Promoting Mathematical Competence & Confidence in Latina Preservice Teachers

Examining Home & School Experiences

Cynthia Gautreau, Lisa Kirtman, & Andrea Guillaume

This article presents the activities and results of an American Association of University Women (AAUW) Campus Action Project designed to promote Latinas' mathematical confidence and competence in teaching elementary mathematics. The project explored how school and family experiences contribute to Latinas' sense of self efficacy as teachers of mathematics in elementary schools. Through analysis of their personal histories as they intersect with mathematics, and the patterns found among those histories, Latinas pursuing careers in education explored issues of confidence as they relate to both teaching and learning mathematics.

The goal of the project was to ensure confidence and self efficacy among Latinas in order to enable them to encourage powerful mathematics learning and confidence in their own students. Participants' experiences suggest improvements and inclusion for K-12 and teacher education as well as ways to promote and connect learning to at-home experiences.

Different Student Groups, Different Mathematics Education Experiences

A large body of research as well as state and national achievement results underscore the disparate nature of the mathematics educational experience and its outcomes for specific subgroups of the U.S. student population. Gender is one example of such a set of student population sub groupings. Despite the fact that male and female aptitude for mathematics is equal (Spelke, 2005), past achievement data indicate slight differences between male and female achievement.

Although the results of the National Assessment of Education Progress (NAEP) reveal that since 1973 mathematics achievement for nine-year-olds has been similar for girls and boys, by age 17 males have, in the past, outperformed females slightly in mathematics (U.S. Department of Education, 2008a). Fortunately, meta analytical findings conclude that overall gender differences in mathematics are trivial (Hyde, Lindberg, Linn, Ellis, & Williams, 2008). However, Hyde et al. do note that national achievement data suggest that differences in one critical subcomponent of mathematics achievement—complex problem solving—seem to favor males.

Additionally, despite the fact that girls and boys currently take advanced mathematics courses at about the same rate, boys still pursue certain Science-Technology-Education-Mathematics courses (such as physics) at higher rates (NSF, 2006). Finally, families appear to encourage boys more strongly in mathematics than they do girls, and fathers appear to have a strong influence on whether girls come to love mathematics (Jacobs, Davis-Kean, Bleeker, Eccles, & Malachuk, 2005). Thus, even in the face of similar mathematics aptitude and achievement based on gender, it appears that gender-based stereotypes still plague U.S. learners, their families, and educators (Cavanaugh, 2008).

Race and Ethnicity

Students also have different mathematics experiences based on race and ethnicity. Although children of color bring to the kindergarten classroom "the same basic intellectual competencies in mathematical thought and cognitive processes as their White counterparts" (Walker & McCoy, 1997, p. 71), performance gaps in mathematics are found between students of color and their White peers.

For instance, in California, although 58% of seventh-grade students' performance levels were proficient or advanced, 32% of Latinos performed at proficient or advanced levels, and just one quarter (26%) of Black seventh graders achieved proficiency (CDE, 2009). National data indicate similar disparities. Although the 2008 NAEP data show a slight narrowing of the achievement gap since 1973 for nine-year-olds, there is still a 16-point gap in achievement between Hispanic students and White students and a 26-point gap between Black students and White students (U.S. Department of Education, 2008b). By the time students hit 17 years of age, the Hispanic/White gap increases to 21 points, and the Black/White gap to 27 points. Given the fact that aptitude across races and ethnicity is equal, how do we account for such differences?

Many factors appear to contribute to the differences in academic performance associated with race and ethnicity. Some researchers focus on students, what they bring to school, and how that influences achievement. For example, some researchers (Cocking & Chipman, 1988; Cornelius-White, Garza, & Hoey, 2004) emphasize that factors affecting Latino achievement include motivation, entry level knowledge, family support, opportunities to learn, and attitude.

