Academic Leadership: The Online Journal

Volume 8
Issue 2 *Spring 2010*

Article 15

4-1-2010

Connecting Math and Science to Home, School and Community Through Preservice Teacher Education

Cherie McCollough

Olga Ramirez

Academic Leadership Journal

Parental Involvement in the Education Process

The importance of parental involvement in enhancing the quality of their children's educational experiences and academic success is well documented in the literature (Chrispeels & Rivero, 2001; Cordry & Wilson, 2004; Delgado-Gaitan, 2001; Dierking & Falk, 1994; Jones &Valdez, 1997; Quezada, Diaz, Sanchez, 2003; Valdes, 1996). Parent involvement results in higher reading scores, greater language growth and development, and increased motivation to achieve (Harvard Family Research Project, 2007). Parental involvement includes a wide range of activities from promoting the importance of education to participating in the decision-making and operations of schools. For maximum results, there should be some alignment between parents' attitudes and practices and the school's expectations of parents and support for family involvement.

While research indicates that increasing parental involvement has a direct positive impact on student achievement, especially among Hispanic students (Jones & Valdez, 1997; Mendoza 2009B), parental involvement in the education process is often not common in Hispanic families. Traditionally raised Hispanic parents believe that the educative process and all that is involved in formal education is the role of the educators and that the role of the parent is to provide for the well-being of the entire family (Valdes, 1996). However, educators generally believe that their role is to provide knowledge and skills for the students to become productive citizens and that the parents provide assistance at home in reviewing material, seeking ways to ensure that their children are successful in school (Brian & Reid, 2003). This disconnection between expectations of home and the expectations of the school often leads educators to conclude that Hispanic parents simply are not concerned about the education of their children. This misconception is further complicated because of the barriers that many Hispanic parents face including not having English as their first language. Therefore they require support in engaging with schools to participate in their child's learning (Chavkin & Gonzales, 1995; Friedlaender, 1999). A survey of Texas school administrators identified the need to increase parental involvement as one of the barriers to student achievement in their schools (Texas Elementary Principals and Supervisors Association, 2006). However, despite the importance of parental involvement in enhancing the quality of their children's educational experiences and improving the likelihood that children will be successful in school (Cordry & Wilson, 2004; Delgado-Gaitan, 2001; Valdes, 1996), schools continue to struggle in designing programs and curricula that increase parental involvement, especially programs that dignify the parent's culture.

Policy makers and educators agree that parental involvement is critical, yet schools often struggle to create effective partnerships with parents, particularly for poor, or underprivileged minority parents. Parents, regardless of race or ethnicity or socio-economic status are concerned about their children's education and are willing to become involved if schools provide the support and information they need (Chavkin & Williams, 1988; Epstein, 1987). As the number of Hispanic students entering our schools increases, teachers need to be provided with the skills, strategies, and attitudes to overcome the challenges of language differences, cultural understandings of the roles of parents and teachers, and

anxiety about parents' efficacy to help their children with schoolwork in order to forge effective school/parent partnerships (Mendoza, 2009). If we are to have a corps of teachers who are highly effective in involving parents, it is imperative that pre-service teachers (PSTs) receive training in their teacher education programs that prepare them to encourage and develop partnerships with parents. Epstein (1993) stresses the importance of school and teacher practices in the equation:

When parents believe the schools are doing little to involve them, they report doing little at home. When parents perceive that the school is doing many things to involve them, they are more involved in their children's education at home and at school (p. 67).

Some universities have considered changing the way they prepare preservice teachers to work with parents. Many teacher preparation programs have been slow at including and implementing content coursework that infuses pedagogical content knowledge that prepares teachers to collaborate effectively with parents and families (de Acosta, 1996), especially in science and mathematics (Alagic, M., Haack, C., Rogers, G., Gibson, K. & Watters, J., 2003; Lowery, 2002).However, many teacher preparation programs lack any coursework that prepares teachers to collaborate effectively with parents and families (de Acosta, 1996). PSTs receive no training to address the common misconception that parents are adversaries who lack knowledge in science and mathematics (Mendoza, 2009) and, for that matter, other subjects.

