THE ESL FAMILY SCIENCE NIGHT: A MODEL FOR CULTURALLY SENSITIVE SCIENCE EDUCATION PEDAGOGY

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Introduction

This paper will describe a five year research project of a teaching strategy whereby pre-service credential students at a southern California university were taught to develop and apply science curriculum to parents of elementary-aged English as a Second Language students. The paper will elaborate upon the importance of parental engagement in science pedagogy as it relates to working with under-represented minority groups. Moreover, the focus of this teacher research centers upon the implementation of teaching strategies that are culturally sensitive, contextually rich, and scientifically accurate. The article will conclude upon general findings and suggestions for further research and pre-service teacher education as it relates to teaching science pedagogy in a way that better serves minority children and their parents and/or guardians. Here, we are defining minority children as those that come from non-mainstream Anglo-American culture and are second language learners.

Literature Review

According to projections made by the Bureau of Labor Statistics (BLS, 2005), there will be close to two million open positions in STEM (Science, Technology, Engineering and Mathematics) related fields in the United States by 2014. This figure represents both the steadily increasing number of new positions created and the number of positions that will become vacant due to the retirement of many 'baby-boomer' scientists. The growth rate in the STEM fields is approximately three-times that of other fields. Despite the positive employment opportunities, there appears to be a steadily decreasing number of individuals entering into the workforce in STEM related fields (National Science Foundation, 2008). While the number of Bachelor's degrees granted in all fields over the last 40 years has nearly tripled, degrees in the STEM fields

have remained stable or even decreased. Of particular interest to this paper's focus on education in the physical sciences, degrees granted in this STEM area have continuously decreased every decade from 1966-2006, going from an already minimal 3% in 1966 to 1.1% in 2006 (NSF, 2008).

At the same time, the United States is experiencing a significant change in population demographics. A number of references reflect a growth rate in the Hispanic population that far exceeds the overall population growth (i.e. 3.6% as compared to 1%), which places them as the largest minority group in the United States (Bernstein, 2005; Grieco, & Cassidy, 2001; Perez & de la Rosa Salazar, 1997; Ruiz, 2002). Of particular importance and interest is that the Hispanic population is relatively youthful, which means that they will soon represent a significant proportion of the upcoming workforce. Recent statistics show that while the percentage of Hispanics in the overall population is approximately 12%, they represent nearly 17.5% of the overall college age population (Chapa & De La Rosa, 2006). Moreover, while the national average of individuals under the age of 18 is 25%, the population of Latinos under the age of 18 is 33% (Chapa & De La Rosa, 2006). It has been projected that by 2020, Hispanics will account for nearly 20% of school-aged children in the United States (National Center for Education Statistics, 1999).

Despite this growing percentage of Hispanic children in our schools' population, the sad truth is that Hispanic children have the highest dropout rates in the nation (NCES, 1999). According to Haines (2006), the dropout rate for Hispanic high school students exceeds 40%. There are many factors that contribute to this phenomenon, not the least of which is the limited educational opportunities provided to these students, and their families, that are meaningful and culturally sensitive. For those Hispanic children who do remain in school, there is still the concern that, on average, they score 25-30 points lower than their white counterparts on proficiency tests in mathematics and science (NCES, 1999), which equates to a performance gap of 2 years by the age of 13.

This performance gap eventually leads to the disproportionate representation of Hispanics, in comparison to other groups, that we see in science careers as compared to the proportions we see in the general population (i.e. despite a much larger number of Hispanics in the general population as compared to African Americans, there are fewer Hispanics in science careers than African Americans). Given the current state of affairs noted above, it would appear advantageous for educators to consider how we can ensure these children remain in school and how we can encourage them to consider and support them in succeeding to develop careers in the STEM fields. What does appear certain is that parental involvement and capturing their interest at an early age are key factors in fostering this interest in children (Astone & McLanahan, 1991; Fan & Chen, 2001; Griffith, 1996; Smith & Hausafus, 1998).