Self-efficacy, or the belief that one can work toward a set of goals to achieve success, is also related to academic achievement. Despite the fact that Hispanics come to school with aptitude equal to that of their peers, Hispanics tend to have lower self-efficacy in mathematics (Stevens, Olivarez, & Hamman, 2006). And self-efficacy tends to function differently for different

Cynthia Gautreau is an assistant professor and Lisa Kirtman and Andrea Guillaume are professors in the College of Education at California State University, Fullerton,

ethnicities. For instance, Stevens, Olivarez, and Hamman found that the theoretical model that adequately explained their White participants' mathematics self efficacy was inadequate for explaining that of their Hispanic participants.

Another study found that Hispanic students' self-efficacy was influenced more by their past performance than was the case for their White peers (Lan, Olivarez, Stevens, & Tallent-Runnels, 2004). Thus, a number of "personalogical" factors contribute to the mathematics experiences of students. These factors alone, however, do not account for the differential experiences of our students.

Structures of Schooling

The structures, patterns, and activities of schooling also contribute heavily to students' mathematics experiences. Kozol (1995) and countless others have argued that inadequate and inequitable funding of schools serving primarily African American and Hispanic children contribute to achievement disparities. There are structural features of schools that sort students into groups that experience different opportunities. Thus some individual students are not given options that allow them to achieve to their fullest potential (Bourdieu, 1975; Bowles & Gintis, 1976; Oakes, 1988).

In addition, some scholars maintain that practices *within classrooms* affect students' later success. Valiente (2008), for example, emphasizes the importance of the interaction between a student's background and the learning context:

> The analysis of the learning process in different cultures highlights that both a learner's previous experience and the context in which learning takes place significantly condition the development of their preferred styles… (p. 74)

Those interactions often do not contribute positively to students' experiences. Valenzuela (1999) argued that schools can have a "subtractive effect" on Latino/as success by stripping away important social and cultural strengths and exposing them to academic failure.

Delpit (1988) also argued that predominant teaching methods do not explicitly allow children to know what is expected of them for later success. Thus the influence of school experiences in mathematics is strong and, in many cases, not entirely positive for subgroups of the student population such as females of color.

Societal Patterns

Finally, societal patterns at large often place children of color at a disadvantage. Societal factors such as racism have been linked to the underachievement of children of color and girls:

> Racism has been shown to diminish affected individuals' academic and social development, self-esteem, and personal feelings of competency, [and] women and girls of racially marginalized groups are discriminated against in the labor market, political realm, educational system, and judicial system. (APA declaration, 2001, p. 2 & 3)

Ladson-Billings (2006, 2007) argued convincingly that differences in student achievement are the result of a number of societal inequities that extend throughout our nation's history and across its many institutions, creating a cumulative *education debt* that threatens the success not only of our students but of our nation. This debt, she argued, must be paid down.

Suggestions from Research

What have researchers suggested in order to ameliorate the problem of inequities in schooling? How have they suggested we pursue, in essence, the hard work of paying down this debt? Some earlier researchers like Rist (1973) have argued that increasing teacher expectations is the key to improving student achievement. Others such as Hale (1994) have discussed the importance of culturally relevant curriculum. Slavin and Calderon (2001) have argued that successful programs for Latino students must build on students' linguistic and social assets. One way of building on students' assets involves making positive connections between school and family.

Some research suggests that recently immigrated Latino families find a disconnect between their wishes for success and the realities of schooling. Galindo (2007), for example, found that Latino parents had higher expectations and confidence in the education system than non-Latino participants. However, Latino parents were less involved in school functions as demonstrated by their participation and attendance. Latino parents also reported providing less support at home in mathematics.

Quiocho and Daoud (2006) found that, despite Latino families' high expectations for their children's achievement and desire to be more involved in the school community, some teachers had negative perceptions of them, and Latino parents often felt excluded. However, this state of affairs is not inevitable. When they reach out to families, educators can positively influence the learning experience.

Positive outcomes have been reported in K-12 programs that promote school and family connections where elementary and high school educators can establish an effective rapport among Latino families and schools. Rosario (2006) notes that family connections and student leadership programs where students feel empowered and in control of their education promotes academic achievement among Latinos. Cooper, Denner, and Lopez (1999) emphasize that "Teachers—from any ethnic background—can also act as cultural brokers who help Latino children to succeed in school and to achieve their dreams" (p. 52). Teachers can implement curricula that includes connections to future careers, college requirements, and academic success.