Family Science and Family Math

Another reason to underscore the importance of preparing teachers to work with parents centers on the significant influence that parental attitudes and knowledge have on their own children's attitudes towards learning, particularly when it comes to learning about science and mathematics (McDonald, 1997; McDonald & Canales, 2005). Programs like Family Science and Family Math provide opportunities for teachers, parents, and children to engage in learning these subjects together and to experience how science and math are a part of their daily lives. The coupling of science and math with lived daily experiences is what makes science and math culturally relevant. When children see their parents showing an interest in science and math and having fun conducting simple investigations, they too show an interest. This modeling of positive attitudes toward science and math can, in turn, shape their children's beliefs and attitudes towards these subjects. By linking classroom content to students' experiences, demonstrating, modeling, explaining and emphasizing higher-order skills, and using pedagogy and curriculum that is responsive to students, culturally relevant teachers support the academic achievement of all students (Darling Hammond & Bransford, 2005; Ladson-Billings, 1994).

To summarize, research suggests that teacher preparation programs that include community-based experiences involving programs such as Family Science and Family Math, with a focus on culturally and linguistically diverse populations, has the potential to improve the self-efficacy of future teachers with respect to teaching. In line with this research, this paper describes a National Science Foundation (NSF) funded study at two different Hispanic Serving Institutions in south Texas, identified by the pseudonyms "University Science" and "University Math", that prepare preservice teachers (PSTs) to work with families as part of their university science/math coursework. Researchers at these institutions sought to investigate how PSTs' participation in Family Science/Math Learning Events, otherwise referred to as Family Learning Events (FLEs) affected their: 1) feelings of self-efficacy in science and math teaching and the ability to conduct a FLE in the future and, 2) perceptions of teaching science and mathematics to diverse student populations and, 3) ability to engage lower socio-economic status

minority parents and their children in the science and math activities.

This study ran concurrently for four (4) full semesters and four (4) summer sessions resulting in a sample size of 334 future elementary, middle and high school science teachers, and 153 elementary and middle school math pre-service teachers. PSTs worked in groups to create life science and/or math activities that were engaging and involved children and their parents in hands-on explorations of science and math content.

Activities consisted of simple experiments and demonstrations using items such as paper clips, paper cups, manipulatives, inexpensive grocery items and other common house-hold items. Some of the FLE's contained a theme such as "Super-Sized Science" that related to science and nutrition while others were a collection of various life science activities. For mathematics activities, topics in fractions, algebra, geometry, measurement, probability, statistics, as well as patterns and number sense were presented via demonstration and experimentation by PSTs using a variety of manipulatives and inexpensive teaching tools.

All activities required materials that were inexpensive and easily found in households to maximize the emphasis on cultural relevance. Strong connections to one or more state science standards – in this case, the Texas Essential Knowledge and Skills (TEKS)- were also required. Activities at University Science often centered on culturally-relevant themes where PSTs investigated the problem of diabetes, it's prevalence in south Texas, what causes diabetes, how diabetes affects so many organs/systems in the human body and why diabetes is such a problem in this particular region. PSTs looked at various foods that are part of the Hispanic culture and their nutritional value (or lack thereof), what alternatives would be better food choices, and often provided taste tests. At University Math, the culturally responsive activities centered on the type of groceries, currency, games, agriculture crops that are staple foods to Hispanics, language, local Hispanic cuisine, diseases prevalent among Hispanics, social events, and Hispanic art. PSTs were continually reminded to bring the science/mathematics concepts forward in all activities and to make the science/mathematics concepts overt and obvious, emphasizing the "hands-on minds-on" approach to project based instruction (Krajcik & Blumenfeld, 2006). Science stations were accompanied with attractive copies of take-home pamphlets describing how to construct and repeat the activity with brief explanations of the science content involved. In many cases, the tri-fold display that drew attention and interest to the math/science activity and illustrative directions were written in English and in Spanish. The activities were peer-reviewed by PSTs in the college classroom prior to public implementation to allow for appropriate and timely feedback.

