

THESIS

A PROCESS FOR BUILDING THE CAPACITY OF INFORMAL SCIENCE
EDUCATION PROVIDERS TO ENGAGE LATINOS

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WE HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER OUR SUPERVISION BY ERICA K. SORENSEN ENTITLED A PROCESS FOR BUILDING THE CAPACITY OF INFORMAL SCIENCE EDUCATION PROVIDERS TO ENGAGE LATINOS BE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE.

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ABSTRACT OF THESIS

A PROCESS FOR BUILDING THE CAPACITY OF INFORMAL SCIENCE EDUCATION PROVIDERS TO ENGAGE LATINOS

The challenges of our global economy and escalating environmental concerns are fueling the demand for qualified graduates in science, technology, engineering, and mathematics (STEM) fields. However, the U.S. now lags behind many other industrialized nations in science achievement. Furthermore, educators have been struggling to close the gap in science achievement between White and non-White students in this country for decades. Considering the rapid demographic changes occurring in the U.S., improving science education for all students has become a critical priority. Latinos are the largest and fastest growing ethnic group in the United States, yet Latino students remain at the margins of STEM education and are underrepresented in these fields in the workforce.

Informal science education (ISE) is science learning that occurs outside of formal classrooms in settings such as museums, zoos, science and nature centers, and other community-based youth development programs. ISE programs can have many academic and social benefits for participants and play an important role in improving science education, yet they often face challenges in engaging Latinos and other diverse youth and families.

This case study describes the assessment process one group of ISE organizations in northern Colorado went through to examine how they could build their capacity to improve access to ISE for Latino youth and families. This study recommends that ISE organizations 1) develop awareness and knowledge about Latino cultural values, needs, and social structures as well as culturally responsive teaching strategies; 2) build new partnerships and strengthen existing relationships with schools and local Latino-serving community organizations; 3) utilize culturally relevant advertising and promotion strategies, and 4) structure programs with an awareness of cultural and practical considerations to meet the needs of Latino audiences.

The process enabled ISE organizations to identify strengths and weaknesses in their current outreach strategies and to set priorities for improving access to ISE as a community of ISE providers. It was also effective in raising awareness of resources for connecting to the Latino community and provided opportunities for networking and collaboration. Limitations of time, staff, money, and lack of expertise were perceived as barriers to implementing changes in outreach strategies. The process and findings of this study may serve as a useful guide to ISE organizations in other communities adapting to cultural and linguistic demographic changes.

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Chapter I

Introduction

The challenges of our globalized economy and the escalating environmental concerns that accompany economic development are fueling the demand for qualified graduates in science, technology, engineering, and mathematics (STEM) fields. The science and engineering workforce has shown sustained growth for over half a century, and growth is projected to continue into the future (National Science Foundation [NSF], 2010). Furthermore, science literacy is an essential skill for all future leaders and decision-makers in our technology and knowledge driven society.

However, the U.S. has fallen behind many other countries in science achievement. According to the 2006 Program for International Student Assessment (PISA), U.S. students scored 16th out of 30 industrialized countries in science literacy (Organisation for Economic Cooperation and Development [OECD], 2009). American youth as a whole are less prepared than their international counterparts to compete for high-demand jobs in STEM fields. Certain groups within the US face an even greater struggle to succeed in science-related fields. There has been a well-documented gap in science achievement between White and non-White students in the United States for decades (National Assessment of Educational Progress [NAEP], 2005; National Center for Education Statistics [NCES], 2009).

Addressing the science achievement gap becomes even more crucial considering the demographic change occurring in the United States. Latinos now comprise the largest ethnic group in the United States at 46.9 million, or 15% of the total population (U.S. Census Bureau, 2009). The U.S. Census Bureau defines the term *Latino* as a person of Cuban, Mexican, Puerto Rican, South or Central American or other Spanish culture or origin regardless of race. The Census predicts that 62% of children will be from non-Caucasian backgrounds by 2050 and that 30% of those children will be Latino. Although the proportion of Latino and other diverse students is growing, they remain at the margins of STEM education. Latino students score lower on math and science achievement tests, are more likely to be placed in low-achieving tracks, take fewer higher-level classes, are more likely to drop out compared to middle class Caucasian students (NCES, 2009; Pew Research Center, 2005). Subsequently, Latinos are underrepresented in STEM fields in the workforce. Latino representation in high-skill science and math-related fields such as engineering, computer and math science, health care, and life, physical and social sciences hovers around five percent, about one-third of their representation in the general population (Pew Research Center, 2005).

Despite underrepresentation in STEM education and careers, interest in science is reportedly high among diverse elementary school students (Wenner, 2003) and is increasing among Latino high school students (National Latino Heritage Foundation, 2007). At some point in the education system there is a failure to sustain interest in and commitment to science and related fields for diverse students. While formal schooling has long been held responsible for addressing the achievement gap, it has been insufficient in doing so. Society must involve the full range of science learning

experiences, including informal science education (ISE), in improving science education in the U.S. for all students.

ISE is science learning that takes place outside of formal classrooms in places such as zoos and aquariums, museums, parks, science and nature centers, and other community-based programs youth development programs such as 4H and Scouts. These programs can have many academic and social benefits for diverse youth including promoting interest, confidence, and self-efficacy in science, improving science literacy and academic achievement, and influencing youth to pursue a science career (Bell, Lewenstein, Shouse, & Feder, 2009).

Not unlike formal science education, ISE programs often face challenges in reaching nondominant groups. Both formal and informal educators are struggling to adapt to the cultural and linguistic changes occurring in communities across the United States. While there has been considerable research into understanding barriers to participation in ISE for nondominant groups, research is sparse on how to structure informal science learning opportunities to meet the needs of diverse groups (Bell, et al., 2009). There is a need for more research into the process of developing, implementing, and evaluating strategies for broadening participation in ISE, especially among Latinos.

This thesis addresses this need. The goal of this study is to develop, implement and evaluate a process for assessing and building the capacity of ISE providers in northern Colorado to more effectively engage Latinos in STEM education. This study is the third phase of a larger exploratory mixed methods study that began in 2006. Initially supported by the National Science Foundation (NSF), the goal of the larger study was to address how universities could be a better resource of informal science education for the

community, specifically for underserved youth. A local foundation and Colorado State University Extension provided continued support for this phase of the study after NSF funding concluded in 2008.

In the first phase of this process, the research team conducted focus group interviews with Latino parents in the study area to learn about their interest level in ISE and the barriers to participation in ISE they perceived for their families. In the second phase researchers developed and administered a quantitative survey to Latino households to expand on the themes identified in the focus group. In this third and final phase of the study ISE providers participated in a series of two workshops to raise awareness of the needs and interests identified by Latino parents in the first two phases of this study, raise awareness of the best-practices and recommendations for increasing access to ISE for Latinos found in the literature, and to provide opportunities for ISE providers to brainstorm and set goals. The participants also completed an organizational assessment tool, developed for this study, to assess their current capacity for successful outreach to Latinos. Finally, the participants evaluated the effectiveness of the process.

Gatekeepers to the Latino community also participated in the workshops to provide understanding of the local context and to facilitate collaboration between ISE providers, the school district, and Latino-serving community organizations. *Gatekeepers* are individuals who have an official or unofficial role at a study site, provide entrance to a site, help researchers locate people, and assist in the identification of places to study (Creswell, 2008).

This study was guided by the following research questions:

1) How can collaboration between ISE organizations and the local Latino community facilitate increased engagement in ISE opportunities by Latino youth and families in northern Colorado?

2) How will participating in this assessment and evaluation process affect the capacity of ISE organizations to develop culturally responsive programs and outreach strategies?

This thesis consists of two parts: a journal article and a technical report. The journal article discusses the prior research on this topic and makes recommendations for broader application of this process and findings of this study. The technical report provides an overall assessment of the capacity of the ISE community in northern Colorado to effectively engage Latino youth and families. It also outlines the priorities and specific strategies for improving access to ISE for Latinos and other underserved audiences identified by the study participants. The technical report also includes an extensive resource directory to assist ISE providers in taking the next steps toward developing culturally responsive ISE programs and organizations. This process and the assessment tool, with some modification, may serve as a useful guide to help ISE providers in other communities build the capacity to more effectively engage Latinos and other underserved groups in their programming.

Chapter II

Manuscript 1

A Process for Building the Capacity of

Informal Science Education Providers to Engage Latinos

Abstract

Informal science education (ISE) can help address the science achievement gap between U.S. students and their international counterparts as well as the gap within the U.S. between White and non-White students. Latinos are the largest and fastest growing ethnic group in the U.S. and also the most left out of critical science-related education and careers. Previous research has addressed the barriers to participation in ISE for Latinos, but research on how to structure ISE programs to meet the needs of diverse groups is limited. This qualitative case study addressed this issue by engaging a community of ISE providers in a process to assess their organizations and build capacity to engage Latinos. Participants completed an organizational assessment tool, developed for this study, to identify strengths and weaknesses in their outreach strategies and attended two workshops to discuss their assessment results, network, and set priorities for improving access to ISE. The assessment tool suggests four themes ISE providers should consider to develop culturally responsive programs: 1) developing cultural awareness, knowledge, and skills for working with Latinos; 2) build partnerships with schools and Latino-serving community organizations; 3) utilize culturally relevant advertising and promotion strategies, and 4) structure programs with an awareness of cultural and practical considerations to meet the needs of Latino audiences. This process may serve as a useful guide for other ISE providers working to increase access to ISE experiences for all youth and families.

Keywords: Informal science education, Latinos, diverse youth, cultural responsiveness, program assessment

As society confronts the challenges of the global economy and the environmental concerns that accompany economic development, there is an increasing demand for skilled workers in the science, technology, engineering, and mathematics (STEM) fields. However, students in the U.S. are less prepared to compete for these high demand jobs: the U.S. now ranks 16th out of the top 30 countries in science achievement (Organisation for Economic Cooperation and Development [OECD], 2009). Certain groups within the U.S. face an even greater struggle to succeed in science and related fields. There has been a persistent gap in science and math achievement between White and non-White students in the U.S. for decades (National Assessment of Educational Progress [NAEP], 2005; National Center for Education Statistics [NCES], 2009).

Considering the rapid demographic change occurring in the U.S., the need to improve STEM education for all students becomes even more critical. Latinos now comprise the largest and fastest growing nondominant ethnic group in the United States at 46.9 million, or 15% of the total population (U.S. Census Bureau, 2009). The U.S. Census Bureau defines the term *Latino* as a person of Cuban, Mexican, Puerto Rican, South or Central American or other Spanish culture or origin regardless of race. The Census predicts that 62% of children will be from non-Caucasian backgrounds by 2050 and that 30% of those children will be Latino. These students who will become our future leaders and workforce are the ones most absent in crucial STEM education and careers (Pew Research Center, 2005).

Improving science education must include all aspects of the system – including informal science education. Informal science education (ISE) programs occur outside of the formal school system in settings such as science and nature centers, zoos, museums,

and youth development programs (e.g., 4H, Scouts) and play a pivotal role in engaging youth in science. ISE experiences can promote interest, confidence, and self-efficacy in science, improve science literacy and academic achievement, and can influence youth to pursue a science-related career (Bell, Lewenstien, Shouse, & Feder, 2009). Despite the benefits and unique role of ISE in improving science education, diverse groups are often underrepresented in ISE programs.

While there has been considerable research into understanding the barriers to participation in ISE for nondominant groups, research is sparse on how to structure informal science learning opportunities to meet the needs of diverse groups (Bell et al., 2009). The purpose of this study was to engage ISE providers in a process of assessing and developing their capacity to structure programs to better meet the needs of Latino youth and families. The study was guided by the following research questions:

1) How can collaboration between ISE organizations and the local Latino community facilitate increased engagement in ISE opportunities by Latino youth and families in northern Colorado?

2) How will participating in this assessment and evaluation process affect the capacity of ISE organizations to develop culturally responsive programs and outreach strategies?

Literature Review

Changing Demographics and the Science Achievement Gap

The proportion of Latino students is growing rapidly, yet these students remain at the margins of STEM education and are subsequently underrepresented in these fields in

the workforce. When considered as an entire ethnic group, Latinos are the least educated with only American Indians/Alaska Natives faring as poorly (Pew Research Center, 2005). Latino students score lower on national science and math achievement tests than the national average, are more likely to be placed in low-achieving tracks, take fewer higher-level classes, and are more likely to drop out compared to middle-class Caucasian students (NAEP, 2005; NCES, 2009; Pew Research Center, 2005).

This disadvantage in K-12 schooling contributes to the under-representation of diverse groups in STEM fields in college and careers. Latinos, African Americans, and American Indian/Alaskan Natives together constitute 24% of the U.S. population, yet make up just 10% of workers in STEM fields holding college degrees (NSF, 2010). More specifically, Latino representation in high-skill science and math-related fields such as engineering, computer and math science, health care, and life, physical and social sciences hovers around five percent, about one-third of their representation in the general population (Pew Research Center, 2005). If this trend of low participation in science-related education and careers goes unchanged, the U.S. as a whole stands to lose as the Latino population continues to grow.

It is important to recognize that diverse students often reflect multiple social factors affect that affect achievement when ethnicity and race are controlled for, such as coming from low-income households, limited English language proficiency, generation, parental involvement, as well as parent and teacher expectations (Kao & Thompson, 2003). These distinctions are particularly important among Latinos because they are an extremely heterogeneous ethnic group. There is substantial variation in the academic success of Latino students depending on language dominance (whether Spanish or

English is primarily spoken) and generation, which describes the length of time in the United States and relates to levels of acculturation, which is the change in cultural behavior and thinking of a person or group of people through contact with another culture. Many Latino families have been in the U.S. for generations, don't speak Spanish, and are highly acculturated into the mainstream culture.

The Pew Research Center (2005) explains that first-generation Latino students whose parents were born in another country tend to receive less parental support and involvement in their education. Second or higher generation Latino students who primarily speak English have higher academic success when measured as a sub-group among Latinos. Immigrant parents often work two or three low-paying jobs and do not have the education and literacy skills, or the time to support their child's learning. Furthermore, immigrant parents may not have the ability to navigate the U.S. school system and may have very different perceptions about their role in their children's education (Garibay, 2009; Sanchez & Arce, 2009; Springer et al., 2009). These researchers have found that Latino parents have a high level of respect for educators and recognize the value of education, but tend to believe that they should not interfere with school activities and are not as vocal or assertive about their children's education as other parents. ISE providers can play a role in reconciling this paradox by involving parents in informal learning opportunities to help bridge the gap between home and school.

Interest in Science

The underrepresentation of Latinos and other diverse groups in STEM education and careers is not likely due to a lack of interest in science and related fields. A recent study found that Latino high school students are increasingly more interested in math,

science and engineering (Latino Heritage Foundation, 2007). Another study found that low-income elementary students from nondominant backgrounds demonstrated even stronger interest in science than their middle-class White peers (Wenner, 2003). Similar results have been found by other researchers (see Anderson & Kim, 2006; Basu & Calabrese-Barton, 2007; Bruyere, Gobbs-Hill & Paulding, in review; Fadigan & Hammrich, 2004; Jones, 1997; Sorge, Newsom and Hagerty, 2000).

Despite reported high interest in science, at some point in the education system there is a failure to sustain commitment to science among diverse youth. Cole and Espinoza (2008) and Fadigan and Hammrich (2004) separately found that students who have the opportunities to take rigorous math and science classes in high school are more likely to follow STEM paths in college and careers. However, schools with higher percentages of low-income and diverse students are less able to provide such opportunities due to insufficient resources, lack of experienced teachers, and limited learning enhancement opportunities (Bevan & Semper, 2006; Martinez, DiGarmo, & Eddy, 2004; Miller, 2003).

Furthermore, diverse students frequently report that what they learn in school, particularly in school science, has little relevance to their lives outside the classroom or to their futures (Atwater, 1996; Fusco, 2001; Nieto, 1994; Sleeter & Grant, 1991). Many low-income, diverse students describe science as a discipline that generates boredom, anxiety, confusion, and frustration (Basu & Calabrese-Barton, 2007). However, young people often find informal science experiences more attractive and relevant to their lives than school science. In fact, many people with science-related careers credit their initial interest in STEM to informal rather than formal exposure, identifying museums and

science centers as the most important stimulants to their childhood interests (COSMOS Corporation, 1998). ISE has an important role to play in supporting school science and expanding opportunities to connect diverse youth with science.

Benefits of ISE

The nature and structure of ISE programs make them uniquely situated to have profound positive benefits for diverse youth. ISE experiences are characterized as “learner-motivated, guided by learner interests, voluntary, personal, ongoing, contextually relevant, collaborative, non-linear, and open-ended” (Bell et al., 2009, p.11). These descriptors contrast with traditional classroom science experiences, where learning is generally externally-motivated, teacher- or curriculum-centered, and students have little control over their learning.

ISE programs appeal to multiple learning styles and offer hands-on, stress-free activities in a real-world context. ISE can foster “free-choice” learning, a well-documented approach to enhancing science learning (see Falk, 2005; Jones, 1997; Kola-Olusanya, 2005). Learning in free-choice setting is voluntary, often socially mediated, and stimulated by the needs and interests of the learner. Free-choice programs allow for the integration of prior learning experiences and knowledge brought in by ethnically and culturally diverse visitors and can facilitate the progression from *interest* in a topic to *action* and *learning* about that topic (Falk, 2005).

This progression is well illustrated in Fadigan and Hammrich’s (2004) longitudinal study of low-income, minority women who attended a year-long urban ISE program. Of 152 participants, 93% went to college and 45% of those women chose a major in a STEM field. The women identified friends and role models in the program

and supportive relationships with ISE staff as factors that contributed to their educational choices. Similarly, in Riggs and Greenberg's (2004) study of immigrant Latino children participating in an ISE program, researchers found significant increases in participants' math, reading, and spelling but more importantly found that the program increased parental involvement and contributed to a strong sense of community. Involving parents, peers, and role models to create a sense of community and support for science learning are important factors in influencing academic success, school attendance, and improving social skills for diverse students (Cooper, Jackson, Azmitia, Lopez, & Dunbar, 1995; Kao & Thompson, 2003; Martinez, et al, 2004; Pew Research Center, 2005).