Another recommendation is to involve parents in their child's education experiences by including them as guest speakers, experts, and valued contributors. Similarly, the Achievement for Latinos through Academic Success (ALAS) program has shown success in reaching parents and promoting family involvement in education (Institute of Education Sciences, 2006). Civil, Bratton, and Quintos (2005) experienced success in working with Latino families in mathematics through a collaboration of the roles of parents, learners, teachers, and leaders. A common thread among successful programs is the respectful recognition of the strengths of all parties and the empowerment of families to help foster children's mathematics success.

A Silencing Effect

In summary, we find that schools tend to silence the voices of Latino families as well. Although schools tend to have a silencing effect for all students in mathematics, the problem is particularly pronounced for women, especially women of color. Finally, those who speak languages in addition to English seem to be placed at special risk in schools.

We find a paucity of public school mathematics experiences that amplify women's voices and experiences in ways that allow them to become successful teachers of elementary mathematics. Further, we find a general lack of realization or utilization of the powerful results that can occur when schools draw Latinos into the culture and practice of mathematics education at school. Fortunately, we have seen places where

those pockets of excellence exist, and the potential for success looms large.

The Opportunity: AAUW, CAP Grants, and CSU Fullerton's Project

A report issued by the AAUW (Corbett, Hill, & Rose, 2008) details the achievement gap related to race, ethnicity, and family income rates. The report further explores the income gap among men and women. Despite earning college degrees, women continue to earn less than their male counterparts. This disparity in salary is partly based on the career paths that women tend to select, as fewer women pursue careers related to many areas of mathematics, science, engineering, and technology (Acherman-Chor, Aladro, & Gupta, 2003; Corbett et al., 2009; Stevens, Olivarez, & Hamman, 2006). Thus the AAUW established Campus Action Project grants as a means to provide start up funds for campus programs to empower women and improve academic outcomes.

Project Rationale

In an effort to address several of the concerns noted in the AAUW report, we developed a Campus Action Project (CAP) in order to explore these issues of mathematics education, instructional methodologies, and the divide that occurs between home and school for Latinas. Our university campus is considered a Hispanic Serving Institution as 28.1 percent of our students are Hispanic (CSUF, 2008). The four participants in this study were Latinas enrolled in a bilingual cross cultural language and academic development (BCLAD) credential program.

The AAUW accepted our project partly because we proposed to address the dispersion effect, that is, that there was a wide range of individuals who would be directly impacted by the results of this project. Those affected included pre-service teachers, professors, and elementary students. Furthermore, our project addressed the needs of pre-service teachers and provided them with an opportunity to share their education stories as told from their point of view—in essence providing them with a voice.

What made this project unique was that it afforded pre-service educators time to discuss their math histories in detail while offering a safe place to share with other like-minded individuals. This created a forum to explore their successes as well as an opportunity to develop promising practices for the Latino elementary students they would teach.

Project Design

In order to address the goals of the CAP program and the needs of California's students and teachers, we designed the CSUF Campus Action Project to be multifaceted in its approach. Our aim was to empower participants to identify and address the barriers often faced by Latina teachers with faculty members serving as co-participants. The project included the following components:

- Regular scheduled meeting sessions with participants leading the way in identifying issues and developing a plan to address them.
- Opportunities to build a community of participants through low-anxiety activities such as mathematical games and the sharing of meals.
- Examination of participants' mathematics histories, including in-school and out-of-school factors that contributed to participants' views of themselves as mathematics learners and teachers (with data to be analyzed qualitatively).
- Selection and provision of mathematics manipulatives for participants' classrooms.
- Development of a web site with participants' strategies for improving mathematics instruction for California's elementary students.
- Presentation of the project's findings at the National Conference for College Women Student Leaders in Maryland.

As part of our CAP grant, we also conducted an interpretive study to explore the relationship that Latinas have with mathematics.