Following revision, the science activities were implemented in three different after-school settings for each full semester and at one venue for each summer session. Math activities were conducted once per semester as part of the PSTs math content course. FLEs were held from approximately 5:00-7:30 p.m., allowing parents to attend the events after their employment hours or household duties. Students were required to bring a parent/guardian and siblings and extended family were also invited. Parents accompanied students from station to station at their leisure, with lessons ranging from seven to fifteen minutes in length. Venues were purposively selected and included elementary and middle schools in ethnically diverse school districts, low- and middle- socio-economic districts, a charter school, rural farming community schools, and a location within a regional science fair. Summer session science PSTs conducted their activities at a local Boy's and Girl's Club. Approximately 558 students in grades K-12 were involved in the study and approximately 245 parents attended these events.

Data Collection

Data collected included PSTs' TEKS aligned formal lesson plans written for their activity and all brochures and photographs of the project presentation board. Rubrics were used to quantitatively measure overall organization and appearance (artistic elements and creativity) of presentation boards and quality/clarity of handout. The science and math activities were also evaluated via a quantitative rubric that included elements of creativity, appropriateness for students, scientific or math purpose, presentation and educational value ("the overall science/math in this activity is obvious"). Additional qualitative data included PSTs' semi-structured written reflections regarding the creation and implementation of their curriculum (cost vs. benefits), overall experience at the FLE (positive or negative), overall perceptions of student and parent participation (positive or negative), perceived self-confidence in organizing an FLE at their future school, and other impressions (see Appendix A). Parental involvement was documented with audio/videotapes, photographs, and written and oral survey data. Parent survey questions were open ended and included questions regarding prior experience with after school programs, overall enjoyment level, favorite activities, likelihood to return for another FLE, and suggestions for improvement.

Quantitative data consisted of Likert scaled pre- and post-attitudinal surveys regarding perceptions of student and parent engagement in science/math, confidence in ability to conduct an FLE at their future schools, and affect questions regarding confidence in ability to use culturally relevant teaching strategies in science teaching (Appendix A). Other data collected at the event included post-event parent surveys in both English and Spanish, video-taped and audio-taped interviews with parents, students and PSTs during the FLE, and data regarding ethnicity and age of the participants. A probability value (p) of less than 0.05 was accepted as significant in all statistical analyses.

Data Analysis

Data was analyzed using a mixed methods approach following the fundamental principle of mixed research that evaluates the collection of multiple data using different strategies, approaches and methods in such a way that the resulting mixture or combination is likely to result in complementary strengths and non-overlapping weaknesses. (Johnson & Onwuegbuzie, 2004; Johnson, Onwuegbuzie & Turner, 2007).

In this study, a quantitative component (Likert-scale surveys) was used to triangulate evidence found in the qualitative preservice teacher, student and parent interviews and in audio-taped and video-taped observations. Trustworthiness was established in this research through creating credibility, transferability, dependability and conformability (Lincoln & Guba, 1985; Tashakkori & Teddile, 1998) and was achieved through the triangulation of data generation and collection, having a purposive sample, member checking, and the incorporation of a quantitative data component.

Results

Exit interviews and surveys revealed that participating elementary and middle school students had very positive comments regarding the FLEs . Participating students indicated that they were excited to learn more about science and math, spend time with their family, and receive handouts to duplicate the activities at home, thereby continuing the science and math conversations. Several of the FLE venue host teachers and administrators contacted the university faculty members to personally comment

about the excellent ideas that the future teachers had presented at the FLEs. One FLE principal was quoted as saying “this is the best science we’ve had”. Another principal stated that in her nine years as a school administrator/principal, the FLE was the “first time I’ve ever had parents actually doing math with the students in our school”. Following are more specific findings related to the research questions that guided our study.

Increased Confidence in Teaching Science

While teacher content knowledge is a major indicator in measuring success of student learning (Darling-Hammond & Bransford, 2005), 87% (n=253) PSTs surveyed on their first class day stated that they did not like science and did not feel confident teaching science. Similarly, 82% (n=103) of the Prek-4th grade level pre-service teachers indicated apprehension involved in teaching mathematics. Most (68%, n=253; 70%, n=103) of their comments indicated that this lack of confidence to teach science/math respectively was primarily attributed to a general lack of exposure to the subject. Written reflections revealed many stories of negative memories of science and math instruction with the greatest reported method of knowledge transmission being constrained to text books and worksheets and an occasional laboratory demonstration. Few (12%, n=253; 10%, n=103) students reported having a rich or enjoyable background in science and math. An announced “draw a scientist doing something” activity on the first class day always revealed almost all of the students having a stereotypical view of the white, male ‘nerd’ scientist that is pervasive in the media. Science, in their opinion, was only meant for scientists and not for them.