Barriers to Participation

Despite the benefits of ISE, several studies note that ISE programs face challenges in reaching nondominant groups (Allison & Hibbler, 2004; Bell et al., 2009; Dierking & Falk, 1994; Fadigan and Hammrich, 2004; Hong & Anderson, 2006; Jones, 1997). Participants in ISE have tended to be White, older, wealthier, and more educated (Bell et al., 2009). In a quantitative analysis of national out-of-school program participation, researchers found that Latino youth participated at significantly lower rates (30%) compared to both Caucasians (56%) and African Americans (42%) with the exception of tutoring programs where participation with Caucasians was comparable (Weiss et al., 2006). The discrepancy between high interest in science and low participation in ISE has prompted considerable research into the barriers to participation for Latinos and other nondominant groups.

Two behavior theories discuss constraints to participation in various discretionary-time activities for individuals. In the hierarchical model of leisure

constraints, Crawford, Jackson, & Goodbey (1991) found that *intrapersonal*, *interpersonal*, and *structural* factors may prohibit people from participating in leisure (i.e., recreation) activities. *Intrapersonal* are constraints are those that occur within an individual, such as a person's interest level or ability. *Interpersonal* constraints are those that are affected by other people or social norms, such as different leisure preferences within a family or peer network. *Structural* constraints are practical issues that intervene between preferences and participation such as financial resources, availability of programs, and time. *Intrapersonal* constraints were identified as the first and most powerful in the sequential hierarchy of constraints because they provide motivation for participation. Structural constraints (e.g., transportation, cost) were identified as less important as they are typically easier to change. While the application of this model to ISE participation is uncertain due to its focus on recreation and leisure behavior, it is helpful in conceptualizing factors that might influence ISE participation.

Walker and Manjarrez's (2003) free-choice learning participation framework applies to individual participation decisions in cultural and educational opportunities and shares many commonalities with the hierarchical model. In the free-choice model, *individual* and *community* factors together influence participation. *Individual* factors consist of personal motivations which depend on values, beliefs, skills, and interests and are comparable to the *intrapersonal* factors in the Crawford et al. model. The free-choice model also includes factors such as the availability of resources such as time and money in the *individual* category, whereas in the Crawford et al. model these are considered structural constraints. *Community* factors include *paths of engagement* and the *structure of opportunities* and are comparable to the *interpersonal* and *structural*

constraints respectively in the Crawford et al. model. *Paths of engagement* are ways that family and social ties, organizational affiliation, and business/professional relationships influence and connect people to free-choice learning opportunities. *Structure of opportunities* includes the number, quality, and accessibility of programs or events.

A recent study by Bruyere, Gobbs-Hill, and Paulding (in review) proposed a framework specifically for ISE participation based on the hierarchical and free-choice learning participation frameworks as well as findings from focus group interviews with Latino, African American, and Caucasian parents (see Figure 1). In the focus groups parents discussed their interest levels in ISE, preferable program formats, potential constraints to participation, and possible resolutions to those constraints. In this model, as in the Crawford et al. and Walker and Manjarrez models, *interest* (an *intrapersonal* or *individual* factor) is understood as a prerequisite to participation decisions. All three of these theories agree that if a person is not interested in an activity or program, he/she is unlikely to be affected by higher level constraints.

This framework differs from the previous two behavior theories by taking into consideration that if individuals are unaware of opportunities, they cannot choose to participate in them. Therefore, *culturally effective promotion* strategies are necessary to inform individuals about programs of potential interest. Then, people decide whether the program has desirable characteristics. At this point individuals may encounter *practical* constraints (comparable to *structural* or *structure of opportunities*) and/or *cultural* constraints (comparable to *interpersonal* or *paths of engagement*) to participation.

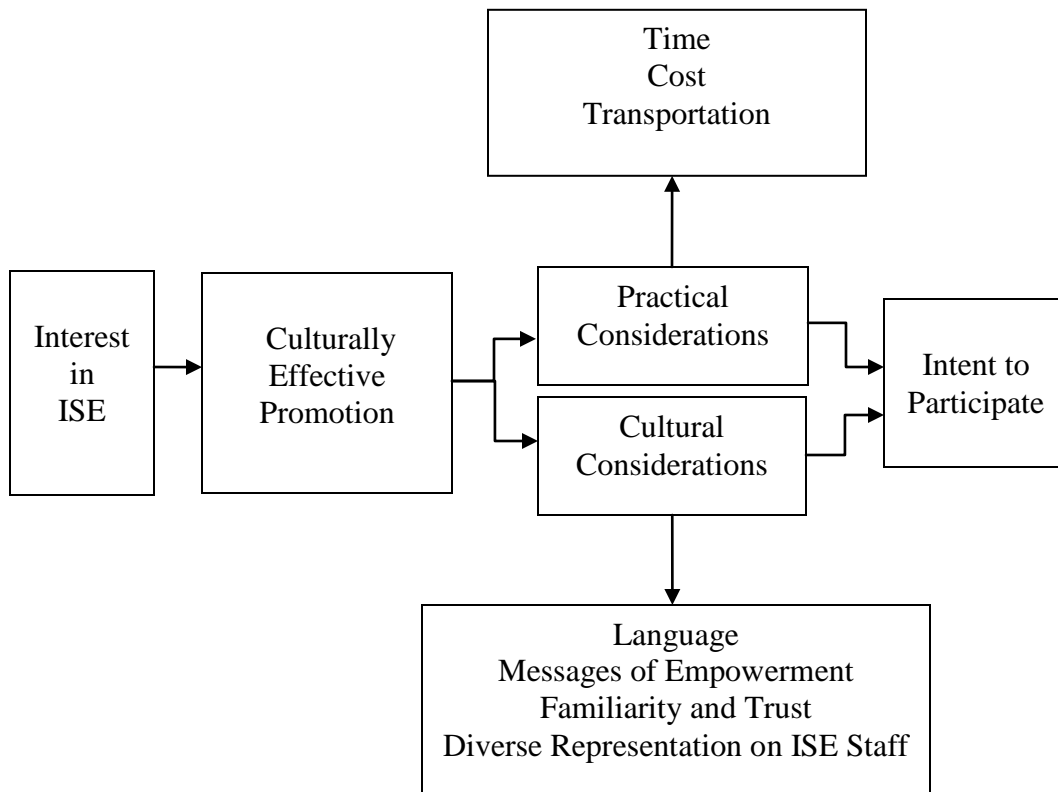


Figure 1. Model of Informal Science Education Participation. From “Developing a Model to Predict Participation in Informal Science Education by Families on Colorado’s Front Range,” by B. Bruyere, S. Gobbs-Hill, & L. Paulding, (in review).

The Bruyere et al. (in review) study revealed a high level of interest in ISE among all focus group participants, suggesting that a lack of interest in ISE, a difficult to change *intrapersonal/individual* constraint, was not a perceived limitation. However, parents from all three cultural groups did express a lack of awareness of ISE opportunities and reported that ISE organizations’ advertising strategies did not reflect how they typically learn about educational opportunities. Preferred communication strategies varied among cultural groups. Latinos and African Americans a preference for information distribution via personal networks and community gathering locations, such as churches and community centers, as well as in-person appeals. In addition, Latinos

expressed a desire for advertising in Spanish and via the schools. Caucasians preferred internet and email communication.

Cost, time, and transportation were barriers classified as *practical* constraints described by all three cultural groups. Latino and African American participants described other, more culturally rooted constraints or preferences that Caucasians did not describe. These *cultural* constraints included language barriers (Latinos only), the lack of representation of diverse people in STEM fields and as staff of ISE organizations (African Americans only), the desire for programs that send messages of empowerment and opportunity (i.e., opportunities to learn new skills or how to become a scientist) and a lack of trust in and familiarity with ISE organizations.

Many other studies describe similar constraints to participation in ISE for Latinos that can be organized using the Bruyere et al. model. Certain cultural and practical barriers to participation in ISE that have been frequently described by Latinos in the literature are shown in Table 1. The practical barriers of cost, transportation, and time are repeatedly identified in the literature. However, cultural barriers such as the lack of Spanish-language programming and materials, the lack of representative bilingual staff, and not feeling welcomed at ISE venues appear to be more salient participation constraints for Latinos.

The Oregon State University Extension Service recently published a report of their findings from ten years of Latino outreach programs in partnership with 4H. This quote from that report concisely summarizes how cultural barriers limit participation in out-of-school programs by Latinos:

“The major barrier to Latino youth participation...is that most parents have no prior experience with youth organizations. Parents lack an understanding of the benefits of such organizations and how to access them. Most importantly, they feel no connection to mainstream organizations and thus have no trust in them” (Hobbs & Sawer, 2009, p.4).

Table 1

Frequency in Selected Literature of Practical and Cultural Barriers to Out-of-school Program Participation by Latinos

Author	Practical Barriers			Cultural Barriers					
	Cost	Trans ^a	Time ^b	Lang ^c	Rep ^d	Aware ^e	Safety	Trust ^f	Atm ^g
Allison & Hibbler (2004)				X	X				X
Borden et al. (2006)	X	X	X	X			X		X
Bruyere et al. (in review)	X	X	X	X		X		X	
Cooper et al. (1995)		X	X						
Garibay (2009)	X			X	X	X			X
Hong & Anderson (2006)	X			X	X			X	X
Miller et al. (2003)	X	X		X	X		X		
Rideout (2000)		X				X			
	5	5	3	6	4	3	2	2	4

Note. An X indicates studies that concluded the barrier existed for out-of-school program participation. ^aTransportation. ^bTime constraints included home/ school work, family, or religious obligations and sports. ^cLanguage barriers. ^dLack of representation/Spanish- speaking staff. ^eLack of awareness. ^fUnfamiliarity and lack of trust. ^gUnwelcoming atmosphere (e.g., negative attitudes, stereotypes, fear of discrimination).

The emphasis on these culturally-rooted constraints to participation reflects the need for ISE providers to think beyond practical measures to make their programs more accessible to all audiences. ISE organizations must take into account the unique needs, values, and cultural perspectives of Latinos if they wish to engage this growing segment of the population and contribute to improving science education for all.

Developing Culturally Responsive ISE Programs

Recent advancements in cognitive and neurosciences have contributed to new understandings about how people learn, which has in turn influenced how teachers teach. The contemporary sociocultural view of education considers learning as it occurs within a larger interpersonal system characterized by physical, social, and cultural aspects that people bring to the learning environment (Correa-Zeigler, 2009a). People construct their understanding of the world based on their experiences and prior knowledge (Bransford, Brown, & Cocking, 1999). This new understanding of learning has brought about substantial interest in and commitment to developing cultural competence and culturally responsive education programs.

Cultural competence is defined as a set of congruent behaviors, attitudes, and policies that come together in a system, agency, or among professionals and enables people to work effectively in cross-cultural situations (Cross, Bazron, Dennis, & Isaacs, 1989). In education, such practices are often labeled culturally responsive teaching (CRT). CRT is an approach that validates and incorporates the values, prior experiences and cultural knowledge of students (Gay, 2000). CRT strategies aim to empower

students intellectually, socially, emotionally, and politically by using cultural referents to impact knowledge, skills, and attitudes (Ladsen-Billings, 1995). ISE programs that take into account the contexts, perspectives, and needs of diverse populations by implementing culturally responsive practices have been successful in engaging ethnically and culturally diverse audiences.

The Oregon 4H report identified three critical factors that have sustained ongoing, culturally relevant programs:

1. 4H approached the community with an open mind, readiness to learn from the community, and the belief that Latino community members possess unique knowledge and understanding of what Latino youth need to thrive.
2. Culturally responsive programs were developed in response to the needs and interests identified by Latino youth and families.
3. 4H placed bilingual/ bicultural outreach staff in their programs for at least three years. The long-term presence of staff with a deep understanding of Latino culture and fluency in Spanish enabled 4H to establish a foundation of trust and to build relationships, two values of great importance in Latino culture.

The Oregon report also outlines specific aspects of culturally responsive programs. Such programs:

- Respect and reinforce the cultural identity of the youth and involve youth in active learning that makes real contributions to their communities.
- Set high expectations and help youth achieve their goals, including education and career goals.
- Reinforce social capital and strengthen ties to networks and resources in the greater community.
- Are contextual, based on the reality of youth's lives, and take place in an environment that "fits" who they are.
- Provide opportunities for youth to learn in an affinity group based on culture while at the same time encouraging participation in multi-cultural contexts.
- Encourage parental involvement as a way to support learning and to help parents understand how to support their children's aspirations for a college education (Hobbs & Sawyer, 2009, p.4).

In a 2007 study, Basu and Calabrese-Barton found that key program design strategies including a) flexibility in content (i.e., self-directed choice of topics) and assessment methods (e.g., video and other technology); b) providing access to materials as well as time and opportunities to experiment in a safe place; and c) involving families were factors leading to the development of long-term interest in science for low-income, yet high-achieving diverse students who participated in an afterschool program. Students developed a sustained interest in science when program experiences connected with how students envision their future, supported social networks that students valued, and supported students' sense of agency to enact their understandings and shape their communities.

Howe (2009) offers a model for developing a multicultural education program, useful to formal and informal educators alike (see Figure 2). It describes four dynamic steps that are involved in an on-going, continuous process of developing culturally responsive programs: Awareness, Knowledge, Skills, and Action. The first step requires an organization to develop awareness of bias and stereotypes within the organization about diverse communities and recognize the need to adjust to meet the needs of new audiences. Next, organizations must develop knowledge about the needs, interests, cultural values, prior experiences, social structures and other facts about the target group, as the Oregon 4H report also recommends. Skill development includes training ISE staff in strategies for working with culturally and linguistically diverse youth and families (e.g., the ability to deliver bilingual programs). Finally, with a solid foundation of awareness, knowledge, and skills, effective action can be taken to implement culturally

responsive programs based on the needs and interests of the community identified in the earlier stages of the process.

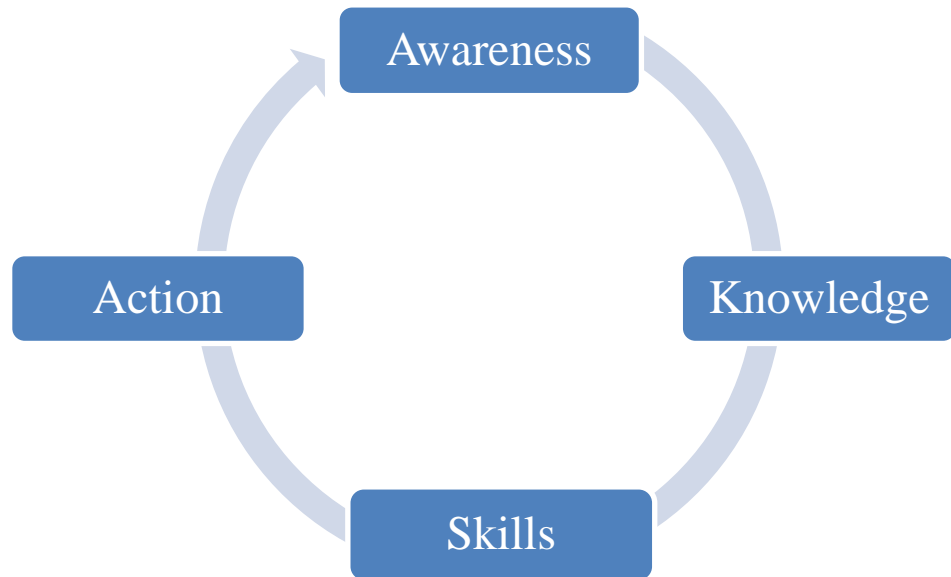


Figure 2. The four dynamics steps in the process of developing a multicultural program. Adapted from “Developing a multicultural curriculum: Keys to student achievement” by W. Howe, 2009, *Proceedings from the 19th National Association for Multicultural Education Conference*, p.5. Connecticut State Department of Education.

There is a wealth of knowledge and experience about working with diverse groups that can guide the development of culturally relevant ISE programs. Many other researchers that study pathways to sustained interest and achievement in science for diverse youth have made similar recommendations for developing programs that effectively engage diverse youth (see Borden, Perkins, Carleton-Hug, Stone, & Keith, 2006; Cooper et al., 1995; Fadigan & Hamrich, 2004; Jones, 1997; Martinez et al., 2004; Moll, Amanti, Neff, and Gonzalez, 1992; Rahm & Ash, 2008; Riggs & Greenberg, 2004; Springer, Hollist, & Buchfink, 2009). However, programming demands leave little

time for staff to synthesize and share this information and there are few models of fully mature, culturally relevant ISE programs (Bell et al., 2009; Lozar-Glenn, 2009). There is a shortage of easily accessed information on this topic and many ISE organizations proceed on a trial and error basis (Hobbs & Sawyer, 2009). Existing knowledge needs to be organized into a cohesive and accessible structure that will allow ISE organizations to assess their current outreach strategies and raise awareness of strategies and resources to help them connect with their communities.

This study contributes to this gap in research by synthesizing existing knowledge of best-practices and strategies for engaging Latinos groups in ISE and applying it in the form of an organizational assessment tool. The assessment tool used in this study was based on the most universal recommendations and strategies for engaging Latinos in ISE described in the literature, the findings of prior research conducted in the study area, and member checking interviews with local leaders in the Latino community. Based on this information, four themes or key areas of program assessment emerged: 1) *Organizational Awareness*, 2) *Partnerships*, 3) *Culturally Effective Promotion*, and 4) *Program Structure*. Appendix A is the complete assessment tool used in the study.