Participants

Our four participants were pre-service elementary teachers enrolled in a mathematics methods course. The women were seeking initial certification in elementary education (via multiple subject credentials) with bilingual (Spanish) authorization. Given state requirements, each participant had previously completed an academic major (these were not in education) and was required to prove "subject matter competence" in mathematics and other subjects through an examination.

They had also each passed a state test of basic skills in English and mathematics. Three of the four participants were born outside of the U.S. Three of the four participants were from Mexico and one was from Guatemala. All of the participants attended U.S. public schools during a portion of their K-12 experience, and all of the participants were first-generation college students.

These student participants were joined by three faculty members who were also the grant leaders. The faculty leaders were CSUF mathematic methods instructors with interest in issues of teacher development, equity, and mathematics education. One (Gautreau) taught the participants' mathematics methods course and is of Mexican heritage. Kirtman is African American and Guillaume is White. All three faculty members are female.

Data Sources

Participants supplied two sources of data for analysis. Before formal mathematics methods instruction began they submitted electronically their personal histories with mathematics. They were to consider, as far back as they could remember, both in-school and out-of-school experiences, including family members, friends, school personnel and experiences that had a strong effect (either positive or negative) on them with respect to mathematics. They were not given any limitation on length. This assignment is a requirement for the mathematics methods course.

In addition to the personal histories, four of the regularly scheduled CAP project meetings were recorded and transcribed. These sessions allowed students to engage in a discussion and brainstorming session to determine obstacles that adversely affect the progress of women in mathematics and to consider promising practices for educating Latino elementary students in mathematics. Informal data sources included faculty member's field notes, planning and post-meeting conversations, participants' drawings, recorded messages to future teachers, and their presentation for the project's final formal meeting. Participants also collected and analyzed elementary students' drawings about mathematics.

Analyses

Data were analyzed through standard content analytic procedures (e.g., Bogdan & Biklen, 1992; Miles & Huberman, 1994).

As advocated by McMillian (2007), we used multiple sources of data to help improve credibility. The researchers reviewed the histories and transcribed sessions. Data were analyzed for themes using frequency counts. The themes most prevalent were reviewed and discussed with the study participants for accuracy.

Latinas and Lumberjacks: Findings and Implications

Our findings fall into three categories:

1. Home-school disconnect,
2. Playful curriculum, and
3. The power of teacher communities.

Home-School Disconnect

In several grade levels (particularly grade three), California students study folk tales. Participants in this study—all reared in the dry deserts of Southern California—told vivid and humorous stories of confusion about when their elementary teachers read numerous stories about a giant lumberjack (Paul Bunyan). The participants recalled having no context for understanding the concept of "lumberjack" and no rationale for appreciating the role of the stories in U.S. history and traditions. These lumberjack stories became a common touch point as participants explored the disconnect between the elementary school curriculum and the students' lives and experiences.

Previous writers, too, have noted the importance of realistic contexts (including home) for the learning of mathematics. Boaler (1993) argued

> Genuine understanding which allows for the appreciation of links between different situations will only come about if students are encouraged to communicate, challenge and negotiate mathematics…School mathematics remains as school mathematics for students because they are not encouraged to analyze mathematical situations and understand which aspects are central. When using their own self-generated methods students transfer from one situation to another because these methods are meaningful to students; the methods learned in school often are not. (p. 12)

The preservice teachers in our study clearly experienced a disconnect between mathematics at home and mathematics at school. Although in retrospect they now understand that they participated in mathematics-related activities at home and at school, while they were in school they did not make that connection. As one participant noted,

> My mom let me pay for things. I didn't see that as a part of math; there was no connection between home and school. It was totally different. It wasn't until I became older.

Another participant noted,

> Dad could add fast, was a mechanic, but never made the connection to math. Did not think he was good at it. He didn't think he could help. So they stop helping in the 3rd or 4th grade.