As educators we often focus the majority of our attention on the cognitive and academic growth of our students. We tend to consider their socio-emotional development as something that rests primarily on the shoulders of their families. It has been purported, however, that a child's socio-emotional development is the foundation upon which all cognitive and academic skills are built (Eliot, 2000). There is an abundance of literature that supports the general claim that a nurturing, positive and supportive home environment, where the parents are involved in the day-to-day

events of their children, sets the stage for academic success, while the opposite can readily lead to failure (Astone & McLanahan, 1991; Fan & Chen, 2001; Griffith, 1996; Shumow & Miller, 2001). Taking this one step further, involvement of parents in school activities has been shown to enhance academic performance in children (Stevenson & Baker, 1987), and simultaneously decrease dropout rates while increasing attendance (Flaxman & Inger, 1991).

This latter finding was evident across socio-economic, racial and ethnic groups. With specific focus on Hispanic families, parental involvement has been found to predict academic resiliency (Ruiz, 2002), promote gains specifically in math, science, reading and social studies (Diaz, Mill & Mehan, 1992; Keith & Lichtman, 1994) and increase motivation and engagement (Cappella-Santana, 1998). Given the underperformance noted in our Hispanic children, one might deduce that their parents lack involvement in their academic activities. A number of studies have found, however, that Hispanic parents are as involved, if not more involved, in their children's educationally related activities than their white parental counterparts (NCES, 1999; Raffaele & Knoff, 1999; Sui-Chu & Willms, 1996). Moreover, despite the underrepresentation of Hispanic children in accelerated science classes and subsequent undergraduate majors, several studies have found that Hispanics are as interested in the sciences as other groups of children (Catsambis, 1994; Snyder et al., 1997). It thus does not appear to be a lack of interest or parental involvement that is driving the performance gap noted in these children.

What does appear to be a factor in their decreased success is the lack of educational opportunities that are contextually and culturally sensitive. A number of researchers have found that children from diverse backgrounds, including Hispanic children, learn best when material is presented in an applied, contextualized setting (Brooks & Brooks, 1993; Garcia, 1988; Gibbons, 2003; Gibson, 1998; Hofstein & Lazarowitz, 1986; Irvine & Armento, 2001; Kruse, 1998), where they are actively engaged in 'hands-on', kinesthetic learning that allows them to construct meaning via action. These experiences can be particularly beneficial for children who have limited proficiency in the English language, as this modality of learning is more language independent. Likewise, parents with limited English proficiency can more readily participate in these applied science activities, thereby further fostering their involvement in their child's education and enabling them to reinforce the material at home. While there is a general awareness in the field of Education that partnerships between parents and teachers are essential to student outcomes, there is little evidence to suggest that teachers actually receive instruction in their educational programs as to how to engage in this collaborative act (Curran & Murray, 2008). In fact, other than a number of researchers mentioning the importance of including parents in educational experiences, it is difficult to find reference to programs that specifically train pre-service teachers on how to engage parents in the curriculum. As there is a strong empirical basis for developing this hands-on, relevant and culturally sensitive science curriculum geared towards the needs of our diverse population of children and their families, we believe it is imperative then that we educate our pre-service teachers to deliver this type of curriculum.

The current paper describes one such educational opportunity, including development of the curriculum and reflections from the pre-service teachers following the delivery.

We believe this work holds the Eight (8) Principles of Whole Schooling in mind, as evidenced by some of the following outcomes of the project: 1) creating an inclusive learning space for

parents to be included in their child's education; 2) instilling pre-service teachers with the concept of democracy and shared decision making in curricular development; 3) empowering parents to facilitate learning and carry-over of content into the home environment; 4) supporting the social-emotional bond between parents and children that is critical to academic success; and 5) using authentic, real-world activities that allow diverse learners to develop their skills and knowledge in meaningful, practical ways. We believe this paper will be useful to teacher trainers and teachers themselves in considering and developing curriculum to meet the needs of all students in the classroom, and in particular to create inclusionary education for parents and children in non-majority cultures.

