). It also supports what Braidotti, Charkiewicz, Hausler and Wieringa (1994) critique: that women in a patriarchal ideology stand for nature, White motherhood, and the male-dominated society. Because these ideas are considered to be *natural* by some and even “biological destinies” by others, they are not only considered unchangeable, but there is no need to seek for change either (Sadker, 2000).

If teachers relate to these ideologies, then the expectations that they will have for their female students will be very different to what they expect from boys. Their instructional decisions (for example in strategy use) may be different whether they are directed to boys or girls (Carr, Jessup and Fuller, 1999). According to Arambula (1996), Clewell and Campbell (2002) and Fennema (1998) not only are teachers' expectations different, but they also influence classrooms. Leder (1990), Arambula (1996), and Sadker (2000) state that teachers interact more with boys than girls, and Altermatt, Jovanovich, and Perry (1998) added that the nature of those interactions is different. Girls appear to be in the background of the class, with boys being part of the first act, dominating the interactions. Girls and boys are asked different types of questions that will require different kinds of Mathematics in response. For example, it was found that boys were asked more questions that required that the students incorporate already existing knowledge or material covered in class to build up a solution to a problem that is new for the students. Also boys were asked more questions that these authors call “divergent”, where students should search in their broad

existing knowledge in order to come up with an answer, and the answer to this type of question is not unique. In the same paper the authors go one step further, and say that the interactions girls have with teachers, are not as “good” as the ones boys have. For example Sadker (2000) lists “relegating girls to the sidelines while boys keep the spotlight”, as one of the top-ten gender biases. The author adds that “Studies of teachers discourse underscore male dominance in the classroom” (pp. 4). Arambula (1996) expressed the same idea about the lack of attention girls get from teachers. But she also found that boys' call-out answers were accepted more often than those from girls, boys received more direct questions, and their answers to open teacher questions were accepted more frequently than girls'. The practices and beliefs teachers hold are at least a partial explanation for the gender differences in performance mentioned before (Leder, 1990). The ways teachers see girls and their attitudes (Isaacson, 1990) will affect what they expect and demand from girls. Leder (1990) also speculated that it alters the self-image of girls and boys regarding Mathematics. The fact that teachers seem to be unaware of this situation, accepting it as a norm (Arambula, 1996), justifies that if a girl is successful in Mathematics, some explanation other than “skill” and intelligence will come first to their mind.

Teachers attribute girls' success in Mathematics to hard work, while considering ability to be the reason for boys' success (Forbes, 1996; Damarin, 1995; Fennema et al., 1990; Walkerdine, 1989). Naturally, teachers think that a boy that is failing still has the potential to succeed, but a girl that is succeeding, only does so because she is a hard worker. Walkerdine (1989) talks about “the just

or only phenomenon”:

By this, we meant that whenever a positive remark was made about girls' performance in Mathematics, particularly the strong sense that girls performed well in school up until they transfer at 11, a remark would be brought in which suggested that the performance was to be accounted for by 'something which amounted to nothing'. In other words, no matter how well girls were said to perform, their performance was always downgraded or dismissed in one way or another. These pejorative remarks usually related to the idea that girls' performance was based on hard work and rule-following rather than brains or brilliance (in other words what was supposed to underlie real mathematical performance). (p. 268)

Considering these findings under the light of those of Blackwell and Dweck (2007), it appears as if teachers hold an *entity* theory of intelligence when it comes to boys, and more of an *incremental* theory for girls. For the first theory, the authors explain, intelligence is a “thing” that one may have or not, or have at different degrees. For the incremental theory, intelligence is something that can be developed by working it out. Students with an incremental view of intelligence, according to Blackwell and Dweck, have advantages over those who have an entity view. These students' positive efforts beliefs appeared correlated with this incremental theory of intelligence, that is also related to motivational constructs. A question that comes to mind at this point, is what happen to girls that see their teachers believing boys “are naturally” smart for Mathematics, when they have to “work for it.” Teachers do not assume that girls cannot succeed in Mathematics,

but have a starting point that appears to be far below that of boys. It is not hard to imagine that teachers believing girls aren't simply "good for Mathematics", may try to help them by teaching a kind of Mathematics where girls need to memorize and reproduced strategies showed by teachers.

Being that teachers are a great influence for girls (Maire Rodgers, 1990), it is not a surprise that girls will go through Mathematics classes thinking that "the clever boy" will make them look bad, or that the teacher is not being encouraging, causing girls to try to hide in the class and from Mathematics Isaacson's (1990). It is not enough to end the discussion by saying that simply girls don't want to be noticed by teachers (Sadker, 2000). This is not helping girls nor is it helping teachers: teachers are more accurate at the time of selecting their most and least successful boys than girls, also encouraging boys more to study Mathematics, and attributing to them all sort of positive qualifications regarding Mathematics:

They perceived boys as being their best students, attributed effort and ability as reasons for success and failures differently. They believed that the causes of success and failures were different for boys and girls, and the way in which attributions for girls were made are widely believed to have a negative impact on achievement." (Fennema et al., 1990, p. 66).

Teachers have to act on these issues if gender inequities are to disappear from classrooms. With teacher preparation programs and staff development programs doing little to help teachers to see these differences (Sadker, 2000), there is important self-evaluation to be done.

Teachers need to be more critical of their interactions with girls, and

observe what is really going on in the classrooms. In their interactions with teachers, girls are criticized more for the academics when at the same time there is less interaction (Campbell, 1995). “Teachers -through their behaviors and interactions with students- have long been considered important influences on girls’ attitudes and achievement in science, Mathematics, engineering, and technology” (Clewell & Campbell, 2002). It is clear that these experiences are everything but pleasant (Rodgers,1990). Their early encounters with Mathematics leave in women an impression that is so strong, that many years later they still remember with apprehension. For example in Isaacson's chapter, we hear what grown-up women have to tell about their memories of Mathematics class. It is not without certain dread that they remember the “clever boy” of the class, the lack of women in the class as well, the competitiveness, and the lack of encouragement of the teachers. Both authors also discuss us about how these past experiences not only helped these women become alienated from Mathematics, but also as a result, became excluded from it. It doesn't appear to be difficult to connect these experiences with the choice women make of staying away from math.

When women become alienated from Mathematics, and exclude themselves from it, it is not hard to imagine some may thing Mathematics it is not a female domain by nature. Studies have shown that teachers believe that Mathematics is a male domain, overrating male student’s capacity to do math, and holding higher expectations for them also (Clewell & Campbell, 2002; Walkerdine, 1989). Boys and girls also appear to believe (or maybe learn), that the reasons for their success or failure are different as discussed in the previous section. In the meantime, girls

are encouraged to be obedient, compliant, and to accept methods as they are given to them (Boaler, 2002). These expectations from teachers are shaping the schooling experience girls have regarding Mathematics and also the kind of Mathematics they produce, and the options they choose for their future.

According to Beilock et al. (2010), female students with female teachers who are math anxious, are affected by that anxiety, subscribing to traditional stereotype of “girls are good at reading, boys are good at math”, and achieve lower than girls who did not hold the stereotype. The authors hypothesize that young female students, modeling behaviors that are “gender appropriate” and subscribe to the stereotypes, feel that boys are the ones who are good at math. Affected by this stereotype leaves them with no option but to achieve lower not only than boys, but also than girls that are less affected by that model the teacher is offering. The authors maintain that teachers are not the only models girls have regarding what is gender appropriate, and there are other characters affecting those beliefs, like previous teachers, parents, peers, etc. Also in that paper, only female teachers were studied. There is still a question of what would the results be if male teachers would have been considered, like Plante, Protzko and Aronson (2010) state in their response to the previously mentioned article. There is an indication though, that girls more than boys may be affected by the feelings female teachers have regarding math, and being that education is a field populated with women, especially at elementary levels, this is a path worth studying. It also raises questions not only for male teachers and their effects on female and male students, but also for female students who are not White. Recent research show

that Mathematics stereotypes for students has decreased and even reversed (Plante, Protzco & Aronson, 2010). Research on this area appears to contradict itself, and even if girls don't subscribe to those stereotypes, what if those around them do?

In general, students think Mathematics is gender neutral, but girls are the ones who feel more strongly about some aspects of gender stereotyping in Mathematics while at the same time, boys are the ones that stereotype more (Forgasz, Leder & Kloosterman, 2004; Arambula, 1995). For example, even though boys didn't stereotype Mathematics strongly as a male domain, they always did it more than females did. This puts girls at least as the object of the stereotyping done by boys. Being the object of the stereotyping is as important an issue as it would be if they held the stereotype themselves. If they think they have the skills to occupy male dominated spaces, but the spaces are not open for them and they are not welcomed, wouldn't the consequences be similar? It is important to note that those girls who are not accepting of traditional gender roles have higher Mathematics achievement (Campbell, 1995). Traditional roles appear to be the natural choice for girls in order to avoid conflict in the school system and society today. The conflict that will come with the change in that system if girls were going to opt out of those traditional roles. Gender stereotyping may be the only aspect of Mathematics attitudes where there is a significant difference between boys and girls (Hyde et al 1990). Changing this perception, however, is not easy.

To change this perception teachers may need to revise their own ideas about

how to teach Mathematics and what it means, instead of trying to change girls (Campbell, 1995) where girls would have to acquire characteristics like competitiveness, or risk-taking, that had been traditionally considered male characteristics (Leder, 1996). The job here involves boys as well, and a lot more than just schooling. This doesn't mean teachers cannot do anything regarding this issue. It just means it is more complex than the solution of simply changing girls and it depends on all of us. Teachers should start with their own classrooms. Like I said before, teachers should revise and be critical of their own practice. If teachers also think that mathematic is a place for boys and not girls, they are probably sending that message to their female students. It does not stop or start with teachers either. Teachers are part of a society whose rules and relationships they reproduce in the classrooms. Stereotyping affects us all, and teachers are nothing but one of the pieces in the system that needs to be readjusted, as many others need as well if the problem of stereotypes is going to be eradicated or controlled.

Even though women have been under the stereotype mentioned before, they have proved the stereotypes wrong, and have closed the achievement gap that once existed compared to men (Clewel & Campbell, 2002). Despite the message delivered by Mattel's speaking Barbie doll: "Math class is tough" (Leahey and Gou, 2001), that is just a piece of what the media, another piece of the system, tell women, that has efficiently constrained them and their aspirations (Leder, 1996), scores showed that Mathematics is not tougher for women than it was for men. But if Mathematics will be a path girls and women will pursue, there will be some



relationship between taking that decision and how Mathematics make them feel. Mathematics could be something girls and women enjoy or suffer. This will make a difference at the time of making those decisions.

### **How do girls feel regarding school Mathematics?**

The ways school Mathematics and other actors in school or home make girls feel about it, will affect the way girls achieve, or the choices they make for the future. Will they include Mathematics as part of their future? If the memories they have are not problematic and don't involve feeling less adequate, they are probably more likely to participate. After reviewing the previous sections about the different problems girls face when it comes to Mathematics, it is not hard to imagine how they feel about it. In the coming paragraphs, I will review the literature on self image and confidence of girls in school Mathematics.

Girls' attitudes towards Mathematics as well as science are not always negative, and women have proved to be successful at any level of Mathematics across time in different cultures (Koblitz, 1996). Arambula (1995) states girls' attitudes not only can be positive, but that they are more positive the younger the girls are. This directs our attention to the many sides of the socialization experience of girls. For the case of this paper, the author will focus on one in particular: schooling and the consequences of that schooling. Even though those attitudes are not always negative, girls are opting out of mathematical careers. They do so despite girls' adequate or superior achievement in Mathematics. They see themselves as less functional Mathematics learners having more negative

attitudes towards Mathematics than boys have (Forgaz, Leder & Kloosterman, 2004). The higher the grade level, the less they report liking Mathematics, and the less competent they feel even when their academics are fine (Campbell, 1995). Regarding this issue, Barnes, McNerney, and Marsh (2005) say: “People are generally more inclined to be interested in tasks about which they feel confident and are inclined to show little interest in tasks which they feel are beyond them.” (p. 7). It comes naturally that if girls don't have a high image of themselves regarding Mathematics, they will be less interested in careers that demand Mathematics.

These perceptions and feelings go hand in hand with the fact that girls don't choose paths where Mathematics is present and their choices don't match their ability in the subject. Is Mathematics presented to girls in such a dry and traditional way that they receive a disempowering message? Methods like inquiry that increase girls' enjoyment of Mathematics will help teachers help girls by analyzing their own practice (Battey, Kafai, Nixon & Kao, 2007), but the reality is different. Also this way teachers discover what works and also identify what isn't working, in this particular case: what isn't working for girls. Battey et al. also point out that inquiry “can challenge the relationships girls develop with science and Mathematics by privileging the interests and concerns of learners allowing girls to ask different kind of questions and pursue different goals in their scientific development” (pp 224). These positive practices don't make it all the way into the classroom maybe because even though many theories have been developed lately for understanding learning, teaching remains somehow underdeveloped

(Jaworski, 2006). Every decision and action the teacher makes will be a factor in creating a system that is encouraging or not encouraging women to take the Mathematics-intensive path all the way.

The system in which girls find themselves immersed in our schools, a “banking” system (Freire, 1970), in which the teacher “deposits” knowledge into students as if they were empty vessels, causes girls to see themselves as disempowered. Girls' interests and concerns are not considered in the system. The questions they may have remain unanswered while boys take the spotlight, and leaves girls following the rules of this system that was not thought for them. Girls then choose structured learning environments in contrast to developing a will to create and modify the Mathematics in order to adapt it to different problems and situations (Boaler, 2002). Adapting the Mathematics it is not the goal of the system. That they, the girls, adapt is. Female students still ask more questions at higher grade levels than boys, and initiate more work related contacts with teachers, only to observe that boys get more attention from teachers (Clewell & Campbell, 2002).

### **Why should we still worry about this issue?**

Even though the performance of girls and boys is almost (if not) the same, the field is still interested in gender equity because the participation of women in STEM careers is still lopsided despite achievement scores being similar. Even when the numbers of girls and boys graduating from these majors are getting closer, women still are under represented in occupations that demand

mathematical skills. The issues girls had to face during school Mathematics may give use a clue as to why this phenomenon is happening with women today. There may be many different factors contributing to this phenomenon, more than just school. But I argue that it is important to better understand how schooling influences the career choices girls make for their future since they are underrepresented in Mathematics, science and technology (Clewell & Campbell, 2002).

We also cannot forget Nel Noddings (1998), who wondered why we see it as a problem that girls do not choose Mathematics, but that it is ok for boys to not choose early childhood education. She explains the situation by saying girls are maybe less interested in Mathematics than boys are. Noddings goes on to say that worrying about this just because jobs for those knowledgeable in Mathematics are better paid tells more about us than about these girls. However, though Noddings may be right, we need to make sure that if girls really are less interested in math, we know why that is and what would change that fact. In other words, if the schooling system is training girls to disengage, or if girls are learning that Mathematics is static, procedural, and elitist, then the system of education is at fault, not girls' interests. "Women account for half the world's population and half of its talent. The costs of not developing and using this talent are huge", said Hausmann, Tyson and Zahidi (2007). Therefore searching into why girls are not choosing Mathematics appears worthwhile. Mathematics means power in today's world and discouraging girls to engage Mathematics can be considered a form of oppression. "The science and engineering professions typically offer relatively

high pay, stable positions, which should be particularly appealing in an economy where unemployment and poverty are increasing for both women and people of color” (Tressou-Milonas, 1996, p. 2). Being as women are part of “the other”, we all need to make sure they have the tools to appropriate the power that has been taken away from them. Choosing to learn and engage in Mathematics means exercising power. If society sends the message that Mathematics is inappropriate for girls, it is worth studying how this message is impacting the lives of young women.

The participation in high school Mathematics courses is fairly even between boys and girls as is achievement, but numbers change drastically when it comes to bachelor’s degrees or graduate degrees in Mathematics. The percentage of women graduating with a PhD in Mathematics and Statistics in the US was 29.6% of all the earned doctorates in that areas in 2006 (National Science Foundation, survey of earned doctorates). The numbers for careers that demand Mathematics in the United States and other countries like Australia or England are not very different (Boaler, 2002; Campbell, 1997; Clewell and Campbell, 2002).

The reality is similar when it comes to jobs: “In the workplace, men vastly outnumber women in mathematically oriented occupations (Kenway, Willis and Junor, 1994; Leder, 1990)” (Boaler, 2002). This was also supported by Boaler (2004), and Clewell and Campbell (2002). In 2007, De Welde, Laursen and Thiry, state that:

Men outnumber women (73% vs. 27% over all) in all sectors of employment for science and engineering (S&E) ... Gaps between men and

women are larger in business and industry (79% men vs. 21% women) and in federal government jobs (73% vs. 27%) (pg. 1).

When these same authors studies the data considering race and ethnicity as a factor, their findings were troublesome for non-White women. For example, Hispanic women comprise 1.2% of all science and engineering workers. To complete this picture, women with science and engineering degrees are less likely to be employed or even be in the work force than men (Clewell & Campbell, 2002), and when they are in STEM they are more likely to hold a lower rank than men (De Walde, Laursen & Thiry, 2007). It shouldn't come as a surprise then that children of both sexes are asked to draw a mathematician, they typically draw a White man, and this fits reality. "There is certainly a huge deficit of female mathematicians" (Leahey and Guo, 2001), and not surprisingly since its creation in 1936, no woman has been awarded the Fields Gold Medal, which is the equivalent of the Nobel Prize for mathematicians. It is not a minor detail that this medal is only awarded to mathematicians under the age of 40, and women historically dedicate themselves to Mathematics when they are older: "Anecdotal evidence shows that whereas male mathematicians report getting their best results between the ages of 25 and 40, females generally find that their best research occurs between 35 and 50. (Gray, 1996, p. 31). Women are not less able to achieve these honors and the power that comes with Mathematics knowledge. Yet, they are limited participants in STEM careers.

This lack of participation of women in STEM careers is only part of the problem that this paper addresses. One issue that appears across the literature just

reviewed, with the exception of the international studies mentioned, is the assumption that the girls studied in the US are an homogeneous group, when in reality it is an heterogeneous group. We know a lot today about the situation of women and Mathematics, but not all women. We know about White girls and their experiences with school Mathematics. What would happen if we expand our research to reach other girls?

How will the results obtained in the field change if we considered Latinas or African American girls? Latinas are also a diverse group, and the situation of Mexican girls in the US, may not be representative of the situation for girls from Puerto Rico. Will we find that they face different issues? As an example, if we focus on Latinas, we can see that language needs to be added to the list of complexities they encounter in school and therefore, in school Mathematics when they are not allowed to use their bilingualism as a tool to learn Mathematics. We don't need to dig deep to see issues that will make the Mathematics schooling of these girls fundamentally different than that of White girls. In the coming sections, I review the literature regarding Latinos, Latinas and Mathematics.

### **Latinos, Latinas, and Mathematics in the US**

Researching the literature on Latinos and Mathematics is not an easy task. Despite the growing numbers of Latinos in the US schools, there is not a lot of work done regarding this topic. Despite the prevalence of this population in the US schools, there is a disturbingly low amount of research on Latinos in Mathematics. Despite this, there are some things we know about Latinos and

school, other than that they are a good percentage of the US student body. Latino educators, and educators interested in equity and social justice, are working to fill in the gaps of this literature. An example of that is the National Science Foundation Center for Learning and Teaching, the Center for the Mathematics Education of Latinos/as (CEMELA), that has amassed excellent resources for research as evidenced by this part of the paper. In this section I review this literature, showing by the need for more studies that shed light on the complex intersection of Latinos and Mathematics learning. The struggles that Latinos have gone through and still do, will help explain in particular part of the experiences the participants of this paper go through.

Latinos have been and still are, subject of discrimination. Not preparing teachers to work with students whose first language is not English, and furthermore, prevent those teachers from communicate in the first language of the students is a form of discrimination. These are issues that Latinos in US schools face today (Gutierrez, 2002). A clear example of this, are the strict regulations created in Arizona regarding its policy of English-only. Latino students will be segregated in classrooms as it is admitted in the text of the policy itself, in chapter 7, article 3.1, of Title 15. Efforts have been and are still done to change that situation, as the number of Latinos grows in the US schools, it is getting harder to think of them as a minority (numerically speaking). Different projects bring light on how Latinos learn, and what is the reality outside school that supports (or not) their schooling experience. We know a little more now, but there is much to be learned, and even more to be done if our goal is that of offering equity in



education to all the students in each school of the US.

In the coming sections I review what little is known about Latinos, and the issues they face in school Mathematics in the US. The role of language in the learning experience Latinos have is discussed first. Then I will move on into the role of parents in the schooling experience of Latinos in the US. This section will be followed by one describing the situation of this population in respect of Mathematics achievement and STEM participation, so then I can review the situation of Latinos and equity. At this point, I will assess the literature on Latinas and Mathematics in particular, that proved to be poor and underdeveloped, proving the need for studies like the present one.

## **Language**

It is hard avoiding thinking about the schooling experience of Latinos while avoiding the issue of language. How does language shape Latinos' schooling? They are overrepresented in special education classrooms, and it's mostly due to language issues. Second language acquisition is often mistaken for learning disabilities, resulting in an over representation of Hispanic students in special education classrooms (Civil, Planas & Quintos, 2005). Those authors draw their conclusions based on two research studies conducted in Barcelona, Spain, and Tucson, US, with similar theoretical backgrounds. They were focusing on immigrant parents and the struggles they were going through side by side with their children regarding their schooling in Mathematics. They argued that to understand better the mathematical performance of immigrant students, it is

important to research the students' social contexts, and especially, the home environment. The authors were concerned not only with the Mathematics being taught to the immigrant children, but also with the language struggles they were going through. Based solely on language ability, Latinos can be also found in lower tracks (Gutierrez, 2002; Civil et al, 2005) as were the immigrant children in the studies previously mentioned. But when language is no longer an issue, and Latino students are allowed to speak Spanish drawing from their culture to learn Mathematics, students were successful in their Mathematics (Marshall, Musanti & Celedon-Pattichis, 2007). In this study the authors explored how first grade student learned Mathematics and developed when using their own language to problem solve. The success experienced by these students not hard to understand when we remember that when students are engaged in problem solving, communication of the strategies used is central and the use of a language in which they feel comfortable will help them interact with others. In a different study Vomvoridi-Ivanovic and Khisty (2007) also found that Latino students whose first language is Spanish, can be better motivated to do Mathematics when they have the chance to learn it in Spanish. The authors were focused on prospective bilingual teachers, and how language and Mathematics played out for them and the students. This doesn't mean students were unable to succeed in Mathematics if they had to do it solely in English, but motivation should not be underrated. One student in the study discussed appeared to be off tasks and not interested in Mathematics unless the conversation and the Mathematics was taking place in Spanish, his native language. Events like this could be the difference between

choosing to take more advance Mathematics next semester, and to stay away from Mathematics and science.

When we think about Spanish and Mathematics and the relationship with Latino students living in the US, it is unavoidable to think about the type of Spanish or English required so students can use it as a tool to learn Mathematics. What Vomvoridi-Ivanovic and Khisty (2007) found in their study, is that conversational Spanish it is not enough. It is not enough for students because being able to have conversations in Spanish doesn't mean that they can talk about Mathematics in Spanish. To be able to move from basic Mathematics to advance strategies, students need to understand those strategies well enough to be able to explain them to others. To be able to talk in Spanish doesn't mean that students have access to the Mathematics registry in that language. It is also not enough for teachers, or future teachers, like the participants on the paper just mentioned. These future teachers met with students once or twice a week for about one and a half hours, where they were supposed to work with the children as a more experience peer rather than a tutor or a teacher. These teachers realized that working in Mathematics when using Spanish was more challenging than they thought. They were fluent in conversation, but that was not all they needed. Another thing that Vomvoridi-Ivanovic and Khisty (2007) found, was that these future teachers tended to switch to English if even just one student in the group (they were working on) didn't know Spanish. The reverse was not true, and students who couldn't speak English were placed in a position of disadvantage even though the teachers could speak a language they did understand. But even if

these teachers would have position Spanish as the language of instruction for all Latinos, this would have not been enough, as Gutierrez (2002) points out.

When Gutierrez (2002) explored the work of three high school teachers that had been successful teaching Mathematics to Latinos, she noted the importance of working in the native language of Latinos by providing support and materials in Spanish, but also that this was not enough. The teachers that participated in this longitudinal project of more than three years of duration, were interviewed and observed, and their students were also interviewed. The study found that there is a need for teachers to know what the students bring to the class: to know their culture, their previous experiences with Mathematics, to have a clear idea where these students stand as Mathematics learners, what they know, and how they know it. Gutierrez states that teachers should have reasonable expectations regarding the language skills Latino students have and they can only do this by taking the time to know their students deeply. Teachers should also know the relationship between language and teaching Mathematics. The author goes further to say that language is a “defining aspect of identity”, and as such, needs to be present in the class if teachers hope to be effective while teaching Mathematics. But language is not only an issue for the children in school, but also for their parents.

## **Parents**

Despite having sometimes English as a barrier, parents struggle to help their children. Studies show that Latino families appeared to be very supportive to their

children when it comes to school, and when it comes to Mathematics in particular (Civil et al., 2005; Civil et al., 2007; Diez-Palomar & Civil, 2007). Latino mothers have a lot to say regarding experiences and difficulties in helping their children with Mathematics work (Civil et al., 2007). This idea of parents caring and having valuable things to share with and teach to their children defies that belief that claims that Latino families don't care about school, or any other deficit view (Zarate & Gallimore, 2005). As Civil, Planas and Quintos (2005) put it, parents are an intellectual resource. But the school may not always value this resource. The school may not understand what these parents bring to the desks of their children, or simply may discard their input altogether. Sometimes, this situation makes it twice as hard for the parents: it is not only difficult to help their children, but their children prefer not to be helped by parents since what they learn at school and what the parents “teach” at home appears to be in conflict (Diez-Palomar & Civil, 2007).

In Diez-Palomar and Civil study, where researchers talked with mothers and heard their reflections about Mathematics education, brought up not only how interested Latino families are regarding the Mathematics education of their children, but also the frustration to be caught up in the middle of two ways of teaching the same content. These two ways of teaching mathematical content bring up an important duality: Latino parents constantly compare what their children are learning, and how they are learning it, with the ways and content that they were taught in their home countries (Civil et al., 2005; Diez-Palomar and Civil, 2007; Civil et al. 2007). Not only can this confuse children, but it also

create a barrier between children and schools on one side, and parents on the other, taking away the power of parents to help their kids when the algorithms taught in the US look different than those taught in their home countries.

Immigrant parents deal with this issue different ways, passing on different values of their home culture to children.

Different outcomes can come out of the comparison just mentioned: parents struggle to give their children what they consider to be “the best way”. This will often value what immigrant parents bring from their schooling experiences in their home countries, in other words, their culture. Another outcome could be giving up their past, and accept the new schooling system “as it is”, like one of the two groups of immigrant parents appeared to do in the study conducted by Civil, Planas and Quintos (2005) that was mentioned before. These parents who adopt the latter option, accept that “low grades are unavoidable”, that children need to leave behind what they learned before, and that their children should be placed in “slower” tracks. In Freire's terms, these parents accept life “as it is”, accept the status quo without challenge, as if there is nothing they can do to improve their condition or that of their kids: facing the education of their children from a powerless position. But parents that realize they have something valuable to offer their sons and daughters, feel that they can help them more if they are placed in a bilingual program or other self determined course of action (Civil, et al., 2005) and worry about lost time (Diez-Palomar, Civil, 2007). For these parents lost time appears in two different ways: the time that it takes students to get used to the new school system and learn English, as well as time when children are placed in a

class where the Mathematics taught is at a lower level than the one they were learning in their home countries. In the Diez-Palomar and Civil article, one can read mothers' thoughts on these issues, and the concern that any mother will have when she finds out that it took two years for her children to even smile in a classroom. Parents also see a lost of time when their children go through some material all over again, when they already learned that in their schools back home. That is lost time as well. Gutierrez (2002) points at this when she says:

Latina/o students who are recent immigrants to the United States often have experienced very effective and rigorous Mathematics instruction in their home countries. Moschkovitch (1999b) argues that without more accurate assessment of students' academic knowledge, recent immigrant Latina/os are often placed in math classes that cover material they have already covered in their home countries (pp 1053).

Not only this shows pride in their culture by saying “what we learned is valuable and we don't have to learn it again”, but also shows interest in what school has to offer to their children. Latino parents are involved and want to help.