Mirroring an activity from a CAP meeting, participants asked the upper-elementary-grade children in their student teaching placements to create drawings in response to the prompt "Draw a picture of you and mathematics." Participants' analysis of these drawings suggested that today's students may be experiencing a similar lack of connection between mathematics and their own lives, as the majority of the drawings showed students sitting in classrooms completing rows of exercises such as addition, subtraction, multiplication, and division. Only a few of the drawings showed the students using mathematics in non-school contexts such as cooking, building, playing games, or sports.

The disconnect between school and home mathematics prevented our four participants from understanding how mathematics was relevant to their lives and why they needed to learn it. From these experiences it is clear that:

1. Teachers need to realize that students do complete mathematics-related activities at home,
2. As a result, teachers can build on this background knowledge if they get to know the students and their environment, and
3. Teachers need to help parents and students label home activities as mathematics activities.

In addition, the participants made it clear how important family was to them on many levels. These connections are critical to allowing parents to feel more connected to school and homework as well as helping students make real-life connections to their personal experiences.

The concerns expressed previously were exacerbated by the fact that many times the teachers did not make attempts to understand and relate to the students' community. Gutstein, Lipman, Hernandez and de los Reyes (1997), when studying culturally relevant mathematics in a Mexican American context, stated that strong teachers

> . . . build connections with families to create classroom cultures that mirror students' own or that teachers build on students' first language as part of a curriculum of empowerment and as a way to promote cultural excellence and biculturalism. (p. 733)

Similar to the conclusions of Gutstein, et al., the participants in our study never argued that teachers need to be of a particular race or from a particular community to be able to relate to the students. They did all agree, however, that attempting to understand the community and connecting home and school was essential for making mathematics understandable. One participant said,

> the teachers would just teach and not relate things. It was not even like tapping into prior knowledge. Or even front loading the vocabulary. They just assumed that I knew these things because everyone else in the class did. So it was like "let's read a story about lumberjacking."

Participants felt strongly that assignments must relate to students' lives. If students' background experiences do not match schools assignments, tasks such as word problems cause confusion and inhibit success. Participants concluded that teachers need to get to know their students, communities, and backgrounds so that they can determine how to structure and present instruction and assignments in ways that make them accessible to students.

One participant stated that

> . . . teachers need to be ambassadors because you want the teacher to provide access to this other world. But they also have to know the world the students are coming from.

In short,

> Another important insight for us is that by demonstrating solidarity with students, whether or not they share the culture, teachers may create educational settings in which students, families, and teachers can be allies in a common effort. (Gutstein, Lipman, Hernandez & de los Reyes, 1997, p. 733)

Playful Curriculum

To build community, we started many CAP sessions with games that were intended to develop logical mathematical thinking regardless of participants'

language skills, and we provided these games to the teachers for their own use. Examples include *Blokus* and *Set*. Game playing reinforced participants' own notions of effective teaching and learning in mathematics.

The four pre-service teachers feared that both for themselves and for the students they were currently teaching, the standards-driven, high-accountability curriculum was devoid of opportunities for students to enjoy learning through interaction, problem solving, and play. Games help break down barriers, engage students, and inspire students to behave within given expectations. The participants noted the importance of games in teaching students:

> When I first started student teaching what I did was I incorporated a lot of games, and they used to get excited and make up more, and I'd tell them, "no keep on going!" It was an hour long. So I noticed that if you're engaging and they find you interesting, they'll learn more. Versus if you're just, "Okay, come on, take out the worksheet." When math is boring students shut down.

Educational games allow all students to participate in a non-threatening way no matter what language they speak. In addition, game playing in mathematics reinforces skills without using rote memory techniques and it helps with problem solving.

Underscoring this concept, Ke and Grabowski (2007) indicated that:

> . . . game playing was more effective than drills in promoting math performance, and cooperative game playing was most effective for promoting positive math attitudes regardless of students' individual differences. (p. 247)

Power of Teacher Communities

One of the major sets of findings and implications from our study is the importance and power of teacher communities. The participants grew by listening to each other's experiences and reflecting on them in order to address insufficiencies in schooling practices. Through regular, interactive meetings that occurred over time, our participants built a community that allowed them to analyze currently unexplored experiences and apply them in order to improve mathematics learning in their own classrooms.