The ESL Family Science Night

The English as a Second Language (ESL) Family Science Night is a culminating assignment in the second of two curriculum and instruction seminars at Cal State San Marcos, San Marcos, California. These courses, EDMS 511 and EDMS 512, are required in the course program for obtaining a multiple subject teaching credential. In these courses, preservice teachers study and develop lesson plans and curriculum along a developmental continuum from basic to sophisticated. All aspects of curriculum planning are taught in these courses, however, students are instructed to a great extent the practice of *backwards design,* as articulated by Wiggins and McTighe in their seminal work, *Understanding by Design*. (Wiggins, McTighe 2005). The basic premise of backwards design is for teachers to begin with the learning outcomes in mind and to develop and design lesson plans, curriculum and activities to achieve these goals. In this sense, the teacher is starting with the end goal in mind and working 'backwards' to select materials that are in line with optimizing the outcomes.

The ESL Family Science Night is a one-night after school program in which parents are taught how to conduct simple science experiments at home using everyday objects. The program is comprised of a small meal, science experiment workshops, child-care, and a raffle. The science workshop format centers on eight experiment tables. Parents rotate to eight large tables where they are taught how to conduct simple science experiments using common household items through hands-on demonstrations. As the parents engage in experiments they are taught science concepts in their primary language (Spanish) and English. Parents are also provided printed workbooks describing the experiments in English and Spanish. As noted, before each of the four programs families enjoy a meal. Each science night also had a raffle for door prizes related to science education. In addition to the workshop, age appropriate child-care was provided to allow the parents the freedom to learn and explore.

Context of the Teacher Research

Cal State San Marcos (CSUSM) is located in North San Diego County, a county noted for its large Hispanic population. CSUSM students who participated in this study were enrolled in an off-campus cohort located in a North County district twenty miles from the main CSUSM campus. One of the unique features of this off-campus cohort is the fact that the seminars were taught at English/Spanish dual immersion school in Poway. Given this fact, CSUSM students

could easily observe and reflect upon inclusive, culturally and linguistically diverse teaching methodologies at an elementary school where instruction was conducted in both English and Spanish. The five family science nights of this study were held during the evening at two school locations in North San Diego County. Two ESL Family Nights were held in Poway and three in Escondido, California. In all and over the five years, 146 CSUSM students participated in this study - average class size, 29.2. Both schools serve Hispanic children from lower to lower middle class homes. Parents who participated in the project spoke little to no English and many were recent immigrants to the United States.

Program Development

At the start of EDMS 512, preservice teachers were given program parameters that included a description of the ESL Family Night program and the participating school context. To best facilitate this inclusive model of curriculum development, it was necessary to provide the CSUSM preservice teachers a working set of guiding principles to conceptualize their curriculum planning. These guiding principles were taught at the beginning of the first semester course, EDMS 511, and were referred to throughout in EDMS 511 and 512. The following is the set of five guiding principles:

A. Meaning can be ascertained across curriculum areas,
B. Science education and literacy skills instruction should occur simultaneously,
C. Specially-Designed Academic-Instruction in English (SADAIE) strategies are essential in developing science curriculum for all students and are critical when working with second language students,
D. Instruction in science should include community outreach and foster community within and outside the classroom, and
E. Science education and the use of technology should occur seamlessly in the elementary classroom.

The explanation, and subsequent instruction, as to the full impact of the guiding principles was critical to the success of the project since students were able to align their tasks to teach in a realistic school setting. At this beginning phase, pre-service students were informed that they would develop and implement all aspects of the program. The following list encapsulates what was required for the completion of the ESL Family Science Night, The students:

A. Developed a program agenda,
B. Developed eight experiment tables. This required the students select experiments using common household items. Presentations of experiments had to be presented in the language parents understood),
C. Coordinated four child-care classrooms: Pre-K and K, 1-2, 2-3, 4-5 grades. (It was a requirement that child-care focus upon teaching science concepts to youngsters),
D. Planned and prepared a small meal for participating families,
E. Coordinated a raffle of science items to give to participating families, and
F. Published a workbook of all experiments conducted during the science workshop in English and Spanish. The workbook was provided to all participating families.