However, FLEs provided opportunities for the university students to directly observe learning-related phenomena. For many of the university students, this was their first authentic teaching experience. Results from t-tests indicated that virtually all of the university students and FLE participants were positively impacted by their participation. Preservice teacher’s level of confidence in teaching science significantly increased ($p = 0.002$, n=253, $\alpha = 0.05$) and for teaching math the results were similar ($p=0.005$, n=153, $\alpha = 0.05$). FLE’s provided future teachers’ experiences of learning theory in action and opportunities to observe teaching techniques such as collaborative learning, lesson planning and implementation and various management strategies. Consequently, PSTs expressed an increased enthusiasm toward teaching science.

I have always been intimidated by science and thankfully, those feelings went

away during this event. I was surprised to realize how calm I was while

teaching our information. I had not realized how social I can be with students!

Future elementary teacher

Math was my most dreaded subject and now I feel remarkably confident that I can

teach math to elementary children. The parents were so supportive; it was

amazing!- Future elementary teacher

After initially expressing a negative attitude toward science or math, students experienced the power of involving students in hands-on minds-on learning opportunities and attitudes changed. FLE PST’s

written reflections revealed that many students expressed increased confidence in science and math teaching, excitement about the prospect of teaching science and math, and the desire to host a FLE at their future campus.

I think that when you love to teach, it does not matter whether you work with children or adults….I was intrigued by the number of students and parents alike who did not understand simple science concepts and I wish to create a society that has increased scientific understandings beginning in my classroom. …. This experience has definitely enhanced my passion to teach science.– Future high school teacher

Increased Confidence in Culturally Relevant Teaching

Culturally relevant curriculum discussions presented to the science PSTs included examples from works such as Delpit and Kohl Other People's Children (2006) , Darling-Hammond The Right to Learn (1997) , Kozol Savage Inequalities (1991) , Ladson-Billings The Dreamkeepers (1997) , or Valenzuela Subtractive Schooling (1999) . In addition, examples of culturally relevant science were used in class at University Science and culturally relevant math examples were used at University Math (pseudonyms). A science example related to prickly pear cactus (nopal), which grows throughout Texas and from Mexico to Canada and can be purchased in most Texas grocery stores. The ability for the prickly pear cactus (nopal) to lower blood sugar has been well documented by many studies. In traditional Mexican medicine, nopal is used for treating type-2 Diabetes (Gibson, A. C., 2008). Other culturally relevant teaching examples included the use of the theme "Super-Sized Science" where PSTs addressed prevalent nutrition and health issues involving science. Childhood obesity and diabetes are significant medical problems in South Texas. Examples included foods that are typically eaten in Hispanic households as well as fast foods restaurants and convenience stores. Culturally relevant math activities included planning a Quinceañera party; that is, a 15^{th} birthday party for a female celebrant, plus finding all possible rectangles on a Mexican Loteria card that resembles American bingo. Parents at the FLE's would comment that they had never thought of using everyday cultural topics such as these to help their children learn math.

PSTs mentioned not really understanding the culture of many of the Hispanic students and English Language Learners (ELLS) until they entered schools with low socio-economic status (SES) and/or an alternative setting for those students who did not succeed in a traditional school, a local charter school. In these settings, PSTs had Hispanic students, parents and even grandparents attend the FLE. Many PSTs commented that they never felt more welcomed and appreciated as they did at the lower SES schools and charter school. They initially had misgivings about "these kind of students" and after, commented that their perceptions were negated and they felt somewhat ashamed for thinking that their stereotypes were accurate.