In her reflection, one participant wrote that, through the project, she built a new understanding of herself as a Latina and as a teacher:

> This new understanding of where I fit in society as a Latina Woman will be extremely important when I teach. This means that I have to consider the extra obstacle that my girls are facing and will be facing as they are learning, especially when they are learning mathematics because it is a subject that it has already been stereotyped as easy for boys only.

McLaughlin and Talbert (2001) have argued that teacher communities provide an ongoing venue for teacher learning. Our work has similar findings and, as a result, we suggest that teacher educators strive to foster and maintain communities of mathematics teachers and learners through their methods classes, out-of-class gatherings such as those from this project, as well as in virtual communities.

Such meetings can provide opportunities for teachers to uncover school and home influences on their own mathematics learning, to analyze the shortcomings and strengths of these experiences (particularly in light of trends like those discussed in the background of this article) and to invent new, more equitable practices for today's young mathematics learners. This became a very powerful learning mechanism for our students. They discovered that they were not alone in their feelings and experiences, and they realized that together they could make changes.

One participant commented that,

> Bringing all our struggles in math to light through discussion, presentations and through the video interviews, I have become aware of a common fear that most Latinas have toward math. I will use what I have learned to create an environment that positively promotes the learning and use of math in my classroom.

Reflection in a safe group discussion forum allowed students to acknowledge the impact of negative instruction while determining how to utilize more positive instructional methods.

Conclusion

This Campus Action Project underscores an important agenda for mathematics teaching and learning—specifically that home and school connections must be made. Because the main limitation of this study was the small number of participants, we suggest that the research be repeated with larger numbers of pre-service teachers. This limitation, however, does not make the implications any less relevant.

On a broad level, the research suggests the need for a focus on Latinas and mathematics in teacher education. Further we suggest that future studies should not be limited to pre-service teachers. Such research needs to determine ways to impact the relationship between the Latino parents and the schools. Finally, more research needs to be developed in order to continue to address the causes of differential performance in mathematics and science of school-aged children.

In addition to the broad issues that this work addresses, the research clearly points at the need for reflection. Reflection must occur not only for pre-service teachers, but also for their K-12 students. Data collection strategies such as surveys, drawings, oral histories, journal writing, photography, video projects, and informal conversations can all provide information for reflection. Data collection strategies such as these allow schools to connect with home and community and only through an analysis of these efforts can a strong relationship be developed between home and school.

References

Acherman-Chor, D., Aladro, G., & Gupta, S. (2003). Looking at both sides of the equation: Do student backgrounds variables explain math performance? *Journal of Hispanic Higher Education, 2*, 129-145.

American Psychological Association (2001). *Declaration.* UN World Conference Against Racism, Racial Discrimination, Xenophobia and Related Intolerance. Prepared for the Third Session of the Preparatory Committee. Durban, South Africa.

Boaler, J. (1993) The role of contexts in the mathematics classroom: Do they make mathematics more real? *For The Learning of Mathematics*, *13*(2) 12-17.

Bogdan, R. C., & Biklen, S. K. (1992). *Qualitative research for education: An introduction to theory and methods*. Boston: Allyn & Bacon.

Bourdieu, P. (1975). Cultural reproduction and social reproduction. In J. Karabel & A. H. Halsey (Eds.), *Power and ideology in education*. (pp. 487-511). New York: Oxford University Press.

Bowles, S., & Gintis, H. (1976). *Schooling in capitalist America: Educational reform and the contradictions of economic life*. New York: Basic Books.