No matter how much these parents can actually help and considering the issues described before, Diez-Palomar and Civil (2007), state that parents were always very present in the school, showing interest in the education their kids were receiving, and even asking for workshops to re-learn what their children were learning in Mathematics. All of the mothers that were interviewed agreed on the need for resources for them to learn the way their kids are learning. But that is not all. Latino mothers also took English classes with the same goal as the

workshops (Civil et al., 2007). With that said, the question that naturally follows is are there spaces for Latino mothers and fathers to discuss the education of their kids with the school and teachers? How “real” or meaningful are these conversations on the other end? Maybe an indirect answer to those questions comes to us when we see other ways these mothers have developed for helping their kids. Latino mothers trust in different ways of networking, like youth and community centers. Also family and friends organizing so when one child has a problem with homework, there is a house or place where this student and parents know he or she can go for help. It doesn't come as a surprise that Willey and Radosavljevic (2007) found that promoting this collaboration between schools and families had a positive impact on the learning of the students.

In the previously cited study the authors examined the effects of “play” as a developmental tool with parents usually participating in the sessions. The project took place in an urban area, and it took the form of an after school program where children were doing non-remedial Mathematics. Even when the focus of the vignettes presented in the paper was the interaction between the facilitators of the program (graduate and undergraduate students), the participation of parents is highlighted. Games, they argue, provided an excellent opportunity for parents and children to find and share a space where they can be at the same level, sharing an activity. But if students in the program didn't acknowledge the presence and potential participation of parents, what parents have to offer is lost. Not only do the children lose, but also the teachers, who could have learned something about how to teach these children.



Latino parents are involved in the education of their children although the position they find themselves in sometimes makes them feel impotent. In the studies reviewed, it was clear the will to be more involved and to do whatever it takes to be able to help their children. No matter what were the problems they encountered, these parents tried their best to be a part of the education of their children, and more specifically of their school Mathematics. The spaces for them to offer their help are not always available, and one may wonder what is the direct consequence of this. The field does not know that yet, but there is some knowledge we have about the achievement of Latinos in Mathematics, and their participation in STEM careers.

### **Latinos, achievement and STEM participation**

One thing that *has* been well documented is the participation of Latinos in Mathematics courses, their achievement, and participation in STEM careers. Latinos appear to be over represented in low ability classes (Catsambis, 1994), and under-represented in high ability math courses and STEM careers (Zarate & Gallimore, 2005). The news about their achievement is not promising either. According to Gutierrez (1999), even though the scores for Latinos in Mathematics have improved, the improvement has been mostly in basic skills. She states that this under achievement “has serious life consequences for earning potential and for participation in an increasingly technological society” (2002, p. 1048). In her 1999 paper, Gutierrez goes on by saying that not only are Latinos and African American scores below those of White students, but that they also tend to score

significantly below in advance placement courses and college entrance exams.

Civil, Planas and Quintos (2005) say: “The under-achievement of many low income immigrant students in school Mathematics has become a globalized phenomenon in the modern world.” (p. 81).

Filiberto Barajas' dissertation presents narratives of seven immigrant Latino students to portray broader issues that other students could be going through regarding school Mathematics and school in general. In this moving work, the author tells us in the voice of his participants about the “little” things that happen in the classroom, and school experiences of these students that make a big change in their lives. For example, the connection that is made between inability to speak English and inability to learn Mathematics places students in classes that are less challenging, boring, and below their already achieved skills. Other stories include the “mistakes” that are made when placing students in different courses. Placements that destines them to fail over and over, moving student onto classes for which the students haven't met the prerequisites yet, in which they can almost only fail. When students realized these “mistakes”, their attempts to fix the errors put them in a hopeless position, with no adult able to speak for them. One student lost the chance to use the advantages of being designated as a gifted student, but he never knew about this until the researcher checked his transcripts and academic history of the student. Latino students' participation in school Mathematics is limited. Starting with a limitation can bring nothing but other short ends.

Situations like the ones described in the previous paragraph, with Latinos placed in the wrong classes, losing motivation, feeling impotent, it is not hard to

imagine how they wear out students that have to go through them. This could be a reason why the “return” of classes for Latino students won't be the same that the “return” for White students (Riegle-Crumb, 2006). Latinos are in a group that can be considered at risk since its gains from taking a class are less than those of White students. Even when they may start the sequence of Mathematics courses at the same point than White students do, they lose this advantage, reaching lower levels of the Mathematics course sequence. This loss could mean that these students don't reach to courses such as Trigonometry and Calculus, both courses that predict college attendance. One reason that may explain that loss according to Riegle-Crumb, is the lower grades Latinos achieve. For her study, she used national data from Adolescent Health and Academic Achievement (AHAA). She used the 9<sup>th</sup> to 12<sup>th</sup> cohort of high school students from 1995-95, and analyzed this data using descriptive techniques and Hierarchical Linear Model (HML). Like I said before, studies about Latinas are lacking, but in this article we found some valuable information that brings light to the issue. Studies like this one clearly manifest not only that the situation and starting point of Latinas is not the same as that of White girls, but also that their needs and interests may be different.

The dominant culture in the US won't necessarily have the same needs and desires that Latinos use as a guideline to make decisions when it comes to education. Neither is it in their best interest to meet the needs of “the other.”. Marginalized groups needs may not be addressed by the dominant groups (Civil, Planas & Quintos, 2005), and at the same time members of marginalized groups may also accept their role without critically thinking about it.

## **Latinos and equity**

To address problems that arise from the situation described above, Gutierrez (2007) prompts us to rethink what equity means. She proposes four dimensions of equity: access, achievement, identity and power. Gutierrez also focuses on two that have been less explored in research and that should be having a more central role. The two dimensions that have been extensively explored in many of the efforts done to address equity are access and achievement. In the previous section the literature reviewed made it clear that achievement and the study of the “gap” has an important part in the literature regarding equity. Tests results were analyzed to determine whether there were or were not any differences in achievement between boys and girls. And test results still are analyzed to determine whether there is a “gap” between White students and students of color (Martin, 2009).

When it comes to access, Gutierrez (2007, 2008) points out that students need to have access to qualified Mathematics teachers, technology, and all the resources needed to facilitate an environment where the teaching and learning experience can happen. Access and achievement conform what Gutierrez called the “dominant axis”. This in itself won’t address equity fully, although it is an important aspect. The author focuses on what she called “the critical axis”: identity and power.

Moving to this access as the one to focus research, we might ask questions similar to the following. Whose voice is the one that is heard in the classroom and is the mathematic we teach empowering? Why is it important that this Mathematics is critical and empowering to Latinos? Gutierrez

(2008) talks about “changing the game” on the students side, which is equivalent of “writing the word” that Freire once advocated for. Unlike those parents in the in the Barcelona case that Civil, Planas and Quintos (2005) studied, students should realize the power that lies within them, and that can be channeled through education, more specifically Mathematics education, to change the world. This author uses a metaphor that states very clear how mathematic education can address these two dimensions, by saying this education should be like a “window” for the oppressed and a “mirror” for the oppressors, who can learn from critically observing the status quo.

Through Mathematics education, students, and in this particular case, Latino students as being part of the oppressed, should realize their potential in Mathematics, and their potential to change the world “as it is” now. If they are part of the system without critically challenge it, then there is no window of opportunities where their future changes are improved. The oppressors on the other hand, need this mirror through Mathematics education where they can analyze their reality in critical ways, and see where being part of the dominant culture has given them advantages that have cost to others. This idea of the mirror/window has been considered by Eric Gutstein and his work teaching Mathematics for social justice.

With his work teaching Mathematics for social justice, Gutstein has proven that it is possible that young students (and in his case mostly Latinos) can learn Mathematics and also address issues of power, vindicating their voice and identity (Gutstein, 2003, 2006, 2008; Gutstein & Peterson, 2006). To develop

sociopolitical awareness using Mathematics, while at the same time developing other competencies as well like reading and writing, the author worked with what he called “real-world projects”. He followed the guidelines of NCTM, and also used the Mathematics in Context (MiC) curriculum. Gutstein states that through those real-world projects, controversial issues were discussed, different points of views were shared and accepted and respected, and Mathematics was a central tool for the investigations done, and also a tool to take actions for social justice as well. Gutstein (2006) states that the three pedagogical goals of teaching Mathematics for social justice are reading the word with Mathematics, that is, using Mathematics as a tool to understand that situations that surround us; writing the word with Mathematics, which entails using Mathematics to initiate change in the situations that are unfair; and developing positive cultural and social identities. “By positive cultural identities, I mean that students are strongly rooted in their home languages, cultures, and communities, but at the same time, can appropriate what they need to survive and thrive in the dominant culture” (p. 28). This way that he has developed of teaching Mathematics addresses the dimensions of power and identity that Gutierrez argued for. It is worth noting that the Mathematics goals are just as important: reading the Mathematics word, succeeding academically, and changing one's orientation towards Mathematics. Both sets of goals work together, and the results are for everyone to integrate Mathematics and social justice in every lesson for his Latino students.

Why would these authors think that is so important that right now populations like Latinos start rediscovering their own voice and power? Gutstein

(2006) talks about today's education and says: "First, US schools socialize students into non-questioning roles, creating and maintaining passive identities so that students do not believe in their own power to shape the world -what Macedo (1994) called *literacy for stupidification*." (italics in original, p. 88) Is this education different than what Freire (1970) called "banking education"? Latino students are not empty vases that can be filled with any information disregarding how relevant it is for their cultures and current contexts including their "battles" to find their place in US society. Has anything been done with Latino students that points out to a different direction than this *literacy for stupidification*?

In a project where Hispanic kindergarten students were experiencing a different kind of instruction, results were promising. Turner, Celedon-Pattichis and Marshall (2008) worked with three kindergarten teachers and their students. The teachers used a problem solving approach to their teaching of Mathematics, combined with story telling. The stories the teacher told related to the students and provided students with a base or model for explaining strategies. Because the contexts were familiar to the students, they could use their previous knowledge and culture as a resource to solve Mathematics problems. The project was based on the research for Cognitively Guided Instruction (CGI) conducted by Tom Carpenter, Elizabeth Fennema, and Megan Franke in 1993. However, similar to Secada and Carey's work on CGI primarily with students of color, Turner et al. (2008) conducted research with Spanish speaking and English language learners. The growth of the kindergarteners was remarkable and the final results were comparable with those of Carpenter et al. (1993). The exception was in advanced

problems, where the results for Hispanics were a slightly below Carpenter's: 40% to 50% for Turner study, in comparison to 60% to 70% in Carpenter's. However, the authors also found that the teachers in the project did not practice these more advanced problems as extensively as in the original work.

## **Latinas**

The Riegle-Crumb study lets us know that overall girls achieve in Mathematics better than Latinos do overall, but they don't reach White girls achievement level, and they also receive lower grades in general than White girls do. The author was interested in course sequences and academic performance in Mathematics, but also at the intersection of race/ethnicity and gender, arriving at the conclusion that race-ethnicity does not shape Mathematics course options for females and males in the same ways. For example White female and male students have a higher percentage of representation in higher-level Mathematics courses, which the author called "elite math categories". It was also true, according to this study, that females of every gender had a better presentation in Algebra I, but Riegle-Crumb notes a detail that is not minor: this difference is only statistically significant among White students. With grades it is a similar story: "within each gender, the percentage of African American and Latino students with high grades is significantly lower than the percentage for Whites" (pg. 112). The author claimed that even when some attention has been paid to the under-representation of Latinos and African Americans in advance level courses, we have yet to study what happens when gender enters that equation. And even



though research in the field claims that the “gender gap” had been closed, it is not clear to whom this is speaking, and whether this holds for Latinos. In her conclusion, Riegle-Crumb says: “... while females of every group appear to have higher grades than their corresponding male peers, the difference is significant only among White students.” (p. 112). There is little research focusing at the intersection of ethnicity and race, especially for Latinas. One example of a study at this intersection is Varley Gutierrez's dissertation.

Varley Gutierrez (2009) worked with seven 4<sup>th</sup> grade Latinas in the Southwest of the US. The author and the girls worked biweekly in a math club, where girls were meant to re-discover their voice and sense of agency through critical Mathematics and relevant social projects. The girls solved problems in a math journal as well as participated in social analysis of their local context. An example of this is the “Save our School” project, where girls had to justify why their school was worth saving using mathematical tools to back up their reasoning. This was especially critical as the district was actually deciding to close their school site. The mathematical research that the girls had to do for the project was then used to engage them in activism. This resembles Gutstein's work, but in this case, Varley Gutierrez's students were merely 4<sup>th</sup> graders. Even though their visions of Mathematics were poor at the beginning, by the end of the project they saw themselves as someone who can use Mathematics to make a point, critique other's point of view, and change reality around them. In her study, Varley Gutierrez observed her participants' classrooms, interviewed the students, took into account parent contributions, and some other unexpected sources of data such

as that provided by the media or the reflections that students even asked to write. In the club, girls were encouraged to find strategies that made sense to them, and for that, they drew upon their funds of knowledge. The author stated that this kind of knowledge not only made them feel like their point of view mattered, but also made them feel as a part of a larger reality where they were not alone.

Another study that examines the context of Latinas and Mathematics is Catsambis (1994). In her paper, the author states that gender differences are the largest among Latinos, and that Latinas are the ones that are facing more barriers in the three dimensions that the study was focused: learning opportunities, achievement and choice. Latinas tend to have less confidence in their ability, and less interests in Mathematics. For example, more females than males report being afraid to ask Mathematics questions in class, and are also less likely to say they are looking forward to Mathematics class compared to males. Using data from the base year and first follow up of the National Educational Longitudinal Study of 1988 (NELS:88), Catsambis concluded that by 8<sup>th</sup> grade, fewer females than males decided to pursue a career in Mathematics or science, with African American and Latinas being the least likely to do so. This positions girls, and in particular non-White girls, on a path that is not likely to include Mathematics as a career option: “Women of color are the most underrepresented group in Mathematics and science, but few researchers have specifically studied their educational experiences.” (p. 201). The author adds: “Female African American and Latina students are the least likely to aspire to such careers [Mathematics and science related], and White male are the most likely to do so.” (p. 205). In this

paper we also learn about the high levels of anxiety that Latinas exhibit, and how they think these courses won't be useful for them. Why they think so and how they arrive at this conclusion are questions that will help guide the work that needs to be done if the reality of under-representation is to be changed. These are questions that according to Varley Gutierrez are unanswered: "... little (if any) Mathematics education research speaks specifically to girls of color or to a feminist of color perspective in relation to Mathematics." (pg. 49) In addition to that, the same author states: "... there is an urgency to include the voices of women of color in re-envisioning Mathematics education so (...) [it] is used as a tool to transform society to be more just." (p. 49) What factors lead to college enrollment for Latinas and Latinos? Zarate and Gallimore (2005) studied this issue and concluded that Latinas' teacher classroom performances and the advice from high school counselors play an important role.

In their paper, Zarate and Gallimore used data from a 15-year study of randomly recruited Latinos. Students were interviewed annually, in Spanish or English, at the students' home or on the phone. Parents were also interviewed annually, and teachers were asked to complete individual ratings of the students. Their main results pointed to the different factors that affect the enrollment of Latinas and Latinos in higher education. Unlike Latinas, the enrollment of Latinos depended on academic achievement on standardized tests, parental factors, and language proficiency. But for girls, parents thought college education was important for different reasons: "Parents of girls seem to characterize formal education as a means of counteracting the girls' gendered vulnerabilities." (p.

394). Examples given by the authors of what parents said in their studies were: “to defend oneself”, “to confront life”, phrases that I heard myself at some point in my own life.

Considering the literature just reviewed on gender equity and Mathematics, and more specifically Latinas and Mathematics education, it is clear that there are still many questions that need to be answered, and even some that need to be asked. Following the suggestions for future research made by Rochelle Gutierrez (1999, 2002, 2007), more work needs to be done observing what is working or what appear to be working. This way others can benefit from it, as well as developing strategies to help students that, like Latinas, have not been the focus of research, but need to be under the spot light.

## **Theoretical Perspective**

Gender equity in Mathematics education has been of great interest to researchers since the 1970's. The outcome of this research has resulted in some improvements in the way Mathematics is taught in the classroom; however, in spite of the fact that the gender gap has been closing, other issues still remain that should be researched further and addressed; such as gender equity in the context of a student's ethnic identity, economic level, home culture, and out of school experiences. These issues, when addressing gender equity, create a more complex problem when developing the Mathematics curriculum.

In this section I briefly review the most influential theories in this field that led researchers and educators to move towards improvements at the intersection of gender and Mathematics education. These theories can be grouped into: 1) biological; 2) test-taking; 3) social-psychological; and 4) cognitive theories (Clewell and Campbell, 2002). In the next section, I review these theories, I and in the second section critique the work done offering alternatives: sociocultural theories, feminist approaches, Critical Race Theory (CTR), and Latino critical theory (LatCrit), giving reasons why these alternatives are requisite for the research at hand.

### **Biological**

If it were found that a male possessed a Mathematics-gene that made them more capable than females, then research would have found that they could not achieve at the same level as we know today. Research by the First International

Mathematics Study (FIMS) suggests that in different environments, females can achieve at the same level as males and sometimes accomplish more. Time has proven that the difference in tests scores between girls and boys is minimal and not biologically bound.

The explanations of the gender gap, based on biology, has another set of points to highlight. As Clewell and Campbell (2002) noted, some of the reasons for the differences in higher performance levels of boys include: neuronal density in the right hemisphere of the brain; puberty hormones; natural selection; and adaptation, a theory based on the variability of the scores male had on tests. The nature of these reasons as explanations of the gender gap makes this gap unchangeable. Subscribing to these theories means that there is little interest in projects or interventions to make improvements in the achievement and participation of females in Mathematics since *naturally* they are condemned to achieve lower than boys.

In the past, biology was the reason why some people believed that People of Color were less capable; and thus less than human. Today this kind of reasoning is not as *popular* and race is considered a social construct. But there are those who still advocate for biology as basis of this inequity although in more subtle ways. Now the argument is stated in the form of “women's brain perform better at this”, with “this” not being Mathematics, adding that the fact that men's brain do perform better in this field (Herrnstein & Murray, 1994; Lynn, 1994; Halpern, 1997; Jackson & Rushton, 2006; Penner, 2008). Though overall men and women are said to be as intelligent, women supposedly do not hold Mathematics in their

“tool box” and men do (Johnson & Bouchard, 2006). It seems the reasoning behind taking biology as an unchangeable fact justifies the lack of effort in changing inequitable situations. Thus, if Mathematics continues to be taught in the same way, only the dominant group will maintain its power.

Blaming biology today for differentiated achievement in Mathematics is an outdated notion when the conversation includes gender. The fact that today no one is claiming biology solely as a reason, or that those arguments need to be masked or backed up with statements like “this may vary from individual to individual”, manifest the weakness of the argument. It is still tempting to use this same idea to justify the difference in Mathematics scores of White students and students of other races and cultures. Martin (2009) tells us that there is a claim today that 8<sup>th</sup> grade African American have the same mathematical skill and abilities than 12<sup>th</sup> grade White students based on NAEP results. The author continues by claiming that this statement as other of the same sort, are not considered to be related in any way with racism, and to say so, would be resisted. One may take the results from the NAEP assessment as objective, and disregard the different process of socialization students go through in school, accepting that White and Asians have skill for Mathematics, and Latinos and African Americans do not. But International studies present evidence that this reasoning once again takes the field to a dead end. Hanna (1986) states in her study about girls' and boys' mathematical achievement levels and attitudes in 20 countries, that in some girls outperformed boys, for example Belgium, Thailand, Finland and Hungary. This poses serious doubts about using biology as reason why in some countries boys

outperform girls. As a result, these notions are mostly outdated and have created space in for other theories in the research literature.

### **Test-Taking**

Among other theories that fill this space just mentioned trying to explain the achievement differences between boys and girls in Mathematics, is the one based on the study of test taking behaviors in the US educational system.

Researchers theorize that the difference between boys and girls in Mathematics achievement might be explained based on the kind of Mathematics that was being used to measure what students knew. When a question is worded in a certain way, it can determine test results for both girls and boys (Clewell and Campbell, 2002). The type of questions can suggest that one or the other gender is superior. If teachers consider Mathematics a male domain then it is possible that they are using a context to teach that subject that is more familiar for boys than it is for girls. The context chosen for every activity, especially word problems could also favor boys rather than girls. If a student cannot relate to the problem to be solved, it is more difficult for that student to arrive at a solution.

The item format and the content of it will determine the gender differences one can find in a test (Garner & Engelhard; 1999). Multiple-choice favor girls when the content is Algebra, and the authors note that these items were “very abstract and algorithmic”. The advantage of girls over boys for that type of items and in that specific topic was statistically significant. On the other hand boys did better (but less consistently) on multiple-choice items about geometry and



measurement, number and computation, data analysis and proportional reasoning. When the items were the constructed response type, no difference was reported between girls and boys, except for the content of geometry, where girls (surprisingly, consider the literature) outperformed boys. For this study, the authors worked with American students. It is important to note this, because the reality in other countries is different, as I will discuss below. The results regarding multiple-choice items favoring males, and constructed response items favoring females corroborate Bielinski and Davidson (1998), who also worked with American students. These authors add that boys performed better in items set in real life context, and girls performed better in items that are “textbook like”.

Girls appeared to do better with abstract items, whereas boys related to items that need to be solved by using visual reasoning and problem solving skills. This is not surprising when we consider the fact that girls use more taught strategies, reaching the expectations of teachers that think can only do good in Mathematics thanks to their effort and not their natural skill. The type of Mathematics favored in the class will have an effect on the results of the tests. Test results suggest that boys are better in items that recalled information gathered outside school, but girls relied on curricular knowledge and were “least disadvantaged” with these types of items. This outcome requires a new era of research to explain how outside-of-school factors affect girls as well as boys schooling experience and how they learn Mathematics.

A different example of how problematic it is to take test results as our only evidence to determine the mathematical skills and abilities, is given by Martin

(2009), when he states that

Strong societal beliefs in meritocracy, innate ability, and the objectivity of tests obscure findings that many achievement tests are biased toward middle- and upper-class White students because pretest items favoring low-achieving and African American, Latino, and Native American students are often rejected in the test construction process (pg. 312).

This time it is not about gender, but about race, and the problem with test items is the same. The test can be constructed favoring one group and another. This last piece of information that Martin brings up awakes serious concerns about the situation for females of color. Not only they seem to be confronting bias in testing because of their gender, but also because of their race.

It is also important to take into account the international studies conducted by the International Association for the Evaluation of Educational Achievement (IEA): the First, Second and Third International Mathematics Studies, across different countries of the world, girls either achieved at the same level as boys or higher (Hanna, 2003). The same item in different cultures was more or less relevant for girls. Female students who found the item meaningful were able to find the solution, thus proving that girls also had the skills to solve those Mathematics tasks, but that culture imparts a gender bias. For example, by content area, girls did better than boys in items related to Algebra in Australia, but they did worse than boys in the same kind of item in Denmark (Kaiser & Steisel, 2000). In the same study, made based on TIMSS data, it was found that by the required mathematical qualification to solve the item, again the results were

diverse. For example, for items that the authors classified as “elementary conceptual understanding”, where the students need to apply once a basic mathematic concept or idea, girls did better than boys in Thailand, but worse than boys in Israel. For what the authors categorized as “problem solving”, where students had to “develop individual solutions of a problem by using already known mathematical methods” (Kaiser & Steisel, 2000, p. 21), girls did better than boys in Thailand, but worse than boys in Denmark. We don’t know what girls are expected to do in countries like Thailand or Israel, but their socialization is likely different to the one girls in the US experiment. So will be the relationships with teachers and the expectations educators’ hold for girls.

Using the results of tests to judge whether girls can or cannot achieve at the same level as boys is controversial. The items used on the testing instrument can favor one group over the other. Depending on how much the student can relate to the Mathematics used to test his or her ability the result can be different. The extent to how much students relate to one type of item or a mathematical area, will be related to the socialization process that student experiment. Test items can vary by context, approach or format, type or representation used in the classrooms and in the tests, and type of knowledge. For example Forbes (1998) states that US girls do better on examinations where there are no time restrictions, on questions that are gender neutral, or set in their real world context. Focusing our attention again to international studies, we observe that girls in different cultures, that were exposed more or in different ways to Mathematics, could solve items that in other cultures appeared to be more difficult for other girls. This comes to prove that is it

not inherent to the girls themselves, but to the instrument used to measure their Mathematics ability. This lens then, appears to have a weakness by not being able to take into account the socialization girls have in different parts of the world.

### **Social-Psychological**

What other lenses could be used to look at the problem of different achievement of boys and girls in school Mathematics? Social-Psychological lenses offer an alternative to previously discussed perspectives. These theories include: Mathematics as a male domain; influence of teachers, parents and peers; attitudes, self-image and confidence towards Mathematics; and out-of-school experiences. In the following paragraph I summarize the main characteristics of the theories mentioned embedded in the social-psychological space.

#### **Stereotyping: Mathematics as a male domain.**

Some researchers state that stereotyping is currently not as big of a factor in today's society as it was in the past. Forgasz, Leder and Kloosterman (2004) say that students mostly feel that Mathematics is gender neutral, and that it is men (not women!) who strongly stereotype. Others support this claim (Hyde, Fennema, Ryan, Frost & Hopp, 1990). Yet the meaning of those statements is more complex than it appears. Historically women were assigned roles and activities, by men, for which they were believed to be better suited; usually in a caretaker field; i.e., a mother, teacher or nurse. Women were not given credit for their mathematical work (Forgasz, Leder & Kloosterman, 2004), getting even less recognition than men in society for their mathematical work (Osen, 1975). Le-

May Sheffield (2004) mentions that history says nothing about the contribution of women in the design and construction of the atomic bomb (not that it should be an honor), and many women worked on it. Considering Mathematics as a male domain is something that girls breathe from the society they are a part of, as well as the system they are part of as well. Earlier I referred to Beilock's work about the Mathematics anxiety female teachers and how it affects girls' Mathematics achievement. But Plante's work contrasts with Beilock's findings that many of today's students do not consider Mathematics a male domain. They may not consider Mathematics as a male domain, meaning that is something only men can do; yet they don't participate in Mathematics careers at the same rate as boys do. The times stereotype does happen, it is more strongly felt by women than men. Women feel the stereotype strongly, but males appear to stereotype more (Forgasz et al., 2004). This means, even though they don't agree with boys that Mathematics is destined for males, the boys' traditional beliefs have an effect on girls. In the study by Jackson, Hodge, and Ingram, (1994) differences in self-concepts were not significant, but they were consistent with gender stereotypes. Jacobs et al (2002) also concluded that by high school, the self-concept of boys and girls are almost the same when it comes to Mathematics ability. I should point out that this result speaks about the situation in the US with middle school and high school students, the population of interest for this paper. When the scope changes to younger students, self-images in Mathematics can be different depending on the country of study. For example, Skaalvik and Skaalvik (2004) found that 6<sup>th</sup> graders from Norway do present different self-concept in

Mathematics, with boys having higher ones than girls, following gender stereotypes. In different countries one would encounter different outcomes, but in this paper we are focusing on the context of the US. According to the earlier study, Jackson, Hodge & Ingram (1994), males have more favorable self-image when it comes to the Mathematics dimension. Boys also hold more traditional views in aspects like division of family roles and workplace attitudes. Girls live in this society where boys hold the kind of beliefs described. It would be naïve to believe this has no consequence in the decisions girls make disregarding whether they think the problem is inherent to Mathematics, or just a problem that comes from the hand of boys and their beliefs. Considering that it is not just boys that girls live with, but also teachers, parents, and a society that through media sells certain view of who does Mathematics, puts in evidence that whether girls stereotype or not, won't be enough.

Seeing gender as a “project (...) achieved in interaction with others” (Mendick, 2005, pg 235) rather than seeing this simply as gender stereotyping, raises issues of institutional sexism. If women are underrepresented in Mathematics and science careers so this information amplifies relevance. If women and men are supposed to have the same opportunities for their career choices, then it is interesting that they are underrepresented in a field that can offer so many advantages socially and economically speaking. Where do these differences in numbers starts and how? One question that needs to be asked is whether girls would choose a field that they believe they don't belong in or that they won't be accepted in. Another question to ask is, in those cases where

Mathematics is stereotyped for girls, why is this happening? One wonders whether it is enough to think that Mathematics is gender neutral or this stereotyping mentioned before is important enough to make a difference for a girl when making career choices.

According to Walkerdine (1989) females are stopping themselves from performing academically as well as men do, because this could be challenging their “femininity”. Fifteen years later, Mendick (2005) agrees by equating “doing Mathematics” as “doing masculinity” when searching for an explanation of why Mathematics is male dominated. In her paper, the author compares the analysis on interviews conducted with two girls about their interests in Mathematics, with those of boys. Her conclusion was that the reasons why these girls wanted to “do Mathematics” are very similar to those of boys. In particular, Mendick talks about “proving something to others” and “proving something to themselves” as reasons. In the detailed analysis the author does of the discourses of these two girls, she finds their experiences with Mathematics, and other aspects of schooling, as gendered. The author adds that these discourses practiced by the girls, inscribe Mathematics as masculine. Mathematicians are a combination of heroes and nerds, both oppositional and gendered discourses. So she concludes that “doing Mathematics”, as well as “doing masculinities” are inextricably intertwined, making it more difficult for girls to choose the field and succeed.