Theme One describes the need to develop awareness, knowledge, and skills through cultural competence training. This was recommended in the literature as the first-step in developing culturally responsive programs in the literature. Theme Two, developing partnerships with organizations that have trusting relationships established with the Latino community was another universal theme in the literature. Both of these concepts were supported in the interviews. Prior research in the study area found that Latino parents have low awareness of ISE program offerings. This finding provided the

foundation for Theme Three, developing culturally effective promotion, a concept that was also supported in the literature and the interviews. Finally, Theme Four, program structure, was developed based on the findings of the Bruyere, Gobbs-Hill, and Paulding (in review) study and their model of ISE participation that included both cultural and practical barriers to participation in ISE by Latinos as well as recommendations of the literature. See Appendix B for a table of the recommendations found in the literature that supported the development of each theme in the assessment tool.

Much of the existing literature is focused on the barriers to participation in ISE, either from the perspectives of potential participants or ISE staff themselves. There is little research examining how ISE organizations are responding to this information on a community level. This study implemented and evaluated a process to assess how one community of ISE providers is addressing the need to improve access to ISE opportunities for Latinos.

Methods

Study Area

This study took place in Larimer County, Colorado located in the north central part of the state. In 2009, Larimer County had an estimated 293,000 residents. Sixteen percent of students in the Larimer County school districts are Latino. Over the last decade, Latino enrollment in Larimer County schools has increased by 52.8% from 4,551 to 6,953 students (Compass of Larimer County, 2010). The majority of Latino families in the study area are of Mexican descent and are primarily first or second generation U.S. residents. Most Latino families in the study area have been in the U.S. an average of two

to ten years and many have moved between several states during this time. Most Latino students in this district are bilingual, but many parents are monolingual Spanish-speakers (T. Ellis, personal communication, November 16, 2009).

Three Phase Study

This study is the third phase of an exploratory mixed-methods project addressing how universities can be a better resource for informal science education in the community, specifically for underserved youth. The first phase of the project, conducted in 2006-07, conducted qualitative focus group interviews with 31 Latino parents to gain understanding of the level of interest in ISE and the factors that influence their families' participation in ISE programs. Parents were also asked for suggestions about how to improve ISE programs to make them more inclusive, such as preferred time frames and how to increase awareness of program offerings. Recruitment for the focus groups was conducted in partnership with local elementary schools and organizations that work with Latino families.

The second phase, conducted in 2007-08, developed and administered a quantitative survey to 83 Latino households in the study area to test the themes identified in the focus groups based on a larger sample population. The survey generally asked parents to respond to statements such as: "Participation in community science programs is important for my child," "I am unaware about opportunities for science education in my community," and "Transportation to community science programs is difficult for my family." Responses were measured on a Likert scale of 1 (strongly disagree) to 7 (strongly agree). Both mail-in and in-person purposive sampling strategies were used to target Latino residents.

In the third and final phase of the study, a qualitative assessment of local ISE organizations was conducted during 2009-10 to understand how these organizations are addressing the issues identified in the first two phases of the project.

Collective Case Study

A case study is an in-depth exploration of a system (e.g., an activity, event, process, or individuals) bounded in terms of time, place, or some physical boundaries and based on extensive data collection (Creswell, 2008). More specifically, this was a collective case study, in which multiple cases are described and compared to provide insight into an issue (Stake, 1995). This phase of the study explored the process of how a group of ISE organizations in northern Colorado is addressing the issue of engaging Latinos in ISE opportunities.

Education coordinators and program staff from local ISE organizations participated in two workshops and completed an assessment tool which enabled them to identify their strengths and weaknesses in terms of organizational effectiveness for reaching the Latino community. Representatives from local Latino-serving community organizations and from the local school district also attended the workshops to provide insight and understanding of the needs and circumstances of the Latino community and to facilitate collaboration between the two groups. These representatives, hereafter referred to as gatekeepers, did not complete the assessment tool. *Gatekeepers* are defined as individuals who have an official or unofficial role at a study site, provide entrance to a site, help researchers locate people, and assist in the identification of places to study (Creswell, 2008).

The purpose of the first workshop was to familiarize participants with the previous research and to introduce the assessment tool. After completing the assessment tool on their own, participants were invited to attend a second workshop several weeks later to discuss their results, brainstorm next steps, and set goals and priorities for implementing more effective outreach strategies as a community of ISE providers. Finally, participants evaluated the effectiveness of the process as a whole.

Study Participants

Fourteen ISE organizations were originally invited to participate in the study and nine completed the assessment tool. A total of 20 individuals attended the first workshop: 14 staff members from nine ISE organizations, four gatekeepers from the school district, and two gatekeepers from community organizations serving the Latino community. Ten participants attended the second workshop: seven staff members from six ISE organizations and three gatekeepers from the school district.

Data Collection

Data was collected from multiple sources during the study including quantitative and qualitative results of the assessment tool, workshop notes and observations, written responses to workshop evaluations, and audio recordings of small group evaluation discussions.

The assessment tool. Due to the lack of an existing Latino-specific assessment tool, one was developed as part of this study (see Appendix A). As described earlier, the tool integrates the recommendations and best-practices for effective outreach to Latinos based on an extensive review of the literature and prior research conducted in the study area. In addition, five member checking interviews were conducted with local

gatekeepers to confirm research findings from previous phases of this study and the topics addressed in the literature. These steps were taken to ensure the trustworthiness and validity of the assessment tool. Four overarching themes emerged from these sources: 1) *Organizational Awareness*, 2) *Partnerships*, 3) *Culturally Effective Promotion*, and 4) *Program Structure*. Each theme was further defined with five to nine statements to which participants assigned a score for their organization between zero (0) if the organization does not currently meet the statement at all and three (3) if the organization currently fulfills the statement and considers it a strong aspect of their organization. A total of 90 points were possible. The scoring was subjective (i.e., self-report) and meant to serve as a gauge for each organization to measure their own policies and procedures.

After participants returned their completed assessment tools, the researchers converted the reported scores into percentages for each theme and overall, allowing each organization to identify quantitatively their areas of relative strength and specific areas that need improvement. In addition, the mean scores for each theme and overall were calculated for all organizations to offer an initial indicator of ISE providers' capacity for effective Latino outreach in northern Colorado from a community perspective. At the end of the assessment tool participants were asked to reflect on their results and describe their greatest strengths and areas requiring the most attention in open-ended responses.

Evaluation questionnaire. The workshop evaluation questions were guided by the research questions and the goals of the study and designed to enable the researchers to understand the effects of the workshops and assessment tool. Participants were asked to respond to the following questions:

1. Do you feel like participating in these workshops has helped you identify organizational needs and goals? What was most eye-opening for you?
2. Please describe how it felt to look objectively and critically at your organization.
3. Has participating in this process improved your preparedness for developing (or reassessing) an organizational outreach plan to make your programs more equitable and accessible to all audiences? Has it encouraged you to take steps in developing a plan to do so?
4. Did you discuss the assessment tool with others at work? What were reactions to the concepts of developing organizational awareness, cultural competence, and changing how outreach is currently done? Did you encounter resistance, or were people supportive and enthusiastic?

Participants spent 10-15 minutes writing their responses. The researchers then recorded small group discussions guided by the evaluation questions. The audio recordings were transcribed following the workshop.

Data Analysis

The audio transcripts, workshop notes, and written evaluation responses were coded using thematic narrative analysis methods (Riessman, 2008). This approach is commonly used in applied settings and the primary focus is on content, or *what* is said rather than *how*, *to whom*, or *for what purposes*. “Data are interpreted in light of thematics developed by the investigator, influenced by prior and emergent theory, the concrete purpose of an investigation, the data themselves...and other factors” (Riessman, 2008, p. 66). Thematic analysis differs from grounded theory due to this reliance on *a priori* themes and theory. In thematic analysis the investigator goes back and forth

between primary data and the scholarship of others to check what is seen against concepts others have related.

In this study, the prior themes established in the assessment tool and rooted in the literature (e.g., Allison & Hibbler, 2004; Howe, 2009; Hobbs & Sawyer, 2009; Lozar-Glenn, 2006; Sherman, 2009) served as resources for interpretation of spoken and written narratives from ISE participants. These four thematics, *Organizational Awareness*, *Readiness and Skills*, *Building Partnerships*, *Culturally Effective Promotion*, and *Program Structure*, guided the workshop discussions and became the groups to which the researchers classified statements during the coding process. For example, comments regarding staff training in cultural competence were coded as “Awareness Development” under Theme One. Comments regarding cost or transportation issues were coded as “Structural Considerations” under Theme Four and so on.

The workshop evaluation transcripts were coded based on categories established by the evaluation questions and participant responses. For example, comments in response to the question of what was most eye-opening about the process were coded as “Benefits of Workshops” and were grouped together for interpretation. Responses that described how an organization intended to proceed with Latino outreach were classified as “Next Steps.” The responses to the open-ended, qualitative section of the assessment tool were coded as either strengths or areas of growth.

Findings

Phase One

Five categories emerged from analysis of the focus group transcripts in the first phase of the study: 1) interest in ISE, 2) perceived barriers to participation, 3) preferred program formats and 4) preferred ways to learn about ISE programs. One hundred percent of Latino parents who participated in the interviews reported a high level of interest in ISE. The barriers identified in the focus groups included practical barriers consistent with those identified in other studies such as cost, time, and transportation as well as the lack of programs for older youth and sports (a constraint related to time). Cultural barriers were also consistent with those identified in other research, including the lack of awareness of ISE program offerings, the lack of friends and family, safety concerns, and the lack of Spanish language programming. Parents' education level was mentioned as a limitation by a few participants, meaning they felt they lacked prior knowledge that would make ISE programs accessible to them. Programs that covered the entire work day were most preferred to avoid transportation and work conflicts, followed by afternoon/evening or weekend programs that parents could attend with their children. Participants identified finding out *through the schools* and *word of mouth* as the best ways to be informed about ISE opportunities.

Phase Two

The results of the quantitative survey supported the findings in phase one and indicated that *interest in ISE* is the strongest predictor of participation in ISE for Latinos followed by *awareness* and then *language*. Respondents also reported a number of barriers to ISE participation identified in phase one and in many other studies, among the

strongest being *cost, transportation, safety perceptions, and time*. The results of phase one and two are explained in more detail in a paper by Bruyere, Billingsley and O'Day (2008).

The finding that interest in ISE was the strongest indicator of intent to participate in ISE is extremely important and encouraging, as a lack of interest in ISE would represent a difficult to change intrapersonal/individual barrier. If there were no interest in ISE, the subsequent practical and cultural barriers would be irrelevant. However, this is not the case in the study area. Latino parents expressed high interest in science education opportunities for their families and indicated that other barriers affect their decisions or ability to participate in ISE programs, primarily the lack of awareness of programs and language barriers. These barriers are structural in nature, requiring tactics to increase awareness of ISE opportunities such as developing bilingual marketing materials and utilizing schools and word of mouth networks. Phase one and two findings also indicated that ISE providers must make changes to overcome language barriers to meet the needs of Latino families.

Phase Three

The research in phase three of this study applies the knowledge about the interests and concerns of Latino families gained in the first two phases with the goals of 1) raising awareness of best practices, strategies, and community resources for increasing access to ISE for Latinos and 2) encouraging ISE organizations to build their capacity to develop culturally responsive programs. The assessment process not only highlighted the strengths and areas of growth for each organization on an individual level, but also

provided an understanding of how ISE organizations are meeting the objectives outlined in the assessment tool at the broader community level.

Assessment tool results. Overall, 64% (9/14) of the ISE organizations invited to participate attended the first workshop and 43% (6/14) attended the second workshop. The quantitative results of the assessment tool indicated that as a community, ISE providers are strongest in the areas of *programming* and *partnerships*. *Organizational awareness* was the area requiring the most attention followed by *culturally effective promotion*. The scores for each ISE organization as well as the community means are presented by theme and overall in Table 2. The numerical scores were converted into percentages in the table. For example, if an organization scored 18 out of 27 on theme one, it scored 67% in that area. The overall scores reflect the total number of points scored for all four themes out of 90 points. If an organization scored a total of 54 out of 90, their overall score would be 60%. As a community, ISE organizations scored 47% overall, indicating that the capacity of ISE providers can be developed in many areas.

Strengths. The frequency of specific strengths described by participants in the open-ended section of the assessment tool is shown in Table 3. These open-ended comments generally corroborated the quantitative results of the assessment tool and offer insight into specific ways that organizations feel they do display capacity for effective Latino outreach. Collectively, ISE providers reported that programming is their strongest area, meaning they feel they provide programs in formats that are viable with and preferable to the Latino community such as low-cost or free programs that the whole family can attend and integrate content related to empowerment and science careers. Partnerships were identified as the second strongest aspect of the ISE community's

outreach capabilities. Participants recognized that strong partnerships already exist in their community, but there is a need to revitalize and expand those relationships in order to better coordinate efforts and pool resources.

Table 2

Assessment Tool Scores of ISE Organizations by Theme, Overall, and Community Means

ISE Organization	Awareness	Partnerships	Promotion	Programs	Overall
n=9	%	%	%	%	%
1	52	73	54	67	60
2	54	75	77	69	69
3	41	60	54	71	56
4	22	33	33	50	34
5	48	40	46	50	46
6	30	37	50	92	53
7	11	17	20	80	14
8	44	87	78	75	69
9	11	42	29	33	26
Community Mean	35	52	49	57	47

Table 3

Strengths Described by ISE Participants on the Assessment Tool

ISE Orgs	Partners	Programs	Free/Low Cost	Family-Oriented	Promote science career	Inclusiveness an explicit goal	Long-standing program
1	X				X		
2	X	X		X			
3	X	X	X	X			
4	X	X	X				
5						X	X
6		X	X				
7						X	
8		X			X	X	
9			X				
	4	5	4	2	2	3	1

Areas of growth. The frequency of specific areas of growth described by participants in the open-ended section of the assessment tool is shown in Table 4. The need to provide staff training in cultural competence and culturally responsive strategies and the need for accurate translation of marketing and program materials were most commonly identified. ISE providers also reported struggling with recruiting Latino program facilitators and volunteers and delivery of bilingual programs.

Table 4

Areas of Growth Described by ISE Participants on the Assessment Tool

ISE Org	Involve Families	Diverse staff/vol	Emp/ Opp ^a	Train ^b	Promo ^c	Transl ^d	Participate in events	Limits ^e	Prog. Eval ^f
1	X	X	X						
2				X	X				
3		X			X	X			
4				X		X			X
5		X						X	
6						X		X	
7				X	X				
8				X		X	X		
9				X		X	X		
	1	3	1	5	3	5	2	2	1

Note. ^aIncorporate messages of empowerment and opportunity. ^bStaff training. ^cCulturally effective promotion. ^dTranslation. ^eLimitations of staff, time, and money. ^fProgram evaluation.

Priorities. While participants felt that they are doing relatively well in the areas of programming and partnerships, they believed that significant improvements could be made in all four categories. Based on the collective results of the assessment tool ISE providers identified four priorities and corresponding sub-goals during the second workshop (Table 5).

Table 5

Priorities Described by ISE Providers for Building the Capacity to Effectively Engage Latinos

1. Staff Training (Theme 1)
Cultural Competence training to develop awareness and cross-cultural communication skills
Culturally Responsive Teaching training for education/outreach staff working with Latino audiences
2. Marketing and Promotion (Theme 3)
Producing quality translations (accurate and appropriate language)
Developing word of mouth networks
Utilizing school district communication channels
3. Program Content and Structure (Theme 4)
Integrating messages of empowerment and opportunity (e.g., "science pipeline," real world experiences)
Programs that develop science skills, literacy, and understanding of the nature of science
4. Expand and Strengthen Partnerships (Theme 2)
Develop knowledge about existing partnerships to identify gaps
Continue collaboration between ISE providers to overcome constraints to effective outreach (i.e., money, time and staff limitations)

Evaluation results. The process of conducting workshops in conjunction with completing the assessment tool was based on the premise that bringing together staff of ISE organizations with gatekeepers to the Latino community would facilitate collaboration between these parties and increase awareness of resources and strategies for making ISE more accessible to Latinos. The participants indicated that these opportunities to network, discover resources, and exchange ideas with the gatekeepers and other ISE providers was one the most important benefits of the process. This face-to-

face interaction helped ISE providers learn more about the Latino community and see how others are approaching this issue.

P1: “A valuable thing was to see how many people were involved, to really see the breadth of work in ISE in the community was really eye-opening to me.”

P2: “A lot of good resources came up. I’m leaving this meeting with a lot of ideas about who to talk to.”

P3: “The most important benefit was face to face contacts with people who are doing similar work.”

Other benefits of the workshops and the process overall that were identified by participants are listed in Table 6.

Table 6

Benefits of the Assessment Process Identified by Study Participants

Networking
Learning about the Latino community
Learning how others ISE providers are approaching this issue
Contributed to a community/collaborative perspective
Assessment Tool (tangible outcome)
Resource Directory (tangible outcome)
Reinvigorated motivation, brought issue to the forefront

Participating in this process led participants to view themselves more as a community of providers rather than as individual, competing organizations. The workshops contributed to a creating space that was safe to share information and ideas where they could tap into their collective knowledge and experience.

P1: “Maybe 10 years ago, people may not have been willing to be so open about discussing their strengths and weaknesses with competitors.”

P2: “Doing this as a group we’re able to capitalize on the strengths, knowledge and experience of other organizations. Now that we understand what our weaknesses are we can learn from other organizations how we might be able to overcome those weaknesses.”

Participants recognized that they have shared goals as well as common struggles and that by working together, pooling resources, and sharing information they may be able to accomplish more than they could alone, especially during times of economic recession.

Another important outcome of the process was the assessment tool itself. The assessment tool provided a holistic structure for addressing the challenges of engaging diverse groups. It provided a manageable, step-by-step approach to help ISE organizations identify their strengths and weaknesses and build the capacity for more effective Latino outreach. Although scores were low in many areas, the tool gave participants a place to start.