Honestly, I am sad to admit that I thought that people who came from other countries are not that intelligent due to their education systems. Working with these individuals has helped me understand that they are bright and extremely smart. The only barrier is language and it is no more their fault that they do not know English than it is mine that I don't know Spanish. So I am glad that I have grown in this way…I feel as though I have grown a lot this semester and I believe a lot has to do with getting out there and working with students…. I am so proud that I was able to be part of something so meaningful and in helping families learn together.-Future Elementary Teacher

One venue had adult ELLs attending an evening class. The adults ELLs came to the FLE and both the adult ELL students and PSTs engaged in teaching and learning science. ELLs asked the bilingual preservice science teachers to refrain from using Spanish during their presentations as the adult ELLs wanted to learn English. PSTs also engaged with students who spoke English accompanied by parents and grandparents who spoke Spanish. For many PSTs, the idea of teaching diverse learners was limited to theoretical reading assignments and was never experienced in an authentic context. Further, many had never considered teaching science to ELLs, and found the experience beneficial. One student wrote in her reflection:

The experience made me realize just how important it is to be bilingual.- Future elementary teacher

I was really proud to see such a big turnout from the Hispanic population. Both my parents are from Mexico and I remember them making me go to school events like 'Family Science Night' while all my friends stayed home and played hide-and-seek. When I saw so many Hispanic families, it made me happy to know that there are teachers out there who make a difference in a child's education. These children not only learn to believe in themselves, but their parents begin to believe in them, too.- Future middle-school teacher

In spite of the fact that over 40% of preservice teacher participants were Hispanic and many were first generation college students, they revealed having little exposure to culturally relevant teaching strategies in science and math. This is consistent with the notion of subtractive assimilation in schools as a process that removes Hispanic youth of "important social and cultural resources, leaving them progressively vulnerable to academic failure" (Valenzuela, 1999, p. 3). Teachers often fail to forge meaningful connections with students of differing races and cultures and these students are often alienated from their teachers. However, by including culturally relevant activities, tri-fold posters with English and Spanish titles and in many cases, take-home handouts in English and Spanish, and relating to Hispanic students in unfamiliar school settings, PSTs' post-surveys (Appendix A) revealed statistically significant increased confidence in utilizing culturally relevant strategies to teach science ($p= 0.002$, $n=253$) and math ($p= 0.005$, $n=153$) to diverse student populations in elementary and middle school. Observed conversations that occurred between PSTs and Hispanic families were initially hesitant and stilted. However, as time progressed, videotapes and photographs revealed that body language and tone of voice revealed more trusting, open and friendly conversations. Activities were fun and engaging. Refreshments provided the opportunity to engage in friendly conversation while eating and drinking. Social and language barriers became less noticeable as all participants formed a community of learners (National Research Council, 2000).

Increased Confidence in Engaging Parents

The need for teacher training in parental engagement has been documented in several studies (Epstein, 2001; Hiatt-Michael, 2001; Minnick & Associates, 2005. Power and Perry (2002) found that PSTs who were involved in working with family and community at local school districts during their teacher preparation period demonstrated strong beliefs in family involvement and an understanding of the difference it makes in the learning process. Strategies that address parental involvement are typically superficial and rarely provide PSTs with a theoretical framework or formal opportunities to interact with parents except for the occasional observational role during student teaching. Compounding this limitation in teacher preparation programs is the state-restricted number of credit hours in a teacher certification granting program that must provide professional preparation for

teachers in educational foundations, pedagogy, curriculum development and assessment. As a result, teachers generally do not see parent engagement as part of their professional obligation and often do not have any experience in communicating with parents until asked to do so during a parent-conference as an inservice teacher.

Following the FLE, PSTs felt significantly more confident in engaging elementary (p = 0. 005, n=242) and middle school (p = 0.003, n=11) parents in their children's science education. Results were also significant for 50 middle school math preservice teachers. PSTs noted in their reflections that by becoming personally acquainted with the child's parents, they felt they better understood the child. PSTs' written reflections mentioned the newly perceived feeling of importance of getting to know the child's parents and siblings. Videotapes revealed enthusiasm and body language that was engaging and animated as PSTs became more comfortable when talking to parents, encouraging them to participate in the activities. Students were surprised at the level of enthusiasm that the parents had:

Family Science makes science real to parents. It connects science to their children which connects it to the parents. It connects their children's classroom to the real world – their world.- Future elementary teacher

Parental Involvement

Oral and written interviews collected during the FLE indicated that parents enjoyed spending time with their students in a school setting, and conversely, the students enjoyed seeing their parents in the role of a learner. Parents commented on the fact that they had never been involved with FLEs and felt it was a good use of time to spend with their child. PSTs reported they were impressed when they heard their parents brag about their children's ability to learn. The only complaint that many had on the (written) exit survey was that, in spite of their 90 – 120 minute duration, the FLE didn't last long enough and many commented that the events should be offered more frequently and in a much larger place to accommodate larger crowds.