“Gender stereotyping” and “feminine role” are institutionalized ideas that find their way through girls that way. This is not an exclusively Mathematics issue, but also one that has to do with the social roles society believes belong to

“real” women. The message girls get is that school Mathematics may be as feminine as it is masculine, but the place of women is at home, or in occupations related to social sciences. This message that is systematically delivered to girls and women and that keeps the status quo unchanged, is embedded in society through institutions. In this paper, I focus on one of those institutions in particular: schooling.

**Attitudes towards Mathematics: self-image and confidence.**

Close to stereotyping, this theory is centered on how girls perceive themselves regarding mathematic, their confidence in the subject, and reasons why they believe they are not as successful as boys. Both socio-psychological theories are linked to each other but they show different facets of the same issue. It is difficult not to relate confidence, or lack thereof, to girls and Mathematics especially because of the way teachers relate to girls, as well as the way others around them stereotype Mathematics. To present a global view of the issue, let's turn to an international study.

Considering the data of a study involving 20 countries, Hanna (1986) concluded that even when achievement does not always benefits boys, when it did, they also had better self-images than girls. This shows a possible relationship among self-image and achievement when talking about Mathematics. It seems helping girls feel more comfortable, less anxious, and more capable of doing Mathematics would influence their achievement. That would have been an interesting implication for future research. It is important to note that those ways to help girls just mentioned, can not mean “making the job easier” or lowering the



standard bar. By doing so, girls would be getting a “washed down” kind of Mathematics instruction. It seems we need to help teachers understand how their attitudes privilege boys in Mathematics. This has interesting implications for future research.

**Influence of teachers, parents and peers.**

Another way to explain the phenomenon of differentiated achievement in Mathematics by boys and girls is to consider the influence of teachers, parents and peers in the decisions girls make. These voices often delivering messages from society are critical since their influence occurs daily and in steady ways. Some aspects of these socializing influences are considered in research mostly in terms of achievement in Mathematics and course taking (Hyde et al., 1999; Hart & Stanic, 1988; Zarate & Gallimore, 2005). The relationships girls have with some influential adults like parents and teachers must not be left out of consideration. The expectations these actors have regarding what girls can and can't do will affect them. And so will the ideas these influencing adults have regarding what it is suitable for a girl to do.

The learning environment, created by teachers and schools, does not always support girls' needs (Boaler, 2002). For example, teachers who interact more with boys, questioning boys' strategies for problem solving and only asking girls about answers, are not helping girls learn Mathematics. This type of behavior alone may lead girls to learn Mathematics in a more structured but less inventive way. When this is the case, it is not surprising that girls choose to give memorized answers and use taught and more traditional strategies (Fennema et al., 1998). It also

explains why girls have more difficulties with problem solving compared to boys, who vocalized their strategies in class, thus making their Mathematics experience more meaningful. Perhaps this may not cause a big effect in elementary school, but Hyde et al (1990), stated that the differences in the perceptions girls have of teacher's attitudes gets worse with time, peaking in high school.

The nature of teachers' interactions with students is also related to their belief about a girl's ability to understand Mathematics. Walkerdine (1989) points to how teachers talk about girls' success in Mathematics is as a result of their "very *very* hard work" while, in the same classroom, boys who are not achieving are believed to have "potential" but just not trying hard enough. According to Walkerdine, teachers choose to believe boys have the ability, while girls have to struggle often-disregarding test scores.

This socio-psychological theory suggests that change needs to happen in the educational environment to help girls achieve better results. This takes the burden away from girls and shows that it is not a problem of girls, or the "girl problem", but a problem of schools and society. It is a matter of accommodating and adjusting education for girls to offer them as much as it offers boys. Programs like EQUALS or QUASAR should be taken in account when thinking about ways to improve the school Mathematics experience for girls.

## **Cognitive**

### **Comparison of outcomes: invented versus taught strategies.**

With the achievement gap almost (if not) closed, but differences in

participation in Mathematics careers still evident, it is important to look at other factors for why this might be. Researchers have observed that during the early grades, there was no difference in the achievement of boys and girls in number of items solved. Yet, the ways in which boys and girls solved the items showed that girls used taught algorithms while boys invented algorithms (Fennema et al., 1998). The type of strategies produced by boys and girls was different.

The idea of a different school Mathematics for boys and girls in the same classroom is not new. For example in the study just mentioned, Fennema et al. (1998) discovered that boys solved problems using invented algorithms that helped them develop problem-solving skills. In that paper the authors explain the outcomes with the aide of Hyde and Jaffee, who state that the program, based on CGI, may have given teachers freedom to make instructional decisions that showed their stereotypical views of Mathematics and gender, thus maintaining differential treatment of girls. This “freedom” mentioned, is the one needed by teachers to uncover issues that otherwise remain hidden, and therefore, go on without efforts to correct it. CGI may have given these teachers the insight they needed to see their practice critical ways, and change it if necessary.

This work raises issues about whether the Mathematics done by girls is naturally less sophisticated, or whether this type of Mathematics is exactly what is expected from them, and therefore, elicited? One argument is that the kind of Mathematics “used” by girls during schooling does not give them access to more sophisticated Mathematics and therefore opportunities to pursue higher-level coursework in the future. While these issues has not been answered, it points to

the power of social theories in understanding not only what girls do, but how the social space engages girls in critical Mathematics as well.

Table 1

*Summary of theoretical approaches taken to research into gender equity and Mathematics education*

<b>Theory</b>	<b>Summary</b>
Biological	Outdated. Today the field is inclined to believe there are no biological reasons for boys to outperform girls in Mathematics tasks. There are almost no differences (if any), in the mathematical performance between boys and girls to begin with. Also international studies have provided evidence that confirms whatever small difference there may be can hardly be considered of biological origin considering that girls outperform boys in some countries.
Test taking	Depending on the type of item of the test, either boys or girls will be favored. Test items can vary by context, approach or format, type or representation used in the classrooms and in the tests, and type of knowledge. For each variation, it can be found that boys or girls will perform better. For example, girls tend to perform better than boys on open-ended questions, and boys on multiple-choice examinations. It is also true that girls do better on textbook like items, and boys on “real life” problems. Depending on the type of test used to measure the ability of the students, boys or girls will appear to be more successful. A change in the type of test may change the results of that comparison. As a result, test can be a poor tool when comparing boys’ and girls’ mathematical ability.

<p>Social-psychological theories:</p> <ul style="list-style-type: none"> <li>a) Stereotyping: Mathematics as a male domain</li> <li>b) Attitudes towards math: self-image and confidence</li> <li>c) Influence of teachers, parents and peers.</li> </ul>	<p>Male students stereotype Mathematics more strongly than girls do, but girls feel the stereotype more strongly. Boys subscribe more to traditional gender roles, and girls feel that “doing Mathematics” is “doing masculinity”. Gender stereotyping makes its way to the classrooms, and girls find it more difficult to accept Mathematics as an option for the future.</p> <p>Girls also have low self-image and confidence than boys in Mathematics. An international study also showed that when boys performed better than girls, they also had better self-images than girls did.</p> <p>The beliefs and gender stereotypes of parents and teachers influence the students’ math ability. Teachers then do have different relationships with boys and girls. The reason for that is the beliefs they hold for boys and girls as Mathematics doers: boys have skills, and girls work hard. As a result, the type of questions and feedback girls get, influence not only the schooling experience, but also future decisions.</p>
<p>Cognitive</p>	<p>Girls tend to use more taught algorithms than invented ones, as boys do. This affects the type of Mathematics they are learning and that they can use in the future. The role of socialization should be taking into account: girls do what is expected from them, they follow the rules because that is what teachers hope they do. Boys have the freedom to “look outside the box”, and create their own Mathematics rules.</p>

## Discussion

I began this discussion by saying that today biologically-based theories to explain different achievement in Mathematics among boys and girls, appear to be limited and weak. If one accepts the outcomes obtained internationally (for example TIMSS’ scores) as well as the results of the past few years, we can no longer accept that there is a biological reason as the cause of women scoring lower in Mathematics. Women have already shown that they are not “destined” to

lower scores in the field. A variety of different studies support the conclusions that there is no Mathematics gene that boys have and girls do not. Some girls are able to perform better, if not just as good, in a variety of mathematical tasks compared to boys. Even if we consider the testing results from just one country, women have shown that they have improved their scores compared to girls in the past, scoring on par with their male counterparts.

Moving on to test-tasking theories, findings point to the importance of wording and quest type. The type of questions affects the results of the tests interactively of what the children know or don't know. Tests can be developed to reveal that boys are superior, or the opposite case. Even schools within the same district teach Mathematics differently. Some students have advantages over others because of cultural, environmental and social differences. Irrespective of international studies, within the same state of the United States, different districts have populations that are more or less socially advantaged producing better or worse scores on tests. Contemplating this, test results should be considered carefully in order to compare students on any basis. I am not claiming tests results should not be considered, and I understand their contribution to the field, but data suggests there is more going on than simply test performance. Considering what we know about international studies, and how girls from some countries performed better than boys on certain items on country A, but worse than boys on the same items on country B, and also taking into account the diversity of the school population in the United States, socialization and home culture are likely also playing a role in the reaching of those tests scores.

Social and psychologically-based theories offer us the kind of information that test scores and biological based theories can't. Both examine the teaching and learning experience in globally, while considering various actors such as teachers, parents, and peer relationships.

When considering girls we must also consider those around them, raising the issue of enacted stereotypes. For example, isn't it important knowing if boys stereotype Mathematics, and then how that might affect girls and through what mechanisms? When given a choice, could this be a reason why girls do not select Mathematics classes and careers? The fact that girls consider Mathematics to be gender neutral doesn't mean they don't see whether boys agree with this or not. We need to understand what males believe about females in the context of Mathematics, and how that affects the choices women make, and not on their capabilities to do Mathematics. The role all the actors play in this play is to be put under the spot light. It is true that girls are part of this system, and in their interactions with boys, teachers, parents and the broader society, they choose to opt out Mathematics. It is needed that all the actors analyze their part if the system is to change and offer equitable opportunities to girls as well as boys.

The strength of these theories is in including teachers and how Mathematics is actually being taught. The more we know about how all of the actors in the educational system interact, the more we know about the reasons for the success or failure of girls and the reasons they opt to follow a path with or without Mathematics. The more we investigate the experiences girls have, and the interactions with the educational system and other actors on it, the closer we will

be to knowing why many girls, who achieve at the same level as boys, select careers unrelated to Mathematics. As Mendick (2005) puts it: “Mathematics is a powerful subject, a signifier of intelligence that acts as a 'critical filter' (Sells, 1980) controlling entry to high-status areas of academia and employment.” (pg. 236). Some may say that this concern is materialistic, but this is a pattern that is worthwhile to explore. There is a history of girls being disadvantaged due to socialization processes in school. It is important to continue to research how much of a choice it is, the constraints surrounding those choices, and the socialization that frames these choices for girls.

A weakness of these theories is the lack of connection made with social class and race, which would bring more complexity to our understanding of girls' participation in Mathematics. Consider that in a large country like the US, this complexity is a given because teachers encounter diversity in their classrooms everyday. We need to unpack data to determine girls' needs in relation to what they already have. Do some girls feel stereotypes stronger? Or is it simply White females? Do Black females feel they have the same support from parents as Latino females report? How does this compare to boys? And we need to consider that “boys” is a complex category unto itself. Are we talking about Latino, African American, or White boys? When it comes to what boys and girls learn outside school, and the effects of the neighborhood on Mathematics learning (Entwisle, Alexander and Ingram, 1994), it is important to know what kind of neighborhood we are talking about. What advantages do urban girls have compared to girls who live in suburbs or in rural areas? The picture gets more



complex but also richer when we consider social class and race. Anyon (2005) makes the case that talking about urban schools brings embedded issues of class as well. This complexity is potentially full of information that may help us know more about girls and Mathematics and how to help them perform at a higher level, while also supporting their engagement and challenging institutions that are deterring.

Reviewing the literature, one discovers that the research regarding Mathematics and gender has not only been done using particular analytic lenses (comparing tests results, trying to see where girls aren't functioning instead of observing in what conditions they are succeeding), but also concerns primarily middle class White girls. What we know does not explicitly consider races or social classes. While recognizing the importance of this work, it is also necessary to realize the need to go one step further, and observing what is going on with the rest of the population. What are other girls' experiences like? In this specific case, what experiences do Latinas have with school Mathematics. Bringing culture, race and social class into the equation allows researchers to consider the intersectionality of these dimensions with gender, shedding light on previously ignored social group and their engagement with Mathematics.

Finally, what type of Mathematics is taught and how do girls embrace it compared to boys? What do teachers think they are teaching? Is there a key to know why attitudes towards Mathematics remain the same for boys as it did in the past while girls still opt out of mathematical careers? I believe this still needs to be studied and that social and psychologically based theories offer more to

respond to these research questions. However, recent theories conceptualize dimensions of race and culture in ways that social and psychological theories do not. Theories like Critical Race Theory, Latino Critical Theory fit this work that pretends to uncover the voices of Latinas. In this paper their points of view as women, but also as women who belong to a minority are going to be highlighted and put in the center. For that the theoretical perspectives mentioned offer a new tool and one that reaches to the complexities of their particular situation.

### **Latinas and research in Mathematics education**

One must be careful when using the term “Latino” or more particular for the interest of this paper “Latina”. Lugo-Lugo (2008) says that many women of Latin American descent have been “lumped together” under the term Latina. The author adds that we can be talking about 19 to 21 different groups of women, including Chicanas, Spaniards and Brazilian women, who are often counted in. This calls to the similarities among the different cultures this women come from. But one must remember the diversity as well. As it is commonly used today, Latinas are a diverse group, where different cultures meet joined by the Spanish language (not for the Brazilian case). With the richness that comes from joining different cultures, comes also complexity as well as the need of acknowledge differences as well. As a Latina myself, of Uruguayan descent) I don’t claim to have more similitude with the participants of this study (of Mexican descent) than differences. So by applying the label of “Latinas” throughout this paper, I don’t forget Lugo-Lugo’s words, and I am not trying to erase the differences that exist

between me and my participants, or my participants and other groups of Latinas. “The others” are not a homogenate group. In this case Latinas groups women that have a different “history, material conditions and cultures” (Lugo-Lugo, 2008, pg 622) and my group of participants are just one part of the rich spectrum.

Conceptualizing Latinas means considering their gender but also their cultural background, language, race and ethnicity. It also means considering a part of the population that is growing in the US and that needs to be acknowledged as an important part of the future of this country. As Rochelle Gutierrez (2008) states, it is not only what Mathematics we can give to these students, but also what they have to bring to the field.

To know more about their real and potential contributions, we need to know more about their experiences. It is not an easy task. Their position outside the dominant race and gender makes their experiences rich in complexity and therefore different theoretically. This is why theories that do not consider gender and race won't be able to capture their unique positionality, experiences in their whole complexity and won't inform the field well enough to make changes for these girls.

The work of Varley Gutierrez (2009) and Barajas (2009), as well as work from the center CEMELA inform the field about nuances with respect to race and gender using sociocultural and critical approaches adequate to address intersectionality (Vomvoridi-Ivanović & Khisty, 2007; Civil et al., 2007; Fernandez, Anhalt & Civil, 2009; Turner, Celedón-Pattichis & Marshall, 2008; Turner, Celedón-Pattichis, Marshall, & Tennison, 2009; Marshall, Musanti,&

Celedón-Pattichis, 2007). This work responds to Fennema's (2000) call for different approaches and takes the field one step further. These authors not only considered feminist approaches, but also Critical Race Theory (CRT), and Latino Critical Theory (LatCrit) in framing their work. As a result, voice was given to the subjects studied validating not only their experiences regarding Mathematics, but also who they are in terms of race and gender.

But the quantity of work done in the field using such approaches to understand Latinas is not abundant. This paper has the goal of addressing this need. Through the lenses of feminist approaches, especially feminist of color, CRT, and LatCrit, this research will situate the experiences of successful Latinas and Mathematics remembering that race and gender color those experiences making them unique, and specifically, making those experiences different from those of White female students. I will attempt to inform the field on what young Latinas do in order to succeed and at what price. With this information, the field can better address the task of educating Latinas, so we have more engagement of successful Latinas in STEM fields.

I expand on the reasons for these research choices below. First, I explore why using a feminist lens is advantageous for understanding the experiences of young Latina students in Mathematics. Then, I explore why using critical race approaches will help conceptualize this research space.

### **Why a feminist approach**

Considering women as part of "the others", means that they were not likely

the ones “telling the story” in the first place. Not being able to tell the story is one of the “hidden weapons” that dominant cultures have (Anzaldúa, 1999). Once women have the power to tell their story, sides of it will take the spotlight for the first time, weakening the oppressor. Over time women have found ways to express themselves and tell their story, but one should question in research and Mathematics how much space women have had to do so and talk about their experiences and truths. Having the power to write their own stories mean women have the power to re-write the world, including rewriting research in Mathematics and Mathematics education. It is also worth noting who the audience of those stories has been, and who also found ways to dismiss the chronicles told by women. Not only that, but also consider that it was not every women who was heard, but only those belonging to certain groups.

Authors like Chandra Talpade Mohanti (2003) state that feminist movements became conservative with time. Others like hooks (2000) say that feminist movements attended mostly to the needs of White women. This raises the concern for hearing the voices of women of color. hooks (2000) also states that the goal of feminism should be to eradicate any kind of oppression. Working with young Latinas living in the US and learning about their Mathematics schooling experience needs to be placed at the center of this concern: they have been fighting oppression not only for not being White or speak English, but also oppression from their own culture: oppressed Latinos that took out the oppressor inside them (Freire, 1970) with those more vulnerable: women and children. We must also consider that “... privilege nurtures blindness to those without the same

privileges.” (Chandra Talpade Mohanti, 2003, p. 231). Therefore, studying the experiences of women of other color is just as relevant and necessary today. And since according to Freire, the oppressed fail to see their oppression thinking that their condition in the world is a given, work helping Latinas rediscovers their realities and denounce them in their own voice is a liberating task.

According to Freire (1970), it is in the hands of the oppressed to liberate him or herself. Villenas et al. (2006), state that the struggle must start from those more oppressed, like women and children. Then the power is in the hands of women to re-define the situation they are living, and put it in their own terms. Anzaldúa (1999) also took Freire's ideas of liberation, and referred to this as letting White people not only be our allies, but also take them under our lead, since they are not destined to liberate us. As a Latina myself, and with this project, I expect to contribute to this liberation by helping young Latinas tell their stories about their Mathematics schooling, putting their experiences at the center rather than the margin.

The experiences and needs of Chicanas<sup>3</sup> have sometimes been forgotten by White feminists or even Chicanos (Villenas et al., 2006). It is safe to say that the situation is similar for Latinas, not just Chicanas. The author also points out that by accepting as fact the needs of these women in addition to their views and experiences, we also must accept the fact that there is work to be done and

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3 By “Chicanas” the author of this paper does not pretend to clump together all Latinas. Not all Latinas share the same histories, material conditions or culture, and there is where the reason to make the distinction lies. Chicanas, are considered in this paper as they were by Lugo-Lugo (2008): “American women of Mexican ancestry.” (pg. 626) Considering that not all Latinas are Chicanas, but indeed all Chicanas are Latinas (Lugo-Lugo, 20108), this emphasis by Villenas shows how at least sectors of the Latina population have endured certain struggle, and wonders if the experiences other Latinas have are similar.

questions to be answered. It is clear that there is a concern to be addressed, in this case, in the Mathematics schooling of Latinas. By seeing how young Latinas have adjusted to school in order to succeed, and what they have lost in the process, we can learn how to provide better opportunities for them, and for those less fortunate. And to do so, we can't forget that "How young women experience gender will depend on their social location within a range of hierarchies, including ethnicity and class" (Zinn & Dill, 1996 in Brickhouse & Potter, 2001, pg 967).

Accepting that the experiences of Latinas count, means consider these women as "whole humans" (hooks, 1994). Latinas' experiences in and outside of school can be very different than those their teachers (often White middle class women) have had or can even imagine. Letting their experiences take part in the production of knowledge will help to validate (by the system) their culture, families, and language: everything that is a part of them as human beings, experiences older than their schooling history. These experiences could not only shape the Mathematics of the classroom, but also how the students engage the content. If teachers attempt to teach Mathematics for all, then they need to find ways to value the diverse ways of knowing in classrooms (Calabrese-Barton, 1998).

School Mathematics should reflect some connection with the experiences girls have, rather than being a completely separate experience for them. Considering Latinas students as "whole human beings" in the Mathematics classrooms, places demands on the teachers more than just "teaching the math."

Teachers not only need to learn about the experiences students have had, but also about the ways they see themselves as Mathematics doers. Educators should also consider the choices students make based on those perceptions and images of themselves. The ways Latinas make choices and their self-images will affect their future, positioning them in relation to the power structure facilitated by the school system and the teachers (Calabrese, 1998).

When schools ignore the experiences of Latinas, the message Latinas may be getting is that they don't belong, and because of the implications of a message like that, it is important that we investigate these cases. Why would anyone want to participate in an institution that doesn't value his or her experiences, culture, knowledge and perspective? In this case, why would Latinas want to be a part of a system that negate who they are, their roots, and their identity? That would be like negating what their families have taught them, their cultural heritage and the things they believe in. Just as important is to know what do girls who participate and succeed *give up* in order to do so. Do successful Latinas understand what they are giving up to participate in Mathematics or can they engage in ways in that their identity is not violated? In middle school, girls that hold a more mainstream idea of what Mathematics is and should be are the ones encouraged by teachers to participate in mathematical communities (Brickhouse & Potter, 2001). That reinforces the stereotypes while at the same time may subject these participating girls to painful experiences, making the choice of staying in those communities for reason other than liberation or even love for Mathematics. But as Narayan (1997) puts it, from pain is born rebellion and change. Finding the points where



pain transforms into rebellion for Latina girls means finding the first step to change and success.

The question then is whether Latinas need to put on a disguise before entering the Mathematics classroom to succeed? In her chapter “*Huizlampa: surtiendo invisibilidad* South: sorting through invisibility” Mixpe Ley (2006), tells us how she not only had to wear a disguise pretending to be someone else than herself, and denying who she was as a Latina in a White high school, but also how her mother had to go through transformations depending on the social situation - always denying their identity. If the way of being a successful Mathematics student as defined by the school system means that Latinas need to hide who they really are, and pretend to be someone else, what kind of learning and engagement can be expected? An engagement does not involve Freire's “conscientization” or what bell hooks (1994) defined as awaking critical awareness. Along these conceptualizations the student would be an active participant in society instead of passive consumers of what is offered to them by the dominant culture.

In her study on teaching science to homeless children, Calabrese-Barton (1998) says that “In terms of science in classrooms, the ways teachers choose to present science to students leaves no room for particular kinds of engagement, particular kinds of activities, and particular kinds of identities” (p. 380). In saying this, it appears as if in order to be successful in science, and here extending the argument to Mathematics, it is necessary to subscribe to certain identities, devaluing others. The various ways the institutions sanction particular emotions,

behaviors, knowledge and experiences, are ways in which the spaces become gendered or “Whitewashed”. It is in finding the sanctioned or unsanctioned identities and ways of being that we can understand how schools, or Mathematics education in this case, sort and structure opportunities in society for different student groups.

In the coming sections, I explore different theoretical perspectives on equity that add racial lenses to the study of the schooling experiences of Latinas in the US. These lenses are Critical Race Theory and LatCrit theory.

### **Why Critical Race Theory and Latino Critical Theory**

As mentioned before, a weakness of previous research is that it does not take into account the racialized experiences of the individuals. When the research wants to focus on those that are “at the margins of society” (Solorzano & Yosso, 2002), we cannot pretend that any of the experiences we want to study, in this case their relation with Mathematics, won't be “touched” by their gender, race, or social class. The definition that Solorzano and Yosso (2002) gave of critical race methodologies places this at the center of study when trying to uncover those gaps in research. The authors defined these methodologies as:

A theoretical grounded approach to research that: a) foregrounds race and racism in all aspects of the research process. However, it also challenges the separate discourses on race, gender, and class by showing how these three elements intersect to affect the experiences of students of color; b) challenges the traditional research paradigms, texts and theories used to

explain the experiences of students of color; c) offers a liberatory or transformative solution to racial, gender, and class subordination; and d) focuses on the racialized, gendered, and classed experiences of students of color. Furthermore, it views these experiences as sources of strength and e) uses the interdisciplinary knowledge base of ethnic studies, women's studies, sociology, history, humanities, and the law to better understand the experiences of students of color. (pg. 24)

Critical race theory and methodologies consider not only racism as a category of analysis, but also its intersection with other forms of subordination like sexism or class discrimination (Solorzano & Delgado, 2001; Solorzano & Yosso, 2002). To accept and use the fact that these intersections exist is to work at the center of the complexity when studying people whose lives cannot be captured by any one issue. This is manifested in the fact that CRT has drawn from “an extensive and broad literature base that is often termed *critical theory*” (Solorzano, Delgado, 2001, p. 311). This theory also responds to the critics of Freire (1970), for forgetting gender and race, for example. But CRT takes Freire's principles further, positioning Latinas, for instance at the multiple intersections of gender, class and race.

To use the lens of CRT regarding schooling experiences of Latinas in Mathematics, is also to challenge the notion that the functions and ideological purpose of schooling is colorblind, objective, based on merit, neutral and offers equal opportunities (Solorzano & Delgado, 2001; Solorzano & Yosso, 2002). How do the participants, in this case young women of color, experience school and

Mathematics and how much does their race, class, and gender affect those experiences? Voices of women of color must be central in answering that question, and no school can do it for them, nor can studies that have focused on girls, ignoring these complex intersections.

Another characteristic that this lens has and that it shares with this project is its commitment to social justice (Solorzano & Delgado, 2001; Solorzano & Yosso, 2002). Hearing the voices of those oppressed should be the first step to ending oppression. Researchers may initiate facilitating those spaces, but the meaning making, the liberation process, lies with the oppressed (Freire, 1970). Subscribing to CRT helps to open a door for those voices to come out and inform the field of the racialized and gendered experiences some students go through, to reconstruct institutions that are preventing access to further education or mathematical careers. In this way, CRT will contribute to the elimination of racism and sexism, as well to the empowerment of those oppressed to go one step forward in their liberation process. It is then in the hands of Latinas to end that injustice that they have been subjected to by the oppressors. It is also in their hands the power to challenge the system, and change in search of more equitable situations. This challenging of the system is equivalent to regaining that humanity that Freire (1970) talked about.

CRT also highlights the value of experiential knowledge (Solorzano & Delgado, 2001; Solorzano & Yosso, 2002), legitimating the experiences of people of color and recognizing that they are of value for analysis. The stories and voices of Latinos are the vast data to be examined using a CRT lens to explain the

racialized experiences of Latinos Villenas and Deyhle (1999). In this case, the research will focus on learning from what successful young Latinas have lived and the kind of experiences they have gone through in order to be considered successful by the school system. By putting the participants experiential knowledge under the spotlight, they have the chance to tell their own stories instead of what Solorzano and Yosso (2002) call “majoritarian stories”, stories about racial, gender and class privilege. Critical Race Theory offers that needed opportunity for people of color to tell their story, and that is why it is so valuable and adequate for this project.

This project involves Latinas, and it is not hard to imagine that the realities of girls of color are not the same as that of White females. The stories of Latinas will also be different from those of African American girls or Asian girls. This is the reason why LatCrit theory becomes beneficial to the study of young Latinas and Mathematics. Even though LatCrit and CRT are similar, LatCrit addresses issues that concern Latinos: language, immigration, ethnicity, culture, and identity (Solorzano & Delgado, 2001). Like CRT, it also addresses the intersectionality of racism, sexism, and classism, along with other forms of oppression.

## **Resistance**

CRT as well as LatCrit also serve as a tool to analyze the types of resistance that Latino and especially Latina students engage in. Resistance is a behavior understudied in the field, in the words of Solorzano and Delgado (2001) “resistance theories demonstrate how individuals negotiate and struggle with

structures and create meanings of their own from these intersections” (p. 315).

Using the CRT framework we can look at the instances of resistance among students of color that are political, collective, conscious and motivated by the idea that social change is possible.

Cammarota (2004) found that one way Latinas resisted the deficit ideas that they were subjected to was by achieving in school. Achievement turns into a high school diploma and that may provide the status to go back to the community and make changes for others. The author stated that the social struggles these girls face outside of school (being considered as not capable, “meant” to be in the house, etc), shape the schooling experiences they have. In the case of his study, they struggled for achievement and this struggle helped them move from “underperforming” Latinas, performing. This type of resistance has been denoted as “positive resistance”. The author argues that this resistance will shape the orientation Latinas and Latinos have toward school. In Cammarota (2004), Latinos chose to cut classes as a way to resist to an inadequate schooling, something that also Fernandez (2002) noted, and Latinas chose to perform and graduate, so they could mark a difference in status in their community, and the society at large. Without the critical race lens, one may lose the fact that it was their racialized experiences that led them to resist and achieve. Latinas are not an isolated case, as McKinley and Brayboy (2005) showed us with their case focused on Native Americans in Ivy League schools.