P1: “The tool gave us a framework to work within that mitigates feeling overwhelmed and not knowing how to handle these issues.”

P2: “Putting it all into one document holistically really helped me see where we’re at.”

P3: “Now that we know where we stand we can decide what steps to take next.”

P4: “One of the values of the tool is that it breaks large objectives down into manageable steps.”

ISE providers had little awareness of specific contacts and resources in the community to help them connect to Latino youth and families, such as the family liaison coordinator and the equity and diversity coordinator at the school district and staff of community centers. A resource directory created in this process was another important tangible outcome that will help ISE providers facilitate partnerships and develop more effective advertising approaches (see Appendix C).

Participants felt that rather than the workshops motivating them to make changes in their outreach strategies, they had internal motivation to do so, especially for those who attended the second workshop. They participated in this process because the issue

was important to them already. The workshops brought the issue to the forefront; they sparked ideas and discussion and increased awareness of resources and key contacts in the community. Some participants feel more prepared to implement changes as a result of the process.

P1: “The people that are probably most interested in the topic are here this time. There were a lot more people that were peripherally interested [at the first workshop] but not necessarily ready to be engaged.”

P2: “Just by pooling our collective knowledge and our access to various resources, it makes me feel that our organization is a little bit more capable of implementing some of these steps.”

P3: “This experience gave us a new perspective and focus.”

P4: “We constantly strive to reach all audiences and I have gained some insights about how to be more effective.”

P5: “It was rejuvenating and gets me excited for the future and how much more we can do with our staff. This is a topic that our organization has named as a priority.”

For others, participating in the process helped them feel more prepared, but they do not intend to implement changes immediately. Several organizations were in the process of drafting strategic plans at the time of the workshops and intend to incorporate the steps outlined in the assessment tool into their larger organizational planning processes.

P1: “The tools provided in this process will help develop an organized outreach plan, but we haven’t begun one yet. This needs to be one of those foundation blocks that look at how we are dealing with any program or with any audience. I don’t think that right now we would be able to sit down and focus on this specifically.”

P2: “I realized that there has to be buy-in by senior management. What I’m grappling with is, how do you get that?”

P3: “It is great to assess our organization, but also somewhat frustrating due to shortage of staff to do the work and lack of financial resources.”

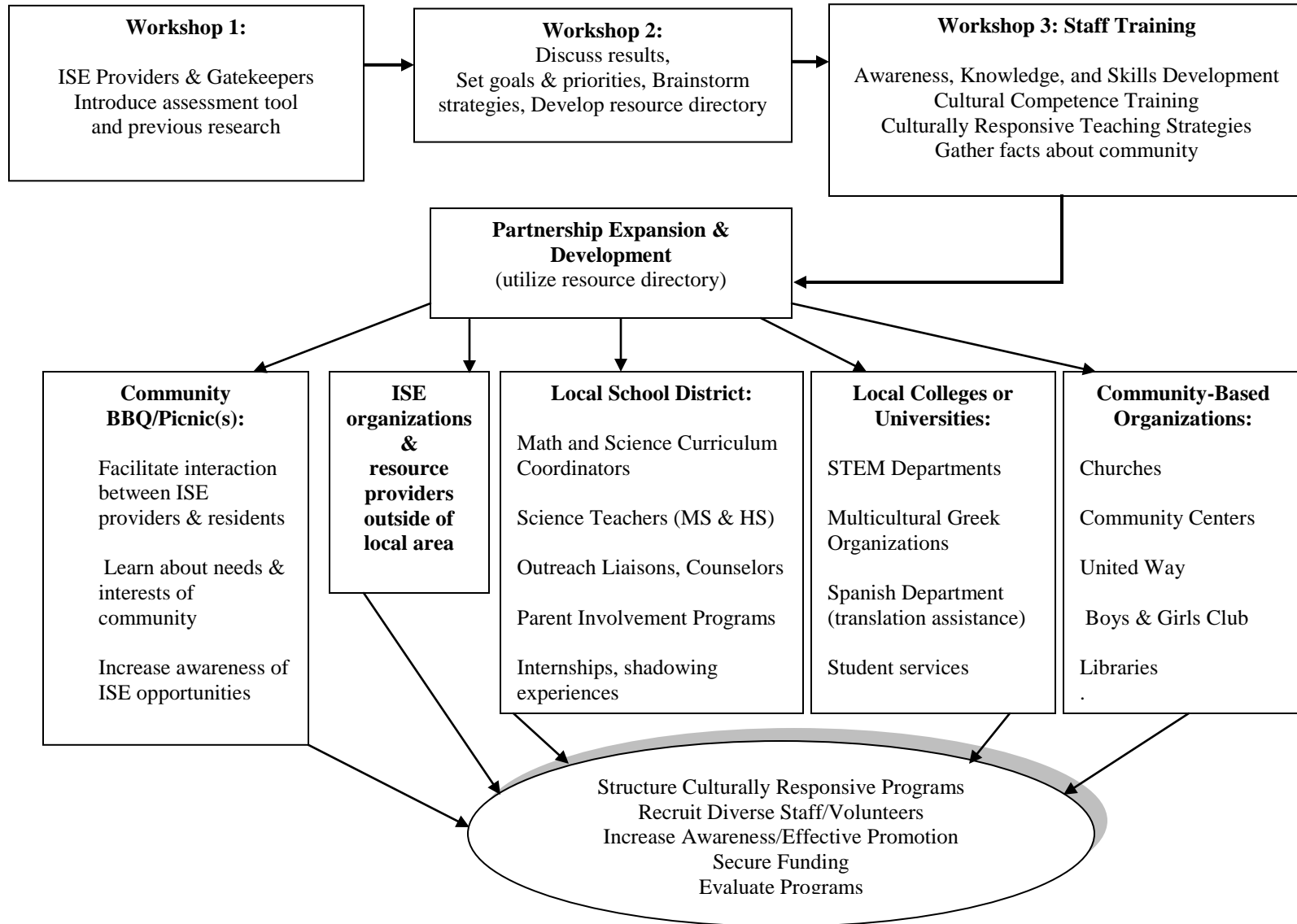
Participants described two future steps that they felt would help them move forward in addressing this issue. First, participants suggested another workshop to help them transfer what they've learned to the rest of their staff and organizational leaders. Second, participants wanted opportunities to interact directly with Latino residents to learn more about their interests and needs and to recruit volunteers or staff.

Discussion

A Process for Capacity Building

The results of the assessment tool and the workshop discussions revealed that ISE providers in northern Colorado have significant work to do to build their capacity to effectively engage Latinos. Nonetheless, improving access to ISE for Latinos and other underserved groups is a salient issue in this community, one that ISE providers are already working on. Participants were well-aware of the science achievement gap and the need to improve science education. Their participation in the process signified that they recognize the need to make ISE more inclusive. This process gave ISE providers the opportunity to address this issue from an institutional standpoint and created a time and space for collaboration that did not exist previously. This study contributes to the existing research a model of this process that was a catalyst for change for this community of ISE providers (see Figure 3). This model can provide a framework and guidance for other ISE organizations adapting to cultural and linguistic changes in their communities.

Figure 3. A Process for Building the Capacity of ISE Providers for Effective Latino Outreach



The first step in this process goes back to the first two phases of the study in which focus groups and surveys were conducted to learn about the needs and interests of Latino families. This step provided the researchers with the background knowledge to begin developing the assessment tool. The next step was to transfer this knowledge about the local Latino community, as well as the information about best-practices and strategies recommended in the literature, to ISE providers in the first workshop. The first workshop also facilitated interaction between the ISE community and gatekeepers to the Latino community, an essential connection that raised awareness of local resources and contacts and resulted in a community resource directory. Next, ISE providers completed the assessment tool to identify their strengths and areas of growth. If an organization or group of organizations wish to create change, it is necessary that they first understand where they are in order to build a vision of where they want to be. In the second workshop ISE providers outlined priorities and next steps they believe they should take in order to build their capacity to engage Latinos.

Depending on the needs defined by ISE providers and gatekeepers in the first two workshops, the researchers recommend that further workshops be implemented to meet those needs. In this case participants identified the need to transfer this knowledge to the rest of their staff and the need for face-to-face interaction with Latino residents. Therefore, the researchers recommend coordinating a third workshop to train staff in cross-cultural communication strategies and culturally responsive teaching strategies, as indicated by participants as their top priority. Participants expressed interest in coordinating a voluntary training in cultural competence and culturally responsive teaching strategies open to staff members of all ISE providers. This format would allow

ISE organizations to share costs and avoid the logistical issues of gaining support for mandatory all-staff training.

The researchers also recommend that ISE organizations utilize the resource directory to strengthen and evaluate existing partnerships and to develop new relationships. Creating a directory of community resources will be an important step for ISE providers in any community wishing to replicate this process. The resource directory developed for this study can give other ISE organizations an idea of the types of contacts and resources they should include in their own community directory and also lists several national organizations and resources for developing culturally relevant ISE programs for Latinos (see Appendix C).

Once these relationships have been established ISE providers should work together with these partners to coordinate a culturally appropriate venue to facilitate interaction with Latino residents. Other community development projects in this study area have found that community barbeques or picnics are an effective and culturally preferred way to encourage dialogue and face-to-face interaction between agencies and Latino residents. The researchers recommend this approach to bring together Latino residents to talk about their needs and interests in an informal, no-pressure setting.

Working in partnership with Latino community organizations will help raise awareness of ISE opportunities among Latino families and enable ISE providers to improve the design and structure of their programs. While participants in this study felt that programming was their strongest area, they recognized that the underlying awareness, knowledge and skills are lacking. Taking the steps to develop cultural awareness and build deliberate partnerships will help ISE providers develop and raise

awareness of programs that are truly culturally responsive and structured to meet the needs and interests of Latino youth and families.

In many ways the priorities for making ISE programs more inclusive and accessible identified in this study all tie back to the overarching concept of getting to know the community and developing an understanding of their values, needs, and interests (Hobbs & Sawyer, 2009; Howe, 2009). Latino culture is centered on relationships, trust, and family. ISE organizations that genuinely tap into these cultural values and display the willingness to listen to and become part of the community will be successful in engaging this audience (Lozar-Glenn, 2009).

Achieving this goal will require an on-going commitment to developing trust and a sense of community that are essential to engaging audiences that have little experience with mainstream organizations. Many participants felt that their organizations are not ready or able to make this kind of commitment at this time. However, participants did believe that there are small, manageable steps they can take towards their priorities. By working together ISE providers can pool resources, knowledge, and experience to have a broader impact in the community even if each organization is not prepared to develop its own Latino outreach program.

Limitations

The generalizability of this study is limited. This study focused on one specific community with a population of first or second generation Latinos of primarily Mexican descent. The Latino population across the country is extremely diverse in their heritage, culture and prior experience. The results here should not be understood as applicable to

another community, though the process and the themes that emerged in this study might guide other communities in how to approach their own work in engaging Latino audiences. Another limitation of the study was the self-report format of the assessment tool. While this format was effective in enabling ISE organizations to see where they stand, if the tool were to be used as a diagnostic measure the researchers recommend that an outside observer complete the scoring based on staff interviews, program evaluation data, and document reviews.

Future Research

On a broader scope, the researchers suggest that this process be tested in other communities to assess the capacity of ISE providers to engage Latinos as well as other immigrant groups. With further research into the cultural values, needs, and interests of other cultural groups the assessment tool could be adapted to assess access to ISE in other communities adapting to changing demographics. Finally, more research into program evaluation techniques for diverse audiences would enable ISE providers to assess the effectiveness of changes in outreach strategies that might be inspired by this process.

Conclusion

ISE providers in this study recognized their important role in improving STEM education and science literacy in the United States and that their organizations must respond proactively to changing demographics if they wish to remain relevant to new audiences. In any community successful outreach to Latinos depends first and foremost on cultivating trusting relationships and creating a sense of community and family. It

requires listening and learning before acting. There is no quick fix or easy way to achieve to the goals and objectives outlined in the assessment tool and suggested in the literature. Implementing changes will require time, trial and error, and continuous evaluation to see if ISE organizations are actually succeeding in engaging Latinos. Not every organization will become an expert in connecting to Latinos. Constraints such as shrinking budgets and over-extended staff place considerable limitations on outreach capabilities. However, regardless of where each organization currently stands, by collaborating with other ISE providers and utilizing community resources ISE providers can take incremental steps to creating more accessible, inclusive, and welcoming environments that support science learning for all.

Chapter III

Manuscript 2

Technical Report

Connecting to our Community: Improving Access to
Informal Science Education for Latinos in Northern Colorado

Technical Report

Connecting to our Community: Improving Access to Informal Science Education for Latinos in Northern Colorado



**July, 2010
Colorado State University
Fort Collins, CO**

Participating ISE Organizations

Center for Science, Mathematics, and Technology Education (CSMATE)
Colorado State University

Environmental Learning Center
Colorado State University

Fort Collins Museum and Science Discovery Center

Fort Collins Natural Areas Program

Larimer County Department of Natural Resources Education Program

Larimer County 4H

Larimer County Garbage Garage Education Center

Little Shop of Physics
Colorado State University

Rocky Mountain National Park Education Program

Executive Summary

This technical report describes the outcomes and findings of a study that brought together nine informal science education (ISE) organizations in northern Colorado with people who work with the local Latino community. The purpose of this study was to assess the capacity of ISE providers to engage Latinos in their programming with the goal of raising awareness of resources and strategies that can facilitate improved access to ISE opportunities for Latino youth and families.

Increasing equity and access to science and related fields of study including technology, engineering, and mathematics (collectively known as STEM) is important for all diverse groups represented in our community. However, Latinos are the largest and fastest growing ethnic group in Larimer County, in Colorado, and in the United States. When considered as an entire ethnic group, Latinos are the least educated with only American Indians/Alaska Natives faring as poorly (Pew Research Center, 2005). Latino students score lower on science and math achievement tests than the national average, are more likely to be placed in low-achieving tracks, take fewer higher-level classes, and are more likely to drop out compared to middle-class Caucasian students (NAEP, 2005; NCES, 2009; Pew Research Center, 2005). This study focused on assessing and developing strategies for engaging this particular group in ISE opportunities due to the high number of Latino youth and families in the study area and in response to these educational inequities. Ideally, the concepts and strategies discussed in this report will encourage ISE providers to work towards developing welcoming organizational cultures and programs that are more accessible for all groups.

In this study, the participating ISE organizations completed an assessment tool to help them identify their strengths and areas of growth in four main areas: *Organizational Awareness, Partnerships, Culturally Effective Promotion, and Program Structure*. The objectives described in the assessment tool were based on an extensive review of the literature, the findings of prior research conducted in the study area, and interviews with local leaders in the Latino community. In addition to completing the assessment tool participants attended two workshops. The first workshop introduced the study, prior research, and the assessment tool. In the second workshop participants discussed their collective assessment results and evaluated the process overall.

The workshops also provided opportunities for ISE participants to network with people who work with Latino youth and families and to learn more about this part of our community. Participants reported that the workshops reinvigorated their motivation to work on this issue and contributed to creating a sense of community among ISE providers, with shared goals and common struggles. The workshops facilitated an opportunity to learn how other ISE providers are approaching this issue in a non-competitive environment. The assessment tool provided a manageable, step-by-step approach to implementing outreach that ISE providers can refer to and integrate into their larger planning processes.

The assessment results showed that *programming* and *partnerships* are the greatest strengths of ISE providers in northern Colorado. Developing *organizational awareness, knowledge, and skills* for working with the Latino community was identified as the area requiring the greatest attention, followed by the need to develop *culturally effective promotion* strategies. While assessment scores were generally low across the board, there

are several examples of successful strategies, programs, and events that can serve as models for the community that will be described in the report.

Four priorities for ISE providers emerged from discussion of the assessment results during the second workshop:

1. Awareness, Knowledge and Skills Development: Staff Training

- Cultural competence training with a focus on effective cross-cultural communication and cultural awareness.
- Pedagogy and skills for working with diverse audiences (i.e., training in culturally responsive teaching strategies).

2. Culturally Effective Marketing and Promotion

- Producing quality translations (e.g., using appropriate and accurate language in advertising materials).
- Developing culturally effective promotion strategies (e.g., word of mouth networks and advertising via schools).

3. Program content and structure

- Programs should focus on integrating messages of empowerment and opportunity (e.g., the “science pipeline,” how to become a scientist, and real world experiences).
- Programs should be designed to develop science skills, scientific literacy, and an understanding of the nature of science.

4. An overarching and ongoing need to build on existing resources and partnerships

- Develop knowledge about existing partnerships in the community to identify gaps in service (i.e., who is doing what and what else could be done?)
- Continue collaboration between ISE providers to overcome constraints to outreach (i.e., money, time, and staff limitations).

Introduction

This report is the product of a case study conducted in the spring of 2010 by Colorado State University's (CSU) Human Dimensions of Natural Resources. The study involved a group of informal science education (ISE) providers, Poudre School District (PSD) personnel, and leaders of other community-based organizations in northern Colorado who share the common goal of improving access to science education opportunities for Latino youth and families. It is part of a larger study initially supported by supported by the National Science Foundation (NSF) that began in 2006 to examine how universities can be a better resource of informal science education for the community, specifically for underserved youth. The Bohemian Foundation and CSU Extension provided continued support for the study after NSF funding concluded in 2008.

The goals of this phase of the study were to:

1. Raise awareness among ISE providers in northern Colorado about research and strategies for engaging diverse groups to their educational programs.
2. Brainstorm how the community of ISE providers can collectively better serve northern Colorado's diverse communities.
3. Provide opportunities for interaction and networking between diversity-serving organizations and ISE providers to facilitate partnerships for improving awareness of and access to ISE programming.
4. Develop and implement a tool for assessing the capacity of ISE organizations to reach Latinos, identify strengths and areas to build on both as individual organizations and as a community, and evaluate the assessment process overall.