In choosing a conceptual framework for this research, the ESL Family Science Night was designed intentionally as an "authentic performance task" as articulated by Grant Wiggins. According to Wiggins and McTighe (2006), an authentic performance task contains six key features in that it:

A. Is realistically contextual,
B. Requires judgment and innovation,
C. Asks the students to "do" the subject,
D. Replicates key challenging situations in which adults are truly challenged in the workplace, in civic life, and in personal life,
E. Assesses the student's ability to efficiently and effectively use a repertoire of knowledge and skills to negotiate a complex and multistage task, and
F. Allows appropriate opportunities to rehearse, practice, consult resources, and get feedback on and refine performances and products.

(Wiggins, and McTighe, 154)

Given these elements, the ESL Family Science night is a very "pure" example of a performance assessment. In order to fulfill the assignment requirements, students employed a repertoire of knowledge and skills from their science, literacy, math, and social studies courses. Judgment and innovation were critical to the process as students had free rein in executing the assignment. Moreover, the assignment itself is highly authentic since *real* parents were taught in a realistic setting using commonplace objects.

Each of the five cohorts assigned themselves to working committees. Committees fell into the categories of workshop agenda (which included the selection of the experiments), raffle, childcare (which included the developing of grade appropriate science curriculum), food committee, set-up, and workbook publishing committees. Additionally, every cohort elected a committee chairperson to serve as a liaison to the participating school and the CSUSM professor. Half of the students elected to teach the adults, the other half elected to in childcare. Childcare was provided for children aged 4 to 10 and covered kindergarten to fifth grades. As a rule, students were given an hour each class session during EDMS 512 to process their work and to address issues that come up during this kind of collaborative assignment.

A week before the workshop the cohorts visited the participating school to plan the logistical elements of the event. In each instance, the principal introduced the school to the preservice students. Afterward, CSUSM preservice teachers visited classrooms, met the school custodian, studied the floor plan of the multipurpose room, and were introduced to the school secretary. For the remainder of the field trip students planned more extensively the details of the event.

The family science workshops all occurred in mid-March in early evening from 6:30 to 8:30 p.m. Generally the first half hour was devoted to welcoming parents and children. A small dinner/snack was served. The programs lasted an hour and a half; at the conclusion of each event a raffle was conducted whereby the parents were given baskets of prizes filled with science items. As noted, parents in all five workshops were given gift bags containing a workbook developed by the preservice teacher. These workbooks were written in English and Spanish; the

workbooks documented all eight of Family Science Night experiment. The gift bags also contained materials to conduct one experiment from the workshop to be replicated at home.Another key feature of this project was fundraising. For all five events the preservice teachers took it upon themselves to obtain donations in a variety of forms from cash donations to free tickets to the San Diego Zoo. In this way, the preservice teachers employed skills in community outreach and project development. For four of the events the instructor applied for and was granted a *State Farm Good Neighbor Teaching Grant t*o pay for experiment materials, publicity, and travel expenses.

Findings

The data points for the findings of this teacher research were obtained from three sources. The first source is a simple counting of students and parents who participated in the five events. A tally of monies collected and spent to put on the events was also tabulated. Secondly, the teacher evaluations were used to elicit both positive and negative comments about the event. Finally, students were asked to write a reflection about the family science night to determine what they felt were the more memorable aspects of the project, its impact on their teaching practice, and whether they would incorporate a community outreach as part of their own curriculum development. To begin, the following graph illustrates the attendance of parents to the event, the number of students who participated, and the amount of resources collected each year of the project:

Academic Year	**Number of Students**	**Number of Parents**	**Monies Collected**
2004-2005	30	44	$400.00
2005-2006	28	65	$1400.00*
2006-2007	29	120	$1700.00*
2007-2008	30	55	$1500.00*
2008-2009	29	130	$1650.00*
Total	146	414	$6650.00
Averages	29.2	82.8	$1330.00

*indicates a $1,000.00 grant from State Farm included in the amount.