What this second article adds to the equation is the costs for those engaging in this type of resistance. Latinas, like the Native Americans, suffer from being on

the border. Once more, their race and experiences make them an “other”, and sometimes this is a heavy weight to carry, especially when they are “the other” in their own communities as well. In Camarota (2004b) this struggle is clear. Latinas receive a double message from mothers, who on one hand encourage their daughters to perform, but on the other hand want them to also continue to preserve their gendered cultural norms.

### **This study**

In this study I am interested in answering the question of the kind of Mathematics identity successful young Latinas are building during their schooling in the US. By Latinos we understand persons of Latin American origin. Using the theoretical approaches described in the previous sections, I will focus on uncovering data that explains the following questions:

- a) Who do the participants consider they are in regards of Mathematics?
- b) How does that belief ties to their future options for education, careers, and job opportunities?
- c) Do young Latinas see Mathematics as a way to achieve social and political power?
- d) What are the trades off young Latinas experience for being successful in school Mathematics in the US.

In order to answer those questions, I have chosen to work with comparative case studies using focus groups. The participants, young Latinas who are

successful at school Mathematics, will be getting together in groups to discuss the subject. During these focus groups or group interview, I will be collecting evidence that allows me to learn about their experiences. Not only that, but also inform the field about the struggles of Latinas in order to be successful in Mathematics. It is not only the struggles that the field should learn from, but also from the success they have achieved.



## **Methods**

### **Design and Justification**

For this study the methodology that offers rich information needed to understand these complex issue is that of multiple case studies, a variation of case study design (Yin, 1994). By using case studies, the researcher will be able to find out what girls think about Mathematics, and why they think that. Being this new to research, especially with Latinas, there is a need for more exploration before decided what to measure, and take quantitative steps to study these issues. For that reason, and in order to start that exploration, qualitative research appears to be the natural choice. Qualitative research can still take one step forward in the field, using less traditional tools to try to answer the relevant questions we still have today. According to Miles and Huberman (1994), “A main task (for qualitative research) is to explicate the ways people in particular settings come to understand, account for, take action, and otherwise manage their day-to-day situations” (pg. 7). This is what this study intends to accomplish with the proposed study. I would like to understand how young successful (in Mathematics) Latinas identify themselves when it comes to Mathematics, and then understand how they will make future decisions.

For this research each girl will be a case from the populations of “successful Latinas in US school Mathematics from immigrant families.” Treating each girl as a case will help me not only find out the common experiences they have, but also observe their differences. If it is true that the same variables

affected the outcome of each girl in the same way, in Miles and Huberman (1994), “variable X1 has an effect, but only if variables X2, X3, and X4 are present.” (pg 208), then the results obtain will be more powerful for the field. The authors pointed out that this kind of approach is used when a great deal of information is collected about a small number of cases, so it is appropriate for this study. With this information, I will be better able to answer my questions, to sort through what works for these girls, and to explore ways for them to maintain success with fewer sacrifices. Also with this information other Latinas that have not been as successful can be helped by creating conditions where they can develop their mathematical thinking without losing their identities as Latinas.

Because of the importance of the case, the conclusion to which the author arrives should be verified. One way in which the researcher does this, following Erickson's approach, is embedded in the data analysis itself: one assertion will not be accepted unless there are many instances in the whole body of data that confirm that statement. Another way to validate the study, it is to take the four main cases and compare those results with the other four. Having comparison cases will help me verify one with the other. Lastly, I also intend to share the findings with the participants, in order to hear what they have to say about them. The theories that emerge through the data collection and analysis will be shared and therefore tested with the participants. This is another way in which I will work towards getting valid results.

The tools of data collection that were employed to answer the research question of this study were: focus groups with the young successful Latinas;

individual interviews with the girls; and an interview to the parents by the daughters. Focus groups were video-taped, and the rest of the interviews were audio-taped. I was present to observe the interview the girls conducted to their parents. In the following sections I will discuss in depth each one of these instances, and also describe the participants and data analysis.

## **Participants**

The participants in this research project are five 8<sup>th</sup> grade first generation Latinas, whose families emigrated from Mexico. Even though five of them participated in the study, the results will focus on the stories of three of them. Another relevant characteristic of these girls will be that they have been successful in US school Mathematics according school standards. This means that on the school system's terms, these girls are considered successful and excelling. This means the 8<sup>th</sup> graders were at the time of data collection taking Geometry while in a honors track at their school, and all the girls had a history of A's in Mathematics. The participants were tracked in advanced courses and had a successful academic history in their Mathematics courses.

The reasons for selecting successful Latinas are many. To start with these students live at the intersection of two groups considered as "the other": they are female, and they are not White<sup>4</sup>. But "the other" is not their "default" situation. It

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<sup>4</sup> When talking about "White male" the author refers to the idea of whiteness other authors in Critical Race Theory (CRT) had referred before. The definition of Whiteness and who are included in that group has changed historically to maintain dominance (Doane and Bonilla-Silva, 2003; Haney-Lopez, 2006). The distinction originally included the White/Anglo-American group, but it grew to include all Europeans. The flexibility shown so far will also affect the term in the

is in school, as in broader US society, that they face this projected identity institutionally. Despite this, they had navigated the school system in a way that allowed them to be successful under the terms of that same system. This may place them in a position of being an example for other Latinas. These students will be probed to talk about their experiences to achieve success, their possible gains and possible losses.

Focusing in the gains Latina students have in Mathematics means walking a new path in research. The field has been concerned so much about the failures of Latinas and Latinos, that it almost seems impossible some of them make this system work out for them as it works out for the dominant culture. It is vital that we focus also in the success of Latinas and listen to their stories to learn from them, but first to accept that these stories exist even when they go against what seems to be the status quo. First these successful girls tell us a story of what it is possible to do against all odds, and then they inform us about the characteristics of the way they sailed in order to achieve and excel in school Mathematics in the US. Part of those stories will be the stories of those around them, that is why in this research study I would like to hear about and from parents.

The parents or guardians of the girls will also be participants in this

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future. This means that for example some people of Hispanic descent will also be (if they are not already) included in the definition of “White” as some Asians and Native Americans are. At this point Haney-Lopez sees the need to differentiate three categories of Whites: Passing as White, those whose physically appearance allow them to pass as white disregarding their ancestry; Fully White, those who will be considered White by the community at large, and Honorary Whites, those who have extended their status of whiteness even though it is clear to the public that from the bio-racial perspective they are not White (see Haney-Lopez, 2006). Physical features remain foundational in the racial categorization.

project. Talking to them will also help distinguish how the parents' voices appear in the lives of the teenagers. The dialogue between daughters and parents will also help uncover details about the paths these girls have followed and how that has affected their choices regarding their school and Mathematics.

### **Data collection**

Data was collected over a period of six months. The researcher met with the participants four times in a focus group of five girls, another five times individually (four to conduct interviews, and one time to work on a Mathematics problem), and one more time when the researcher met two of the girls and their parents. During the different instances of data collection, I built a collaborative relationship with them (Erickson, 1986), to gain access to central information. I made an effort to establish trust with the participants, and maintain it throughout the process of data collection. To do that, as suggested by Erickson, participants need to know their experiences are valuable, as it is the researcher who is learning from them. This will not be and cannot be understood by participants as an evaluative process, but one where the researcher is learning from the participants.

Table 2

#### *Data Collection Timetable*

	September	October	November	December	February	March
Focus group meetings	One focus group on the 16 <sup>th</sup>	One focus group on the 7 <sup>th</sup>	One focus group on the 19 <sup>th</sup>		One focus group on the 4 <sup>th</sup>	
Individual interview with girls	One interview on the 30 <sup>th</sup>	One interview on the 1 <sup>st</sup>	One interview on the 4 <sup>th</sup>	One interview on the 2 <sup>nd</sup>		Last individual meeting and math working session on the 24 <sup>th</sup>
Interview with/to parents						Parents' interviews on the 7 <sup>th</sup> and 14 <sup>th</sup>

I used four forms of data collection for this study: focus groups, individual student interviews, interviews with parents, and supporting documentation. The interviews took place in the language of preference of the participants, which was English. During the meetings with parents all the participants chose Spanish and I translated the interviews, being bilingual and also familiar not only with the topic, but also with the culture, my position was particularly convenient at the time of making sense of what the participants shared in either language.

### **Focus groups.**

The focus groups were designed to help the students open up to the researcher in an environment where girls could support each other and help generate memories about their experiences with Mathematics that included school and home experiences. Through these meetings, the author identified the community that these girls belong to, how they see this community, and what kind of participation they have in it. They voiced their shared experiences. It is not just their stories, but also their history in their voices. By being in a group with others that identify with similar realities, the participants brought to the table discussions about things that are common knowledge to them, but that may not be so for those outside of their community. Others that are not young successful Latinas in the US may not find those discussions and topics relevant or even believe they exist. By open conversations with the participants, I opened a door to their everyday life in connection with Mathematics. Each meeting turned around a different theme. The topics of the four meetings were:

*Autobiography in Mathematics:* in this session the participants explored the

moments in the participants' pasts that led them to see Mathematics and themselves in Mathematics, the way they do today. Important moments and people that influence this view were investigated. Ellsworth and Buss (2000), state that autobiographies are a good way to assess students' predispositions toward Mathematics and science, and also to see change over time. In their paper with pre service teachers, they used this tool to find out what content course experiences affected perceptions of Mathematics and science. For this project they will not only be used as a tool to find out how participants' past experiences with Mathematics and with the educational system have shaped their predispositions to stay in Mathematics, but also to talk about those people who were influential. I explored relationships with parents, teachers, and peers, and how each factor affected the participants' past experiences with Mathematics. The session also revolved around the reasons they had and have for trying and succeeding in Mathematics, as well as the rewards they foresee in the future. Who do they think they are and who they think they will be. Holland (1998) says that "People tell others who they are, but even more important, they tell themselves and then try to act as though they are who they say they are" (pg. 3). This project starts by investigating the identities these girls project and share.

This session gathered evidence in response to the question about who the participants are in respect to Mathematics, and also how they see themselves in relation to it. Because I consider this building up of an identity as a social process, the questions regarding other influences in school or outside of it regarding Mathematics, are not only relevant, but also necessary. During this session about

the participants' autobiography in Mathematics, the girls told their stories about Mathematics, and shared who and what made an impression in their lives. With this kind of information, future efforts to help other Latinas will have at least a clear start point.

Sample questions for this session are:

- Do you like Mathematics? Why or why not?
- What role do you think Mathematics will play in your future?
- Do you think it is important that everyone is successful in Mathematics?  
Why or why not?
- Who was a big influence in your life regarding Mathematics?
- Was there anyone that changed your perception of Mathematics for better or worse?
- Why do you think it is important for your parents (or other influencing person) that you succeed in Mathematics?
- Do you remember any particular experience that changed your idea and feelings towards Mathematics? Any particular experience at school?
- How would you describe your relationships with Mathematics teachers?
- How much did teachers influenced your like (or dislike) of Mathematics?

*What is needed for success in Mathematics:* Considering their present success in school Mathematics in the US, what do these girls think they already possess that helped them to walk this path. I had them respond to Schmader's (2001) notion about whether they have lower gender identification that allowed them to fight against stereotype threat and succeed in Mathematics. Do these girls also "do



masculinity”, like Mendick's (2005) suggested? These kinds of questions are related to gender, but what happens when race and ethnicity are considered? It was investigate if Latinas saw the potential of Mathematics as a tool to achieve social justice as stated by Gutstein (2006). In addition to what it means for these girls to be successful in Mathematics, I probed specifically for what success in Mathematics means for young Latinas in particular.

These last questions are tied to the previous focus group since they give further information about who these Latinas are in respect to Mathematics. But they also help answer questions regarding the power of Mathematics itself in the view of young Latinas, which also bring us to the future of the participants in respect to Mathematics. If success in Mathematics can be reflected but nothing else other than a grade or the placement on an advance course, then it is likely the presence of Mathematics in the future of these girls will not be in relation to rewriting their stories and that of other Latinas. Therefore in this session I started investigating the relationship (if any) in this girls mind between social and political power and Mathematics.

Sample questions for this session are:

- Why do you think that women (in Schmader’s study, 2001) who identify more with their gender did worse in Mathematics tests?
- Do you think that happens to younger girls as well?
- Do you see it happening to girls you know? Girls in your class?
- Do you think some girls are more susceptible to this kind of things?
- What girls?

- Did something like that ever happen to you?
- What do you think about this issue?
- What do you think this means for boys?
- Do you think there are other “things” some girls identify with that makes it harder for them to be successful in Mathematics?
- What kind of things?
- Why do you think it works that way?
- From the perspective of a Mathematics successful young Latina, how have those things played out in your life?

*Why others do not succeed in Mathematics:* during this session, the author encouraged girls to talk about the reality for Latinas in the US when considering school Mathematics. How much do they know about the success of Latinas in school Mathematics or the number of Latinas in STEM careers, and how do they explain this. Are the participants' stories different from other Latinas? Why and how do they explain this? Willey and Radosavljevic (2007) point out that Latinos are the biggest “minority” in the US, and Latinos also “have the most persistent and disturbing pattern of educational underachievement among all racial and cultural groups in the country” (pg 3). What are the ideas the participants of this study have about this reality, and about Latinas scoring lower than the national average (Varley Gutierrez, 2009)? And how do they explain that when comparing Latinos and Latinas, girls outperform boys, in contrast to White boys and White girls (Riegle-Crumb, 2006). The under representation of Latinas in STEM careers (Table 8, NSF, 2006) and in the work of Mathematics education research is

another reason to give these girls voice on what is current happening.

In order to achieve the goals I just mentioned for this group interview, specifically for the last questions that are closely related to the literature reviewed, I showed the participants excerpts of the articles I just cited. We will discuss the excerpts, and I will gather the participants' reaction in this matter. This way to motivate participants to talk about particular topics was successfully used by Stinson (2008), and provided me with participants opinions that helped me uncover their position regarding the issue of Latinos and Latinas, and underachievement in school Mathematics in the US, and most important, their position in the issue. This takes the investigation into the identity they are building one step forward by allowing girls to talk about the issue from outside it (since they are successful students), and not simply from their particular experiences and points of view.

Sample questions for this session are:

- Why do you think others find it so difficult to succeed in Mathematics?
- What do you think about the number of Latinas successful in Mathematics in the US today?
- Did you ever talk about this with your parents?
- What do they think about this issue? (Or what do you think they think?)
- What makes do successful Latinas have in common with those that don't succeed?
- What are the differences?
- How about your case?

- Do you think there are ways in which school produces that outcome for Latinas?
- Why would this happen to Latinas but not to White girls?
- How does this compare with the situation of successful young Latinas?

*Preparing interview for parents:* in this session I did not only help the participants get ready for their interviews, but also investigated the ideas they have regarding their parents Mathematics schooling. In crafting the questions, I attended to both the interests of the girls and their own answers to the questions. The research investigated any comparisons and what images these students have of the Mathematics schooling of their parents. Ultimately, if those comparisons existed and affected the girls, I investigated how they affected the schooling the participants experienced. The parents are important for this research because of their undeniable effect on girls, but also because the involvement of Latino parents in education the education of their children (Olmedo, 2003) as well as being important representatives of the larger Latino community that is central to this work. The involvement of Latino parents in education appears as something that is lacking. But for example Civil et al. (2005), have shown that the involvement of Latino parents is critical, even though they sometimes feel overpowered by the system their children are a part of. Parents' encouragement also appeared as a factor that influenced college enrollment for Latinos (Zarate & Gallimore, 2005). For those reasons, it is important that girls have a chance to talk about the role of parents in their Mathematics education and their comparison of that with the stories they have created of their parents' schooling. Through

this session, some of those stories became clear, and the relationship across generations was probed. For example, were parents successful in school Mathematics back in their home countries? How do parents help the young Latinas with school Mathematics today? Is it really helpful? Why or why not? Do girls believe their parents think the education they received in their countries was “better” than the one the participants are getting? “Better” how? Do the participants think they could do better if they had the same kind of opportunities their parents have? Do the parents think the participants would do better under those different conditions?

This session helped separate some of the voices of the parents in the girls’ conversations and statements. As Bahktin (1982) said, in everyone’s discourse there are traces of those around us. Our stories are tied to those that have had any influence in our lives, and not only in our decisions, but also in the ways we choose to talk about ourselves, we will find the voices of others. The voices of the parents must be present all throughout the data collection, and it is important that to know who these girls are in comparison with Mathematics, we know what part of them is parents’ influence. The direction of that influence, the reaction and maybe even resistance to it. To know who these girls are and how they positioned themselves in Mathematics, we need to know not only who the parents are, but also who the Latinas think their parents are, their expectations, and influence of their stories in the girls lives.

Sample questions for this session:

- How do you think school was like for your parents?

- How about Mathematics?
- What do your parents say about the quality of the Mathematics taught there?
- Do your parents ever try to teach you something the way they learned it?
- How has that gone?
- What do you think about the ways they learned Mathematics?
- How do you think your parents imagine your Mathematics classes?
- Can your parents understand how it works now?
- Why do you think so?
- Can your parents help you to learn Mathematics?
- How so?
- What do you know about the relationship that your parents had with their Mathematics teachers?
- How does it compare to the one you have or had?

**Individual interview with students.**

Individual interviews further investigated statements made by the girls during the focus groups: to understand them better, and give them a chance to explain what they meant and why they made those statements. They also worked to expand on the biographies the researcher collected of the participants on their mathematical schooling in the US, to give context to all the data in the corpus. These individual conversations also expanded on the topics discussed in the groups, and they served also to allow the participants an instance to share other issues that they may prefer not to discuss in the bigger group, or give

detail that they prefer to keep more private.

These interviews were semi-structured, with guiding questions written following the interests just mentioned, but with enough freedom to have an open conversation pursuing any theme that arise. At points where the conversation did not flow with the questions that I present below, the author moved back into a topic that the participant felt more comfortable talking about before. From there, I redirected the conversation, but from a different stance, to the point where we had to look back. I used easier questions in order to go back into the conversation. Considering that each interview was tied to a group interview, the author provides examples of those guiding questions:

- Autobiography in Mathematics
  1. Please describe crucial moments that shape who you (the participant) are in math right now
  2. Why was it important to succeed in math? Was it important to you or to someone else that influenced you greatly?
  3. What was your relationship with teachers (both good and bad)?
  4. Was there any particular situation in the classroom that you consider changed your point of view regarding Mathematics?
  5. Were there classroom situations were you felt “especial”? Was that good or bad or both? How so? (Expand)
  6. What kind of reward will have for the future to be successful in math?
  7. Did you have to experience stereotypes about being Latino, a girl,

or even both at the same time that made it hard for you to succeed?

- What is needed for success in Mathematics

1. What did you already have that helped you being successful in math?
2. What did you have to learn in order to be successful in math?
3. Did you have to give up anything in order to achieve success in math? What kind of things did you give up?
4. Where there things you had to change in order to “fit in”?
5. Where there things about your identity that you had to “hide” or “get over”?
6. How, what you already knew helped you succeed or held you back?
7. How did being a “Latina” influence your process towards success?
8. What part of it do you think it was due simply to you being a girl?
9. How is the process toward success for Latinas?
10. What kind of issues do they encounter?

- Why other young Latinas don't succeed in Mathematics

1. What makes you different from the rest of the Latinas that don't succeed in Mathematics?
2. How did you do to use the system so you could have better access to Mathematics and take advantage of it?



3. How does the system prevent other Latinas from being successful?
4. Why would it be difficult for other Latinas to follow the path you followed?
5. How are you and your experiences different from your parents'?
6. How would your parents do in school Mathematics if they had to be part of the school system?

- Preparing interview for parents.

1. How do you think their parents' schooling in Mathematics was different to your own?

2. What do your parents think about the American school system (and how to take advantage of it), Mathematics, and Latinas?

3. Why do the parents think their daughters are successful and other Latinas aren't?

4. Do parents understand the advantages and disadvantages, gain and losses of being a successful Latina Mathematics student in the US?

### **Interview with parents.**

These interviews had a particular characteristic: the daughters will be interviewing the parents, and the researcher will be a participant/observer until the girl was done, and then established a conversation with parents and daughters.

The main goal was that both daughters and parents opened a discussion where the issues described in the previous section for the particular focus group were addressed. As important as the answers the parents gave to the questions crafted

by the young Latinas in the focus group, it is the replica the girls had in the conversation. The interaction between girls and parents is key to the data I gathered through this tool. The opinions or remarks girls gave after knowing the parents' answers to their questions was data that I also analyzed. This data gave more detail on who the girls are, and how the parents' stories have influenced them. The opportunity for the girls to reply offered me the chance to know more about the parents' involvement, and compare this to the stories the girls had shared with me by then about their experience learning Mathematics in the US.

Ideally, the researcher would have operated as an observer, but the girls and parents invited me to participate, and also as it was considered in some circumstances there was a need for clarification of what was said.

These interviews will be also recorded with a voice recorder and transcribed for analysis. The possible questions for this interview were discussed in the corresponding focus group and interview with girls.

### **Artifacts.**

The last mean of data collection is the analysis of different artifacts like the mathematical autobiography produced by the participants; correspondence kept between participants and researcher; interview items created with students, and notes from observing the interview to their parents.

### **Analysis of the data**

Following Erickson's (1986) methodology, the data was carefully revised and read five times, in search of critical events (considering their frequency of

appearance in the data, as well as the affect and emphasis the girls placed upon them), that defined 1) what the girls thought about their school Mathematics experiences, what they emphasized about them regarding their identity 2) who they felt they were regarding Mathematics, and 3) the people they considered relevant in their story, and 4) the role Mathematics will have in their future.

From the reading of the data, the author made assertions based on the relevance given to those themes by the girls, connecting them to the topic under discussion. Later the whole body of data was examined critically to determine counter-arguments that could serve to disprove the relevance of the potential assertions the author considered. When evidence was found that the assertion was explanatory for the girls' verbalizations compared to competing arguments, the assertion was supported. As Erickson also pointed out, this process provides "evidentiary warrant" for the assertions that were generated in an inductive way. He also states that those assertions that have more links among each other, and that are backed up by different sources of data (focus groups notes, interviews, etc), will be the strongest claims and therefore, the strongest conclusions obtained from the study. I describe this process on detail below.

As focus groups and interviews took place, video and audio were reviewed for transcription. It was necessary to transcribe 100% of this data considering the way the participants connected different topics simultaneously, and how subsequent conversations would refer back to earlier meetings. Transcribing the focus group conversations gave structure to the individual interviews, in that it enabled the choice of focus topic, but also allowed the researcher to directly refer

to what the participants shared in the groups. The transcription process also provided the author with a rough idea of what the initial categories for analysis would be. Those themes that appeared connected the most with the things the participants shared, and that appeared to be robust no matter what was the topic for the meeting were chosen as early candidates. An example of this is the fact that each of the girls repeatedly cited lack of help from parents and expressed meritocratic attitudes about success multiple times. These themes insured that the cases I present in the Results embody a case of *something*—something theoretically important and practically relevant. Examples of these are the contradicting narratives girls engaged in regarding the relationship between gender and success in Mathematics, between their Latino culture and Mathematics, and in the interaction of these two variables in forming their mathematical identity.

Once the whole body of data was collected and transcribed, it was given a first read-through to get a sense for those themes mentioned before, as well as to uncover potentially new themes. This careful reading of the data involved going over it several times, resulted in some themes being discarded because they were not appearing consistently through the whole body of data and girls, as well as others added to the list. After crafting a list of initial themes, and to record the ways in which these themes were relevant or not, the author created a separate document for each theme where she wrote down evidence of its frequency and impact in the conversations and interview data. This, was done by writing down direct quotes from the girls regarding each of the particular themes in the

corresponding document. Not all of these quotes pointed in the same direction, initially. Additionally, some of the quotes appeared in more than one theme, showing the connecting between different topics the participants were discussing. For these reasons, I engaged in an iterative methods of reading and comparing themes and assertions to the available evidence. Collapsing themes that appeared to hold the same quotes, and rejecting those where an alternative theme presented more evidence, or where compelling evidence was lacking.

To determine the strongest claims, the author compared all of the pieces of evidence under the document made for that theme, checking whether the evidence pro-claim outweighed that against it. This was done in two instances: one for the whole data, and another one per girl. This allowed different ideographic evidence to appear for each girl representing the same general theme. Because at this point the author was working with pieces of data, and to make sure they were contextualized correctly, often the author went back to the tapes. Having the tapes of the groups available provided the advantage of allowing the author to go back in time and make sure the conclusions based on the transcriptions matched what happened in the meetings.

According to Erickson, the use of video recording has three important advantages: it can help avoid biases, since the author can review the recording as many times as needed, to avoid jumping to conclusions. Because of the possibility of repeated review of that data, the author is able to perform a more complete analysis of the situation at hand, compared to what someone just observing and taking notes can. In this second case, the notes are frozen in time, but with a video

record, the author can place him or herself back to the original situation again and again. Finally, the use of video reduces the chances that the author will rely only on events that appear repeatedly in any one source of data. In this particular case, with the researcher also interacting with the participants, the limitations of having poor interactions where there is no chance to test theories, or the limitation of not having first hand information of the context where these recordings come from, were avoided. The author had plenty of opportunities to establish dialogue with the participants not only in the groups, but also during interviews.

The reading and analysis of the data was done also using Bakhtin's (1982) approaches to text analysis, in order to find the patterns of what the participants mean in interviews. This particular reading provided interpretations that enriched the process, helping the author to stay truthful to the data and participants. In his discussion of the novel, which could be parallel to research, Bakhtin suggests that the story that matters is the one our participants tell us. They should be put at the center as the characters are in the novel. By doing so, we should not force our participants into the categories of analysis we had constructed, but allow them to bring their own finding the meaning our participants share. In the particular worked cited, Bakhtin also point out the importance of discourse even when confronted with acts. The author said that acts alone cannot reveal the ideological position of the subject. We need the participants to share their discourse with us to get a grasp of that position. The data collected in this project targeted the discourse of the participants, and put it at the front, just as suggested by Bakhtin, carefully recording "*who* precisely is speaking, and under *what* concrete

circumstances” (italics in the original) (Bakhtin, 1986, p. 340). This is also what CRT and LatCrit authors prompt us to do: listen to our informants, and consider their stories embedded in the particular circumstances of being (in this case), Latino females. But Bakhtin also warns us of the double-voicedness of anyone’s discourse. No one is the “first author” of anything they say, but we are all responding to those who referred to the topic before us (Bakhtin, 1986), hence the focus on conversations, as opposed to monologues or just the story as told by individuals. This brings our attention to those that have influenced the participants the most, in this case, parents and teachers. It highlights the influence the home culture and the schooling culture have had in the Mathematics schooling experience of the young Latinas, which is central for this research.

### **Limitations**

The design of this study, although carefully planned and carried on was not infallible. Choosing a theory, methods of data collection and analysis also means leaving other options and combinations out. The most important limitation of this study is the impossibility of a generalization. This study aims not to generate a general case for all successful young Latinas in Mathematics in the US, but to bring light into the issue. That light should help others design studies with bigger populations and with focuses born out of what these students have shared. The small sample size needed in order to collect in dept data for the few cases described, prevent the author from formulating a generalization.

Another limitation regarding the design and the tools of data collection

was the lack of classroom observations. Classroom observations would have been useful to tie the words and descriptions of the participants to what happened during their mathematical instruction. They would have provided first hand information about the Mathematics favored in the classroom, instead of the descriptions the participants and their teacher made of it.

These observations would have helped the author not only observe the Mathematics and the participants doing school Mathematics, but also the rest of the honors group, to whom the participants referred back during out conversations. Considering the descriptions of Mathematics, boys and girls the participants offered, to see how those played out and compare to how the participants were describing them would have added dept to the data collected and therefore to the analysis of that data.

These limitations are nothing but possibilities for improving future research. This study is opening a door to Mathematics and the experiences of Latinas in the US. Future research could address these to provide dept to the findings of this study.

### **Collecting the data**

From mid September until the last days of March, I met with Rocío, Viviana, Teresa, Daniela, and Gabriela. We met in groups, individually, and also when I met some of their parents. There were four group meetings followed by four individual interviews with each of the girls. In addition we met one day to work on some Mathematics tasks and two of the families met with me in one occasion.



Finally, the informal conversations I shared with the teacher also led me to interview her, as part of the data corpus.

The groups were very lively and no one was shy. They found comfort in each other, and it appeared that they felt no trepidation at discussing these topics with me or with each other. They showed the same ease and forthrightness in the individual interviews, and a bond between us was clear. We worked, but we had time to talk about other things as well. Sometimes it was music, some other times it was the school, plans they have, things they wanted to know about me. Thus, the communication was fluid, honest, and relaxed.