California Department of Education. (2009). California Standardized Testing and Reporting (STAR). Three charts retrieved December 3, 2009 from http://star.cde.ca.gov/star2009/ViewReport. asp?ps=true&lstTestYear=2009&lstTestType=C&lstCounty=&lstDistrict=&lstSchool=&lstGroup=5&lstSubGroup=78; http://star.cde.ca.gov/star2009/

ViewReport. asp?ps=true&lstTestYear=2009&lstTestType=C&lstCounty=&lstDistrict=&lstSchool=&lstGroup=5&lstSubGroup=80; http://star.cde.ca.gov/star2009/ViewReport.asp?ps=true&lstTestYear=2009&lstTestType=C&lstCounty=&lstDistrict=&lstSchool=&lstGroup=5&lstSubGroup=74

California State University, Fullerton (CSUF). (2008). I*nstitutional research and analytical studies percent distribution of student ethnicity*. Retrieved December 4, 2009 from http://www.fullerton.edu/analyticalstudies/ethnicity/ethpie084.pdf

Civil, M., Bratton, J., & Quintos, B. (2005). Parents and mathematics education in a Latino community: Redefining parental participation. *Multicultural Education, 13*(2), 60-64.

Cocking, R. R., & Chipman, S. (1988), Conceptual issues related to mathematics achievement of language minority children. In R. R. Cocking & J. P. Mestre (Eds.), *Linguistic and cultural influences on learning mathematics* (pp. 17-46). Hillsdale, NJ: Lawrence Erlbaum Associates.

Cooper, C., Denner, J., & Lopez, E. (1999). Cultural brokers: Helping Latino children on pathways to success. *Future of Children, 9*(2), 51-58.

Corbett, C., Hill, C., & Rose, A. (2008). Where the girls are: The facts about gender equity in education. Retrieved December 4, 2009 from http://www.aauw.org/research/upload/whereGirlsAre.pdf

Cornelius-White, J. H. D., Garza, A. C., & Hoey, A. T. (2004). Personality, family satisfaction, and demographic factors that help Mexican American students succeed academically. *Journal of Hispanic Higher Education*, *3*(3), 270-283.

Delpit, L. (2006). Lisa Delpit. Retrieved August 22, 2006 from http://www.2souls.com/calendar/_March/ lisa_delpit.htm

Galindo, C. L. (2007). Latino students' parental involvement and family and school partnerships: Effects on math achievement in kindergarten. Paper presented at the annual meeting of the American Educational Association, Chicago.

Gutstein, E., Lipman, P., Hernandez, P., & Reyes, R., de los. (1997). Culturally relevant mathematics teaching in a Mexican American context. *Journal for Research in Mathematics Education*. *28*(6), 709-737.

Hale, J. E. (1994). *Unbank the fire: Visions for the education of African American children*. Baltimore, MD: John Hopkins University Press.

Hyde, J. S., Lindberg, S. M., Linn, M. C., Ellis, A. B., & Williams, C. C. (2008). Diversity: Gender similarities characterize math performance. *Science, 321,* 494-495. DOI: 10.1126/science.1160364. Retrieved December 3, 2009 from http://www.sciencemag.org/cgi/content/full/321/5888/494

Institute of Education Sciences. (2006). *ALAS: Achievement for Latinos through academic success. What Works Clearinghouse Intervention Report.* Rockville, MD: What Works Clearinghouse. (ERIC Document Reproduction Service No. ED493773)

Jacobs, J. E., Davis-Kean, P., Bleeker, M., Eccles, J. S., & Malachuk, O. (2005). 'I can, but I don't want to': The impact of parents, interests, and activities on gender differences in math. In A. M. Gallagher (Ed.), *Gender differences in mathematics: An integrative psychological approach* (pp. 246-263). Cambridge, UK: Cambridge University Press.

Ke, F., & Grabowski, B. (2007). Gameplaying for maths learning: Cooperative or not? *British Journal of Educational Technology, 38*(2), 249-259.

Kozol, J. (1995). *Amazing grace: The lives of children and the conscience of a nation.* New York: HarperCollins.

Ladson-Billings, G. (2006). From the achievement gap to the education debt: Understanding achievement in U.S. schools. *Educational Researcher, 35*(7), 3-12.

Ladson-Billings, G. (2007). Pushing past the achievement gap: An essay on the language of deficit. *The Journal of Negro Education, 76*, 316 -323.

Lan, W. Y., Olivarez, A., Jr., Stevens, T., & Tallent-Runnels, M. K.(2004). Role of mathematics self-efficacy and motivation in mathematics performance across ethnicity. *Journal of Educational Research, 97,* 208-221.