A total of 120 student evaluations of EDMS 512 over the five years were reviewed. In the comments section of EDMS 512, 51 students reported the family science night was a positive experience, only 5 reported it was not. Of the 51 positive comments, 23 stated the experience

was the "best experience of the year." The most common negative comments had to do with the issue of time and the difficulty of working with committees.

In evaluating the reflections of the family science night, themes were organized around typical responses to the open-ended reflection questions. A response was not considered a theme unless it occurred more than 25 times in the sample of reflections evaluated for this study. A sample of 100 reflections was reviewed. What follows are the three most prevalent themes of students' reflections. Student comments are highlighted to illustrate common thoughts from the participating students in the project.

Themes from Student Reflections

The most consistent theme in the student responses was the significance of collaboration in projects such as the family science night. Almost all of the students reported that collaboration was both difficult and worthwhile. "One of the challenging things," writes Maribel* who is a student from the 2007 cohort, "was collaborating with other colleagues. We all had a vision of what we want to accomplish, However, finding a middle ground that allowed all thirty of us to show our ideas and talents almost seemed impossible on some days" Maribel's comments are typical of many of the responses of the students who often were learning how to conduct a workshop for the first time.

As instructors, it was easy to observe the complexity of this sort of project for whatever the group of students. Over the five years of the study, the students in each cohort exhibited remarkable ingenuity in organizing materials, obtaining donations for the project, shopping for food and other items, etc. The fact that this project engages *real* parents at a *real* school was also a motivating factor for the students who needed to collaborate in order to ensure the success of the project in academic and logistical terms.

Ultimately, all five cohorts organized themselves effectively, though some groups had more instances of conflict. In those instances where conflict arose the students were encouraged to solve their own issues and it was seldom necessary for the instructors to intervene in the settling of conflicts between individuals or groups within a cohort. In a meaningful way, this process taught the preservice teachers about the critical importance of communication and dialogical process in creating this kind of rich educational and cultural experience at a public elementary school.

Furthermore, the project had a maturing effect for many of the students. "I had no idea we could pull this off," writes Raul, a student from the 2004 cohort, "Our project was fantastic and I think it is great that we did everything without the direction of our professors. This was our science night too." Kevin, a 2005 student, wrote about this process in another way:

Right from the beginning of the experience we had to make quick decisions about this event would be structured. While we had a diagram of how we wanted the multi-purpose room to look. There we certain adjustments we had to make based on what we wanted to accomplish. The finished product was definitely conducive to a steady flow of people

going from experiment to experiment, and also to the table of refreshments… Overall, the cohesiveness with this cohort was clearly on display during the Family Science Night.

The second most articulated theme in the reflections was that of the significance of working with the Hispanic community. As has been noted, Hispanics are highly under-represented in the scientific professions. Knowing this project was directed at serving the Hispanic community was as much a source of excitement and apprehension for the preservice students involved in this project. "I was thrilled," writes Laura, a 2007 cohort student, "to find out that we were to do this project with the Hispanic community where there is a drive for knowledge, education, and family activities."

Other students reported misgivings initially but felt the structure and collaborative nature of the project helped to alleviate their fears. The following comments from Britiney, a 2005 cohort student, reflect a concern felt by many students at the start and end of the project:

> *At first I was a little afraid of how I finish this project. I don't speak Spanish and I wasn't sure that the parents would understand what we are doing. After the science night I was so happy about the way things turned out. Working together like we did helped to make the project a success.*

Jenny, a 2005 student, expressed her concerns but also wrote about the value of the experience from the point of view that the science night offered a powerful experience to put into practice all she learned in her credential program:

> *Yet at the end of the day, I am reminded of everything I have learned in the credential program. Our classrooms are going to be filled with diversity…As an educator; I must be prepared to meet the needs of all students. I learned how make learning accessible, SADAIE techniques, and to make accommodations, and provide multiple access points. What better test of our skills, a better measure of our learning, and better way to build community is there than the family science night?*