Informal Science and STEM Education

Informal science education (ISE) is science learning that takes place outside of formal schools in settings that include science and nature centers, zoos, museums, parks and open spaces, environmental education and other community-based programs such as 4H and Scouts. A more holistic definition of the types of organizations involved in the study would be STEM education providers, which expands the definition of ISE to include education programs that focus on Science, Technology, Engineering and Mathematics.

STEM education is critical in today's society. As we confront the challenges of the global economy and the environmental concerns that accompany economic development, there is an increasing demand for skilled workers in STEM fields. Moreover, all people must have a basic level of scientific literacy to be informed decision-makers in today's technology and knowledge driven society. Yet the U.S. has fallen behind in science and math achievement. In 2003, U.S. students ranked 16th out of 30 top performing countries in science literacy and 22nd in math literacy (Organisation for Economic Cooperation and Development [OECD], 2009). See Figure 1 for a comparison of math and science literacy scores for U.S. and international students.

Certain groups within the US face an even greater struggle to succeed in science-related fields. There has been a well-documented gap in science achievement between White and non-White students in the United States for decades. This gap also exists between middle-class and low-income students, who are also often of nondominant (non-White) backgrounds. Due to this gap in science achievement both domestically and internationally there has been major investment in STEM education reform in the United

States, including informal education. Educators now recognize that much of what we learn about science occurs outside of formal classrooms and that schools alone may not be sufficient to meet society’s science needs. ISE has a pivotal role to play in improving STEM education for all students in the United States.

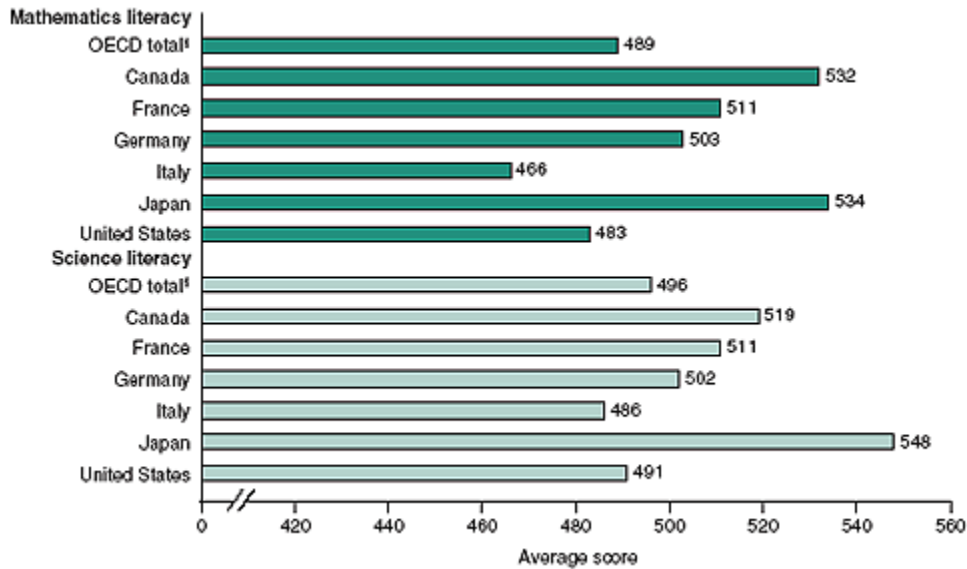


Figure 1. Average scores in mathematics and science literacy assessments among 15 year-old students in selected countries in 2003. Adapted from “Learning for Tomorrow's World: First Results from the OECD Programme for International Student Assessment (PISA) 2003” by the Organisation for Economic Cooperation and Development (OECD), 2004.

Benefits of ISE

A growing body of research demonstrates the academic and social benefits of ISE programs for all youth, including youth from diverse backgrounds. ISE programs can promote interest, confidence, and self-efficacy in science which lead to increased science literacy and achievement, and can influence diverse youth participants to pursue a science career (Bell, Lewenstein, Shouse, & Feder, 2009). ISE programs can also increase parental involvement and foster a strong sense of community, two important factors in

increasing academic achievement for diverse students (Bell et al., 2009; Fadigan & Hammrich, 2004; Riggs & Greenberg, 2004).

ISE is uniquely situated to engage diverse youth because of its appeal to multiple learning styles and ability to foster “free-choice” learning, a well-documented approach to enhancing science learning (see Falk, 2005; Jones, 1997; Kola-Olusanya, 2005). Learning in free-choice settings is usually voluntary, socially mediated, and stimulated by the needs and interests of the learner, who typically exercises a large degree of choice and control over the what, when, and why of learning (Falk, 2005). Young people often find informal science experiences more attractive and relevant to their lives than school science. In fact, many people with science-related careers credit their initial interest in STEM to informal rather than formal exposure, identifying museums and science centers as the most important stimulants to their childhood interests (COSMOS Corporation, 1998).

Unfortunately, ISE programs often face challenges in reaching nondominant groups. Participants in ISE tend to be predominantly White, older, wealthier, and more educated (Bell et al., 2009). While many organizations recognize the need to engage new audiences, they often struggle to adapt to cultural and linguistic differences. ISE providers may not know how to take into account the contexts, perspectives, and needs of diverse populations. As the demographics of the U.S. continue to change, the need for both formal and informal educators to understand how to engage diverse youth in STEM fields becomes even more crucial.

Changing Demographics

Communities across the United States are experiencing major shifts in demographics. Latinos now comprise the largest ethnic group in the United States at 46.9 million, or 15% of the total population (U.S. Census Bureau, 2009). The Census predicts that 62% of children will be from non-Caucasian backgrounds by 2050 and that 30% of those children will be Latino. In Larimer County schools 16% of students are Latino. Countywide, Latino enrollment increased 53% from 4,551 students in 2001-2002 to 6,953 in 2009-2010. In comparison, total enrollment in Larimer County schools only increased 5.8% in the same time period (Compass of Larimer County, 2010).

The Science Achievement Gap

Although the proportion of Latino and other diverse students is growing, they often remain at the margins of education in STEM fields. When considered as an entire ethnic group, Latinos are the least educated with only American Indians and Alaskan Natives faring as poorly (Pew Research Center, 2005). Latino students are more likely to be placed in low-achieving tracks, take fewer higher-level classes, and are more likely to drop out compared to middle-class Caucasian students (NCES, 2009; Pew Research Center, 2005). For example, in 2007-08, nearly 29% of students dropping out of school in Larimer County were Latino, almost double their representation in the total population (see Figure 2).

According to the 2005 National Assessment of Educational Progress (NAEP), Latino 4th graders in Colorado scored an average of 25 points less than their White peers on national standardized science tests, and by 8th grade the gap increased by an average

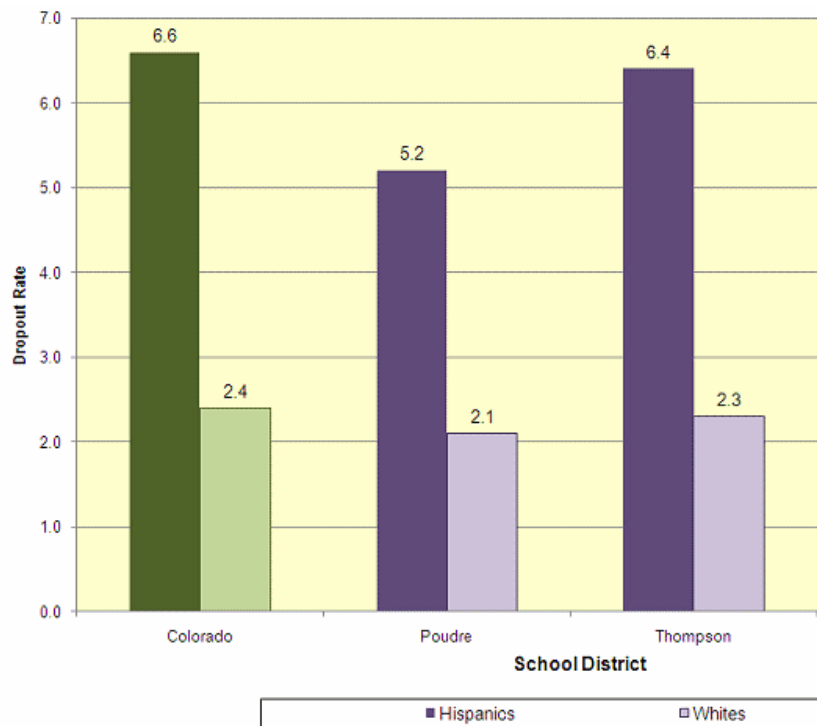


Figure 2. High School Dropout Rates of Latinos and Whites in Larimer County, 2007-08. From Compass of Larimer County, 2010. Retrieved from: http://www.larimer.org/compass/dropout_ed_k12.htm#Chart1

of 32 points in 2005 (see Tables 1 and 2). The tables show the percentage of White and Latino students at various levels of science proficiency in Colorado. Fifty percent of Latino 4th graders scored below basic compared to 15% of White 4th graders. In 8th grade, 59% of Latino students scored below basic compared to 21% of White students. Tables 1 and 2 also illustrate how poverty affects achievement. Students from low-income families (indicated by eligibility for free or reduced school lunch) fare poorly compared to middle-class students.

Table 1

2005 NEAP Science Assessment Scores for Colorado 4th Grade Students

4th Grade	Proficiency Level				Average Score
	Below Basic (%)	Basic (%)	Proficient (%)	Advanced (%)	
Latino	50	37	31	1	138
White	15	44	38	3	163
Eligible for school lunch	48	39	13	0	139
Not eligible for school lunch	14	44	39	3	164

Table 2

2005 NEAP Science Assessment Scores for Colorado 8th Grade Students

8th Grade	Proficiency Level				Average Score
	Below Basic (%)	Basic (%)	Proficient (%)	Advanced (%)	
Latino	59	29	11	1	134
White	21	32	40	6	166
^a Eligible for school lunch	58	30	11	1	135
Not eligible for school Lunch	23	32	39	6	164

^aEligibility for free or reduced school lunch is an indicator of low socio-economic status.

Source: National Association for Education Progress, Retrieved from:

http://nationsreportcard.gov/science_2005/s0106.asp

Diverse students more come from low-income households and reflect other social factors affect that affect achievement when ethnicity and race are controlled for, such as English language proficiency, generation, parental involvement, as well as parent and teacher expectations (Kao & Thompson, 2003). These distinctions are particularly important among Latinos because they are an extremely heterogeneous ethnic group. There is substantial variation in the academic success of Latino students depending on language dominance (whether Spanish or English is primarily spoken) and generation,

which describes the length of time in the United States and relates to levels of acculturation. Acculturation is the change in cultural behavior and thinking of a person or group of people through contact with another culture.

The Pew Research Center (2005) explains that first-generation Latino students (whose parents were born in another country) tend to receive less parental support and involvement in their education. Second or higher generation Latino students who primarily speak English have higher academic success when measured as a sub-group among Latinos. Immigrant parents often work two or three low-paying jobs and may not have the education and literacy skills, or the time to support their child's learning. Furthermore, immigrant parents may not have the ability to navigate the U.S. school system and may have very different perceptions about their role in their children's education (Garibay, 2009; Sanchez & Arce, 2009; Springer et al., 2009). These researchers have found that in Latino cultures parents have a high level of respect for educators and recognize the value of education, but believe that they should not interfere with school activities and are not as vocal or assertive about their children's education as other parents. ISE providers can play a role in reconciling this paradox by involving parents in informal learning opportunities to help bridge the gap between home and school.

Academic disadvantage in K-12 schooling contributes to the underrepresentation of minorities in STEM fields in college and as career choices. Latino representation in high-skill science and math-related fields such as engineering, computer and math science, health care, and life, physical and social sciences hovers around five percent, about one-third of their representation in the general population (Pew Research Center,

2005). Latino families are also underrepresented among those who visit science centers and other informal education institutions. In a national study of out-of-school program participation researchers found that Latino youth participated at significantly lower rates (30%) compared to both Caucasians (56%) and African Americans (42%) (Weiss, Little, & Simpkins et al., 2006). Tutoring was the only type of out-of-school program in which Latinos participated comparably with Caucasians.

A 2009 National Academy of Sciences report summarizes some of the challenges in engaging nondominant groups in the sciences. Studies show that:

1. Inadequate science instruction exists in most elementary schools, especially those serving children from low-income and rural areas;
2. Girls often do not identify strongly with science or science careers;
3. Students from nondominant groups perform lower on standardized measures of science achievement than their peers;
4. Learning science can be especially challenging for all learners because of the specialized language involved (Bell et al., 2009).

Interest in Science

A lack of interest in science and related fields is not likely the root of the problem: several studies have found high levels of interest in science among diverse students.

Wenner (2003) found that low-income elementary students from nondominant backgrounds demonstrated even stronger interest in science than their middle-class White peers. According to a 2010 study by the Latino Heritage Foundation and the National Research Center for College and University Admissions, Latino high school students are

increasingly more interested in math, science and engineering. This discrepancy between high interest in science but low participation has sparked considerable research into the barriers to participation in ISE for Latinos and other diverse groups.

Barriers to Participation in ISE

Understanding the considerations that go into participation decisions for Latinos and other diverse groups can offer insight to the structure, design, and promotion of ISE programs. Several studies have helped develop a better understanding of specific barriers to participation in ISE for Latinos.

One theory of discretionary time behavior is the hierarchical model of leisure constraints, proposed by Crawford, Jackson, & Goodbey (1991). They identified *intrapersonal*, *interpersonal*, and *structural* factors that may prohibit people from participating in leisure activities. *Intrapersonal* are constraints are those that occur within an individual, such as a person's interest level or ability. *Interpersonal* constraints are those that are affected by other people or social norms, such as different leisure preferences within a family or peer network. *Structural* constraints are practical issues that intervene between preferences and participation such as financial resources, availability of programs, and time. *Intrapersonal* constraints were identified as the strongest barrier because they are influential at the beginning of the participation process and are often hard to change. For example, if someone is not interested in science, he is not likely to participate. Conversely, structural constraints (e.g., transportation, cost) were identified as less important as they are typically easier to change and overcome.

In Walker and Manjarrez's (2003) free-choice learning participation model, *individual* and *community* factors together influence participation. *Individual* factors, comparable to the *intrapersonal* factors in the Crawford et al. model, consist of personal motivations which depend on values, beliefs, skills, and interests. The free-choice model also includes factors such as the availability of resources such as time and money in the *individual* category. *Community* factors include *paths of engagement* and the *structure of opportunities*, comparable to *interpersonal* and *structural* constraints respectively in the Crawford et al. model. *Paths of engagement* are ways that family and social ties, organizational affiliation, and business/professional relationships influence and connect people to learning opportunities. *Structure of opportunities* includes the number, quality, and accessibility of programs or events.

A recent study by Bruyere, Gobbs-Hill, and Paulding (in review) proposed a framework specifically for ISE participation based on the hierarchical and free-choice learning participation frameworks as well as findings from focus group interviews with Latino, African American, and Caucasian parents (see Figure 3). In the focus groups parents discussed their interest levels in ISE, preferable program formats, potential constraints to participation, and possible resolutions to those constraints. In this model, as in the Crawford et al. and Walker and Manjarrez models, *interest* (an *intrapersonal* or *individual* factor) is understood as a prerequisite to participation decisions. All three of these theories agree that if a person is not interested in an activity or program, he/she is unlikely to be affected by higher level constraints.

This framework differs from the previous two behavior theories by taking into consideration that if individuals are unaware of opportunities, they cannot choose to

participate in them. Therefore, *culturally effective promotion* strategies are necessary to inform individuals about programs of potential interest. Then, people decide whether the program has desirable characteristics. At this point individuals may encounter *practical* constraints (comparable to *structural* or *structure of opportunities*) and/or *cultural* constraints (comparable to *interpersonal* or *paths of engagement*) to participation.

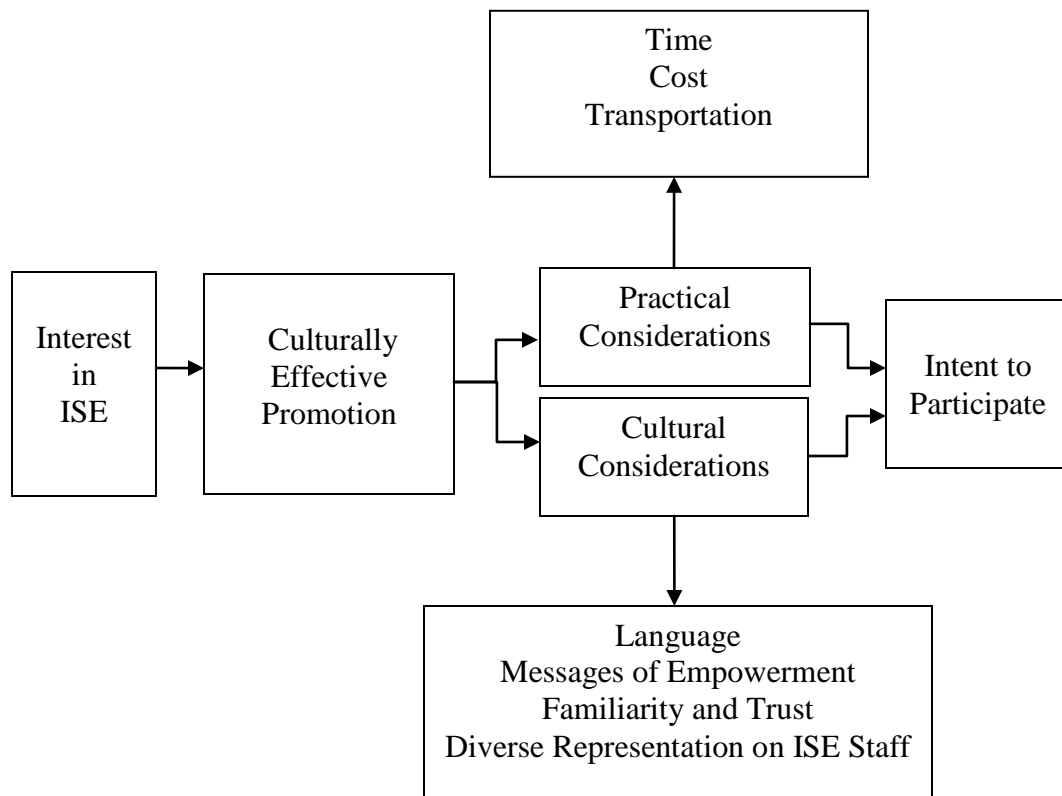


Figure 3. Model of Informal Science Education Participation. From “Developing a Model to Predict Participation in Informal Science Education by Families on Colorado’s Front Range,” by B. Bruyere, S. Gobbs-Hill, & L. Paulding, (in review).