Only three of the girls were present in all of the sessions from the beginning to the end. They were also clearly engaged in the conversations we were having, they were very outspoken and their participation was vast. That provided me with complete data for these three girls, they were clearly the cases that I could present. These three, Rocío, Teresa, and Viviana, shared their stories without reserve, while Daniela and Gabriela helped make the conversations richer for all of us.

Daniela missed most of the first group meetings, and she also missed two of the individual interviews. The first day she simply forgot we were going to meet, and the other days she had no one to take her home late from school, where we met each time. Gabriela had to leave early one day for a doctor's appointment, and she was sick in another opportunity. For those reasons she missed an individual interview and a group meeting respectively.

During the times they were present, they confirmed what the rest of the group said and also what I was learning from the individual interviews. With different

experiences, they appeared to be worried about the same things as Rocío, Teresa and Viviana. For these reasons I will focus my analyses on what the three friends who were always present shared.

**In the parents interviews, in general...**

In particular, Rocío's parents were delighted to participate, and they came to meet me in my office to talk about Mathematics, school, and their daughter. They also brought Rocío's younger brother who even though was shy, participated in the conversation sometimes. Teresa's parents, who were somehow shy but interested in participating and talking to me, met with me in a coffee shop. They also brought Teresa's younger siblings, and we had an animated conversation. Sadly it was difficult to contact Viviana's parents, and her father communicated me he had no time for a meeting.

Lastly, each day that I went to school to meet the girls, I maintained conversations with the teacher. These conversations in addition to the issues the girls raised with me about their Mathematics class, led me to talk to the teacher. She gladly accepted, and her words were of much help.

## **Results**

Below I discuss the three cases of Rocío, Teresa, and Viviana. Each girl revealed reasonably consistent conceptions of their success and how it relates to their culture and gender through different lenses by relating different experiences about their family, schooling, and success in Mathematics.

Based on the stories of these three girls and also aided by the participation of the other two, I go over general traits of their stories, presenting each participant as a separate narrative, capturing the reasons they give for their success, the ways in which they have negotiated being a minority female in a mostly White, honors program, and the role of their culture of origin in this process. Following these individual cases, I present a general case of the successful Latina in Mathematics, based on the commonalities among the narratives these girls presented. Finally I discuss my findings and its implications highlighting how this connects with the literature developed this far, and where to go from here.

### **Rocío**

#### **Introduction.**

It did not take much for Rocío to open up. She was a quiet girl, who thinks a lot before everything she will say. She is a person who clearly showed not only interest but also enjoyment in sharing her ideas and many stories. Most of those stories involved family members, and her family was the one most present in every group and according to the Rocío's teacher, it was also the one more present in school not missing any of the teacher-parent conferences. Her family helped the

rest of us to talk about some easy and some not so easy topics. Her parents' involvement in Rocío's life was made known to the other girls, who sometimes were able to add to these stories even though they were not direct participants. Rocío volunteered these experiences, and she showed pride in everything she told us about her family.

Rocío was getting ready to celebrate her quinceañera party. It was not going to happen in another year, but it is never too early to start these preparations. She told us that she would go back to Mexico to get whatever is missing for the party. Most important of all, she is getting her dress there. But the dress and the party are certainly not the biggest concerns Rocío has. She is thinking about her future very seriously at this time. She knows exactly why she wants to be successful in Mathematics: she wants to be an architect. She told me:

Math is the first thing I do everyday. Like when I get home, math is the first homework I do. And then come the other subjects, 'cause... math is so important to me for my future career. So I want to get it over with, and then... like quickly. It stays in my head (2<sup>nd</sup> II – October 7<sup>th</sup>).

When Rocío says she wants to “get it over with” it makes me wonder how much this experience is enjoyable for her. This phrase it is mostly used for unpleasant things that we need to do, and that we would rather do them sooner than later as a way to make the suffering shorter. Rocío appeared to accept the importance of Mathematics in her life as she has been apparently told, because her words here sounded like something a parent or even a teacher would say to a student to motivate him or her to do that homework. This is not the only time this girl's

words will sound like someone else's discourse. All throughout this section, it will be clear that exposing Rocío's voice requires that we listen to her parents, teachers, and a larger discourse from the dominant culture as well.

### **Culture and Mathematics.**

Rocío wants to build buildings that give back to the earth, and try to end global warming. She told us this goal is not likely to happen if she finds herself back in Mexico, where her parents came from. According to her, only now Mexico is "getting civilized", and more women get to work outside of the house while at the same time taking care of it. She explained:

I think like in Mexico is expected that a woman stays at home and do not work. But now we are getting more civilized, so more women are starting to work and... they pass time at home, but they also pass time working, and helping families (2<sup>nd</sup> II – October 7<sup>th</sup>).

This girl made no comment that when she says "work" she is talking about remunerated work. When I was talking to her, I was confused by this lack of information. It seemed to me that women like her mom do a lot of work at home. Yet what qualifies as "working" for Rocío is not what many women do at their houses, but that which can be remunerated. According to her words, women used to not work in Mexico. Instead they "pass time at home". This provides evidence of Rocío managing deficit ideas about Mexicans that coincide with what she and the other girls said about Latinos being lazy. This is consistent with what Garcia Bedolla (2003) found regarding the image Latinos thought Euro Americans had of Latinos. Interestingly, these women Rocío talks about could only "help their

families” not so much by “passing time at home”, but when they start working and getting paid. This evidently is opposite to the idea of laziness mentioned before. This shows that the ties with her family are as strong of those of the Mexican students interviewed in Suarez-Orozco (1995), proving that success is only one step to the final goal of giving back to the family.

Her dad told Rocío that if she does not get all A’s, her punishment will be to go back to his home country and work to support her grandmother. To be sent back to Mexico appears as one of the threats identified by Gloria G. Rodriguez (1999) to children living in diverse communities. What makes it interesting in this case is from whom is coming: this is not the typical “go back to your country”, but more of a “go back to our country.” This common threat seems to be getting results, because this girl is certainly doing her best to get all A’s as expected. The 8<sup>th</sup> grader explained that in case she finds herself in her parents’ home land, she will have the same kind of hard life her dad had back when he was a child. Schools in Mexico, she added, are too expensive for most people, and the ones she could have access to will not provide her with the kind of education she is getting in the States. Staying in the States she will still eventually help her grandma, but in a more “efficient” way. She will send money once she has a job as an architect.

Not only can one already start noticing a certain distance that this girl is setting between herself and her Mexican heritage, but it also it is noticeable that success in Mathematics and school means “money”. As such, Rocío understands the importance of Mathematics for her future. Even though she has never gone to

school in Mexico, she can still state that schools there are bad. Not only that, she says the whole country is still in a process of “getting civilized”, which is an important statement. According to her, Mexico appears to be a country with poor education and with dangers that cannot provide the benefits of civilization like the US does. What the US does also provide are the means to help financially those who stayed back home, like her grandmother. Interestingly enough, none of this appeared in the conversation that I had with Rocío’s parents about education back in Mexico. Therefore, these ideas the girl shared don’t naturally match what her family thinks about Mexico.

Rocío clearly established in our conversation something that the other girls understood well: that those who want to succeed and try can make it no matter the conditions. The reason why some do not “make it”, is merely because they are not trying hard enough. Considering Rocío is a Mexican American, this supports what Suarez-Orozco (1995) stated about Mexican students not stressing individualism unlike Mexican Americans and American students. She suggested that even if some children may not have the resources at home, or even the parents’ help to do Mathematics, schools and teachers are there to help. Only those who do not reach out for this help are the ones who do not “make it.” This places the burden of success squarely on the individual, and disregards the influence of others, as well as the influence of race, gender and socio-economical status. This system of rule by merit and talent, meritocratic by nature, appears to be fair to Rocío, Teresa and Viviana, and simple enough that there is no need to wonder about social justice. It is what Leo Moore (2008) called “abstract

individualism”. Rocío works hard for herself and for her family, and working hard combined with her talents will take her where she wants to go. She has to try hard because there are others back at home who need her to know Mathematics. Her job “helping” others has started already.

### **Family and Mathematics.**

Her little brother depends on her help with the Mathematics homework. As with many other Hispanic children, Rocío has become her brother’s helper (Orellana, 2001). She is now in charge of checking on him, and making sure he knows the material: “I’m the one who is pushing him [her brother], ‘cause my dad, he comes from work tired, and... he forgets stuff, so I get to help my brother even though he’s annoying” (1<sup>st</sup> II – September 30<sup>th</sup>). Rocío’s words position herself in a parallel situation regarding her father. It appears as that he should be the one who would naturally do the work. But it is she who is taking care of it now. Not only the is father tired, but he “forgets stuff”, which allows us to see that Rocío thinks her memory puts her in a better position to be the one helping the younger brother. Her parents (mostly her dad) helped her but then the Mathematics became too advanced for them. Now Rocío has to teach her parents and brother about it, and sometimes compete with the different ways of doing Mathematics the parents bring to the house. This is something that is not particular to Rocío:

Rocío: My dad, he used to help me when I was in kindergarten through 5th grade, but now he relies on me to help my brother, and like to learn everything that I need at school he doesn’t like really help me. And before...



like when report cards come, he gets mad at me for my grades. Like I have all A's except for one B. Like we just got our report, the progress report. And like, he saw my grades and whatever, and I'm like 'dad I need help on this, you need to help me, how am I supposed to explain it to you?' And my mom got mad at him cause I asked him like two days before and he wouldn't help me, and turned in my homework late for that reason... And then he says he is going to read my math book but never really does [others laugh in understanding]. And then he explains me something and it's not correct. It confuses you and I'm mad.

Teresa: It confuses you.

Viviana: That's what my dad does! When I ask for help he is like 'No, you have to do it this way!' And I'm like 'But dad I was told I had to do it this way.' And he is like 'No, it's wrong.'

Teresa: They were taught different ways than you do. Like division. I learned how to do it, I have to do it step by step to show me how to do it. And my dad, he just tries to do it all like at one step. And I'm just like 'dad, I can't do it like that.'

Rocío: That's like me.

Teresa: That's like really hard for me and I try to show my brother how they show us here [school], cause my dad will just confuse you [laughs].

(...)

Daniela: I was just thinking that... I think the curriculum every year... I think they are adding to it compared to our parents... We are getting ahead of them

sort of, so they can't help us. I just wanted to get that out.

Rocío: It's been so long ago that they learned what we are learning now, that they can't really teach us anything.

Me: Do you think that is frustrating for them too?

Rocío: Yeah 'cos they... we are... they think we are becoming smarter than them, and they limit us... And sometimes like my dad... he... I tell my brother a way to do it [math homework], but he tells my brother another way to do it, and my brother thinks my ways is easier, and like he gets frustrated and sends me to my room or something. [He] tells my brother to do it his way cause is easier supposedly, and... (3<sup>rd</sup> FG – November 19<sup>th</sup>)

Rocío's Mathematics is competing with that of her dad, and she thinks her Mathematics is the one that is "right" and adopts a powerful position with her brother. This girl said she is her brother's leader:

And now he [her dad] stopped helping me because he doesn't remember the stuff I am doing, so I work on [it] myself but I'm like my brother's... leader, cause he is younger than me, and he looks up to me when he needs help (1<sup>st</sup> FG – September 9<sup>th</sup>).

Her Mathematics is the one validated by the school these siblings go to, and it's compared to the one parents can do. This puts parents and the school on opposite sides (Civil et al., 2005; Diez-Palomar and Civil, 2007), and Rocío has clearly chosen one and it seems so has her brother. As the conversation above shows, Rocío is not alone in this situation. Viviana and Teresa know all too well what she is talking about. They are confused and frustrated at the little help parents can

offer today, and even though they need that help, they don't know how to coordinate it with school and the school way to do Mathematics.

Rocío's dad used to help her when she was in 4<sup>th</sup> grade. He even made up competitions to see who could finish the test and worksheet first. Rocío shared with enthusiasm this idea of competing. Her dad talked about the times he would get translated worksheets and Mathematics notes from the school when I met him and the rest of the family, and do those worksheets with his daughter. Rocío told me with pride that she used to beat him. And even though she also stated that competing was not important because no one should feel he or she is better than anyone else, she mentioned that some competitions are good in the Mathematics classrooms, especially when you don't lose. Her father also talked about competing and school mathematics. He commented how frustrating it was when teachers would not teach him more than what he already knew, not allowing him to do something like skipping a grade, something Rocío did. The mother of the girl even joked about this in our meeting mentioning how *desesperado* (desperate) he must have felt. Based on what the 8<sup>th</sup> grader shared about these competitions and Mathematics, it was clear that she did subscribe to the idea that Mathematics and competitions go together. Where there are competitions, there is a winner and a loser. Even though she dedicated some time to say that we are all equal, it is clear for Rocío we are not all equal all the time. Competing places us in different levels: some of us will be higher, and others lower. This idea of Mathematics and competition is also considered a male trait of Mathematics in the binaries Mendick (2005b) talked about. This shows that at times Rocío adopted a male

discourse to talk about Mathematics. This was not the only time Rocío talked about Mathematics in terms of those binaries. Natural able vs. hardworking, and “being quick” vs. “being slow” doing math, were also present in her discourse supporting the idea Mendick presented of doing Mathematics being equated with doing masculinity. Competing was only one side of that discourse she showed us so well.

But there is a competition she is not formally winning, although deep inside she knows she is still one step ahead: who is “right” when helping the little brother. When her dad sent her to bed because her way of solving a Mathematics task was different from his own, she still knew her brother could benefit from her instruction. So later when her dad was not looking, she approached the young man and told him: “Here. Here’s how you do it. The way they do it at school” (3<sup>rd</sup> FG – November 19<sup>th</sup>). This was a very clear example of which Mathematics is “right” for this girl, and of the confrontation of family vs. school. When it comes to Mathematics, school is “winning”. When her dad sends her to her room, he is showing the frustration of knowing about this competition. In the conversation we all had, at times he admitted he was one step behind now, but at other times, when it was pointed out more clearly, he claimed all he had to do was quickly check the textbooks, and he is ready to help both of his children. His interest in doing his best for them is very clear, and it seems hard to admit all he can do may not be enough at this point.

The “right way to do school” has been discussed at home, and Rocío’s parents had no reservations about talking to me about this when we all met. Her

father has discussed with Rocío, and also commented in our meeting, that he does not want his daughter to do what her mom did back in the days, when they were in their country. Back in Mexico, Rocío's mom used to copy the answers from Rocío's dad on the Mathematics tests. She got the answers through a window in a funny operation that made us all laugh:

My dad, he pushes me because, he didn't finish college and all that, and he lived in another part and he had to move away to... to Tijuana to work in his field. He couldn't afford it [college] so he didn't do it. And then he met my mom, in high school I think, and they both studied the same thing... My mom... My dad... My mom wasn't really that smart, cause my dad would pass the answers to quizzes and tests and that (all laugh), through the window, cause my mom used to sit by the window I guess, that's what she told, she tells me. My mom had the morning class, my dad the night class. So my dad didn't have to study, so if they had a test my dad would always know what the answers were. So he wants me to do better." (1<sup>st</sup> FG – September 9<sup>th</sup>)

Here we see again that being smart for this girl means knowing the answers without having to study. Even though it seemed at first the one benefitting from this situation was the father, since he got to know the questions in advance, it was he who provided the answers to the mother. And he could do this without having to study, or asking questions, something that for Rocío appears to be weakness. If this story was not clear enough, the girls explained to me more when we had an individual meeting:

Rocío: Well my dad he's been always helping me, he has influenced me like a role model, because... my mom, she really did get the answers from my dad...

Me: Oh yeah, yeah, you told us that story. She was getting them through the window, right?

Rocío: Right. My dad would tell us that story and tell me not to be like that, make me study, even take tests with me like I said last time, math test. (1<sup>st</sup> II – September 30<sup>th</sup>).

It is a serious matter though, because Rocío has no female role model to follow when it comes to Mathematics and school. Her mother is, as a matter of fact, someone she should not be like. The mom accepts this, and wishes she would have known better, although when asked what would be different today if she would have known better she did not know what to say. But it is not just an issue with the mother. There are other women in the family, just like in Teresa's family, that Rocío does not want to emulate. Women in their family, they said, went for the "easy way out", choosing "lower level" occupations, and relying on their husbands. There are no female role models that this young Latina can access easily in her family, and it was evident that her father was the one Rocío looked up to when thinking about Mathematics. The Mathematics she does and she likes the most is the fast one that allowed her to compete and win with her father, one that seems to be more of a male than a female model. Women in the family have not seemed to have made the right choices about school and Mathematics, and this girl, as many others, lacks models to follow (Daisey & Jose-Kampfner, 2002).

Lucky for Rocío, she thinks differently.

### **Gender and Mathematics.**

Rocío mentioned "... we are all equal, just like men think they are higher than us, but we are all equal..." (2<sup>nd</sup> II – November 4<sup>th</sup>). And also added that boys still think girls are the "dumbest ones of the group, even though I think they [males] are, 'cause they are immature and they don't really pay attention" (1<sup>st</sup> II – September 9<sup>th</sup>). This shows she does have certain exposure to sexist comments that put girls in an unfavorable position. She knew boys don't like getting help from girls, just because that would hurt their pride. Even though she made fun of that attitude, this shows she is familiar with this idea that boys are not considered to be "lower" than girls in Mathematics. It is not the norm that they need help... especially not help from female peers. Gender played a role in the Mathematics schooling of Rocío, and by sharing this experiences with me, she defined I clearly and made fun of it as a way to consciously reject it. But when Rocío was not focused on rejecting this discourse I just described, she added a very significant piece of information when she talked in particular about the ways girls and boys learn and achieve in Mathematics. She added that boys think at a higher level when it came to Mathematics problems, and that they are used to harder problems. "They [boys] think the harder the problem, the more information they are going to get out of it or something" (2<sup>nd</sup> II – November 4<sup>th</sup>). By saying this she shows a subscription to that discourse she was criticizing. Boys, after all, are smarter. What happens now with women?

At the same time males are thinking at a higher level women are used to

easier problems which they do “step by step”, something she and the other girls will later describe in a group as the “text book way” to do Mathematics. Easy problems apparently don’t require higher thinking, and can be solved by following the steps they have learned before. This clearly reflects what the literature says about boys using invented algorithms and girls using taught strategies to solve Mathematics problems (Fennema et al., 1998a; 1998b). Not just that, but it also gave it some value, a higher value for boys. When she says “higher” she is implicitly comparing it to the value of the thinking girls do, which in turn has to be “lower”. Girls are not in the spot where they can see what they can get “out of the problem” like boys do. They just think about solving an equation following steps. Setting up that equation from a word problem can be difficult at times even for these girls. The reason for this is that the real world does not give us a set of equations for us to solve, but instead presents to us in problem form. As much as these girls achieve, it is clear they have a limited view of Mathematics that can only take them so far. But Rocío who has a clear picture of how things work in the world and Mathematics, does not think she will fail. She knows she will be one of the successful ones because she “learns differently.”

Rocío: So some boys can’t even do that, like: they try to think, but they can’t, about what they did. They do it so quickly they can’t even process it.

Me: Why do they do it so quickly? Any ideas?

Rocío: I don’t know.

Teresa: Just comes.

Me: What?



All of them together – It just comes.

Teresa: Comes naturally, I guess.

Mw: What about for girls? Why didn't it just come naturally as quickly too?

Rocío: Well, to me it does but... I learn differently so...

(2<sup>nd</sup> FG – October 7<sup>th</sup>).

Rocío, the most successful of the three girls according to their teacher, explains how she has managed in Mathematics by saying her thinking aligns with that of boys. This matches the cases in Mendick (2005b), for these girls to do Mathematics also mean doing masculinity. Rocío and Viviana were the two girls who were more adamant about not wanting to be associated with the drama girls are associated most of the times. This “drama” apparently gets in the way of success in school, especially for Mathematics tests. They explained this drama to me as how much girls cared about how they look: clothes, hair, make up... It appears to be normal that middle school girls want to be “dramatic”, but for Rocío and friends, “drama” was unwanted. Instead, very clearly, she prefers to be associated with the way boys think when it comes to Mathematics. The three girls always seemed as feminine as any middle school can be expected to be. A little bit of make up and fashionable clothing confused other people who thought they should look like nerds. But when the time came to talk to me, a Mathematics teacher, about Mathematics and success, they chose this male narrative of who is successful and why. Girls who manage to think higher like boys, and to be less “dramatic” than the common girl, are the ones who succeed. This was not the only discourse they chose to explain girls' success.

**Latinos lack of success.**

Rocío also shared that Latinas who do not subscribe much to their own culture have more chances to succeed:

Me: Do you think that some Latinas feel more negative pressure to do Mathematics?

Rocío: Yeah... maybe Latinas that are more into the traditions of their culture.

(2<sup>nd</sup> FG – October 7<sup>th</sup>)

Even though her dad sends messages of being a proud Latino, and she adopted some when she talked to me about being a Latina, she may not be connecting to this identity in particular when she chooses to be successful in the Mathematics classroom. If the women who are in touch with their Hispanic roots are not likely to succeed, and at the same time she is succeeding, what does this say about how important it is to be a Latina for her success in school Mathematics? By listening to what this girl has to say, and observing the world through her eyes, we know that even though there is a need for her to defend women and Latinos, her success in Mathematics depends on her alignment with hegemonic discourses that places White males as the anchor role in academic and economic success by which all other roles, and the place of other races can be compared. The example of her mother, and the examples of her *Tías* (aunts) were proof to her that being a Latina may not be directed connected to being successful in Mathematics. About her aunts Rocío said:

Rocío: I think it's because like, Hispanics go for the... Like my dad, his

family goes for the higher stuff, like engineering, and technology but tías, they went for the lower stuff, they don't care. Like they did stuff that didn't have math in it when my uncles, they did. So they went to college, and they were 8 of them, they lived in a 2 room house in Mexico and like, they all went.

Me: And why do you think they chose that kind of way? All of your tíos doing the heavy math, and all of your tías, not?

Rocío: I think it's because they are being like housewives, they rely on their husbands [Teresa and Viviana agreed]. They like, the husbands take like the harder jobs where they make the most money. And then the wives they just go make less money.

(3<sup>rd</sup> FG – November 19<sup>th</sup>)

Even though first the girl said it was her dad's family who went for the "higher jobs", it is clear later on that it was only the men in the family that did so. The women are very clearly described, and it is also clear that this is not the kind of life Rocío wants for herself. Again, she is describing a situation where the distance between Latinas she knows well and herself is evident. The other girls agreed to this, and added details that will be later discuss in Teresa's story. It shows that this distance is not particular to Rocío, but it is something all these girls know well.

After talking to Rocío a couple of times it was apparent that the message from home was conflicting with another perhaps larger message than the one her parents were sending. At home, Rocío heard stories about racism at school, in

legislation, and about the need for being proud of their culture and background. An example would be when she had to complete some school forms and it was not clear what race she was supposed to mark. The teacher suggested to just leaving it blank but her dad highlighted how important it was for her to proudly point out there Latino background for everyone who wanted to learn about it. At times, she referred of Latinos as “us”, and not “they.” She would explain one reason why she wants to be successful in Mathematics and in life as to:

Prove that Latinas are smart and not dumb like other people think. We can get somewhere in life, and nothing can stops us. We’ll be there we’ll be top of the class. And no matter what someone does, or if someone is above them, they are not gonna put themselves down. (2<sup>nd</sup> II – November 4<sup>th</sup>)

Not only does she want to see the name of Latinas “on top”, but also she wants to prove to others that they can do it. This shows that even though they choose a naïve discourse regarding race and racism. In this discourse racism is reduced to mean comments, and nothing too serious. However, there is a need to show “others” they can do it. If that need exists, they can only know this because they have felt those “others” don’t believe Latinas can be on that level. Keeping this naïve view of “others” and not questioning them allows girls like Rocío to borrow their discourses when needed. For example, they borrow them in order to succeed in school Mathematics.

But if there is this realization of this situation on this 8<sup>th</sup> grader side, then there is a likelihood that this realization is reinforced by comments and conversations at home. After talking to her father, it was apparent that he was

more aware of unfair situations, and he did not look like a man who would not discuss it openly with family. Rocío's father was not ashamed of his background and seemed to be well aware of his and his daughter's potential. He shared his own struggles learning English with teachers who were less than helpful, and who would judge him for what he knew and did not know. He, just like his daughter, also knew his potential and recognized that a teacher who was not interested in his success was preventing it. For that reason he abandoned those English lessons he once took when arriving in the States. He was the proud Latino Rocío talked about in our meetings. And there were other Latinos to be proud of.

The girl had heard before about famous Latino writers and artists and that made her want to succeed in Mathematics, a place where few others have succeeded before. This kind of comment happened when she was clearly making an effort to reproduce in our conversation ideas that had been discussed before, likely at home. There, where issues of race placed her in the spot of having to choose a side, and defend it. Her father could be "heard" when she was talking like this. She would say, for example, when we talked about some people who think they are better than Latinos: "Because we are living in their country, and they know we came here to live a better life" (1<sup>st</sup> II – September 30<sup>th</sup>).

Considering she was born in the States, to say that she came from anywhere is not accurate to her story. A statement like this fits better her parents' story. She positions herself as an immigrant, which she is not, and borrows from those who are and she knows well: her parents. It is clear that this is not the only time she borrows from them, as I have stated before. But when she was not talking like

this, the discourse was different.

It must be hard for Rocío to embrace this idea of being a proud Latina when the reason for Latinos not to succeed (in her words) is laziness. How to be proud of that? Latinos being “put down” by “Caucasians” as she referred to White people did not qualify as racism, and was not an excuse not to excel. It was she who used the expression “to be put down” as something that happened to Latinos quite often. Even though in the expression itself there is embedded an idea that someone else is doing this to Latinos, and that the situation may not be under Latinos’ control. Yet she did not think it depended on anyone but themselves to achieve success. It was laziness, not racism or oppression, the reason for the small number of Latinos and Latinas in STEM careers. By blaming Latinos for not putting forth effort, not only the doors are open for them to change their attitude and destiny since they are not victimized by anyone but themselves, but also there is no reason to search for explanations outside of the community.

The explanation, in Rocío’s words, for the limited numbers of Latinas is explained by the kind of student that is successful in Mathematics: the one that likes competition, that does not ask a lot of questions, and that is born to succeed. And here we see another of the binaries that Mendick (2005b) mentioned: naturally skilled vs. hard working, being the “naturally skilled” view masculine. She said: “Well... to some people, it [Mathematics] comes easier to them, for instance, me. It comes easier to me. And there is other people that they have to... they have to ask a lot of questions” (1<sup>st</sup> II – September 30<sup>th</sup>). So you are either born with this skill, or you struggle and work hard to succeed. This is also what

teachers attribute to girls in general: they succeed if they work hard for it, while boys have the skills for achieving in Mathematics (Forbes, 1996; Damarin, 1995; Fennema et al., 1990; Walkerdine, 1989). Not surprisingly, this was also the point of view of the teacher of these girls. She described them as very hard working, and compared them to her other students who were simply skilled. And even though Rocío was the one achieving the best, she was still a hard working girl. As we can see, there is a disagreement here between what the teacher says, and the self-image this 8<sup>th</sup> grader has. She, as I explained before, appeared to subscribe to all of the masculine trends in the binaries of Mendick (2005b). And she had more to add.

But this young Latina did not stop there, and she stated that in her class: “There are a lot of girls in my math class... They are all White and everything is so easy for them. And they even... they even take stuff easier than me, so...” (1<sup>st</sup> II – September 30<sup>th</sup>). So she did not say it, but left the door open to only one conclusion: if she is smart, these other White girls are bright. For Rocío’s peace of mind, when taking a test to see what kind of learner she was, she got “visual” like many of her “Caucasian” classmates. Other Latinos in her class got “kinesthetic”, but she does not have to deal with that, since it happened to Latinos that do not think differently like she does. This test confirmed something she seemed to know already: her way of thinking in Mathematics does not align with the way Latinos do Mathematics. This helped Rocío explain why Latinas are under represented in STEM careers.

**Summary.**

And there we have Rocío, a bright young Latina succeeding in Mathematics by not doing Mathematics the way most girls do. She thinks boys think higher, and that she can do Mathematics like a boy. She states this clearly, allowing us to see her experience with Mathematics was not separated by her gender. Rocío also tries to keep her Latina identity at the right distance so it won't interfere with her success. Once again she let us know her experience with Mathematics is also racialized. She thinks White girls are bright, that they can learn things with less effort than even she puts into it, and this is not a minor thing. Luckily Rocío also thinks she is a visual learner like her White classmates, and unlike her Latino classmates. Even though the father's influence at home motivates her and keeps her on track while presenting her with the option of being the proud Latina that she can be, she chooses to opt out of this discourse at times, so she can be successful in Mathematics, before being a successful Latina. It was clear in Rocío's words that being successful in school Mathematics requires more from her than to simply do the homework correctly. She also needs to successfully navigate conflicting discourses so she can be what her dad expects from her, and also what it is expected from her at school. As she does this, she shows Mathematics schooling is a racialized and gendered experience.