Many students described the significant role parents play in the education of their children. Other students mentioned that working with parents on the improvement of science education at their child's school should occur in the classroom and at home. This, we believe, is an important understanding as the project reinforced how transforming curriculum requires social, cultural, and academic interventions and projects. To simply discuss the necessity for community outreach is not sufficient to engage underserved populations, such as the Hispanic community, in the further development of science education in elementary schools. In developing and conducting the family science night pre-service, teachers in this project learned how to act as agents of cultural and academic change. This action required them to face their fears and work on a process together to assure the success of the program. More importantly, the family science night gave them an authentic way to demonstrate their developing teaching practice, a practice that includes effort toward educating children about science. Lourna, a 2008 student, expressed this understanding in the following manner:

> *The experience helped me to clarify my views about teaching. I became aware of how important is to involve parents in the schooling of their children When the parents have a first hand knowledge of what is happening in the classroom they are more apt to extend the classroom learning experience to the home environment. As a result, parents and teachers can be more of a team and present a more united front in the education process…the Family Science Night inspired the parents to encourage their children tat home in the study of science and, hopefully in the eventual pursuit of science careers.*

In the third, final theme, the pre-service teachers discussed the need to further develop science education in their future classrooms. It was very evident throughout this process that students in all five cohorts were both intellectually challenged and emotionally engaged. As instructors, this was the most important aspect of this research since it illustrates how curricular change and the needed work with underserved populations requires deep commitments to promoting and increasing science education in elementary schools. This project gave both a structure and a reason to reach out to the parents of the two elementary schools who allowed us into their community.

Here again, cultural action and academic rigor were emphasized as real features of curricular change. It was noted in student reflections that science education should be taught more in all schools and that schools serving minority groups also require community outreach beyond lip service. In order to reach these goals, both new and veteran educators need to act as cultural agents. Indeed, the articulation of cultural agency is central to the new understanding of these pre-service teachers whose educational philosophies were developed more concretely as to the need to further reflect and act upon their educational ideals. Jenny, the previously mentioned 2005 student, described her process as follows:

> *The Family Science Night solidified my thoughts on how I want to teach science but foundation was built on the teaching of my science professor. In his class I leaned about Dewey's thoughts on experimental learning. I learned that the students retain knowledge longer if they have hands-on experience with concepts during instruction. I plan to offer my students opportunities to work cooperatively to solve problems and perform experiments in a hands-on approach.*

Along this line, Courtney, a 2007 cohort student, wrote, "This family science night was so "hands-on and minds-on." I like that we learned how to teach science to parents and students in one program. I learned a lot about myself in this project."

Finally, the overall impression that these students left with was that this project was highly positive. The students learned that serving historically underserved populations is both practical and fun. The tremendous energy involved in such a project is par for the course; however, the final outcomes of this authentic assessment reveals much about how teacher education programs can assert their educational ideals and ideologies in ways that serve real communities in real ways, in real time, and with real feeling.

Conclusions

The best way to encapsulate the success of this project can be illustrated in an event that occurred in the 2005 ESL Family Science Night. That year one of our pre-service teachers, Joanne, donated a brand new telescope to be raffled off at the conclusion of the workshop. The telescope was a gift to her husband, a local physician, who thought it would be better to contribute the telescope to this project. Of course, we accepted this wonderful gift. That night the telescope was the last item to be raffled since it was by far the most glamorous prize of the evening.

Joanne had the honor of selecting the winning ticket. All eyes were on her as she called out the numbers. When Joanne finished calling out it took only seconds for one family to call out, "Aqui, aqui!" (Here, here!). The Hispanic couple who won were in their forties; they brought with them their fourteen year old son who jumped up to collected the package at the front of the multipurpose room. The young man gave Joanne a furtive hug before picking up his prize. Amid the cheers, the young man carried the telescope with such care, almost as if it was an infant.