When asked about the nature of the cultural relevancy in the activities, many parents expressed appreciation in seeing exhibit posters that were both in English and Spanish. They appreciated the teachers who were bilingual and felt "welcomed" when they entered the room and saw their native language represented. Some parents said they were initially apprehensive about coming to the event, but were persuaded by their children and in some cases, the siblings to attend the event. When asked why they were apprehensive, those parents that responded (n = 62) said that they were not comfortable doing science (87%), and math parents (n=160) had a 35% response rate that they did not feel comfortable doing math. Science parents indicated that they preferred not to attend school-sponsored events in general (32%). When asked if they would return for another FLE, 100% of the science parents sampled responded positively.

Contributions/Implications

The results of this study suggest that participation in FLE's that include PSTs can be a powerful facilitator of learning for all involved. Future educators who participated in these events were given the rich opportunity to observe science and mathematics learning in progress, and perhaps had their only opportunity to work with parents as a PST. PSTs reported that they learned to see science and math everywhere, to integrate science/math experiments with artistic activities and to make science/math

culturally responsive. They also reported initially underestimating the parents' and students' capability for comprehending science and mathematics. Engaging students and parents in science and mathematics in an authentic, social context served as a way to deepen PST's teaching strategies while recognizing parent's interest in their children's education. Many PSTs expressed surprise at the level of prior science knowledge that students and parents exhibited, and were encouraged to see the excitement for learning.

In most of our classes we really don't get the chance to truly see how teaching really takes place. In think that I speak for everyone in the class when I say that the experience was an eye opening event and allowed us to get needed experience in planning and teaching and how to put together events that will excite students and parents. – Future secondary science teacher

Future Studies

The incorporation of FLEs into the course curriculum for future teachers at University Math and University Science is now an integral requirement of the curriculum for all students enrolled the contributing author's courses at University Science and University Math. In addition, PSTs that have graduated and are now in their own classrooms are using this model on their respective campuses. Questions for further investigation include how culturally relevant teaching strategies are being used in these classrooms and how this model is being adapted by PSTs that have become inservice teachers with their own classrooms.

Acknowledgements

The authors would like to thank the faculty, staff and students at all schools where Family Science and Family Math events were held. They would also like to thank Dr. Kit Price Blount, Dr. JoAnn Canales, and Dr. Diana Marinez and Dr. JoAnn Montes McDonald for sharing their expertise during faculty training for Family Learning Events.

Note: For student photographs, excerpts of reflections and examples of activities used at Family Science Events, readers are encouraged to go to: www.familylearningevents.blogspot.com This website is maintained by Dr. Cherie McCollough and is updated each semester.

This article was modified from a presentation at the American Educational Research Association annual conference in San Diego, California, April 2009.

This material is based upon work supported by the National Science Foundation under DUE Grant Nos. 0536827. Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation (NSF) .

References

Alagic, M., Haack, C., Rogers, G., Gibson, K. & Watters, J. 2003. Using Global

Learning to Enhance the Preparation of Elementary Teachers in the Teaching of

Mathematics and Science: What We Learned. In C. Crawford et al. (Eds.),

Proceedings of Society for Information Technology and Teacher Education

International Conference 2003 (pp. 1433-1436). Chesapeake, VA: AACE.

Brain, K., & Reid, I. 2003. Constructing parental involvement in an educational action zone: Whose need is it meeting? Educational Studies, 29, 291-305.

Chavkin, N. F., & Gonzalez, D. L. 1995. Forging partnerships between Mexican American parents and the schools. West Virginia: ERIC Clearinghouse on Rural Education and Small Schools.ED388489.

Chavkin, N., & Williams, D. 1988. Critical issues in teacher training for parent

Involvement. Educational Horizons, 66, 87-89.

Chrispeels, J.H., & Rivero, E. 2001. Engaging Latino families for student success: How

parent education can reshape parents' sense of place in the education of their children. Peabody Journal of Education, 76, 2, 119-169.