The Bruyere et al. (in review) study revealed a high level of interest in ISE among all focus group participants, suggesting that a lack of interest in ISE, a difficult to change *intrapersonal/individual* constraint, was not a perceived limitation. However, parents from all three cultural groups did express a lack of awareness of ISE

opportunities and reported that ISE organizations' advertising strategies did not reflect how they typically learn about educational opportunities. Preferred communication strategies varied among cultural groups. Latinos and African Americans a preference for information distribution via personal networks and community gathering locations, such as churches and community centers, as well as in-person appeals. In addition, Latinos expressed a desire for advertising in Spanish and via the schools. Caucasians preferred internet and email communication.

Cost, time, and transportation were barriers classified as *practical* constraints described by all three cultural groups. Latino and African American participants described other, more culturally rooted constraints or preferences that Caucasians did not describe. These *cultural* constraints included language barriers (Latinos only), the lack of representation of diverse people in STEM fields and as staff of ISE organizations (African Americans only), the desire for programs that send messages of empowerment and opportunity (i.e., opportunities to learn new skills or how to become a scientist) and a lack of trust in and familiarity with ISE organizations.

Many other studies have identified similar barriers to participation in ISE by Latinos and other diverse groups. Allison and Hibbler's (2004) co-cultural approach identified organizational constraints to participation from the perspective of recreation professionals based on interviews with 18 staff members, 10 of whom were people of color. The study identified cultural barriers such as *language* and the *need for bilingual staff and volunteers* among the strongest barriers to participation. *Negative attitudes and stereotypes of staff and management* were also described as possible constraints. Similarly, other studies identified cultural barriers such as *unfamiliarity with the*

organization, an unwelcoming atmosphere, and cultural differences such as the lack of culturally relevant or Spanish language programming and Spanish-speaking staff (Garibay, 2009; Hong and Anderson, 2006; Miller, 2003).

In 2006 study by Borden, Perkins, Villarreal, Carleton-Hug, Stone and Keith, Latino participants in youth development programs were asked about their reasons for participating in the programs and why they thought their peers didn't. The top reasons for not participating included structural or practical barriers such as *home/school work, lack of money and transportation*. Other factors included cultural barriers such as *dislike of the people in charge, family or religious obligations, perceived safety concerns, and peers not being involved*.

A recent report discussing findings from the Oregon 4H Latino Outreach programs concisely summarizes the major or cultural barriers to Latino youth participation in community-based organizations:

“Most parents have no prior experience with youth organizations. They lack an understanding of the benefits of such organizations and how to access them. Most importantly, they feel no connection to mainstream organizations and thus have no trust no them” (Hobbs & Sawyer, 2009, p. 4).

Previous Research in Northern Colorado

The first two phases of this study examined interest in science and barriers to participation in ISE for Latino families in northern Colorado. In the first phase of the project, conducted in 2006-2007, five focus groups were conducted with 31 Spanish-speaking Latino parents whose children typically did not participate in ISE. Participants were asked to describe their families' level of interest in ISE in general, their interest in specific science topics and programs, and what would prevent or enhance the likelihood

of participation in ISE programs. Parents were also asked for suggestions about how to improve ISE programs to make them more inclusive, such as preferred time frames for programs and how to increase awareness of program offerings.

Five categories emerged from analysis of the focus group transcripts: 1) interest in ISE, 2) program formats, 3) science subjects, 4) limitations, and 5) ways to learn about ISE programs. One hundred percent of Latino parents interviewed in the study reported a high level of *interest* in ISE. The barriers identified in the focus groups included practical barriers consistent with those identified in other studies such as *cost*, *time*, and *transportation* as well as the *lack of programs for older youth* and *sports* (a constraint related to time). Cultural barriers were also consistent with other research and included the *lack of awareness* of ISE program offerings, *the lack of friends and family*, *safety concerns*, and the *lack of Spanish language programming*. *Parents' education level* was mentioned as a limitation by a few participants, meaning they felt they lacked prior knowledge that would make ISE programs accessible to them. Programs that covered the entire work day were most preferred to avoid transportation and work conflicts, followed by afternoon/evening or weekend programs that parents could attend with their children. Participants identified finding out *through the schools* and *word of mouth* as the best ways to be informed about ISE opportunities.

In the second phase of the study, conducted in 2007-08, researchers developed a quantitative survey to gain a better understanding of the salience of the themes identified in phase one. Eighty-three surveys were collected from Latino households using both mail-back and in-person methods at a number of community events in partnership with local organizations. The survey generally asked parents to respond to statements such as:

“Participation in community science programs is important for my child,” “I am unaware about opportunities for science education in my community,” and “Transportation to community science programs is difficult for my family.” Responses were measured on a Likert scale of 1 (strongly disagree) to 7 (strongly agree). Similar to the focus group questions, respondents were asked to rate their interest level on a variety of science topics and preferred program formats as well as questions regarding basic demographic information.

The results of the quantitative survey supported the findings in phase one and indicated that *interest in ISE* is the strongest predictor of participation in ISE followed by *awareness* and then *language*. In addition, respondents indicated a number of other significant barriers to ISE participation, among the strongest being *cost, transportation, safety perceptions, and time*. The finding that interest in ISE was the strongest indicator of intent to participate in ISE is extremely important and encouraging, as a lack of interest in ISE would represent a difficult to change intrapersonal/individual barrier. If there were no interest in ISE, the subsequent practical and cultural barriers would be irrelevant. However, this is not the case in the study area. Latino parents expressed high interest in science education opportunities for their families and indicated that other barriers affect their decisions or ability to participate in ISE programs, primarily the lack of awareness of programs and language barriers. These barriers are structural in nature, requiring tactics to increase awareness of ISE opportunities such as developing bilingual marketing materials and utilizing schools and word of mouth networks as suggested in phase one. Phase one and two findings also indicated that ISE providers must make changes in program structure to overcome language, cost, transportation barriers.

The barrier of *safety perceptions* is also important for Latino families. Parents discussed their desire to attend ISE programs as a family unit to satisfy two compelling preferences: 1) the strong value placed on family in Latino culture, and 2) to ensure their child's safety and well-being by attending with their child until they become more familiar with the organization and its staff. Overcoming cultural barriers such as safety concerns, fear of discrimination, and a lack of culturally relevant programs will require a deeper commitment to cultivating a welcoming atmosphere and developing cross-cultural communication skills.

Developing Culturally Responsive ISE Programs

A wealth of knowledge and experience exists about strategies and practices for engaging diverse youth in science. In education, practices that validate and build on the values, prior experiences, and cultural knowledge of students are part of an approach known as culturally responsive teaching (Gay, 2000). Cultural responsiveness is defined as being aware of and capable of functioning in the context of cultural difference (Cook, 1997). It requires building the skills and capacity to communicate effectively with individuals from any culture and taking into account the needs, perspectives, and values of diverse audiences. Culturally responsive programs aim to empower students intellectually, socially, emotionally, and politically by using cultural referents to impact knowledge, skills, and attitudes (Ladsen-Billings, 1995).

Several studies that have either implicitly or explicitly embraced culturally responsive strategies have been successful at engaging diverse youth in informal science-related programs. The Oregon State University Extension Service recently published a

report of their findings from ten years of Latino outreach programs in partnership with 4H. The authors identified three critical factors that have sustained ongoing, culturally relevant programs:

1. 4H approached the community with an open mind, readiness to learn from the community, and the belief that Latino community members possess unique knowledge and understanding of what Latino youth need to thrive.
2. Culturally responsive programs were developed in response to the needs and interests identified by Latino youth and families.
3. 4H placed bilingual/ bicultural outreach staff in their programs for at least three years. The long-term presence of staff with a deep understanding of Latino culture and fluency in Spanish enabled 4H to establish a foundation of trust and to build relationships, two values of great importance in Latino culture (Hobbs & Sawyer, 2009).

The Oregon report also outlines specific aspects of culturally responsive programs. Such programs:

- Respect and reinforce the cultural identity of the youth and involve youth in active learning that makes real contributions to their communities.
- Set high expectations and help youth achieve their goals, including education and career goals.
- Reinforce social capital and strengthen ties to networks and resources in the greater community.
- Are contextual, based on the reality of youth's lives, and take place in an environment that "fits" who they are.
- Provide opportunities for youth to learn in an affinity group based on culture while at the same time encouraging participation in multi-cultural contexts.
- Encourage parental involvement as a way to support learning and to help parents understand how to support their children's aspirations for a college education (Hobbs & Sawyer, 2009, p.4).

In a 2007 study, Basu and Calabrese-Barton found that key program design strategies including a) flexibility in content (i.e., self-directed choice of topics) and assessment methods (e.g., video and other technology); b) providing access to materials

as well as time and opportunities to experiment in a safe place; and c) involving families were factors leading to the development of long-term interest in science for low-income, yet high-achieving diverse students who participated in an afterschool program. Students developed a sustained interest in science when program experiences connected with how students envision their future, supported social networks that students valued, and supported students' sense of agency to enact their understandings and shape their communities.

Howe (2009) offers a model for developing a multicultural education program, useful to formal and informal educators alike (see Figure 4). It suggests that four dynamic steps are involved in the on-going, continuous process of developing a culturally responsive program: awareness, knowledge, skills, and action.

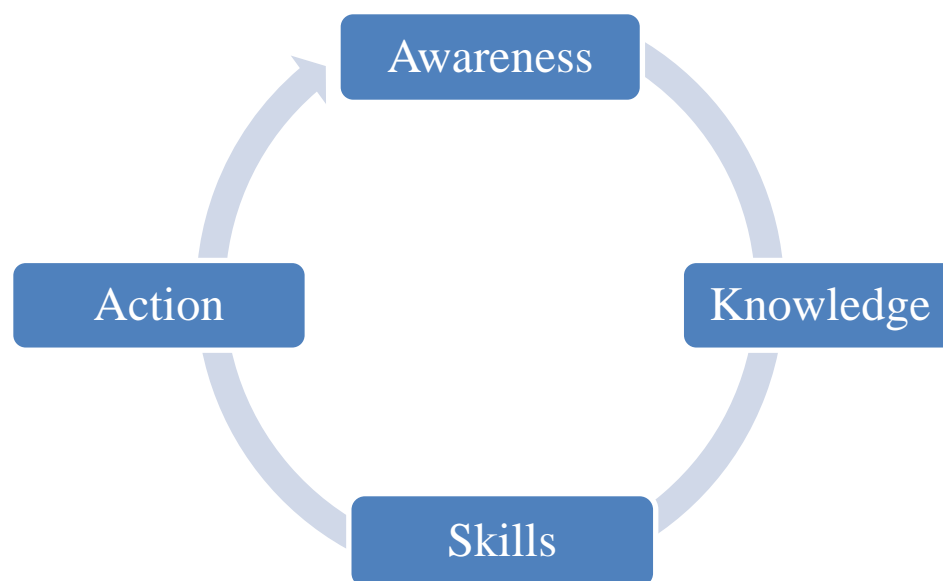


Figure 4. The four dynamics steps in the process of developing a multicultural program. Adapted from Howe (2009). Proceedings from the 19th National Association for Multicultural Education Conference: Developing a multicultural curriculum: Keys to student achievement. Connecticut: Connecticut State Department of Education.

The first step requires making the commitment to develop awareness of bias and stereotypes within an organization about diverse communities and recognizing the need to adjust to meet the needs of new audiences. Next, organizations must develop knowledge about the needs, interests, cultural values, prior experiences, social structures and other facts about the target group, as the Oregon 4H report also recommends. Skill development includes training staff in strategies for working with culturally and linguistically diverse youth and families (e.g., bilingual program delivery). Finally, with a solid foundation of awareness, knowledge, and skills, effective action can be taken to implement culturally responsive programs based on the needs and interests of the community identified in the earlier stages of the process.

Developing culturally responsive programs in ISE is possible; however there is a shortage of easily accessed information related to working with specific culturally diverse audiences in this context. Research is sparse on how to structure informal science learning opportunities to meet the needs of diverse groups (Bell et al., 2009). Due to programming demands, budget, and staff limitations there is little time to synthesize and share this information and many organizations proceed through a process of trial and error (Hobbs & Sawyer, 2009). There is a need for more research into the process of developing, implementing, and evaluating strategies for broadening participation in ISE, especially among Latinos, the largest and fastest growing group in the United States.

Developing a Latino-focused Assessment Tool

The first step in the third phase of the study was to integrate the extensive knowledge of best practices and strategies into a concise assessment tool that would

allow ISE organizations to identify their current strengths and weaknesses and provide guidance in enhancing their outreach policies and procedures. The assessment tool developed for this study was based on an extensive review of the literature, prior research conducted in northern Colorado, and interviews with local *gatekeepers*, key informants who can provide understanding of and access to the Latino community. See Appendix A for a copy of the assessment tool used in the study.

The tool integrated the recommendations and best-practices found in the literature for effectively engaging Latinos in ISE into four themes: 1) *Organizational Awareness, Readiness and Skills* 2) *Building Partnerships*, 3) *Culturally Effective Promotion*, and 4) *Program Structure*. A brief description of the rationale and support for each of the four themes follows. See Appendix B for a comprehensive table of recommendations in the literature that informed the development of the assessment tool themes.

Theme 1: Organizational Awareness Readiness and Skills

Developing awareness, readiness and skills for working with diverse audiences is an on-going process that is an essential part of successfully engaging diverse audiences. Cultural competence can be defined as a set of congruent behaviors, attitudes, and policies that come together in a system, agency, or profession to work effectively in cross-cultural situations (Cross, Bazron, Dennis, & Isaacs, 1989). In order to achieve this, an organization must make an explicit commitment to continually learning about the cultural values, prior experiences, and social structures of the target group. Providing cultural competence training to all staff members will enable ISE staff to communicate comfortably across cultural boundaries and promote a welcoming atmosphere of trust and respect. Practical, hands-on training in culturally responsive teaching strategies such as

sheltered language instruction, total physical response, and cooperative learning will provide education staff with the skills they need to connect with diverse participants.

The need to learn about your audience cannot be emphasized enough. Gathering relevant information about the community will help uncover resources and contacts. For example, attending events and meetings of Latino-serving organizations or visiting restaurants in Latino neighborhoods will provide opportunities to listen, observe, and build relationships within the community. The Oregon 4H report recommends gathering the following information about your community:

- Countries of Origin
- Education Levels
- Immigration Status
- Names of respected elders and official or unofficial leaders
- Ways people earn a living
- Level of involvement in mainstream activities and services
- Issues and concerns of people in general
- Needs and interests of youth
- Community assets and resources

Considering the persistent underrepresentation of minorities in STEM fields, it is not surprising there is also low diversity among ISE staff. Part of developing the capacity to engage Latinos includes recruiting bilingual staff and volunteers who represent the community. The presence of staff with a deep understanding of Latino culture and fluency in Spanish can make ISE programs more welcoming to Latino youth and families.

Theme 2: Developing Partnerships

The importance of partnerships was another universal theme in the literature. Building long-term, committed partnerships with schools and other local organizations that serve the Latino community are essential for effective outreach. In order to build these partnerships, ISE providers must identify and develop relationships with trusted community leaders. These key contacts can act as cultural brokers or mentors who can provide insight into the cultural values of the target audience, provide access to the local community and help build trust. Trust is an overarching value in Latino culture and working with organizations or people who have established trust can help ISE providers connect with Latinos. Inviting these leaders to be on an organization's advisory board or group will reflect that the needs of the Latino community are important and valued.

Schools tend to have trusting relationships established with Latino families, and Latino parents generally respect the authority of teachers and school personnel. Building relationships with school personnel who know the students and their interests such as science teachers, counselors, and family liaisons can help ISE providers connect with youth who display an interest in science or related topics (Correa-Zeigler, 2009b; T. Ellis, personal communication, November 16, 2009). Indeed, Latino families in the study area identified schools as their preferred way of finding out about ISE opportunities in phases one and two of this study. Developing partnerships with schools and other organizations that serve the Latino community can create a sense of community support for science learning that helps promote academic success (Fadigan and Hammrich, 2004; Riggs and Greenberg, 2004).

Maintaining a stable funding source is essential to establish long-term, successful programs (Sanchez & Arce, 2009). The loss of funding can quickly unravel a lot of work and lead to a loss of confidence and trust in an organization (M. Thayer, personal communication, March 9, 2010). Collaboration and partnerships between agencies can help offset costs and grant money is available for ISE organizations working to reach underserved groups

Robertson (2008) describes four key ingredients for maintaining successful partnerships:

1. ***Establish common goals that benefit both partners.*** Each side has to want the same end result and must derive something positive from the collaboration.
2. ***Give and take.*** There will be times when one party or the other will be less able to pull its weight. Staff and volunteers of each side must be flexible and willing to help when needed.
3. ***Communication.*** There is a need for ongoing and constructive communication between partners to keep each other informed of small changes and big issues alike.
4. ***Evaluation.*** Find out what's working and keep it. Find out what's not working and change it. Evaluate *cognitive* (skills and knowledge) and *affective* (attitudes, values, and feelings) outcomes of your program as well as program materials, communication, and funding aspects.