## **Teresa**

### **Introduction.**

Since day one, Teresa showed kindness towards everyone in the group. Trying to keep everyone on check, she made sure I felt comfortable at that big



table where there was five of the group participants and me. She was also the one inviting the only other girl that was not part of the group of friends, and making sure she had a space to talk her mind, and gave her a space recognizing her voice. She made sure she created an atmosphere where she and the rest of the group could comfortably express their opinions. She acted as a mediator at the meetings, and made sure that other participants, like Viviana, did not try to make jokes and monopolize the discussion.

Teresa was kind and humble. Always mentioning that being an honors student sometimes surprised her and that it was not an easy task. Maybe she was not one of those to whom “Mathematics came naturally”, but she was a good example of those who “put forth a lot of effort” in order to succeed. Her teacher described her as someone who needed more time to understand and apply what they were learning, and who was putting a lot of effort forth with no doubt. She said that she would like to help others with Mathematics because she was grateful for the help she got from others. On several occasions, she mentioned interest in teaching but disregarded it as a possible future because “teaching doesn’t pay.”

Along with Viviana, Teresa was clear about that by succeeded in Mathematics today, meant money for tomorrow. Both were embarrassed to express it, but they agreed that better jobs and more money were an incentive for being successful in Mathematics today: “Like Viviana said, I can see myself getting money, being educated, and being happy with what I’m doing” (1<sup>st</sup> FG – September 16<sup>th</sup>). College was also in the plans of success, and like Viviana expressed, it is necessary to pass a lot of mathematic requirements if they want to

go to college. Neither Teresa's nor Viviana's parents went to college, and according to the girls, their parents have a lot of faith and hope that these girls will be the first in the family graduating from college in the United States. When talking about her dream of going to college, she said:

I always knew I wanted to be someone in life. I wanted to do something. But after I got in the program [AVID] it made me realize what things I had to change, and what things I had to give up to go to college. (...) And it's not easy, it's not like you are going to say 'I wanna go to college'. You need to put a lot of effort into it, because it is not easy (3<sup>rd</sup> II – December 2<sup>nd</sup>).

Teresa not only allowed me to see how important this dream of college was for her, but that she had to change and give up things in her life in order to achieve that dream. Her choice of words is interesting. She said she wanted to "be someone", and to "do something", and those two things could be achieved through college. There is a transformation from who she is today and who she can be. It is clear she wants to be somehow different than her parents. Does that mean that for girls like Teresa her parents did not do anything and are not anyone? They did not go to college, and as I will describe later, they did not finish high school either, making Teresa's life sometimes harder by not being able to help her as she wished. If she goes through the transformation she desires, she will be very different to what her parents are today. In Aguilar, MacGillivray and Walker (2003) this issue of "being someone" is addressed by being educated. The authors explain that, in many cases, parents would ask their children not to be like them. In this case Teresa does not want to be like her parents either; she wants to be

someone educated.

### **Family and Mathematics.**

Teresa's relationship with her parents regarding Mathematics also appeared in the conversations shared in the group discussion as well as in individual interviews. Like Rocío, Teresa mentioned how frustrating it is that she cannot get any homework help from her parents. She said: "I think that my parents don't support me like I would like them to all the time" (3<sup>rd</sup> II – December 2<sup>nd</sup>). When we wrote the questions for interviewing parents, her exact words were: "Do you know how hard it is for a daughter to learn Mathematics without a parent's help?" (4<sup>th</sup> FG – February 18<sup>th</sup>). She recognized that it was simply hard for her parents because they only complete elementary school:

I think it's important if they understood it more. Sometimes I wish they could help me in the math because I don't understand it sometimes. And I call my friends on the phone but it's not the same, you know? (1<sup>st</sup> II – October 1<sup>st</sup>).

As described later on, she agreed with the idea that each of us just needs to reach out for help and resources to succeed in school Mathematics, but the fact that her parents could not help her bothered her a lot. It seemed that reaching out, and calling friends on the phone for help, was not the same thing as receiving help from her parents, which makes the schooling experience different and more difficult.

In Rocío's case, her parents had learned Mathematics in a different way that was hard for her to understand. And even if they wanted to help, they just

couldn't. Earlier in Rocío's story, some of Teresa's words showed that when her dad tried to help her, she felt frustrated because she could not do what her father wanted. She could not calculate Mathematics the same way her dad had learned because she was being taught differently. I remember having the same kind of arguments with my grandfather when I was a child; he wanted me to do Mathematics his way, which was the "right" way. For example, when Teresa shared that:

He [her dad] would always tell me stuff about like, how to solve problem a problem 'do it in your head' [making a voice], and I was like 'I don't know how to do that!' But he would just show me stuff and get me confused (1<sup>st</sup> FG – September 16<sup>th</sup>).

When Teresa referred to the help she was getting from her father, who was the only person at home, she confessed getting confused by his help. It was hard for her parents to get involved in her education. She did not say that her way of doing Mathematics was right and her parents' wrong, but was concerned with her parents' lack of knowledge and how she was more advanced and that her parents simply could not help anymore. She said that their ways were different and she did not seem to compare or compete. It is possible that that confusion she experienced, when her father tried to help, led her to believe that they did not know what they were doing because they lacked the education to help her. In addition, the fact that her parents did not finish high school added to Teresa's concern. She tended to focus on the impossibility of getting the help she needed. By concentrating on seeing this issue as a problem, I realized that her meritocratic

discourse still did not fitting her situation well. After all, her success depended on others, in this case, her parents' help, which would make it easier for her to succeed.

Teresa mentioned that she wished her parents would do more than “just glance” at her grades: “In school... ok they see my grades and ok ‘it’s the progress report we have to sign it.’ They check it like really quick, they just glance at them” (3<sup>rd</sup> II – December 2<sup>nd</sup>). In Teresa’s perception, her parents barely even looked at her grades and this made her think they don’t care. She made several comments about this in our conversations, saying that her parents barely took a peek at her grades. A part of her wanted to draw attention to the fact that her parents needed to do more than this, but then she wanted to excuse them as well:

But I know that they can’t do it [do more to help her Mathematics homework] because they don’t understand what I am doing. And it’s different from what they got taught before too. So I mean... I understand that part, but I would like that they actually could help me, and that they could get more involved in my school life (3<sup>rd</sup> II – December 2<sup>nd</sup>).

When I met with Teresa and her parents, they said that they trusted her and there was no reason for them to go to school and talk about Teresa’s progress report. Talking about how much they help Teresa with her Mathematics homework, her father said:

En las tareas no mucho porque tú [Teresa] tienes suficiente inteligente, la realidad de las cosas, para que vamos a decir que no. Ella entiende bien,

ella entiende bien la clase y no batalla para hacer sus tareas, así que...

(Not much... because you [Teresa] have enough intelligence, that is the reality of the things, why would we say no. She understands well and does not fight to do her homework (Teresa's parents interview – March 14<sup>th</sup>).

The parents believed that there was no need to spend time looking at Teresa's grades, because they were good grades. It seems like Teresa should be proud of herself because her parents did not worry about her and school. But Teresa's ultimate wish was that they would offer some help for those things she did not understand well at school: "... sometimes I wish they would ask me 'Oh! What did you do today?' 'What didn't you understand?' and things like that" (3<sup>rd</sup> II – December 2<sup>nd</sup>). Teresa understood that it was no lack of interest on her parents' side, and the ways in which they could help was limited: "They know basics and everything, but they don't really know how to help me or how to say 'oh you can do this better', and stuff like that. And sometimes I really wish they like knew more about it but... unfortunately they don't" (1<sup>st</sup> II – October 1<sup>st</sup>). Teresa still wished her parents could be more involved in her school life.

That lack of involvement of the parents which was a consequence of their limited education may be balanced by the peer support Teresa and friends are getting, something they did mentioned as an advantage. Peer support was mentioned as well as keeping each other on track because they were all honors students. Coherent with Treisman's (1992) findings with Asian students, peer support is known as a predictor for college GPA (Dennis, Phinney & Chuateco,

2005). It also seemed to be related with the success of these girls in middle school as well. Still, the involvement of parents in her school life seemed a problem for Teresa, even though she stated no one needs anyone to succeed.

Teresa also talked about a younger brother that she had to help, but unlike her friend Rocío, Teresa repeated several times how unfair it was that she was in charge of this task, and how much she didn't think it was her place to take care of her young brother's homework. This is what she said when Rocío was sharing her story about her brother:

If they want to have children it's their responsibility to like, check up on them. I mean... If you ask your daughter to help some, cause you don't understand, that's ok, but to put all the pressure on you? That's not right."

(3<sup>rd</sup> FG – November 19<sup>th</sup>)

She added that because she had to go through school on her own and get help from friends, her brother should have the same experience. Here we notice Teresa believes her brother could take advantage of having to work his way through instead of getting somehow an easier way through school. The help she is not getting from her parents, Teresa is unwillingly giving it to her brother. Teresa does not want to be for her brother the support her parents could not be for her. If she is going through school without help then her brother can do it as well. It is impossible to not hear resentment in her voice when she used the expression "just glanced" while talking about the attention her parents gave to her schoolwork. These words show that there are no exceptions to those who put forth the effort and if her brother puts the same kind of effort as her, he will be fine. Clearly, like

Rocío, Teresa subscribes to individualistic ideas that place all the responsibility on the individual, disregarding any other factors like social-structural and historic conditions (Moore, 2008). Success in Mathematics is for those who are willing to do the work.

**Latinos and Mathematics success.**

In Teresa's point of view, one that places all burdens on individuals, Latinos are not doing as much as they could to be successful. In the following dialogue, where Viviana clearly manifests her point of view, Teresa agrees and provides evidence of Latinos lack of interest in Mathematics success.

Me: Why do you think some Latinos don't succeed in Mathematics?

Viviana: They are lazy.

Teresa: They don't want like... work out the problems and the steps.

Rocío: There are many steps.

Viviana: They are lazy! [as what she was saying is evident and the same as the others said].

(3<sup>rd</sup> FG – November 19<sup>th</sup>).

This short conversation shows how these girls all agreed on this topic by completing each other's ideas. It also shows that even though Viviana is the most clear about her thoughts, they agreed on the topic discussed. According to Teresa, it is not that Latinos are not able to work out the steps, but that they must "want" to, which places the responsibility on the subject, in this case, Latinos. Latinos choose not to work out the steps, and that is why someone like Viviana would feel so comfortable saying that they are lazy. Latinos could do better in Mathematics



but they are choosing not to succeed. They do not want to work things out. Rocío adds that there are many steps to take and a lot of work to be done. This piece of information comes to clarify why Latinos choose not to work it out. A lot of work would be discouraging for people with the characteristics of Latinos according to Viviana.

Latinos need to work hard and show teachers and others their interest and effort. Only when teachers/others see that effort, will they have access to opportunities; like being in the honors track and/or being selected for a program like AVID. Teresa, who is always careful with what she says and how she says it, clearly stated that Latinos often do not put forth the effort, like she is doing, which is needed to be recognized by others. For Teresa, to succeed in Mathematics, one needs to prove him- or herself to others and show that you want to be or do “something”.

It is interesting to note that in Rocío’s discourse there is more about “naturally having the skills”, but in Teresa’s there is a push on showing hard work. While both girls support a meritocratic system, it appears as if for Teresa this is requiring a lot of more personal work than for her friend. Teresa and Rocío agree in more than one point, but support their belief from different angles. While Teresa seems to still be thinking about these issues, and the ways in which her choices help her with her Mathematics success, her friend already thought this through and appears to have made a decision, which is also the position Viviana shows in our conversations.

This idea of proving to others that you want to “do” and “be something”

appeared in the discourse with all of the participants. It seemed that others saw them as being “nothing” and the need for proving others they could be someone and something is born there. The participants of this study would be the first in their families to go to college and by going to college they said they would “be someone” or “be something” like in Aguilar, MacGillivray and Walker (2003). This not only shows an important source of motivation, but also an alarming idea; i.e., those who have not gone to college and are not successful in Mathematics (like their parents or a number of Latinos) are not “someone” or even “something”. The educational experience that Teresa and her friends go through, is more than just higher education, because it also changes their condition from this unfinished person to be the first “someone” in the family. This clearly shows that this experience is particularly important for these girls. The college experience for Latinas has characteristics that deserve our attention as much as the experience Teresa and friends have with Mathematics in the middle school. When there is no objection in wanting to improve one’s own condition in life, I wonder whether success in school will distance them from their connection with their Latino heritage. Unlike Latinos who do not show any interest and effort in school, these girls will “be someone”.

### **Individualism and Latinos.**

To achieve this goal of “being someone/something” it was clear for Teresa, Rocío and Viviana, that it all depends on the person. I heard this belief expressed in every group discussion and private interview. In Teresa’s case, I also heard the same belief expressed by her father. When I met with Teresa’s parents and asked

her father why he thought not many Latinos were not in careers that involved Mathematics, he said that it depended on “them”, the students: “Es ellos. Si ellos no le ponen empeño... pues no” (“It’s them. If they don’t put the effort... then no”) (Interview with Teresa’s parents – March 14<sup>th</sup>). It was “them” who had to push through and work hard. The same individualism and meritocracy spoken by Teresa were also expressed by her father. Teresa’s future is clearly in her own hands. No help from her parents will make a difference according to her discourse at times, and also according to her parents’ discourse, because in the end, it all depends on her. This not only reinforces her meritocratic ideas from home, but also could explain the distance between Teresa’s parents and her school life.

In the conversations I had with the girls both in groups and individually, I posed the girls with hard situations other students their age could be going through. I asked what if they lived in an unimaginable situation of poverty. What if they lived with a single parent who cannot help with academics or even not have time to glance at their grades because they have to work two jobs? What if there are many siblings? What if a school, located in an impoverished neighborhood, does not have the resources to give assistance to the students? The girls always responded that it was the student responsibility, and it is the student who decides his or her future. If the resources are not at home, you can get them from school. If your parents can’t help you, you can reach out to teachers. If the school is poor, you can go to libraries... In sum, there is always someone you can go to, and something you can do. And when you fail, it is only you that can be blamed for it. Yet as it was described before, Teresa did not think her situation

was the ideal anyway. Even though at home she was not going through situations like the ones I described, she still felt if her parents could help her more, school Mathematics would be easier for her. Even though she is successful in school, one can only conclude she could be doing better.

Even though Teresa did not use strong words like “lazy” to describe Latinos, something both Rocío and Viviana did, she still made sure to draw a line and say that if they would want to succeed, they could do it. She said Latinos should “push harder.” When I asked her if there were people who thought Latinos learned in a different way, she answered: “Yes, the people that are smart and are not Hispanics. Some people are like ‘you need to focus more. You don’t understand that yet? Really? It was so easy.’ And stuff like that. And I’m like ‘Well, I need help, you know? I don’t understand this problem.’ Then you are asking and they are like ‘you should figure out yourself’. I’m just like ‘ok’” (1<sup>st</sup> II – October 1<sup>st</sup>). That “ok” was showing more a resignation “ok” than anything else, yet she still thought the reason why Latinos are underrepresented in STEM fields is their lack of will to succeed. It is smart people who think Latinos learn differently, not racist or uneducated ones. This opens the door to the possibility that there could be some truth to it because it is “smart people” who are not Hispanic who think that Latinos learn different. One could assume, that smart Hispanics may not agree with this. This puts smart Hispanics and smart non-Hispanics on different sides of the issue. In her story, it was a smart non-Hispanic who pointed out Teresa’s need for assistance but was also unwilling to provide that help. For Teresa, this issue is obviously not an easy one. She indicated that

the topics discussed were issues she had not yet formed a clear opinion. For example, she indicated that being treated this way was not fair, and yet she labeled this person a “smart” one.

Because she spoke about this issue as unfair, I asked if Latinos were put in unfair situations more often than not. This is what she said: “Well, nowadays I don’t think they [Latinos] are [oppressed]. They don’t allow themselves to be oppressed. Not everyone but certainly... most... the majority, they don’t let others tell them you should do this or that” (3<sup>rd</sup> II – December 2<sup>nd</sup>). Not only does this passage show how careful Teresa was choosing her words, but also how conflicted she felt about saying that most Latinos do as they want and not as they are told. Racism, she said, was something of the past, and even though some consequences remain, Latinos will not “be told what to do.” Racism is also reduced to telling others what to do, and it is something that can easily be fought. Yet when she was told what to do, but didn’t receive help, she found herself giving up and, according to her expression, a little helpless. After all, it is not easy to do what we think is right when we do not have any help. Help from parents, teachers or peers can make a big difference. Teresa discovered that when her parents could not help and some people who could have helped her were not willing to do so. But in a system that is individualistic, Teresa cannot expect to get special help for her particular needs as a Latina. An institution that claims to be colorblind cannot acknowledge differences and adapt to them.

### **Gender and Mathematics.**

The idea of one being able to solve problems by him- or herself was

revisited when the discussion was about women, and in particular Latinas, who are also underrepresented in STEM careers.

I think 'cause in a lot of countries men are supposed to be the authority, they are supposed to be the smartest ones, they are gonna go to college. And most of the wives in countries are supposed to take care of the kids and the house also apparently they don't get a lot of education. (...) I guess the men have an advantage but... not all of the time because... not all... men are not always the authority. And they are not the bosses of women, so... (2<sup>nd</sup> FG – October 7<sup>th</sup>).

It is interesting how Teresa kept some distance from what she was saying here by saying things were “supposedly” that way. It is also interesting that women appeared defined in terms of the men. Teresa did not start talking about “women” as she does about “men”, but she says “wives”. Even though she tries to be positive about women and their relative position to men, she sounds doubtful in what she is saying. In some places men are “the bosses” of women, and men tell women what they can do, Teresa shared. But today that has changed. And even in a place like Mexico that is, according to the girls, still in process of getting civilized, women have more freedom than they used to. Yet just like in Rocío's case, Teresa had a contradictory discourse when it came to Latinos, Latinas and Mathematics. She mentioned that Latinos kept oppressing women, and most parents still think the place of a woman is in the home: “They [girls] should clean... They are not the ones that have to do the work [remunerated work, outside of the house] and stuff like that. And, I don't know but I think it's mostly

the male figure that tries to stop us from doing it” (1<sup>st</sup> II – October 1<sup>st</sup>). Teresa was the other girl who shared stories about the women in her family, and how they went for the “lower level” job, relying too much on husbands and making excuses not to go back to school. She had this exchange with Rocío and me:

Teresa: Like, my mom, before she got married was going to school, and was doing this technology thing, I don’t even know what it was, but with computers, and then she got married and my dad started working, and they started to live together... But then she stopped going to school because she started to, like Rocío said, relying on my dad, and then my dad would say like he could take it [made a disgusted face], and that he didn’t need help for anything, and... I don’t know, but like, I think it depends on your will... as a woman.

Rocío: My dad did the same thing. My mom was taking technology courses like my dad, but ended up working in a beauty salon. Now she does that instead of a career in technology like she had planned.

Me – And what do you girls think about choosing that option?

Teresa: I think it’s the easy way out about math... but, I mean, math is always gonna be around. And you are gonna have to find it everywhere. And I think it’s just important to have some knowledge of math.

(3<sup>rd</sup> FG – November 19<sup>th</sup>)

Once more, it was these women’s choice not to succeed in Mathematics, and they were the ones to choose the “easy way out” of Mathematics and any success it could provide them. With disapproval, Teresa described how Latinas take the easy

way out and said it is their parents and husbands who push them to choose this way. Sometimes it seems like a woman's future is in their hands, but other times it is in someone else's hands. Above all, these girls are Latinas who will go to college and won't be told what to do or take the easy way out... Would that count as being a Latina in these girls' eyes?

Teresa also talked about the boys in her Mathematics class. An interesting indication that her perception of boys and success in Mathematics is not as different as the one Rocío has, is that she described the way boys do Mathematics as "whatever". Not careless, but they do not worry about being wrong like women:

Men tend to be stronger. Not careless but they just take it all 'whatever' kind of... It's like... I don't know, they have more potential in themselves. And then women... we start worrying about everything, we are like 'oh my god what if I don't do good.' And I don't know, we just freak out sometimes (2<sup>nd</sup> II – November 4<sup>th</sup>).

Apparently this idea of "whatever" means that boys don't really need to spend as much time thinking about the problems to be able to solve them. In other words, Mathematics "just comes" to them naturally. I believe Teresa wanted to say that because boys believe in themselves that they are more secure of their potential, but instead she just said "they have more potential". This is an interesting choice of words. For someone who has shown to be so careful at the time of explaining her thinking, this comment says something about what she thinks about the different Mathematics potential of girls compared to boys. The way she describes



the girls and Mathematics is also interesting. The “drama” they mentioned before appeared here in a different form. “Freaking out” cannot be a good thing to do when doing Mathematics, and apparently this is part of how women do it.

Teresa mentioned that boys do math in their head. This goes back to this idea of being able to solve problems faster, naturally, and without over thinking them or doubting themselves. But when it came to her, she remembered that there was a time when Mathematics was easier and she also solved problems in her head:

Before, it used to be easy problems like multiplication and everything. But after I started Algebra and Pre-Algebra, they got harder and you actually needed to do steps. So before I used to be like “oh I can do that in my head” or “whatever”, but now actually do the problems, show the work. (2<sup>nd</sup> II – November 4<sup>th</sup>).

She also said that her way to do Mathematics in the past, when it was easier, was also “whatever.” In Teresa’s words, boys find all the Mathematics problems easy like she did in the past. Boys can always be “like whatever” doing everything in their minds. She had a time when she was just like that, and maybe that explains how she is in the honors track. Similar to Rocío, the Mathematics that matters is done the way boys do. Also just like Rocío, Teresa advocated for equality even though comments like the one mentioned above continued showing that even though she said they are all equally capable and smart, boys always do solve math problems the way she did when Mathematics was really easy for her.

In her well thought out verbal communication, Teresa made sure I heard her

saying how important it was to recognize that there was no difference between men and women:

A lot of people think that guys are the smart ones, the ones that can do everything... Like, being a girl, and being smart at the same time, it just shows that not just guys can do things. We can do things too. And it doesn't have to do with gender" (2<sup>nd</sup> II – November 4<sup>th</sup>).

Teresa said that girls should show boys this fact, and when I asked why, she said boys should not feel they have more power than girls and that they are not the bosses. Apparently if there is a need to communicate this, it must mean this is not a fact for everyone yet. Surprisingly, Teresa added that it is girls who need to understand that women do not always realize their potential. Maybe it is even herself who needs to be reminded, because when I asked her if she thought some people were just born to be good at Mathematics, she answered:

Yeah. I have a lot of friends, like, guys that are in my class, they just open... They don't even need the teacher to explain. They just open the textbook, and they just start looking at examples really quick, and they are like "boom", they really quick got the idea. (...) My friend, he goes to another high school to take classes cause they don't offer them here, because he's really smart (1<sup>st</sup> II – October 1<sup>st</sup>).

In her two examples about smart people and Mathematics she chose to talk about boys and did not mention any of the girls in our group, which was something she could have easily done considering they were all in the honors track and I knew them as well. The ultimate example of smartness and Mathematics has a gender...

and it is not female. She did not think all boys fall into this category, but it is interesting that given my question, she chose to talk about boys. This conflict is just as clear like the ones Latinos. She presents two opposite narratives about Mathematics and gender. When I expressed that I wanted to talk about boys, girls and Mathematics, Teresa positioned herself on statement that “we are all equal”. When the conversation was general, without needed further probing, she said Mathematics is easier for boys.

### **What good Mathematics is.**

In that short passage another important thing is revealed: what good Mathematics looks like when it is done well, According to Theresa’s understanding, Mathematics is good when problems are solved fast, “boom”, no need for further explanation from teachers, and it can be done just like in the textbook. As in the case of Rocío, being smart in Mathematics also meant being fast in doing it. Teresa believed boys can do math in their head, fast, without asking questions, and barely with any help given. A very different situation than the one she described for her own case. In a few words, a male’s idea of Mathematics is clear (Mendick, 2005b); it’s not just the speed, but the idea that if you are smart and it came naturally to you, then you need no help from the teachers, because you just need to see a couple of examples so you can answer whatever question comes your way.

### **Summary.**

Teresa, like Rocío, appears to be trapped between discourses: one empowering of women and Latinos, and one that subscribes to the dominant

culture. Meritocracy is highlighted by her own words when she says that Latinos as well as women can do anything they want as long as they put effort into it. The reason for those who do not “make it” is merely because they did not try hard enough. The girls who make it, like Teresa, have uses strategies learned from others; i.e., work hard like Chinese people who spend more hours at school (this was another example provided by this girl), or do Mathematics the way boys do, in their head, fast and without asking many questions.

## **Viviana**

### **Introduction.**

Viviana was the “funny one” of the group. When we were all together it was an opportunity for her to perform. This was also evident during the individual interviews. Another strategy that she used was to whisper. This was noticeable when looking at our videos. Possibly, that was her way to express herself without being questioned, not that being questioned was a problem for her. She appeared very confident in what she was saying and why she was saying it. Based on my observations, Viviana seemed to have a strong personality. Unlike Teresa, she was not there to make it easy for anyone. Her uncensored honesty added valuable controversy to our discussions.

She did not like Mathematics, and she made this clear from day one. However, she was good at it. This was evident by what the other girls said. According to the other girls, Viviana set a standard in math ability. Her math ability was comparable to Rocío. According to Viviana, Mathematics was a

necessary pain. It was necessary because she was thinking about going to college. She knew she needed to learn Mathematics well to get there:

Viviana: I really wanna go to college, I wanna... like... do better than my family members cause none of them really went to college.

Me: Why do you want to do better than them?

Viviana: So my parents can brag about it: 'oh, she just graduated' and I think it will feel good when I'm graduating with all my family there.

(1<sup>st</sup> II – September 30<sup>th</sup>).

From this conversation and others, she has expressed that attending college is very important for her. In another conversation, she shared her plans on which university she wants to attend. From this we can gather where the motivation comes from, but also, her goals. She wants to do “better than” her family. Viviana wants to makes them proud. It is evident that she is able to separate herself from her parents by saying that she wants to do better than them, as long as it is for a good reason.

### **Mathematics in future opportunities.**

Viviana's success in Mathematics and her focus on college does not imply that the career she will choose will be in a STEM field. This is actually unlikely. Truthfully, she is really confused about her future, as most girls her age are. From talking with her it was apparent that she was interested in more than one type of career. However, she expressed that it was her mom's dream to have her become a doctor. This dream of her mothers did not seem to be a heavy burden. Viviana explained that:

My parents really don't care. They just want me to have money when I grow up. (...) Get a career that you have to go to college for... something like that. Not just a job you can get without go to college (3<sup>rd</sup> II – December 2<sup>nd</sup>).

It is clear that Viviana's perception regarding what her parents want is that they "don't care" what she chooses as a career, as long as it provides her financial security and as long as it involves her attending college. Making money was important, but how to make money was important as well. It was important for her parents that she attends college, and that she does not just "get a job", but a career. College and money seem to be her parents' motivator, and Viviana shares some of that. She said that if people could be more successful with Mathematics, they could also have "probably more money." However, she also shared that her parents "don't care" what she does as long as she is successful. This "not caring" can be compared with the way Teresa felt about her parents as well. The attitude of Viviana's parents does not seem particularly engaged toward her academic life. It seemed that it is important that she will be successful in achieving her goal regarding a career and financial security, but how they are helping her at the moment is unclear and was not discussed.

### **Family and Mathematics.**

Viviana did not talk much about her family and their influence regarding Mathematics in school. Yet, similar to the rest of the group and based on what they chose to share in the meetings, the father appeared to be more involved with the schoolwork for Mathematics these girls did at home. This may seem surprising at first, however under the light of the stories of Viviana, Teresa and

Rocío, it is the obvious approach. The descriptions of women in the families of the three friends leads to criticism concerning these women's schooling experiences which was devaluated by the young Latinas.. When I asked Viviana if it was important for her parents that she is successful in Mathematics, her answer was: "To my dad, yes", but about her mother she added: "She's like 'whatever'" with some disapproval. She even added that: "To my mom anything higher than a C is better, because she didn't go to high school so she doesn't understand it that much" (1<sup>st</sup> II – September 30<sup>th</sup>). From these statements, it is obvious that Viviana's role model for school was certainly not her mother. Her mother did not seem to have educational goals as ambitious as Viviana's. This was also seen in Teresa's case, where the lack of knowledge made the mother unable to help. Viviana contributed about the details pertaining to Rocío's family stories, but did not have much to say about her own. She shared that she had four siblings: one older sister and brother, and two younger sisters. According to her, she was "the promise" of the family. She was the one to be going to college. Her siblings were "lazy", and that was why they were not going to make it "big". But she also commented that her father expected a lot more from her older brother compared to her older sister. She thought the reason for these higher expectations towards her brother was probably that he was the only boy. Viviana's father, she said, never challenged her older sister, and he had no need to push Viviana because she was self-motivated to do her work, and to do it right. Although we did not interview Viviana's father, the picture that Viviana painted of her dad was that of a man who favored his son, and who was not present in Viviana's academic life.