Cordry, S., & Wilson, J.D. 2004. Parents as first teachers. Education, 125, 56-62.

de Acosta, M. 1996. A foundational approach to preparing teachers for family and

community involvement in children's education. Journal of Teacher Education,

9-15.

Darling-Hammond, L. 1997. The right to learn: a blueprint for creating schools that

work. San Francisco, CA: Jossey-Bass.

Darling-Hammond, L. & Bransford, J. D. 2005. Preparing Teachers for a Changing

World: What teachers should learn and be able to do. San Francisco, CA: Jossey-Bass.

de Acosta, M. 1996. A foundational approach to preparing teachers for family and

community involvement in children's education. Journal of Teacher Education,

9-15.

Delgado-Gaitan, C. 2001. Involving Latino families in schools: Raising student

achievement through home-school partnerships. Thousand Oaks, CA: Corwin Press.

Delpit, L., & Kohl, H. 2006. Other people's children: Cultural conflict in the classroom. New York: New Press.

Dierking, L.D., & Falk, J.H. 1994. Family behavior and learning in informal science

settings: A review of the research. Science Education, 78, 57-72.

Epstein, J. L. 2001. School , family and community partnerships: Preparing educators

and improving schools. Boulder, CO:Westview.

Epstein, J.L. 1993. Make parents your partners. Instructor, 102, 52-53.

Epstein, J. L. 1987. Effects of student achievement of teachers' practices and parental

involvement. In S. Silvern (Ed.), Literacy through family community and

school interactions (pp. 98-110). Greenwich, CT: JAI Press.

Friedlaender, D. 1999, April 19-23. The need for scaffolding parent support in an urban school. Paper presented at the American Educational Research Association, Montreal, Canada.

Gibson, Arthur C. 2008. Red Scales in the Sunset. University of California-Los Angeles. http://www.botgard.ucla.edu/html/botanytextbooks/economicbotany/Cochineal/ index.html Date accessed: 1/18/08.

Harvard Family Research Project. Winter 2006/07. Family Involvement in Elementary

School Children's Education. No. 2 in a Series.

Hiatt-Michael, D. (Ed.) 2001. Promising practices for family involvement in school. Greenwich, CT: Information Age Publishing.

Johnson, R. B., Onwuegbuzie, A. J., & Turner, L. A. 2007. Toward a

definition of mixed methods research. Journal of Mixed Methods Research,

1 (2): 112-133.

Johnson, R. B. & Onwuegbuzie, A. J. 2004. Mixed methods research: A

research paradigm whose time has come. Educational Researcher, 33 (7), 14–26.

Jones, T. G. and Valdez, W. 1997. Effects of Latino parent involvement on academic

achievement. Paper presented at annual meeting of American Educational Research Association, Chicago, IL.

Kozol, J. 1991. Savage Inequalities: Children in America's Schools. New York, NY:

Crown.

Krajcik, J. S., & Blumenfeld, P. C. 2006. Project-based science. In R. K. Sawyer (Ed.), The

Cambridge handbook of the learning sciences. New York: Cambridge.

Ladson-Billings, G. 1994. The dreamkeepers: Successful teachers for African-American

children. San Francisco: Jossey-Bass.

Lincoln, Y., & Guba, E. 1985. Naturalistic Inquiry. Beverly Hills, CA: Sage.

Lowery, N.J. 2002. Construction of teacher content knowledge in context: Preparing

Elementary teachers to teach mathematics and science. School Science and Mathematics,102, 2.

McDonald, R. 1997. Using Participation in a Public School “Family Science Night”

Programs as a Component in the Preparation of Preservice Elementary Teachers. Science Education, 577-595.

McDonald, J. & Canales, J. 2005. Bridging the Gap: Developing a

School/Family/Community Partnership Model to Enhance the Early Mathematics and

Science Literacy of Children Living in the Colonias. Paper presented at AERA 2005.

McDonald, R. 1997. Using Participation in a Public School “Family Science Night”

Programs as a Component in the Preparation of Preservice Elementary Teachers.

Science Education, 577-595.

Mendoza , S. 2009. Dialogue and Conversation on Latinos in Higher Education: Implementing Culturally Relevant Curriculum for Math and Science. The Hispanic OutlookIn Higher Education 19 (22), 22-24.