McGlynn, A. P. (2008). Proven pathways to success for minority students. *The Hispanic Outlook in Higher Education, 18,* 22-25.

McLaughin, M. & Talbert, J. (2001). *Professional communities and the work of high school teaching*. Chicago: University of Chicago Press.

McMillian, J. H. (2007). *Educational research: Fundamentals for the consumer* (5th ed.). Boston: Allyn & Bacon.

Miles, M. B., & Huberman, A. M. (1994). *An expanded sourcebook: Qualitative data analysis*. (2nd Ed.). Thousand Oaks, CA: Sage.

National Science Foundation. (2006). *Science and engineering indicators 2006*. Retrieved December 3, 2009 from www.nsf.gov/statistics/seind06/

Pajares, F. (2005). Gender differences in mathematics self efficacy beliefs. In A. M. Gallagher & J. C. Kaufman (Eds.*), Gender differences in mathematics: An integrative psychological approach*. Cambridge, UK: Cambridge University Press.

Oakes, J. (1988). Tracking in mathematics and science education: A structural contribution to unequal schooling. In L. Weis (Ed.), *Class, race, and gender in American education*. Albany, NY: State University of New York Press.

Quiocho, A. M. L., & Daoud, A. M. (2006). Dispelling myths about Latino parent participation in schools. *The Educational Forum, 70*, 255-267.

Rist, R. (1973). *The urban school: A factory for failure*. Cambridge, MA: Massachusetts Institute of Technology Press.

Rosario, J. R. (2006). *On engaging Latino students in their education: A resource guide to research and programs*. Retrieved December 4, 2009 from http://www.elpuenteproject.com/styles/elpuente/defiles/On%20Engaging%20Latino%20Students%20in%20their%20Education-%20%20A%20Resource%20Guide%20to%20Research%20and%20Programs.pdf

Slavin, R. E., & Calderon, M. (2001). *Effective programs for Latino students*. Mahwah, NJ: Lawrence Erlbaum Associates.

Spelke, E. (2005). Sex differences in intrinsic aptitude for mathematics and science? A critical review. *American Psychologist, 5*, 950-958.

Stevens, T., Olivarez, A., & Hamman, D. (2006). The role of cognition, motivation, and emotion in explaining the mathematics achievement gap between Hispanic and White students. *Hispanic Journal of Behavioral Sciences, 28,* 161-171.

U.S. Department of Education (2008a). *1973-2008 long-term trend mathematics assessments.* Washington, DC: Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP)..Retrieved December 3, 2009 from http://nationsreportcard.gov/ltt_2008/ltt0004.asp?tab_id=tab3&subtab_id=Tab_1#chart

U.S. Department of Education. (2008b). *1973-2008 long-term trend mathematics assessments.* Washington, DC: Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years. Retrieved December 3, 2009 from http://nationsreportcard.gov/ltt_2008/ltt0005.asp?subtab_id=Tab_3&tab_id=tab1#chart

Valenzuela, A. (1999). *Subtractive schooling: U.S. Mexican youth and the politics of caring*. Albany, NY: State University of New York Press.

Valiente, C. (2008). A multicultural scrutiny for helping teachers to appreciate differences. *Active Learning in Higher Education, 9*(1), 73-91.

W. K. Kellogg Foundation. (2006). *Connection: What makes a difference in the education of Latino U.S. students: Learning from the experience of 13 ENLACE Partnerships*. Retrieved December 3, 2009 from http://www.wkkf.org/DesktopModules/ WKF.00_DmaSupport/ViewDoc.aspx?LanguageID=0&CID=16&ListID=28&ItemID=5000364&fld=PDFFil

Walker, E. N., & McCoy, L. P. (1997). Students' voices: African Americans and mathematics. In J. Trentacosta & M. J. Kenney (Eds.), *Multicultural and gender equity in the mathematics classroom: The gift of diversity* (pp. 34-45). Reston, VA: National Council of Teachers of Mathematics.