Even with her parents' absence in school involvement, Viviana was very certain about having the right attitude and will power for getting the most out of school, and this is what she contributed to her success. According to her, she was doing things right, and she appeared to know what others are not doing right and was ready to point it out.

**Meritocracy and individualism.**

Viviana was very critical of others, including her family members. This is what she said about her siblings:

He [her father] mostly looks on me because my older sister, she is 18, she's not bound to go to college. And my older brother, he has low grades and he says he doesn't want to go to college or anything. And since I am the first one who does wanna go to college, he looks at me (1<sup>st</sup> II – September 30<sup>th</sup>).

Her word choice is interesting. One of her siblings is “not bound” to go to college, and the other does not “want” to. By choosing these words, even an uncommon expression like “bound to”, Viviana coherent with her meritocratic discourse placed the responsibility in the subjects, in this case, her siblings. Meaning that it was her siblings' choice not to succeed and go to college. We can also infer from these statements that it is again the individual's responsibility. There was disapproval in her tone, probably disapproval for the choices her brother and sister made. This disapproval was also seen towards non-family members.

She explained that those who do not succeed are “plain lazy”. This idea was repeated during our meetings in groups and during individual interviews. Viviana, like her two friends, clearly placed the reasons for success and failures in one's



own efforts. Therefore, “not showing enough effort”, or not having the natural ability is not the same thing as being lazy. This is a different perspective regarding this issue compared to the other girls. When asked to be clear on what “lazy” meant, she provided an example based on her school experience. She said that those doing poorly in Mathematics were more interested in hanging out “and that kind of stuff” instead of doing homework. She finished this idea by adding “... they are lazy.” It was interesting to hear her say this and observe that others did not challenge this idea, because it seems natural to me that at this age, most teenagers want to “hang out” and “hanging out” does not necessarily mean being lazy. The way Viviana interacted with the rest of the group was typical teenage behavior. There was no indication that Viviana particularly enjoyed solitude, which would provide her with time to do all that homework that she claimed to be doing. Viviana trades these “hanging out” with friends to do work, and today this does not look like a problem for her. But it is valid to question whether she will feel this way in the future, and if she would like to keep trading things out to do work to be successful. Based on these comments Viviana provides more insight about what affects success in Mathematics: the peers that one chooses to “hang out” with. In Viviana’s case, being in a supportive environment, like the honors class, was an advantage. Also, doing the AVID program together kept students together that had the same focus. She was very clear about this, and commented that they kept each other focused. For Viviana peer support is very important, and like Reyes’s (2006), her peers also contribute to a “new sense of being and becoming, although often conflicted and binary” (p. 181).

### **Peers' support.**

She was not the only girl in the group to mention that being in the honors classes helped them stay on track and do their job putting the effort needed for success. This idea was shared among the girls in the group. Viviana added that having friends that think that school is for nerds might not be the brightest idea:

And I think it [success at school] also depends on who you hang out with and the things you do. Because... if your friends are also in the school and they want to study, then you are probably going to be influenced by them. But if you are friends and... you guys do bad things and your friends don't care about school, like 'eh, that's for nerds or something' you are gonna be influenced by them and thing 'oh, they are not gonna think I'm cool if I go to school' or something like that (2<sup>nd</sup> II – November 4<sup>th</sup>).

This quote concludes what she thinks about who she spends time with, and how that can potentially affect her success in school. Being in the honors track was something that both Viviana and Daniela highlighted as a benefit they had. To be surrounded by other students who were in the same track and apparently valued education as much as they did was a great help for them. Viviana's teacher also commented on the importance of peer support for the three friends.

The teacher talked about the ways the three girls were there and helped each other with the mathematics and all the pressure of being in the honors track. She said: "They kinda have their own little, they kinda support each other. You know: they are friends, and they have been in these math classes for a while together. So I think that helps. And their effort" (Teacher interview – March 24<sup>th</sup>).

It was also clear for me that Viviana and friends enjoyed doing things together like working with me. Offering each other help with mathematics or understanding each other like the times one would finish another's sentence, could only help. The teacher also recognized the parents of her students were involved, and Viviana agreed that family support was important too.

Family also plays a role here. Their support is important even for Viviana, who didn't talk much about them. She did acknowledge that if teachers and family do not see you showing the much-needed effort, then they may not provide the kind of help you need. But also that the group of people you spend the most time at school plays an important role keeping you in track. She also thought it is common for Mexican families to not provide academic support. This idea will be explored in the next section. The individualism embedded in Viviana's words claim that is up to the individual to reach out and get the help if you need it, but having people around you that have the same goals is equally important. AVID also kept this group of supportive friends together. Others could make good use of such an opportunity easily because Viviana thought that this kind of program is available for everyone if everyone is willing to look these type of opportunities.

### **Latinos and Mathematics.**

Even though Viviana did not think availability of these programs was a problem for Latinos, there are other issues that she pointed out:

Me: Do you think a lot of Latinos have access to that kind of program?

Viviana: If they like look forward to it, because some Latinos know about the program but they are like "ew, that's boring!" cause they don't really

think about college and stuff.

(3<sup>rd</sup> II – December 2<sup>nd</sup>)

According to her, not working things out is a choice made by each student, and if they do not succeed, then it is their own fault. According to her last words, Latinos would not make use of potentially beneficial programs because they lack setting goals for themselves, for example, attending college to improve their lives through education.

And who did Viviana blame when asked about the underrepresentation of Latinos in STEM fields? These are some of her words regarding Latinos and success in school and Mathematics:

Mostly some people that drop out are people that they don't care I think they are like, because... since Mexicans they are more like... kinda... like there's people in the US, the Caucasians that are racist to them because they think they are illegal, and so some people are like "oh, so what's the use?!" and all that, so they drop out, or someone in their family is like that, so they really don't care (3<sup>rd</sup> FG – November 19<sup>th</sup>).

She intentionally uses a racial lens when discussing this issue. Her comment on racism is not deep and end up illustrating Viviana's deficit views on Latinos, but it is important to point out her recognition of race being a factor in the schooling experience of Latinos. According to her, the Latinos that drop out choose that option because they don't care. Racism appears to be a minor inconvenience and Viviana does not explore it, this was similar with Teresa. It seems that she finds it difficult to talk about racism, and finally decides to use a second reason as if the

first one was not enough, to explain why Latinos are dropping out of school: that they have that kind of examples in their families. Ultimately, Viviana clearly places the responsibility on the Latinos themselves. Viviana's views on the topic agree with what Suarez Orozco (1995) pointed about the Mexican Americans in their sample, saying that they avoid challenging tasks, appearing as they give up in an important number. In Viviana's eyes, Latinos do not care and drop out.

More than once, Viviana said "they [Latinos] are lazy" when others were sharing alternative ideas to explain this phenomenon. She could have thought as being a little bit cruder than the other girls in the group when talking about Latinos, but her ideas were not really challenged by any of the other 8<sup>th</sup> graders. As a matter of fact, she thought the other girls were saying the same thing she was saying, just being more polite. After different girls in the group shared an idea, she added: "they are lazy", as to sum up what the other person had said. She openly shared that being a Latina prevented her from being successful in Mathematics, although it is important to say that she did not say that it presented a challenge to that success either. Her words about being a Mexican in regards to being successful in school were as follows:

Well, I was talking to my mom the other day, about how she didn't finish school and she regretted it. And she was telling me how like... over there [Mexico] if you don't finish school it was not a big deal and stuff. So I guess they are like... people from Mexico, the Mexicans, they are like 'oh it's not big deal'. But when they come here their children may be like 'oh, it's not big deal if you don't finish high school' and stuff. Maybe they don't get

encourage that much, and that's why they don't see the big picture, you know? (3<sup>rd</sup> II – December 2<sup>nd</sup>).

In this short quote not only can we see that some of Viviana's discourse is borrowed from her mom, but also a detachment to her Mexican roots as along with a deficit view of the Mexican culture. It is her mom who says "over there they don't care", but it is Viviana who concludes that the Mexican students living in the States do not have encouragement but also choose not to care about school. By showing that she cares, she is separating herself from "them." When she talks about "the people of Mexico, the Mexicans", she is also showing some distance from that people that come from "over there." This "over there" also seems to mark some distance between her reality and the one she is describing for the "other people." Viviana borrows from her mom's discourse here, but her mom is not the only one who appears in Viviana's words and thoughts. According to what Viviana shared, her father used to tell her when she lived in California to "watch it" every time they saw someone that looked Mexican because it could be a "Cholo."

Viviana: And then... my dad... we are from, well I'm from California, my dad moved from there because he thought it was a bad neighborhood, and then every time... since over there, there would be gangs and stuff, every time he would be driving by a Mexican he would be like "oh there's a Cholo, watch it" [others laughed].

Me: But they are Latinos like he is, right?

Viviana: Yeah.

Me: Isn't that interesting?

Rocío: My dad he sees people... he thinks that Cholos of whatever... they have to have their head shaved. And wear khakis and like polo shirts.

E – And they have like big shorts...

(3<sup>rd</sup> FG – November 19<sup>th</sup>)

Not all Mexicans are gang members, yet if the people on the street looked Mexican, we can conclude from what Viviana said that that was enough for her father to set a clear distance between them. Viviana's father's deficit view of Mexicans is shared by Viviana. Another marker of distance in that dialogue appears when she talks about where she is from. First she is about to say that her family is from California, but Viviana corrects herself by saying that she is the one from there. This very conscious correction shows that she separated from family. Even though in this case the girls are almost making fun of her father's attitude, they are very enthusiastically sharing the different characteristics that allow them to know whether the person down the street is a Cholo or not. On another occasion, and absolutely out of the blue, Viviana asked us:

Viviana: You know what I've noticed? Do you know that song called "White and Nerdy"? [others laughed and shook their heads] Well, in the video the White persons look all nerdy and the Latinos look all gangsta and stuff.

Me: Does that really represent Latinos?

Viviana: Kinda.

Teresa: Sort of.

(3<sup>rd</sup> FG – November 19<sup>th</sup>)

It is not surprising that Viviana would bring up something like this. Again, she is not uncomfortable bringing up racial issues, demonstrating that bringing up controversial topics is not foreign to her. What is surprising are the answers to my questions. Viviana, Teresa and Rocío then said that they were not free from stereotyping others, and it was clear that the stereotyping Viviana's father appeared to be doing was similar to what the group of friends was doing now. What Viviana brought up here that was interesting, was that stereotyping enters their lives not just talking with their fathers, but also through music and movies: "I don't know why but in shows, in news and stuff, Mexicans are the ones who mostly are like 'oh this person robbed this store, it was a Mexican.' They are most likely... 'It's the Mexican!'" (3<sup>rd</sup> II – December 2<sup>nd</sup>). These two utterances by Viviana show that there is a conflict that she is trying to resolve. First, she admits that she thinks Mexicans look "gangsta." Then, she demonstrates that she cares about the media representing Latinos as always being the "bad guy". Her mentioning this stereotype being present in the news makes this a harder concept for her to deal with. This is because the news is based on facts. If it is always "the Mexican" who broke the law, maybe it is normal that this 8<sup>th</sup> grader accepts "the Mexican" is also a *pandillero*, a gang member. Viviana's ideas about Mexico and Mexicans did not only come from her parents or the media. On her trips to Mexico, she said she learned how things are "over there".

Like Rocío, Viviana's idea of Mexico was less than favorable. I asked her once what she thought of the idea of being sent to Mexico, and she said: "Oh my



Gosh! The schools over there... are like “nieh” [something not too good according to her tone and expression] and then so probably... hum... my grades will just go down” (2<sup>nd</sup> II – November 4<sup>th</sup>). Viviana could see the effect that a schools makes on someone’s academic performance. For American students, all they need to succeed is to show effort and work hard. Yet the reality for Mexican students seems to be different, and the consequences of going to a Mexican school could be damaging even for someone like Viviana. On another occasion she said:

People come from Mexico because the schools over there are horrible. I’ve seen them. And you have to pay.... Hum, the colleges and universities are expensive over there, and some times... you have to travel somewhere else to go to school. And lots of families don’t really like that so they come here for better education (1<sup>st</sup> FG – September 9<sup>th</sup>).

From this sparked discussion about the reasons why Mexicans would migrate to the US. Viviana used this opportunity to talk about Mexican schools, mentioning her information was first hand since she has been there and seen the schools. Schools are expensive, not good enough, and people have to travel away from home to attend college. Putting aside the value Viviana gave the schools by saying they are horrible, the other factors she considers damaging of Mexican schools, are also realities that Americans face in their own schools in the States. In general, a college degree is something parents save their whole life to afford for their children, and the number of out-of-state students in major universities proves that going to school out of state is common for many college students. Yet these are problems in Mexico, and even though Viviana lives in the US, she not only does

not appear to know about the similarity of US reality, but is well informed about the Mexican one, and uses that information to show why schools in Mexico are a good reason to emigrate.

The disregard for the Mexican schools was always very clear. The only time she seemed to see something positive with them was that they go to class for half the time each day compared to the classes in the States. For Viviana there was a direct connection with Mexican schools and lower grades. Not even someone as smart as she was could excel in such an environment. On another occasion, again talking about schools in Mexico Viviana shared:

Over there, well, my opinion, they, school was like ‘whatever’, ‘nieh.’ (...)

And they get taught different things. They could be maybe advanced, but if they don’t get it, they are never gonna get it. And they could be behind (2<sup>nd</sup>

II – November 4<sup>th</sup>).

For Viviana there is a chance they are teaching advanced Mathematics in Mexico schools, but according to her the support is not adequate, and there is a real risk for falling behind. The risk of falling behind may not seem important compared with the fact Mexican schools are “like whatever”, which is a problem Viviana seemed to be more concerned with. When I asked if this situation also happened here, she was not convinced, and gave me a shy “maybe.” There was nothing else she wanted to add, and it seemed to me she did not think there was anything else she could say about this, because things like this happening in US schools was only remotely possible. According to this 8<sup>th</sup> grader, girls in particular had it hard in Mexico.

Girls and women in Mexico have a kind of life Viviana does not want for herself. She told me that in her parents' country, women either stay in the house or work with their husbands, not being able to experience other "stuff" like college:

Well, mostly women just stay home. If they work, they probably work with their husbands, like in their little business or something. So they didn't really experience other stuff. They didn't really go to college or they didn't see if they had any talents and like... artistic or anything. They are just home moms (2<sup>nd</sup> II – September 30<sup>th</sup>).

According to Viviana, not only do Latinas in Mexico not get to go to college to follow their dreams, but even the business they get to work at with their husbands, are "little". Women are confined to their houses, and in Viviana's eyes this is not a good thing. This can be inferred when she states that they are "just" home moms, as if there was something wrong or limited in choosing to do that. If they have any talent or skill, it will be lost because they won't have the opportunity to discover it and develop it. It seems like women in Mexico live under the shadow of their husbands, who maybe will provide them with a job outside the house, but not away from him. Because in her statements there is a fusion of present and past when she described Mexico, I asked about that. Viviana said that things have progressed the US, but things have stayed the same in Mexico. This shows that she believes there was a time in the past that things in her country were like things in her parents' country now. Her beliefs were not only strong about Mathematics education in Mexico, but also about topics like boys and girls achievement in Mathematics.

Talking about how comparing boys and girls' achievement could have a negative effect on the girls, Viviana added:

I think some men will probably do worse like that because if it is a Hispanic man or something, they are not always probably gonna be a dropper or something, and then, if they are compared to Asians... Asians are really smart, so they are probably gonna be like "oh, they are gonna do better than me (2<sup>nd</sup> FG – October 7<sup>th</sup>).

In an attempt to defend women by saying that men are probably put in a worse position because the different ethnicities are compared to each other, she is explaining to us that she expects the Latino men to do worse. It is them that could be affected negatively when compared with Asians. The belief that Asians were in general the "smartest people in the world" appeared once or twice in our conversations. The girls were not sure why people believed that, but they also said that one could see a good number of Asians walking around the local university as to prove they were smart enough to make it there. The fact that Viviana needed to clarify that not all Hispanics would be "droppers" shows what seems to be the common belief about Hispanics as well. And even though she tried to defend them in this rare case, in the end it was the Hispanic males giving up when being compared with Asian males. Maybe for Viviana, the reason why Latinos in general are not succeeding is the lack of good schools in Mexico, or the lack of involvement of the families.

Some of these issues do not have to worry Viviana, because after all she does not live in Mexico, and she is not a Mexican herself. But an issue that does effect

her is the lack of encouragement from home. She mentioned that for Mexican families high school is not important. Even after moving to the States, the parents and children have the same attitude. However, she obviously does not subscribe to that kind of thinking, does that make her different? Not being lazy, worrying about getting good grades, planning to go to college are things Viviana does, and these characteristics appear to distance her from her view of the typical Latina in regard to school. This is not the only time she chooses to do things differently. When it comes to Mathematics, she also distances herself from what appears to be “the Latino norm”.

### **Gender and Mathematics.**

In a conversation with Viviana, she told me how much she enjoyed (and how good she was) at multiple-choice tests for Mathematics. She said she was good at guessing and checking her answer. Here is what she said:

Viviana: Maybe because the guys are probably better at guessing and checking, they know that the answer has to be there, so if they do the problem and get it wrong, they can still try to find the closest one... ‘cos that’s what I do.

Me: So you do what the boys do?

Viviana: Yeah (laughs). And then the girls, they probably... they probably write down the problem.

Me: What do you mean by that?

Viviana: Like the steps, so they use things that they can remember.

(2<sup>nd</sup> II – November 4<sup>th</sup>)

In this short conversation, Viviana showed that, like Rocío, part of her success in Mathematics could be explained by their choice to do Mathematics in a way not so traditional for women, that is, the way boys do Mathematics. Interestingly enough, she also mentioned that the way girls do Mathematics is connected to the idea of “following steps” and also memorization strategies. Even though she did not say (like her friend did) that boys “think higher”, she did say girls are more “emotional”.

She said that girls appeared to be more “emotional” or “dramatic”, this was validated by Rocío. Viviana pointed out that this could be a reason that explains why it is harder for girls to succeed. About boys, Viviana explained: “They think they are like... they are smart, they don’t need to worry, they are too good” (2<sup>nd</sup> II – November 4<sup>th</sup>). Certainly Viviana did not appear to be the kind of person that is particularly worried about what others think about her, nor does she have any doubts about her math skills. This is an observation made based on how we related to each other in the meetings, and not in a direct comment she ever made about this issue. In a previous conversation, she pushed the idea that girls are a lot of “drama”, and this idea was repeated in subsequent interviews. It seemed like Viviana was separating herself from the ways girls do Mathematics by mentioning the points of connection between her way and that of boy’s.

### **Summary.**

Viviana was not the most talkative of the girls, but not classified as shy. It was typical for her to make shocking comments, as if she was searching for a reaction from her listeners. For example, when she brought up that Latinos were

portrayed as “gangsta” in movies, and then admitted that this was the way she thought Latinos actually were. This invited agreement from others that sometimes the picture of Caucasians being “all nerdy” and Latinos being “all gangsta” had some truth in it. Clearly, Viviana expressed deficit views about Latinos. This was evident not only when she said they looked like gang members, but also when she talked about Latinos’ interests and investment in education. The discourse she uses to talk about them distance her from her parents’ culture. It was not only Latinos that she separates herself from but also girls.

Viviana navigated a discourse regarding her success in Mathematics by comparing her math strategy as the same as boys. Her description of girls’ and their strategies of doing Mathematics were different from the way she talked about herself and her success with school Mathematics. The choices she appeared to have made regarding her Mathematics, compared with Mendick (2005b) binaries, clearly show her discourse about Mathematics success lines up with the idea of Mathematics being masculine. Her way of doing Mathematics also distanced her from common girls, who are too “dramatic” to be able to use their whole potential.

Viviana appeared to be a strong girl that is finding her way alone, and discovering how to be successful in Mathematics without parental support. With a different background, and a different style, she shared a picture not so different from the one Rocío and Teresa portrayed. The narratives she uses to explain herself and her success in Mathematics are mostly those of the dominant culture, which shows a separation from her home and parents’ culture.

## **The young successful Latina in Mathematics**

In the stories of Rocío, Teresa and Viviana, as well as in those stories of the other girls that participated in this project, two things were clear: conflict between two different and competing discourses, and the subsequent negotiation. On one hand, they had to be the proud Latina that showed “others” that Latinos and especially girls are smart and can succeed. On the other hand, in order to succeed, they submitted to hegemonic or majoritarian discourses (Solorzano and Yosso, 2002). Additionally, mentions of meritocracy appeared throughout the conversations we had, showing how convinced they are that if one wants something, one can achieve that goal.

In the coming sections I detail how these girls’ relationships and views of Mathematics show this conflict between Latino culture, the dominant culture, and views of boys and Mathematics. Contrasting ideas about what Latinos do and can do show these girls receive a message at home about being and making Latinos proud, but they distance themselves from a group of people that is not showing enough effort or interest in succeeding in school, falling into what they call “lazy” attitudes. At the same time these 8<sup>th</sup> graders defended the position of girls being just as smart as boys, but when talking about the way they do Mathematics, they fell into a male discourse. Rocío, Viviana and Teresa are very clear about this when they say boys think on a “higher level”, but it is less obvious when they say Mathematics is something that comes naturally, that it is done fast, that it is preferable to learn through competition, and that you learn by just looking at a couple of examples and not asking questions. Also, as found in the



literature, Rocío, Viviana and Teresa subscribed to a way of doing Mathematics based on memorization and following steps. They were the ones who compared this to the way boys do Mathematics. According to them, boys were inventing the Mathematics in their heads, and “getting more out of it”. Rocío explained that this was the reason why boys were making meaning out of the problems they were solving, which took them one step further than just “setting up the equation”.

Table 3

*Summary of typical statements by the participants per theme*

	<b>Rocío</b>	<b>Teresa</b>	<b>Viviana</b>
<b>The family: encouraging but unable to help</b>	And now he [her dad] stopped helping me because he doesn't remember the stuff I am doing, so I work on myself but I'm like my brother's... leader, cause he is younger than me, and he looks up to me when he needs help (1st FG – September 9th).	I think that also, the lower Latinas that we were talking about, I think that me as well, I think that their parents are not very aware of like our math education. They don't really know how to help us to know it, and to understand it, but they don't like have the experience to have gone through this, and that's a, I think that's a big thing because if you ever need help in your home, and you have a test the next day you can't go to anyone and ask them "oh how do you do this?" Because they just don't understand the content (3 <sup>rd</sup> FG – November 19 <sup>th</sup> ).	Me - And your parents... do you think it's important for them that you learn math? Viviana – To my dad yes. Me –Yeah? To your mom... not? Viviana – She's like "whatever". Me – Why do you think it is important to your dad? Viviana – Because he wants me to go big. He mostly looks on me because my older sister, she is 18, she's not bound to go to college. And my older brother, he has low grades and he says he doesn't want to go to college or anything. And since I am the first one who does wanna go to college, he looks more at me. (...) Me – What does your mom think about school? Is only your father taking care of pushing about school? Viviana – Well, my mom thinks that anything higher than a C is better because she didn't go to high school so she doesn't understand it that much. (1st II – September 30th).
<b>Latinos: disidentifying selectively and setting distance in order to succeed</b>	Me: Do you think that some Latinas feel more negative pressure to do Mathematics? Rocío: Yeah... maybe Latinas that are more into the traditions of their culture. (2nd FG – October 7th)	Teresa: Like, my mom, before she got married, she was going to school, and she was doing this technology thing, I don't even know what it was, but with computers, and then she got married and then my dad, he started working, and they started to live together... But then she stopped going to school because she started to, like Rocío said, she started relying on my dad, and then my dad would say like he could take it [made a disgusted face], and that he didn't need help for anything, and... I don't know, but like, I think it depends on your will... as a woman. (...) Me – And what do you girls think about taking that kind of options? Teresa: I think it's the easy way out about math... but, I mean, math is always gonna be around. And you are gonna have to find it everywhere. And I think it's just important to have some knowledge of math. (3rd FG – November 19th)	Me: Do you think a lot of Latinos have access to that kind of program? Viviana: If they like look forward to it, because some Latinos know about the program but they are like "ew, that's boring!" cause they don't really think about college and stuff. (3rd II – December 2nd)

<p><b>Boys and girls Mathematics favoring boys' Mathematics even though "girls are as smart"</b></p>	<p>Rocio: So some boys can't even do that, like: they try to think, but they can't, about what they did. They do it so quickly they can't even process it.  Me: Why do they do it so quickly? Any ideas?  Rocio: I don't know.  Teresa: Just comes.  Me: What?  All of them together – It just comes.  Teresa: Comes naturally, I guess.  Mw: What about for girls? Why didn't it just come naturally as quickly too?  Rocio: Well, to me it does but... I learn differently so...  (2nd FG – October 7th).</p>	<p>Yeah. I have a lot of friends, like, guys that are in my class, they just open... They don't even need the teacher to explain. They just open the textbook, and they just start looking at examples really quick, and they are like "boom", they really quick got the idea(1st II – October 1st).</p>	<p>Viviana: Maybe because the guys are probably better at guessing and checking, they know that the answer has to be there, so if they do the problem and get it wrong, they can still try to find the closest one... 'cos that's what I do.  Me: So you do what the boys do?  Viviana: Yeah (laughs). And then the girls, they probably... they probably write down the problem.  Me: What do you mean by that?  Viviana: Like the steps, so they use things that they can remember.  (2nd II – November 4th)</p>
<p><b>The Mathematics:</b></p>	<p>Well... to some people, it [Mathematics] comes easier to them, for instance, me. It comes easier to me. And there is other people that they have to... they have to ask a lot of questions" (1st II – September 30th).</p>	<p>Teresa: Because a lot of people I know that they just know the answer, or they just do it in your head and can just write an answer real quick. But I actually go through all the steps, and make like a long list...  Viviana: Like text books (whispering).  Teresa: ... so I can actually understand it. [Motioned to Rocio and added:] Cause I know she will get the answer really quick, or she will do like short steps, and I need to see like all the problems to understand it.  (2nd FG – October 7th)</p>	<p>When we are young we do stuff the long way, but now there are like... formulas ad sure-ways, shortcuts...  (2nd FG – October 10th)</p>

Table 2 shows representative examples of what Teresa, Viviana and Rocío shared, showing not only the central topics that for all of them, but also how they thought about it in different ways. Even though the three friends experienced similar situations, and were in agreement in how they face those, there were different shades of colors in their comments. One clear example is the lack of help they from their parents: it made Rocío step up as a leader for her brother, but it made Teresa feel disempowered and at risk of becoming one of those “lower Latinas” she talked about.

**The common story.**

Viviana, Rocío, and Teresa have similar views or conflicts regarding both Latinos and women when considering Mathematics. The three girls navigated contradicting discourses that allowed them to stay true to a sense of Latino pride derived from their parents, and at the same time they allowed themselves an

image of success that was in concordance with that of the larger society. This meant a constant back and forward between these two discourses (the Latino culture and the dominant culture), depending on the situation. This negotiation they go through balancing home and school makes these cases singular. On one side they said that they wanted to show how Latinos could do it, could be successful in Mathematics, and get a higher education. They said they wanted to make Latinos proud by being the first ones in the family to graduate from college. But on the other hand they resorted to hegemonic narratives about Latinos being lazy, and blaming them for their failure in school. They based their words on individualistic narratives (Moore, 2008), where one can do what one wants to do. With their attitudes toward work, school, and Mathematics in particular, they distanced themselves from Latinos. They did not consider themselves to be the “typical Latino”, just as they did not consider themselves to be the “typical woman” either.

The case of women and Mathematics brought similar results as the one just described. There is a conscious effort to talk about women as equal to men, just as smart as them if not smarter, with similar set of skills, and who can do the same things men or boys can do. But when the focus of the conversation was not directed to the comparison between men and women, other narratives came out. Even though they considered boys (and in some cases, themselves) as problem solvers compared to girls, who do Mathematics the ways textbooks suggest, in the end Mathematics was reduced to the number of steps they used to solve exercises. The smaller the number, the more abstract they thought their thinking was, and

the happier they were with their Mathematics. According to the teacher, the Mathematics favored in the class was that of the textbook. Viviana, Teresa and Rocío all struggle a little with the problem I proposed to them, but were efficient solving an equation that we worked together. In our conversations it was apparent that they saw this as a limitation of their own with Rocío saying that she did Mathematics like boys did, and Teresa admitting that unlike boys, she was not good at real life applications of Mathematics, and that perhaps she had to change her style.

Viviana's, Rocío's, and Teresa's motivation to succeed as well as their potential to do Mathematics was undeniable. It was not only clear that they could fulfill the expectations of the teacher and school by being placed in an honors track, but they showed me they were good at what they have been taught. They were good at the kind of Mathematics favored in class, solving equations after they had been set up for them. They've been prepared for the Mathematics of standardized tests, so success on these tests will not stand in their way. Knowing the Mathematics the school system favors was not the only thing they knew.