Mendoza , S. 2009B. Dialogue and Conversation on Latinos in Higher Education. The Hispanic Outlook In Higher Education 19 (23), 18-20.

Minnick & Associates, I. 2005. Draft TxCETP evaluation report 200-2004. Retrieved Feb. 1, 2008, from

http://www.sci.tamucc.edu/txcetp/admin/documents/DRAFT_TxCETP_Evaluation_Report_1.pdf

National Research Council. 2000 How People Learn: Brain, Mind, Experience and School

(Expanded Edition). Washington, D.C.: National Academy Press.

Power, B., & Perry, C. 2002. True confessions of student teaching supervisors. Phi Delta Kappan, 83 (5), 406.

Quezada, R. L., Diaz, D.M., & Sanchez, M. 2003. Involving Latino parents.

Leadership, 33, 32-38.

Tashakkori, A., & Teddile, C. 1998. Mixed methodology: combining qualitative and

quantitative approaches. Thousand Oaks, CA: Sage.

Texas Elementary Principals and Supervisors Association. 2006. TEPSA 2006 Member Legislative Survey. Retrieved December 10, 2007, from http://www.tepsa.org/LeadershipGuide/ADVOCACY/LegislativeSurvey.pdf

Valdes, G. 1996. Con respecto: Bridging the distances between culturally diverse families and schools. New York: Teachers College Press.

Valenzuela, A. 1999. Subtractive Schooling: U.S. Mexican Youth and the Politics of

Caring. NY: State University of NY Press.

Appendix A: PTEP Student Survey

University Math and University Science (psudonyms) received funding from the National Science Foundation for the Pre-service Teachers Learning to Engage Hispanic Parents in Mathematics and Science project (PTEP). This survey is designed to provide the project with information about pre-service teachers' knowledge and skills related to parental involvement and will be used in evaluating the impact of PTEP.

Gender: _____Male _____Female Classification: _____Freshman _____Sophomore

_____Junior _____Senior

Race/ethnicity: ___American Indian/Alaskan Native ___Asian/Pacific Islander ___Black ___Hispanic ___White ___Other

Do you have a school-age child? ___Yes ___No This survey is being administered in a ___math class ___science class

Indicate any of the following classes that you have completed in which you participated in Family Math and/or Family Science events:

_____math class taught _____science class

Indicate your level of agreement with the following statements.

1. Developing materials for Family Math events helped enhance my understanding of math concepts.

A. Strongly agree B. Agree C. Disagree D. Strongly disagree E. Have not developed materials for Family Math events

2. Developing materials for Family Science events helped enhance my understanding of science concepts.

A. Strongly agree B. Agree C. Disagree D. Strongly disagree E. Have not developed materials for Family Science events

3. Leading centers at Family Math events helped enhance my understanding of math concepts.

A. Strongly agree B. Agree C. Disagree D. Strongly disagree E. Have not led centers at Family Math events

4. Leading centers at Family Science events helped enhance my understanding of science concepts.

A. Strongly agree B. Agree C. Disagree D. Strongly disagree E. Have not led centers at Family Science events

Indicate on the given scale (1 to 5) your level of confidence in your ability to do each of the following tasks. Please provide your confidence level both before this class began and now at the end of this class.

		Very confident 5	4	3	2	Not confident at all 1
5. conduct Family Science events for elementary school students and parents	Before this class					
	After this class					
6. conduct Family Science events for middle school students and parents	Before this class					
	After this class					

7. utilize culturally relevant strategies to teach science in elementary school	Before this class					
	After this class					
8. utilize culturally relevant strategies to teach science in middle school	Before this class					
	After this class					
9. engage elementary school parents in their children's science education	Before this class					
	After this class					
10. engage middle school parents in their children's science education	Before this class					
	After this class					
11. engage Hispanic elementary school parents in their children's science education	Before this class					
	After this class					
12. engage Hispanic middle school parents in their children's science education	Before this class					
	After this class					

13. What was the most valuable thing you learned in this class related to parental involvement?

14. What was the most valuable thing you learned in this class related to culturally relevant

science?

15. How have your experiences in this class with family science impacted you personally?

16. How have your experiences in this class with family science impacted you professionally?

17. What suggestions do you have for improving the activities in this class related to parental involvement or culturally relevant science?

VN:R_U [1.9.11_1134]