Theme 3: Culturally Effective Promotion

Low awareness of ISE opportunities has been repeatedly found to be one of the strongest barriers to participation in ISE by Latinos (Bruyere, Gobbs-Hill, and Paulding, in review; Garibay, 2009; Hobbs & Sawyer, 2009; Hong & Anderson, 2006; Rideout, 2000). ISE providers must take into account how cultural groups communicate and reflect this understanding in their marketing and promotion strategies. Walker and Manjarrez (2003) observed that people belonging to different cultural communities

follow different paths of engagement, or ways of becoming engaged with free-choice learning opportunities. For Latinos, the reliance on family connections as a source of information and support is widely observed, especially in immigrant communities. Walker and Manjarrez’s study focused on building partnerships between libraries, public television, public radio, and museums to influence people’s awareness of opportunities, but also suggested establishing connections with a broader array of community resources including churches, commercial entities (i.e. businesses frequented by Latinos), and other local community or volunteer organizations where Latino families interact.

Tedrow (2009) reported seven strategies specifically for marketing and advertising to reach Latino audiences summarized below in Table 3.

Table 3

Factors for Successful Latino Media Campaigns.

Culturally Effective Promotion Strategies
1) keep messages simple and clear
2) use multiple mediums (link with credible people and places in the community)
3) ensure quality translation
4) know your audience (acculturation, literacy, language dialects, country of origin)
5) utilize preferred media/communication sources (radio, print, word of mouth)
6) know your weaknesses and use community resources to help meet needs
7) appeal to emotions and personal lives, relevant & meaningful

When marketing to speakers of other languages, Tedrow explains that it is important to keep the messages concise and to ensure that quality translations are done. Poorly translated material may be perceived as insulting and decrease credibility (T. Ellis, personal communication, November 16, 2009; N. Huerta-Kelley, personal

communication, December 2, 2009). Knowing your audience's background, such as country of origin and dialect, literacy levels of parents, and how long they have been in the country can help ISE organizations tailor messages and use appropriate language (Hobbs & Sawyer, 2009; Tedrow, 2009). A seemingly slight *faux pax* can offend a group and make them reluctant to come back because the agency is seen as insensitive (Allison & Hibbler, 2004, Lozar Glenn, 2009). Marketing materials should reflect Latino participants to portray that the organization is welcoming place for Latinos (N. Huerta Kelley, personal communication, December 2, 2009).

As discussed earlier, many Latino parents are unfamiliar with ISE organization and unaware of the benefits these programs can have for their children. Sending messages through trusted people such as teachers, counselors, and community liaisons at schools or via other community members (i.e., church leaders, staff of community centers) is strategy that builds awareness and trust. Messages should make the educational benefits of the program explicit and emphasize a fun, hands-on, family experience (Bell et al., 2009; Borden et al., 2006; Cooper et al., 1995; Correa-Zeigler, 2009; Fadigan and Hammrich, 2004; Fusco, 2001, Garibay, 2009; Jones, 1997; Sanchez, 2009; Sherman, 2009).

Theme 4: Program Structure

Structuring programs to meet the needs of diverse audiences means that ISE providers must take into account both cultural considerations, such as safety concerns and family-level programming, and practical considerations, such as time, cost, and transportation. Investing time and effort into developing cultural awareness and skills for communicating and teaching diverse groups, as well as cultivating partnerships can help

ISE providers understand how to structure programs with an awareness of cultural considerations. Bell et al. (2009) offer two broad suggestions that generalize the concept of cultural considerations in program design: 1) programs should be developed and implemented with the interests and concerns of community and cultural groups in mind and 2) they should expressly draw on participants' cultural practices, including everyday language, linguistic practices, and local cultural experiences.

Latinos have been especially positive about participating in ISE activities that focus on community issues and community-based activities can help strengthen parents' skills and knowledge of ways they can support their children's science education (Bell et al., 2009; Borden et al., 2006; Cooper et al., 1995; Correa-Zeigler, 2009; Fadigan & Hammrich, 2004; Fusco, 2001; Garibay, 2009; Lozar-Glenn, 2009; Riggs & Greenberg, 2004; Sanchez & Arce, 2009; Sherman, 2009).

Latino culture is centered on family relationships. Activities which engage the entire family, provide new learning experiences and opportunities, and have some educational aspect are highly valued (Garibay, 2009; Hudson, 2001; Martinez, DiGarmo, & Eddy, 2004). Furthermore, Latino parents have high aspirations that their children will achieve a better standard of living and quality of life than they have been able to provide (Garibay, 2009). Programs that empower students and help them envision their future by teaching them real life job-skills and exposing them to possible careers in STEM fields have been successful at engaging diverse youth (Basu & Calabrese-Barton, 2005; Bell et al. 2009; Correa-Zeigler, 2009; Fadigan & Hammrich, 2004; Martinez et al., 2004).

The overarching concept regarding program structure can be described as "flexible facilitation" to meet cultural as well as practical needs of Latino parents. ISE

providers need to think differently about where and how they deliver programs.

Partnering with schools and community centers where Latino children go before and after school can circumvent transportation and time issues (Bell et al., 2009; Cooper, 1995; Correa-Zeigler, 2009; Garibay, 2009; Sherman, 2009). Developing the capacity for bilingual program delivery and materials will address the language barrier, help make programs accessible to whole families, and ensure that Latinos feel welcome and included.

ISE organizations will need to address socioeconomic issues to engage Latinos. Providing free or low-cost programs, scholarships and offering membership benefits and other incentives can increase accessibility for Latino families (Borden et al, 2006; Hong and Anderson, 2006; Springer, 2009). These strategies should be implemented in respectful ways to protect people's pride and integrity.

Methodology: Our Approach

Study Area Background

Sixteen percent of students in the Larimer County school districts are Latino. Over the last decade, Latino enrollment in Larimer County schools has increased by 52.8% from 4,551 to 6,953 students (Compass of Larimer County, 2010). The majority of Latino students in the study area are of Mexican descent and are primarily first or second generation U.S. residents. Most Latino families in the study area have been in the U.S. an average of two to ten years and many have moved between several states during this time. Most Latino students in this district are bilingual, but many parents are monolingual Spanish-speakers (T. Ellis, personal communication, November 16, 2009).

Because Latinos of Mexican descent are the largest nondominant group in the study area, this study focused on synthesizing strategies for engaging this specific audience. It is important to recognize that over 70 countries are represented in Larimer County schools (T. Ellis, personal communication, November 16, 2009). However, the majority of students who speak a language other than English are native Spanish speakers while a much smaller proportion are speakers of Asian and Pacific Island languages (Larimer County Compass, 2010). See Figure 5 showing enrollment by race/ethnicity in Larimer County Schools and Figure 6 showing minority student enrollment.

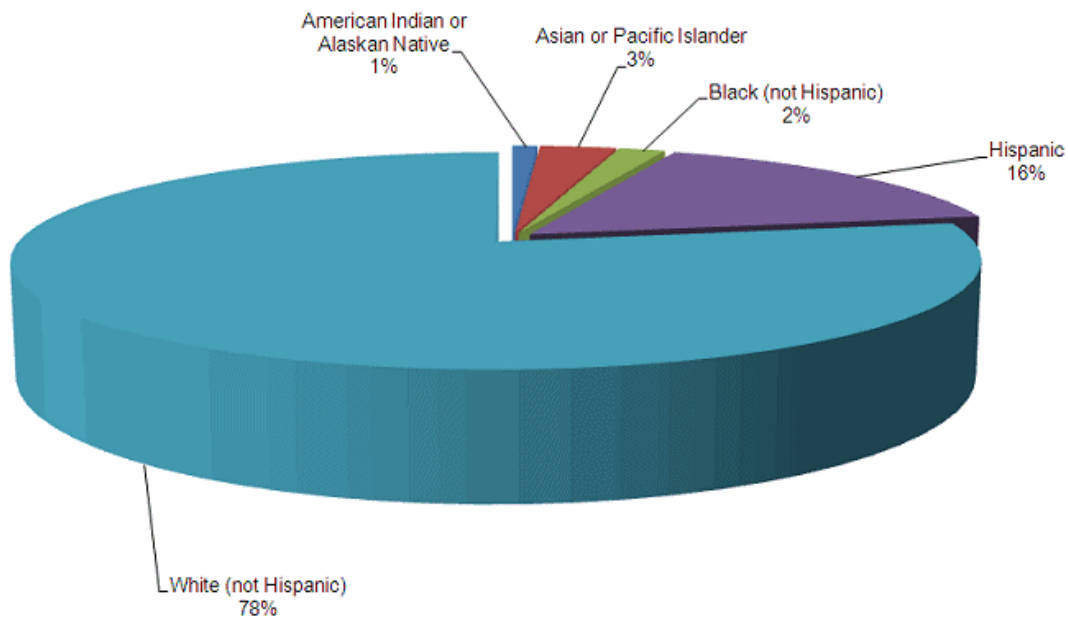


Figure 5. Enrollment by Race/Ethnicity in Larimer County School Districts, 2009-10.
Source: http://www.co.larimer.co.us/compass/ethnicityenroll_ed_k12.htm#MinorityChart0

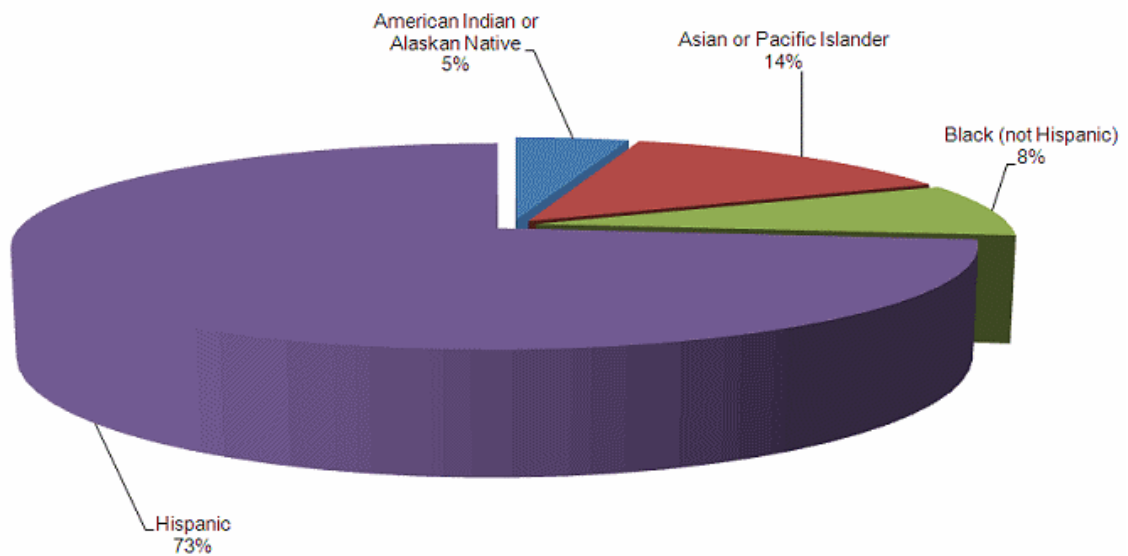


Figure 6. Minority Student Enrollment in Larimer County School Districts, 2009-10.
 Source:http://www.co.larimer.co.us/compass/ethnicityenroll_ed_k12.htm#MinorityChart0

Study Participants

This project brought together 14 education program coordinators and practitioners from nine ISE organizations with gatekeepers to the Latino community in northern Colorado. Gatekeepers are defined as individuals who have an official or unofficial role at a study site, provide entrance to a site, help researchers locate people, and assist in the identification of places to study (Creswell, 2008). Gatekeepers from the Poudre School District included:

- Norma Huerta-Kelley (Equity and Diversity Coordinator)
- Diane Catlin (English Language Acquisition Coordinator)
- Tawa Ellis (Outreach and Family Liaison Coordinator)
- Sarah Daniel (Early Childhood Education Parent Education Specialist)
- Lisa Pitot (Science Curriculum Coordinator)

Other gatekeepers who participated were:

- Guadalupe Salazar (Co-director of El Centro Student Services, CSU)
- Marilyn Thayer (Director of the CORE Center, CSU)

While the science curriculum coordinator does not work closely with Latino students and families, she provided a better understanding of science education in our schools and offered insight on how ISE providers could become more involved in school science programming.

The Process

In the study, participants attended two workshops and completed the assessment tool. The first workshop served as a forum to introduce the project and the assessment tool to ISE providers and to develop a better understanding of the needs and perspectives of the Latino community through interaction with the gatekeepers. This workshop gave participants an idea of the scope of the issue of increasing access to ISE for diverse groups; they saw who was involved in ISE in the community and learned who some key contacts in the Latino community are and what their roles are.

After the first workshop, ISE participants completed the assessment tool by scoring their organizations in the four themes described earlier on a 90-point scale. Each theme was defined with five to nine statements to which participants assigned a score for their organization between zero (the organization does not currently meet the statement at all) and three (the organization currently fulfills the statement). The scoring was subjective (i.e., self-report) and meant to serve as a gauge enabling each organization to measure its policies and procedures. The participants were encouraged to score the assessment with one or more coworkers to reach consensus, although this was not the procedure in all cases.

Nine organizations returned their assessment results. The scores for each theme and overall were converted to percentages to reflect the extent to which each organization is meeting the objectives outlined in the assessment tool. The average (mean) score for all organizations was calculated to reflect the capacity of ISE providers as a community to successfully engage Latinos. One organization that attended the first workshop did not return results; in addition, one organization returned results but did not attend either workshop.

Approximately six weeks later, the second workshop was held to discuss the results of the assessment tool, brainstorm next steps and priorities, and to evaluate the process overall. This workshop was much smaller, with seven ISE participants from six organizations in attendance as well as three gatekeepers from the Poudre School District. The researchers facilitated a group discussion to highlight the collective strengths and areas of growth for ISE providers and to generate a list of community priorities for ISE providers. Following the discussion, participants were asked to write their responses to an evaluation questionnaire. Finally, the researchers recorded a discussion based on the evaluation questions to understand the perceived benefits and overall effectiveness of the process. The audio recordings were then transcribed and coded for analysis. See Appendix D for a table outlining the events and activities that took place during this study.

Results and Findings

Quantitative Assessment Tool Results

Participants scored highest in the areas of *Programs* and *Partnerships* followed by *Culturally Effective Promotion*. The area identified as needing the most improvement was *Organizational Awareness*. Anonymous individual scores for each organization as well as community averages for each theme and overall are shown in Table 4. While there are strengths displayed by several organizations, the overall scores reflect the need to build the capacity of ISE providers to effectively engage Latinos.

Table 4

Assessment scores of ISE organizations by theme, overall, and community means

ISE Organization	Awareness	Partnerships	Promotion	Programs	Overall
n=9	%	%	%	%	%
1	52	73	54	67	60
2	54	75	77	69	69
3	41	60	54	71	56
4	22	33	33	50	34
5	48	40	46	50	46
6	30	37	50	92	53
7	11	17	20	80	14
8	44	87	78	75	69
9	11	42	29	33	26
Community Mean	35	52	49	57	47

Qualitative Assessment Tool Results

In addition to scoring the assessment tool, participants were also asked to describe the areas that they found to be strongest and those that needed the most attention in their organization in open-ended responses at the end of the assessment tool. Specific

strengths described by participants in this section of the assessment tool are shown in Table 5. These comments offer insight into specific ways that organizations feel they do display capacity for effective Latino outreach. Collectively, ISE providers reported that *programming* is their strongest area, meaning they feel they provide programs in formats that are viable with and preferable to the Latino community such as low-cost or free programs that the whole family can attend and that integrate content related to empowerment and science careers. *Partnerships* were identified as the second strongest aspect of the ISE community’s outreach capabilities. Participants recognized that strong partnerships already exist in their community, but there is a need to revitalize and expand those relationships in order to better coordinate efforts and pool resources.

Table 5

Strengths Described by ISE Participants

ISE Orgs	Partners	Programs	Free/Low Cost	Family-Oriented	Promote science career	Inclusive explicit goal	Long-standing program
1	x				x		
2	x	x		x			
3	x	x	x	x			
4	x	x	x				
5						x	x
6		x	x				
7						x	
8		x			x	x	
9			x				
	4	5	4	2	2	3	1

Specific areas of growth described by participants in the open-ended section of the assessment tool are shown in Table 6. Providing *staff training* in cultural competence and culturally responsive strategies and ensuring accurate *translation* of marketing and

program materials were the most commonly identified areas of growth. ISE providers also reported struggling with *recruiting Latino program facilitators and volunteers* and *delivery of bilingual programs*.

Table 6

Areas of Growth Described by ISE Participants

ISE Org	Involve Families	Diverse staff/vol	Emp/ ^a Opp	Train ^b	Promo ^c	Transl ^d	Participate in events	Limits ^e	Prog. Eval ^f
1	X	X	X						
2				X	X				
3		X			X	X			
4				X		X			X
5		X						X	
6						X		X	
7				X	X				
8				X		X	X		
9				X		X	X		
	1	3	1	5	3	5	2	2	1

Note. ^aIncorporate messages of empowerment and opportunity. ^bStaff training. ^cCulturally effective promotion. ^dTranslation. ^eLimitations of staff, time, and money. ^fProgram evaluation.

Workshop Evaluation Results

While average scores on the assessment tool were relatively low, improving access to ISE for diverse groups is something that ISE providers are motivated to do, both as individual organizations and as a community of science education providers. It is a problem that has solutions, and the workshops were an effective way to raise awareness of what to do and how to do it. The benefits and outcomes of the workshops identified by participants are summarized in Table 7.

Table 7

Benefits of workshops and assessment process identified by study participants

Networking
Learning about the Latino community
Learning how others ISE providers are approaching this issue
Contributed to a community/collaborative perspective
Assessment Tool (tangible outcome)
Resource Directory (tangible outcome)
Reinvigorated motivation, brought issue to the forefront

The process of conducting workshops in conjunction with completing the assessment tool was based on the premise that bringing together staff of ISE organizations with gatekeepers to the Latino community could facilitate collaboration between these parties. The participants indicated that these opportunities to network, discover resources, and exchange ideas with the gatekeepers and other ISE providers was one the most important benefits of the process. This interaction helped ISE providers learn more about the Latino community and see how others are approaching this issue.