A moment later, the young man set the telescope at a side table where he contemplated his prize telescope. The exterior of the box had a photograph of the telescope inside depicting a man observing the night sky. The young man was mesmerized as he stroked the flat surface of the box in disbelief. It was as though the adolescent could not accept he could keep the beautiful telescope. While I watched the young man I looked out at my students who didn't say a word. Some of my students, both the women and men, were teary eyed. It was very moving. "I can't believe how good I feel," Joanne said. I replied, "I know."

Indeed this project had a profound impact on the two schools we served and on our pre-service teachers. It is our intention to continue this project employing the practice of *backward design* and performance assessments. We also hope other teacher educators will consider undertaking similar projects in their curriculum and instruction or science education courses. The study illustrates the impact a valid performance project has not only in teaching pre-service teachers how to teach but also as a means to enact cultural change. One day during one of my courses I advised my students that good teachers *report* ideas while great teachers *live* ideas. In many ways, this workshop revealed to our students the great benefit of acting as agents of change whether it is in the classrooms or as member of larger learning communities in the larger culture.

This project, therefore, is a good example of how a performance assessment engages novice teachers at deeper levels of intellectual and affective process in the service of a school community. In many respects, this event solidified teaching practice for most of the pre-service teachers participating in the event. As instructors the performance task model served as a basis for assessment of our students' abilities in creating and delivering meaningful instruction. For many of our students, we argue, this event was tangible proof that they had learned how to teach and how to relate to Hispanic children and parents through a well-conceived performance task. Indeed, it is not incorrect to state that many of our pre-service teachers *became* teachers after completing this program since it engaged them in an enterprise wherein it was required to use all the skills they had learned about in the credential program toward completion of a final product that could be judged on its own merits.

Further research could include follow up of how well these new teachers incorporate the teaching of science in their day-to-day teaching. Moreover, it would be edifying to engage the parents involved in this kind of project to discuss what they believe are the benefits of participation in special programs aimed at enhancing and improving science education at a school.

In reflecting upon the results of this research in our teacher education courses we are encouraged by the findings, and thus believe more deeply, that cultural relevant pedagogy is critical to the promotion of education in general and science education in particular. Today's teacher trainers should consider how effective culturally relevant teaching can impact the progress of a community in the development of children who may well be the star scientists of the future. One cannot help but to think what the young boy with a new telescope might be thinking about as he looks up into the night sky. Maybe he will think about the night he won a prize a part of a school program, where he was made to feel included and where the beauty of science took on a more personal flavor.

References

Astone, N. & McLanahan, S. (1991). Family structure, parental practices and high school completion. *American Sociological Review, 56,* 309-320.

Bernstein, R. (2005). *Hispanic population passes 40 million, Census Bureau Reports.* Available at www.census.gov/Press-Release/www/releases/archives/population/005164.html

Brooks, J. & Brookes, M. (1993). *In search of understanding: The case for constructivist classrooms.* Alexandria, VA: Association for Supervision and Curriculum Development.

Bureau of Labor Statistics (2005, November). Employment outlook: 2004-2014 Occupational employment projections to 2014. *Monthly Labor Review,* 70-101.

Cappella-Santana. (1998). Developing culturally relevant curriculum: parents as a source of knowledge. *Critical Issues in Teacher Education, 7,* 33-44.

Catsambis, S. (1994). The path to math: Gender and racial-ethnic differences in mathematics participation for middle school to high school. *Society of Education, 67,* 199-215.

Chapa, J. & De La Rosa, B. (2006). The Problematic pipeline: Demographic trends and latino participation in graduate Science, Technology, Engineering, and Mathematics Programs. *Journal of Hispanic Higher Education, 5*(3), 203-221.

Curran, E. & Murray, M. 2008. Transformative Learning in Teacher Education: building Competencies and changing dispositions. *Journal of the Scholarship of Teaching and Learning, 8,* 3, 103-118.