They were aware that there is a different way of doing Mathematics and of the power of those various ways. The gender distinction between these ways of working out the Mathematics was apparent in many of their comments. Viviana, Rocío and Teresa knew what Fennema (1999) found regarding boys producing more invented algorithms and girls following taught strategies. Furthermore, they had decided that of those two sides, the boys' side was more beneficial. Though Fennema worked with younger children, Rocío, Teresa, and Viviana could still see

those differences between the Mathematics the two genders produced. Even though they failed to do Mathematics the way they claimed they did, they still knew this Mathematics was the type Fennema argued would have been more beneficial for the future schooling of the 8<sup>th</sup> graders. This issue is of even more importance considering their schooling history and the lack of variety in the type of Mathematics they've been exposed to. Therefore, the process of socialization into Mathematics these girls went through presented particular consequences for the three girls.

According to the stories the three friends shared with me regarding their previous Mathematics class and to what their current teacher told me concerning their current Mathematics instruction, Rocío, Viviana and Teresa have been exposed mostly to a traditional way of doing Mathematics. Cases like these are not hard to imagine, and the number of Latinas exposed to traditional Mathematics teaching is as important as the number of Latinas in middle and high school. With a teacher that would only lecture, and one that would work with practice exercises but not word problems, I argue the participants have “played the game” well and have learned how to do school Mathematics the way school demanded just like Clark Pope (2003) cases showed those high school students new the system and how to make it work for themselves. Succeeding in school Mathematics held many challenges for the girls, but achieved despite these issues. From succeeding on standardized tests to distancing themselves from societal stereotypes as Latinas, playing the game had many facets to grapple with. Even though this meant managing disparate, the contradictions did not stop them from

achieving in school. The possibility of success is still available at this stage of their Mathematics schooling. However, one may wonder how long this possibility will remain available to them.

**Research questions and answers.**

***Who do the participants think they are in relationship to mathematics?***

Even though the participants see themselves as skilled and able to do mathematics and use a meritocratic and individualistic discourse, it does not look like these girls have decided who they are in regards to mathematics, and they are still thinking and transitioning. This is not surprising, given their age, racial status, and gender in relation to these two factors. To succeed they had to navigate contradicting discourses. Sometimes they are proud Latinas, but when considering the success rate of Latinos in STEM, they feel the need to position themselves outside that group and say that Latinos (they) are lazy. Something similar happens when they talk about girls and mathematics. Even though they, at times, claimed girls are as smart as boys, confronted with their underrepresentation in STEM careers, the participants described the mathematics girls do as different from what they do, and aligned themselves with boys. This constant back and forth between conflicting discourses shows that in relation to mathematics the participants felt they had to distance themselves from their cultural background and even from some of their feminine side to succeed. It could happen that this constant navigation is necessary for them to stay successful in a STEM field, and then this navigation would be part of their identity, but observing Latinas through college and after that would be necessary to see whether this option is valid or not.

***How does that belief tie to their future educational opportunities, careers and job options?***

For all of the participants it was clear that success today in mathematics means financial security tomorrow. They see Mathematical success as something that will open doors for them in the future, and they perceived the success in Mathematics they have today as opening doors already. For example being chosen to participate in AVID was proof of that. The participants mentioned scholarships that they thought they would be eligible for because today they are Latinas in the honors track and excelling in Mathematics. The girls linked their success in Mathematics with the possibility of accessing jobs that will pay well. Success in Mathematics is one step, like college, to achieve that end.

***Do young Latinas see mathematics as a way to achieve social and political power?***

Mathematics was clearly not seen as a tool for social justice. As described in the previous section, Mathematics was viewed by my participants as a tool to achieve individual success and economic power. There is nothing linking Mathematics to a group goal. Considering the participants see themselves as part of a particular group depending on the situation, it would be hard for them to conceive Mathematics or any subject as a tool for achieving social and political power. Moreover, the Mathematics they were exposed to, did not make this connection evident, and it would be only in special programs like those conducted by E. Gutstein (citation) that students could have the chance to make this connection.

***What are the trade offs young Latinas face when successful in school mathematics in the U.S.?***

There are clear trade offs that the participants examined while talking, and also one that was not so clear that arose from the analysis of their discourse. For example, the participants stated that they have to sacrifice things they like doing,

like spending time watching TV, or hanging out with friends, in order to do their homework and succeed in Mathematics. This is linked to the idea of the control their parents exercise. The girls, although not happy about this, see it as a way for them to stay on track. There are also the sacrifices regarding their idea of what a girl is, and the “drama” they commented on. Mostly these are related to looks and appearance.

The analysis of their discourse uncovered that these girls are setting a distance between themselves and other Latinos or other girls to allow themselves to develop and maintain a positive and successful image in Mathematics. At time, they sacrifice part of their cultural background and identity. In particular they are setting distance between themselves and their families, sacrificing some of the ties they have to them. The case of the mother, as well as other women in the family is of particular interest. These young successful Latinas apparently do not perceive that they have any positive role model in their family, and they are trying hard not to resemble to the women in their families.

### **Latinas and Mathematics: the family.**

A topic that clearly appeared in the group and the individual interviews was the role of the family in their Mathematics success. Family support was clearer for some than for others, but in general, parents seemed to play an important role in the Mathematics schooling of these girls. This section consists of a summary of the different topics regarding family and school Mathematics that Rocío, Viviana and Teresa shared. The ideas and situations they describe appeared on more than one occasion, and it was clear this was important to them like the kind of support



they were getting at home, or having to help younger siblings with their Mathematics homework because no one else in the house could do it. They identified that support as one of the differences among themselves and other Latinas that are not as successful and parents were clearly a source of motivation for these girls. Teresa said:

Some parents don't really know, they don't get involved in their children's school, so they probably don't get that much help from their parents. But other parents do support their children in everything they do, so that's important, to have the support (1<sup>st</sup> FG – September 16<sup>th</sup>).

That support took different forms and an important type of support, academic, was lacking. This was a major issue for the girls, and in particular, Teresa was adamant about it. But it was clear that at home they were being motivated to do better in school and pushed through the Mathematics that could bring the kind of success they wished in their lives.

The girls were motivated to do better than their parents did. They wanted to make their families proud and reach goals their parents were not able to reach when they were educated. It seemed this was also the parents' dream. The parents showed that they cared in different ways and to different degrees. There is Rocío's father asking for translation of the material his daughter is learning so he can follow her progress closely. He competed with her on who can finish worksheets faster, preparing her for timed tests. Teresa's parents are a contrast. She expressed her wish that they would do more than just checking her grades. And in a sort of middle ground is Viviana's father, who sees in her the promise of a college

degree, and for that, keeps her on track as much as possible. But when it comes to support of more academic nature, the story is different.

The stories of the five girls coincided in the fact that they were not getting the academic support that they wished they could get, although they understood the reasons why this was happening. It was unexpected to discover how profound an issue this was for all of the girls. As vehemently as they claimed that anyone could find support if they search for it, speaking about the lack of support they were getting from parents in doing Mathematics homework appeared as a major contradiction. This issue took two forms in our conversations: having to pursue help outside of the house, and having to help younger siblings to cover what parents were unable to do.

The second form that this issue took was the responsibility they had to teach Mathematics to younger siblings. As clearly depicted in the stories of Rocío and Teresa, this added stress to their lives. Someone has to help the young children with their math homework. Because Rocío and Teresa did not think the parents could do it, they took that responsibility upon themselves but wondered why it had to be them. The consequence of they face of not getting any help with their own homework is that unless they help, their siblings will not get any academic support either. Parents were either unable or maybe considered the girls better equipped to help others with the Mathematics taught in school.

The Mathematics parents wanted to explain to their younger children was sometimes different than the Mathematics the participants of this study were explaining. This made for a kind of power struggle in terms of who was right and

whose Mathematics was accurate. The girls believed their parents got frustrated with the situation. The “right” Mathematics for the girls was not the one the parents brought to the house, but the one they are learning at school. This creates a disconnection between parents and school, with the children in the middle. Other authors already saw this issue. Civil et al. (2005) saw the frustration of parents who were not able to help children with their homework, and mention a “separation” between some of the children and their parents.

There is some distance between the girls and their parents. This is not something the girls think it is beneficial and that they are building up to achieve success. It is a situation they endure and that they wish it was different. Not having the help at home is considered as a problem. Competing with parents about whose Mathematics is the “right” one, takes away from that little help parents can provide, and alienate the girls from the home culture. And having to take care of their younger siblings places a burden on the participants that they take on differently, but that is not helping them in any particular way. They don’t take a lot from “home” into their Mathematics experience. It is more what they bring from their school Mathematics to their home. There is no loop of feedback, and this means a loss of a much needed perspective: that of the Latinos.

### **Latinas and Mathematics: Latinos.**

It is clear that the participants were aware of their race and that they received a message at home that said they needed to be proud of it. The efforts that Rocío’s father made when he told her not to hide her ethnicity when she needs to fill out forms at school by choosing “prefer not to answer”, speaks to the value in

identifying ethnically for him. But pride in stating that she is a Latina maybe lost when he also tells her he will send her back to Mexico as a punishment. This relays a message of Mexico (and by implication *Mexicans*) being lesser than, devaluing their ethnic heritage and using it as a punishment, as Mangual Figueroa (in press) also found with her participants.

All of the girls lectured me about being a Latina, how important it was, and how proud they were of that. They talked about making “their people” proud by achieving in Mathematics and obtaining jobs that will pay well. But who are “their people”? Who do they really want to make proud? And who is it that they want to show and prove that they “can make it”? Their discourse is vague at moments and some other times they are more precise and state that it is their family they want to make proud. They will be the first ones graduating from college, and not only is this a reason for celebration but it also carries the promise of a better financial situation to help parents and grandparents. What happens with other Latinos that are not as close as family to these girls?

Other Latinos, these girls said, are waiting to see them fail. Here is what Teresa said:

Teresa: It [the Latino community pressure] is negative mostly. It’s not that much of a positive. And if it’s positive one, it’s like your parents emphasizing it to you.

Me: Is there a pressure from outside of the community?

Teresa: It’s not as much as your... own people. And like thinking that your own people think of you like that, that you can’t do something, it’s just like

even harder than others. Because others you will be like “whatever”, but your own people should be telling you “you can do this.”

(2<sup>nd</sup> FG – October 7<sup>th</sup>)

The other girls in the group agreed with what Teresa was saying and she articulated how she felt about the Latino community in relation with her school Mathematics success. She thought other Latinos were expecting her to fail and that is clearly a reason to distance themselves from Latinos who have mostly failed themselves due to their bad decisions.

According to what Teresa, Rocío and Viviana shared, other Latinos have not made the right choices and being educated is probably not one of their priorities. There is a need to distance themselves from them and mark what the differences are instead of the similarities. This message comes through clear when Viviana’s father told her to be careful when she sees a “cholo” on the street, that he is nothing but another Mexican or Mexican descendent, that we see this distancing may have started at home.

The kind of expressions that showed this distance between the girls and the rest of the Latino community were mostly related to education. The conflict that comes with this selective identification with the Latino culture, similar to the identity bifurcation Pronin (2003) talked about was shown by expressions about the social and political situation of Latinos in the US and in the state in particular. In these expressions it was clear that girls were re-voicing what they heard at home, but also that meritocracy played a major role in blaming each individual for their failures, in particular, blaming Latinos for their “laziness”. But according to

what the girls shared in our conversations, the distance with Mexicans seems to be set from the beginning.

Latinos coming from Mexico are at a disadvantage according to the girls, because Mexican schooling is poor and sets them up for failure. Teresa expressed that schooling in Mexico is different. But looking more closely, she also stated that education is underfunded and Mexicans would be lucky if they could come to the States to be educated. Other Mexican American children in the position of my participants must consider themselves also lucky. Not taking advantage of that luck, and allowing themselves to fail has no excuse. They place themselves at distance from other Latinos and talk about them as an outsider, adopting the dominant culture narrative to talk about their own culture.

#### **Latinas and Mathematics: boys.**

The situation regarding the girls' ideas of who can be successful in Mathematics, and the success of boys, is similar to the situation just described for White people. When the 8<sup>th</sup> graders were discussing the situation of boys and girls directly, they would vehemently say that boys and girls are just as smart, and that believing otherwise was a thing of the past. They could not even imagine why in the past they would think differently. They agreed some places were more progressive than others regarding leaving those ideas behind. For example Mexico was a place that still kept those "traditions" alive especially if one compares it with the US. But when the conversation did not revolve around boys vs. girls but around the kind of Mathematics they were all learning, interesting ideas came to the surface.

Just like the previous section, the more revealing ideas about boys and Mathematics appeared when we were not focusing on gender, but rather when they were describing the Mathematics they were doing. The three girls described their Mathematics as different to that of other girls, aligning more to what they described as boy's Mathematics, or expressing a desire to move in that direction.

A male discourse for Mathematics came across the words of the girls, considering Mathematics something that should be done fast, that “comes to you naturally”, and where it is acceptable to be competitive. Struggling to conform social norms for girls and balancing the idea of competition, and the idea that we are all the same and there are no “losers”, the girls still admitted that competitions were something good to teach and learn Mathematics. But such an admission was followed by a struggle to highlight that we were all the same and no one was “above” anyone else. The collision of discourses even though was not addressed directly by the girls, was not unnoticed either. Their attempts to make it all fit highlighted the contradictions.

### **Latinas and Mathematics: the Mathematics.**

It was clear during our conversation that these girls were smart girls that had a clear idea of what they wanted and why they wanted it. Sometimes they didn't know exactly how to make the connection between those two things, but they indicated that they thought about it. Maybe it was because of the motivation they get at home, or because of the chance of being part of a program like AVID. Maybe the girls' inspiration was fed by being particularly well supported by the teacher they had. For whatever the reason, talking about the Mathematics they

were learning was not a hard thing and they were articulate about it and critical of what they were doing and why.

They knew that success in Mathematics they experience today will translate eventually to a college degree that will, in turn, put them in a position to earn money. Money was a big incentive. Some of them were shy to admit it at first, but after Viviana did so, it was easier to admit that there is nothing wrong to want to have the means to live a better life. They said they wanted to “be someone” or “be something”. They said they wanted to achieve something better than their parents did. Money was the big difference here. It is not hard to understand that these girls think that to “be someone” they need to have money and Mathematics is the key to opening that door. In these conversations we focused on Mathematics as well as academics.

Even though the girls made a distinction between the ways girls learn Mathematics versus the ways boys do, often subscribing to the latter, when talking about the Mathematics they were doing without focusing on boys and their methods, the girls described Mathematics as “textbook like”. For them this meant following steps, setting up equations, using memorized formulas, etc. This was indeed the way they chose to work on the Mathematics problem I proposed to them. They were more successful working on solving an equation than on solving a word problem, and they said that the fact that the equation was already set up for them was a factor on that. Writing up the equation from the words on the problem was an issue and they accepted and explained that to me. But also this description of their Mathematics, the one they actually do, also marks another



contradiction or negotiation of discourses: this is not the way they said boys did Mathematics, and they said they have managed to work differently to other girls and more similar to boys. They mention doing Mathematics in their head, like boys, disliking “the long way”. Yet this was exactly what they did. They showed a traditional way of doing Mathematics, and proved to be successful at it.

This traditional way of doing Mathematics that they showed and described is what they have experienced in school. The teacher confirmed that the use of word problems in her class was not common. She added she would have liked to work more with word problems, but that it was not possible when following the curriculum. She mentioned this right after the girls attempted to solve a problem in one of our meetings. Even though at certain level Rocío, Viviana and Teresa tried to distance themselves from this traditional Mathematics, this is what school has offered them.

## Discussion

Rocío, Viviana, Teresa, Daniela and Gabriela shared similar stories that showed how they navigated different narratives, and how that distanced them at time from their home culture and even their family or some aspects of what they thought to be “feminine.” They chose when to utilize a discourse or another depending on the situation. Hegemonic discourses proved to be more useful at the time of projecting a successful image of a mathematics student. But while directly talking about family, they opt for discourses about proud Latinos. Same thing happened when they were asked about girls and Mathematics: when talking about girls they made claims about girls and boys being as smart, but when talking about Mathematics the story was different. They described themselves as girls that do not think as girls, but that do Mathematics the way boys do.

Considering the kinds of experiences they shared, it is safe to say that these girls’ Mathematics experiences are different than those that White girls go through during their schooling in the US. Even though the proportion of Latinas versus Whites in my participants’ school is more balanced than in other urban schools in the US (31% White and 47% Latinos), participants were still underrepresented in the honors track they were part of. Only two other Latinos were part of their group, which put them in “the other” situation once more.

Latinos are not the dominant culture, and even if proportionally their numbers are growing in the population, positions of success and advantage, as represented by the honors track in the studied students’ school, still show underrepresentation. The intersection of race and gender, therefore, in the

shaping of these girls' mathematical identities, became evident because the girls were able to gauge their successes against the White norm. Their worries and goals were influenced by this intersection in ways one can only understand after taking extended time to hear their stories.

Their stories were also tied up to their relationships in their families. Parents were an important part of their schooling despite their lack of ability to help them academically. The parents' involvement in Mathematics, in particular, admits little doubt. Rocío, Teresa, and Viviana were motivated to achieve in part because of their parents. This is something that Ceja (2004), Civil et al. (2005), Civil et al. (2007) and Diez-Palomar and Civil (2007) found while working with immigrant parents. These authors talked about mothers that were interested in Mathematics workshops designed to help them learn what their children were learning at school to help them destroy barriers that they felt would add difficulties to their children's education. Their work with parents concluded something similar to what I found with Rocío, Viviana and Teresa regarding how hard it could be for Latino parents to help their children, and how a distance is set between them. The authors provided an example of a girl telling her father to do the calculations "right" when he did it following a different procedure than the one she learned at school. In their study as it is in this one, there is a conflict between the Mathematics parents can do and the one the children are learning at home, and if one is "right", then the other appears to be "wrong". One implication the authors found of this situation was a distance between parents and children that prevented the former to help the latter. In this study sometimes the participants wanted to be

better than their parents, to have a better life, to give back to their family, to help them. But it is understood that regardless of more or less involvement, these parents cared about the Mathematics schooling of the girls.

The participants' ideas on women, Latinos and Mathematics, as discussed previously, were all competing. Navigating two different discourses--one that appears to be initiated at home that is more acceptable in that context and in conversations with others of their culture of origin, and another that conforms to the dominant society--allowed them to develop attitudes of success in terms of schooling. The way this played out in our meetings was the girls talking about being and making Latinos proud, as well as asserting that women could do Mathematics just as well as men because they are all equal. Yet on the other hand, Teresa, Rocío and Viviana set a distance between themselves and other Latinos and also distanced themselves between their Mathematics and the Mathematics other girls produce. That distance was distinguished by their adoption of hegemonic discourses to talk about their home culture and girls' Mathematics as something they are not a part of. This study concurs with Mendick's findings (2005a; 2005b), but with younger Latinas, that doing Mathematics means doing masculinity for these girls. In her paper (2005b) the author expresses how socially the construct of "mathematical ability" is individual and masculine, making it harder for some girls to identify and succeed in it. But not all girls fall in that category. Girls like Rocío, who welcomes the idea of competition in the Mathematics classroom, one of the traits Mendick considers to be masculine in her paper, will do fine. Additionally in the case of Latinas, doing Mathematics

also means distancing at times from Latinos and the parents' culture on something similar to what Garcia Bedolla (2003) called "selective dissociation". In her study the author talked about Latinos setting some distance between themselves and sectors of the Latinos community that according to them could be blame for the negative attributions made to Hispanics.

Suarez-Orozco (1995) and Garcia Bedolla (2003) have discussed the differences between immigrants and Mexican Americans and how those distinctions define the relationships between the groups. Language is a critical issue, providing a dividing line to separate Latinos into groups depending on whether they are monolingual (Spanish or English), or bilingual.

For the generations of Latinos born in the US and for whom language is not a problem, being identified with immigrants can anger them. This anger is also linked to the negative image the media offers, something Viviana commented on when she said in the news Latinos were always the bad guys. As Garcia Bedolla said, Latinos, no matter their immigration status, consistently thought White people saw them as uneducated, dirty, stupid and lazy. It is clear then why Latinos born in the US would like to distance themselves from that group of people trying to build a more positive image of themselves.

In this study Teresa, Rocío and Viviana distance themselves from the Latinos community at times, depending on the situation and the role they are adopting. In their point of view, identifying with Latinos while trying to be successful in school Mathematics may work in different directions. At other times they still identify with the Hispanic culture, maintaining they want to make other Latinos

proud, and show others that Latinos “can make it”. But at the same time they eliminate from their definitions of themselves those traits of their culture they believe bring a bad name to it. While gendered Mathematics was embedded in the stories Viviana, Teresa and Rocío shared, the lenses of CRT and LatCrit allowed a view of their Mathematics experiences as racialized as well.

Allowing the participants to tell their story with Mathematics and school on their own terms, showed clearly how race and gender were pieces of a complex puzzle (Solorzano and Yosso, 2002). For the particular stories of Rocío, Teresa, and Viviana, as well as Daniela and Gabriela, being a Latina influenced the different experiences they went through learning Mathematics and how they chose to identify with the image of Latinas they had built. Focusing on their gendered and racialized experiences provided a good picture of what their Mathematics schooling looked like. Being a proud Latina for the participants did not include being lazy, something they claim Latinos were. Wanting to be successful in school and go to college so that later they could help their families, did not mean they did not subscribed to the idea that each individual can achieve whatever goal they set for him or herself, as long as he or she is willing to put the effort to it no matter what the social conditions are. The stories that were told in this dissertation showed that to be successful, the main characters had to manage different discourses that allowed them to be in touch with their Latino culture, but also to minimize cultural facets that they consider to be detrimental to their school success. It was clear that their success in Mathematics depended on this negotiation.

Learning Mathematics was a racialized experience because as they showed, their condition as Latinas made a difference every day by being one of the few Latinas in the honors track at their school, even when they went home and had no parent able to help them or their siblings. Doing Mathematics, and doing it well, made them consider things others may not have to, like whether or not those in power will help you, or like they said “put you down.” But they also had to put on their shoulders the responsibility of being the first ones in their families that were going to be successful in school, and prove to others that Latinas “can make it” in college.

Viviana, Rocío and Teresa had no doubt they will make it in college. But the more they thought of themselves as Mathematics practitioners and successful students who will go to college the less they considered themselves exhibiting traits of Latinas. They also dropped traits of being a girl; traits that in their own words were typical of girls like wearing make up or what one could consider gossiping. They did so because of their beliefs that identifying with those features would mean failure, a process that Pronin (2003) calls to “disidentify selectively”. In the author’s words: “disidentify with the aspects of one’s in-group, that are linked to disparagement” (p. 153). This was clear when they claimed other girls were “dramatic” when they were referring to how much they care about looks instead of schoolwork. They were clearly navigating the binary presented by Mendick (2005b) of being emotional vs. being ordered and rule-based. Mendick (2005a; 2005b) explores how girls move away from practices that they consider to be typical of girls (like getting ready in the morning to go out, or think a week in

advance to go to a party) as part of their way to create a successful identity in Mathematics. Other girls are dramatic and do Mathematics in a textbook-like manner, but they do not follow those traits. Or at least that is how they presented themselves. They go so far as to consider that the sides of themselves that create distance from other girls and Latinos, are the same traits that allow them to succeed.

They considered themselves different to other Latinas, and that is part of their success. Adopting at times a racialized discourse distancing themselves from Latinos is their secret to achieving in Mathematics. They describe White girls in their class who can learn Mathematics even faster than they do. They also describe boys in their class who can do Mathematics fast, in their head, working with real life application problems. And they talk about Latinos being too lazy to succeed. Then, they position themselves as fast learners, who can also do Mathematics in their head, who like the challenge of a problem. That which they described as White and male is what they also say is part of their success. The White male is embedded in their ways of talking about themselves as successful Mathematics students. This is that they are aware of. It is something that they conceive so they can reach their goals. They do not consider themselves common Latinas.

### **Where shall we go from here?**

In this section different paths of research are suggested that arise from the findings of the study. First, there is a need for studies investigating ways in which



the whole family can act together to eliminate that frustration that appears to be on the side of parents and children when it comes to Mathematics schooling. But for that it will be necessary to know more about the struggle *parents* go through.

Second, there is a need to target parents' narratives about Mathematics success to see whether they are also divided. Next, I suggest on studies to find out how to make the teaching of Mathematics for social justice more efficient, in an attempt to provide Latinas with an empowering conception of Mathematics. And lastly I review the need for research projects that continue to study the process Latinos go through navigating contradicting discourses in for school Mathematics, detailing how and when this contradiction starts, how long it lasts, and what the consequences are.

Researching ways that parents can be helped so they can do the same with their children is a must. Parents, like those of Rocío, who undeniably care about the education of their children and want success for them in school and especially Mathematics, need to be approached and heard. Respect for their form of Mathematics as well as recognizing the powerful tool it can be is an aspect of this process. The field needs to investigate what these parents have to say so they can be better served. Knowing what they know, how they know it, and how they wish to help, can transform their relationship with their child regarding school mathematics and their role as a helper for their daughters. Knowing their mathematical knowledge is the first step in a process of developing programs for increasing the communication between parents and children. This adjustment should not all be on the side of parents, however. School Mathematics needs to

adjust to their needs as well. This could mean adjusting to their language, schedules, and previous knowledge of Mathematics among others issues. What these adjustments are, and how they could be made are questions yet to be answered. This issue is not just a matter of teaching the current Mathematics curricula to parents, but to learn from them and use their background and experiences as resources, giving parents some of the control they have lost and most importantly, providing their children with much needed help at home. Acknowledging that frustration goes both ways, and that children suffer as much as parents do because they are put on different sides of Mathematics and schooling is also critical for this work. Working with parents and children at the same time, keeping everyone on the same side with the clear motivation of advancing in Mathematics while providing piece of mind to whole families, is one place that the field needs to go.

The field also needs to study if the parents navigate the same, contradicting narratives, as their children, and how those conflicts can be avoided both on their side and on the girls' side as well. Young Latinas with the clear potential to achieve in Mathematics should have the option to keep their home culture as a resource as well as their femininity. Maybe that could establish a feedback loop between Mathematics and the everyday lives of these Latina students, each supporting the other, integrating discourses rather than positioning them at odds. For that to happen, the field needs to focus on these students, their lives, and the ways they are experiencing Mathematics.

We need to investigate ways schools can connect Mathematics to the real

experiences of Latina students have, their culture and their struggles, and observe whether they can think of Mathematics as a tool for something more than solving a preexisting equation. Teaching Mathematics for social justice could provide girls like those in the study with the opportunity of learning it more meaningfully while at the same time critically question those conflicting narratives they navigate.

This study suggests the need for studies that reveal about the struggles Latinas go through. The field can benefit from knowing when and how these girls start managing such different discourses. To know when Latinas start choosing *not to identify* with some traits of being a Latino and a woman, and *who and what are the biggest influences* they have at the time of making that decision can change the way we think how Latinas should be educated in Mathematics--if we want to change the rate of their participation on STEM careers. More importantly, we need to understand the role of time in this process and when the key moments of identity development occur and how they can be fostered for both strong racial identity and mathematical identity. If situations like those of Rocío, Viviana and Teresa are common to Latinas succeeding in school Mathematics in the middle grades, studies are required that help us explain better which girls will continue and which ones will forego mathematics in their future educational and occupational goals.

The use of feminist approaches, LatCrit and CRT proved to be ideal for this kind of study. It provided a space to hear the voice of women of color. In this space they were not “the other,” and by talking about their experiences, they

showed us the ways in which they dealt with that condition of “other.” Studies like this are a beginning in opening similar spaces to have conversations with Latinas, to challenge the conflicts discussed, and to clearing out the blindness to issues of race and gender surrounding their own Mathematics schooling. This would validate their experiences and culture so they do not need to change themselves in order to “belong” with no need of the masks that Mixpe Ley (2006) talked about. Using the intersection of race and gender as categories of analysis helped shed light on the fact that the Mathematics schooling these girls experienced is racialized and gendered instead of colorblind and objective like some claim it to be. It also helped in observing the strategies Latina girls use to achieve success in Mathematics and uncover the selective disidentification they are engaged in. Again, this further raises the question of how long it is possible for these girls to maintain this dissonance and sustain a high level of success in Mathematics before opting out.

How long can students that achieve like Rocío, Viviana and Teresa, continue to do so under these circumstances? We now know there are sacrifices these students are making; we need to take one step forward and observe when those sacrifices are no longer sustainable and how they push capable Latinas out of STEM fields. There is no doubt today that Latinas have the potential to be part of those careers. We know now that their Mathematics schooling, although successful, pushes them to situations that are complex and contradictory. By finding the ways to circumvent these contradictions, so they play less of a role in their Mathematics schooling, we may uncover a way to add diversity to STEM

careers as well as providing underrepresented populations with the opportunity to achieve their dreams.

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