Diaz, S., Mill, L., & Mehan, H. (1992). Sociocultural resources in instruction: A context specific approach. In California State Department of Education (Ed.) *Beyond language: social and cultural factors in schooling language minority students* (p. 187-230). CA: Evaluations, Dissemination and Assessment Center.

Eliot, L. (1999). *What's going on in there? How the brain and mind develop in the first five years of life.* Bantam: NY, NY.

Fan, X. & Chen, M. (2001). Parental involvement and students' academic achievement: A meta-analysis. *Educational Psychology Review, 13,* 1-22.

Flaxman, E., & Inger, M. (1991). Parents and schooling in the 1990's. *The ERIC Review, 1*(3), 2-6.

Garcia, J. (1988). Minority participation in elementary science and mathematics. *Education and Society, 1*(3), 21-23.

Gibbons, B. (2003). Supporting elementary science education for English Learners: A Constructivist Evaluation Instrument. *Journal of Educational Research, 96*(6), 371-380.

Gibson, H. (1998, April 19-22). *Case studies of an inquiry-based science programs' impact on students' attitude towards science and interest in science careers.* Paper presented at the Annual Meeting of the National Association for Research in Science Teaching, 71st, San Diego, CA.

Grieco, E. & Cassidy, R. (2001). *Overview of race and Hispanic Origin: Census 2000 brief.* Washington, DC: Economics and Statistics Administration, U.S. Census Bureau.

Griffith, J. (1996). Relation of parental involvement, empowerment, and school traits to student academic performance. *Journal of Educational Research, 90,* 33-41.

Haines, R. (2006). *HACU rededicates Hispanic education advocacy efforts.* Hispanic Association of Colleges and Universities.

Hofstein, A. & Lazarowitz, R. (1986). A comparison of the actual and preferred classroom learning environment in biology and chemistry as perceived by high school students. *Journal of Research in Science Teaching, 23*(3), 189-199.

Irvine, J. & Armento, B. (2001).*Culturally responsive teaching: Lesson planning for elementary and middle grades.* Boston: McGraw-Hill.

Keith, P. & Lichtman, M. (1994). Does parental involvement influence the academic achievement of Mexican-American eighth graders? Results from the National Educaiton Longitudinal Study. *School Psychology Quarterly, 9*(4) 256-273.

Kruse, G. (1998). Cognitive science and its implications for education. *NASSPBulletin, 82*(598), 164-167.

National Center for Education Statistics. (1999). *The educational progress of Hispanic Students.* Washington, DC: U.S. Department of Education.

National Science Foundation. (2008). *WebCASPAR:* Data from IPEDS Completions Survey.

Perez, S. & de la Rosa Salazar, D. (1997). Economic, labor force and social implications of Latino educational and population trends. In A. Darder, R. Torres, & H. Guterrez (Eds.), *Latinos and education: A critical reader.* Routledge: NY. 45-79.

Raffaele, L. & Knoff, H. (1999). Improving home-school collaboration with disadvantaged families: Organizational principles. *School Psychology Review, 28*, 448-466.

Ruiz, Y. (2002). Predictors of academic resiliency for Latino middle school students. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 63*(2-B), 1067.

Shumow, L. & Miller, J. (2001). Parent's at-home and at-school academic involvement with young adolescents. *Journal of Early Adolescence, 21*, 68-91.

Smith, F. & Hausafus, C. (1998). Relationship of family support and ethnic minority students' achievement in science and mathematics. *Science Education, 82*, 1, 111-125.

Snyder, T. D., Hoffman, C. M., & Geddes, C. M. (1997). *Digest of Education Statistics, 1997*. Washington, DC: National Center for Education Statistics (ED).

Stevenson, D. & Baker, D. (1987). The family-school relation and the child's school performance. *Child Development, 58,* 1348-1357.

Sui-Chu, E. & Willms, J. (1996). Effects of parental involvement on eighth-grade achievement. *Sociology of Education, 69*(2), 126-141.

Wiggin, G and McTighe, J. (2005). *Understanding by design*. Upper Saddle River, New Jersey.