P1: “A valuable thing was to see how many people were involved, to really see the breadth of work in ISE in the community was really eye-opening to me.”

P2: “A lot of good resources came up. I’m leaving this meeting with a lot of ideas about who to talk to.”

P3: “The most important benefit was face to face contacts with people who are doing similar work.”

Participating in this process led the ISE organizations to view themselves more as a community of providers rather than individual, competing organizations. The workshops contributed to a creating space that was safe to share information and ideas where they could tap into their collective knowledge and experience.

P1: “Maybe 10 years ago, people may not have been willing to be so open about discussing their strengths and weaknesses with competitors.”

P2: “Doing this as a group we’re able to capitalize on the strengths, knowledge and experience of other organizations. Now that we understand what our weaknesses are we can learn from other organizations how we might be able to overcome those weaknesses.”

Participants recognized that they have shared goals as well as common struggles and that by working together, pooling resources, and sharing information they may be able to accomplish more than they could alone, especially during times of economic recession.

Another important outcome of the process was the assessment tool itself. The assessment tool provided a holistic structure for addressing the challenges of engaging diverse groups. It provided a manageable, step-by-step approach to help ISE organizations identify their strengths and weaknesses and build the capacity for more effective Latino outreach. Although scores were low in many areas, the tool gave participants a place to start.

P1: “The tool gave us a framework to work within that mitigates feeling overwhelmed and not knowing how to handle these issues.”

P2: “Putting it all into one document holistically really helped me see where we’re at.”

P3: “Now that we know where we stand we can decide what steps to take next.”

P4: “One of the values of the tool is that it breaks large objectives down into manageable steps.”

ISE providers had little awareness of specific contacts and resources in the community to help them connect to Latino youth and families, such as the family liaison coordinator and the equity and diversity coordinator at the school district and staff of community centers. The resource directory created in this process was another important

tangible outcome that will help ISE providers facilitate partnerships and develop more effective advertising approaches.

Participants felt that rather than the workshops motivating them to make changes in their outreach strategies, they had internal motivation to do so, especially for those who attended the second workshop. They participated in this process because the issue was important to them already. The workshops brought the issue to the forefront; they sparked ideas and discussion and increased awareness of resources and key contacts in the community. Some participants feel more prepared to implement changes as a result of the process.

P1: “The people that are probably most interested in the topic are here this time. There were a lot more people that were peripherally interested [at the first workshop] but not necessarily ready to be engaged.”

P2: “Just by pooling our collective knowledge and our access to various resources, it makes me feel that our organization is a little bit more capable of implementing some of these steps.”

P3: “This experience gave us a new perspective and focus.”

P4: “We constantly strive to reach all audiences and I have gained some insights about how to be more effective.”

P5: “It was rejuvenating and gets me excited for the future and how much more we can do with our staff. This is a topic that our organization has named as a priority.”

For others, participating in the process helped them feel more prepared, but they do not intend to implement changes immediately. Participants also recognized several barriers to implementing changes in their policies and practices including time, money, and staff limitations as well as the lack of expertise. Several organizations were in the process of drafting strategic plans at the time of the workshops and intend to incorporate

the steps outlined in the assessment tool into their larger organizational planning processes.

P1: “The tools provided in this process will help develop an organized outreach plan, but we haven’t begun one yet. This needs to be one of those foundation blocks that look at how we are dealing with any program or with any audience. I don’t think that right now we would be able to sit down and focus on this specifically.”

P2: “I realized that there has to be buy-in by senior management. What I’m grappling with is how to get that?”

P3: “It is great to assess our organization, but also somewhat frustrating due to shortage of staff to do the work and lack of financial resources.”

P4: “Promoting and delivering programs that meet the objectives laid out in the assessment tool often requires working on evening, weekends, and holidays.”

P5: “We want to do more, but we don’t have the money or the staff for starting new outreach programs.”

Participants described two future steps that they felt would help them move forward in addressing this issue. First, participants suggested another workshop to help them transfer what they’ve learned to the rest of their staff and organizational leaders. Second, participants wanted opportunities to interact directly with Latino residents to learn more about their interests and needs and to recruit volunteers or staff.

Identifying Priorities for Increasing Access to ISE

The discussions in the second workshop helped ISE providers identify and prioritize steps that will help them meet the needs of Latino audiences more effectively (see Table 8). The priorities and corresponding sub-goals align with the assessment tool results; that is, the areas that were scored the lowest were identified as the top priorities. The remainder of the report discusses the ideas and opportunities described by workshop participants for each priority. Examples of ways that ISE organizations do demonstrate

capacity for engaging Latinos and quotes that illustrate key points have been integrated into the text.

Table 8

Priorities for building the capacity of ISE providers to engage Latinos

1. Staff Training (Theme 1)
• Cultural Competence training to develop awareness and communication skills
• Culturally Responsive Teaching training for education/outreach staff working with Latino audiences
2. Marketing and Promotion (Theme 3)
• Producing quality translations (accurate and appropriate language)
• Developing word of mouth networks
• Utilizing school district communication channels
3. Program Content and Structure (Theme 4)
• Integrating messages of empowerment and opportunity (e.g., "science pipeline," real world experiences)
• Programs that develop science skills, literacy, and understanding of the nature of science
4. Expand and Strengthen Partnerships with Schools and Community Organizations (Theme 2)
• Develop knowledge about existing partnerships in the community to identify gaps in service
• Continue collaboration between ISE providers to overcome constraints to effective outreach (i.e., money, time and staff limitations)

Priority 1: Organizational Awareness

Developing cultural competence is a necessary and important next step.

Nearly all of the study participants had participated in cultural competence training at some previous time and indicated that they had done some sort of targeted outreach to Latinos in their careers. Although the participants themselves were generally familiar

with the concepts and ideas related to developing cultural competence that were introduced in the assessment tool, scores were lowest in this category. This implies that personal understanding of these issues by some staff does not translate to culturally responsive organizations. There must be a commitment to developing a culturally responsive program at all levels of the organization including advisory boards, management, and *all* staff, not only the education staff. Gatekeepers emphasized that this is the first, most important step. If an organization doesn't start with awareness the rest will not work (N. Huerta-Kelley, personal communication, December 2, 2009).

Participants recognized the need to train staff in cross-cultural communication methods and culturally relevant teaching (CRT) strategies. One participant stated that a language barrier often exists between staff and Latino visitors, which limits interaction and contributes to stereotypes and bias.

P1: "In situations with Latino visitors, staff may often think they don't speak English anyway so I'm not going to talk to them."

A Latina gatekeeper explained that:

"It can be hard to reach across—coming from a privileged background or community. There is fear on both sides. Going into different communities you have to confront misperceptions. It's important to have those dialogues. There is a lot of fear about going into different communities where threats of even being killed have happened. We have to think differently. If we want our organizations to reflect the community we need to be prepared. It starts with being respectful, having someone that really understands the audience."

While cultural competency training was perceived as a necessary and important step, many participants believe that there would be resistance to mandatory training and questioned whether it should be required of the entire staff or only the education and/or

outreach staff. Gatekeepers from the school district and Latino-serving organizations emphasized the importance of cultural competence training for the entire staff.

G1: “We need to feel like we are referring families and students to safe, culturally competent organizations. We will send families to organizations whose staff have been trained and have a reputation for treating people with respect. Just because a few outreach staff members are prepared and culturally sensitive, others may not be and this could lead to ugly situations.”

ISE participants wanted to clarify what “safe” means in this context. Gatekeepers explained that it means both physical and emotional safety. For Latinos, there is often a fear of discrimination, of being labeled or perceived as dumb.

G2: “People think they [Latinos] don’t understand and don’t realize that they are being treated unfairly.”

ISE staff members have an obligation to create and maintain an inclusive environment and atmosphere. Staff members need to be trained in how to respond if they witness/observe a discriminatory situation. For example, one gatekeeper shared a discriminatory comment she overheard while at a public place reflecting this issue: “When are all the Mexicans going to leave?” Participants recognized that the public can create hostility that the agency may have difficulty controlling, but one gatekeeper argued that if the staff is trained they will know what to do in this kind of situation.

Participants emphasized that the need for and benefits of training staff in cultural competence would have to be explicit in order to prove to management and staff that the investment is worthwhile. One possible barrier to staff “buy in” described by participants is that there is already so much training at many organizations. Some organizations have relatively high staff turnover and would face challenges in training the whole staff

regularly. While barriers exist, to truly develop an inclusive organizational culture training needs to happen regularly and include the entire staff.

ISE providers must accept that they will make mistakes and be willing to try again. Participants had many questions about what culturally responsive behaviors actually are and what they look like in practice. Investing in training can help answer those questions. Gatekeepers emphasized that even basic training staff in customer service skills, such as how to greet customers and being aware of body language is a good start. Essentially, organizations must emphasize the importance of treating people consistently with respect and creating a welcoming atmosphere.

Vignette: Being Aware of Perceptions

When the education and outreach staff at Rocky Mountain National Park realized that their uniforms could be perceived as a threat, they stopped wearing them to school visits. “When we did a program at a school in Denver for the first time we were wearing uniforms and kids literally ran. There was the perception that we were like Border Patrol. We are a federal agency and carry with us the perception of law enforcement, but we are not concerned with documentation. How else can we reassure people that our programs are a safe zone?” –Mark DeGregorio, RMNP

Vignette: Expanding an Existing Structure:

The Fort Collins Museum and Science Discovery Center currently utilizes community advisory committees with Native American groups to allow this community to dictate their needs. The museum realized that these committees are an existing structure that

could enable them to connect better with the Latino community. As a result of the workshops, this organization recognized that it should create advisory committees with Latino representation to aid in developing culturally relevant programs and displays.

Vignette: Making a Commitment to Increasing Inclusiveness

Many organizations are making an explicit commitment to inclusiveness in their public statements. For example, this quote from Larimer County Department of Natural Resources' 2009 annual report: "Our efforts to connect people to the land and its resources through better customer service and communication, as well as actively reaching out to those we have not previously engaged, will be in small steps. These efforts will result in forging new community partnerships, providing new land use opportunities, and overall being more inclusive of all county residents. It will be incremental in coming, but it will come."

Priority Two: Culturally Effective Promotion

Previous research suggests that the lack of awareness of ISE opportunities is perhaps the greatest barrier to participation in ISE by Latinos and workshop participants did recognize that they struggle with culturally effective promotion. They described several constraints to implementing more effective advertising strategies (e.g., lacking an example of what to do, not knowing who to talk to, complicated logistics of in-person appeals). Many organizations were unsure how to proceed in this area. The workshops helped ISE providers connect with resources that available to them that are currently underutilized.

A number of specific strategies for increasing awareness of ISE opportunities were brought up during workshop discussions (see Table 9). The most important next steps identified in this area were: 1) utilizing partnerships to relay messages, especially schools; 2) utilizing personal communication methods (i.e., word of mouth networks); and 3) producing quality translations. These priorities respond to and integrate the findings methods of the first two phases of the study about preferred ways to learn about ISE opportunities.

Table 9

Advertising and Promotion Considerations

Utilize PSD’s communication system and team of Family Liaisons (contact Tawa Ellis)
Ensure quality translation of marketing materials
Utilize personal communication methods (word of mouth networks, attend meetings, events)
Develop an ISE Community Calendar to distribute to schools (monthly or by semester)
Get advertising out well in advance of programs
Take advantage of Healthier Communities Coalition newsletter
Build partnerships with libraries to promote programs
Do not depend on internet advertising and registration alone
Explore radio and TV advertising options (e.g., KGRE Greeley and Channel 10)

Use partnerships to relay messages. A major obstacle ISE providers identified is that they were generally not aware of who to contact in the schools or the community to coordinate programs and establish partnerships. The resource directory (see Appendix C) created in this study provides contact information for community leaders, staff of community organizations, churches, and others who work with Latino families. The

directory can help providers find out about events and meetings of Latino-serving organizations that they may be able to attend. However, effectively utilizing these word of mouth channels will require relationship building on the part of ISE organizations. The people and organizations listed in the directory are willing to help if they feel that here is a shared goal and that participating will really benefit the people they work with.

Utilizing the school district's communication channels. Sending messages via schools will ensure that messages get out to everyone and will prevent certain groups from being singled out. However, to ensure that messages get to Latino parent, ISE providers discovered that the school district has a team of bilingual family liaisons who communicate regularly with Latino families. ISE organizations can tap into this network by contacting the district's outreach coordinator, Tawa Ellis, who can distribute messages to the entire team of family liaisons. These outreach workers make weekly automated phone calls, in Spanish, to parents to inform them of upcoming events and other important information.

Gatekeepers from the school district stressed the importance of keeping messages clear and concise and getting them out well in advance because parents are often overwhelmed with information from schools. They suggested a semester-long calendar of events or a monthly flyer of upcoming events. In response, ISE participants suggested creating an ISE community calendar which all organizations could add to that could be sent out through schools and family liaisons on a monthly basis. Creating a central place for this calendar, perhaps CSMATE's website (STEM.Colostate.edu) could facilitate coordination between ISE organizations and allow providers to see when other events and programs are scheduled to prevent overlap in programming.

Personal communication methods. In addition to printed materials and phone calls, ISE organizations recognized the need to utilize more personal communication methods, especially developing word of mouth networks. Contacting people and organizations in the resource directory about ISE events and programs can initiate word of mouth communication. Gatekeepers also recommended attending PTO meetings and other school or community events as a way to meet in person with school personnel and parents. Going door to door in Latino neighborhoods to tell people about programs and distribute flyers has also been an effective strategy. While time and labor intensive, these relationship building tactics and personal approaches will facilitate familiarity with the organization while doing advertising and promotion.

Quality translation. Gatekeepers repeatedly emphasized the importance of quality translations of marketing materials and that poor quality translations can do more harm than good. Gatekeepers recommended that idioms, slang, and literal translations should be avoided because they often don't translate the intended meaning correctly. Gatekeepers also recommended writing messages in Spanish, framed for Latinos, instead of translating them from English afterwards. ISE providers must be especially cognizant of accents and special characters as the presence of lack of a character can drastically change the meaning. Although translations can be time consuming and costly, it is worth it to do it right.

There are many resources here in our community that ISE organizations can utilize if ISE providers lack the expertise to do high-quality translations. Tawa Ellis' bilingual outreach staff could provide translation services during the summer. Upper-level students in the Spanish department or students connected with El Centro may be

other resources at CSU for translation services. Regardless of who does the translating, all publications should be edited by more than one person for inaccurate or inappropriate wording.

Technology and other communication mediums. Participants discussed the role of technology in promoting ISE programs among Latinos. Gatekeepers explained that relying on the internet to send messages can exclude many Latino families who may not have computers and internet access at home. However, Latino families often use library resources, so building relationships with and sending messages through local libraries can be another effective promotion strategy. Poudre School District's Channel 10 television station is another community resource ISE providers could utilize. Newspapers and radio can also be effective communication mediums; however there is no Spanish language newspaper in the study area and although two Spanish language radio stations broadcast in the area, they are located outside of the community. Further examination of how effective these strategies are in motivating participation would be useful.

Vignette: Increasing Awareness of ISE via the Schools

A product of first two phases of this study was the "Nature and Science Guide," a bilingual booklet with information about informal science education opportunities in the Fort Collins area. These booklets were distributed to all elementary school students in their weekly folders in fall of 2009.

Vignette: Utilizing Community Resources—PSD’s Channel 10

Everyday Science is a production of Poudre School District Channel 10, in cooperation with Colorado State University's Little Shop of Physics. Everyday Science airs at regular times on Friday, Saturday, and Sunday evenings, at 8:30 p.m. CSU's Brian Jones teams up with Poudre School District kids for fun-filled shows of zany Everyday Science. Each episode explores a science theme that not only entertains, but is tied to science standards for grades K-12. Everyday Science captures the best of the nationally celebrated Little Shop of Physics which serves up hundreds of fun and easy to recreate experiments. As Brian says, "science is something anyone can do... everyday!"

Priority Three: Program Structure

Participants reported the highest scores in the program structure area, meaning they feel they provide programs in formats that are viable with and preferable to the Latino community including programs which the whole family can attend, that integrate content related to empowerment and science careers, and that are low-cost. However, participants identified several ways in which program structure and content could be improved to better engage Latino youth and families. Most importantly, ISE providers saw a need to connect to STEM curriculum planning at the school district, especially at the middle and high school levels. Specific program structure considerations identified by participants in the workshops are outlined in Table 10.

Table 10

Program Structure and Design Considerations

Connect to STEM Curriculum Planning in PSD Middle School and High School
Connect to Parent Involvement classes, Parent and Child Together
Internships and relevant, real world experiences (Critical Skills, PACE, ACE)
Develop “Pipeline to STEM Education and Careers” material
Engage students during summer/spring break
Develop more family-level, inter-generational programming
Increase involvement in existing STEM events that target Latinos
Collaborate to integrate and connect community events
Increase capacity for bilingual program delivery and materials
Offer incentives and scholarships

Integrating ISE opportunities at the middle and school levels. Participants recognized a lack of support for ISE at the middle and high school levels and advocate a developing an integrated approach for supporting STEM education outside of the schools. Opportunities to shadow local STEM professionals or having STEM professionals share their educational experiences were suggested as specific ways to engage older students and many participants expressed interest in offering internship opportunities for high school students. By connecting to programs such as Critical Skills class, the PaCE (Professional and Community Experience) and ACE (Alternative Cooperative Education) programs at Rocky Mountain High School, and the Capstone program at Poudre High School, ISE providers can expose students to relevant, real-world experiences that show how science is relevant to students’ lives and their futures. The PaCE and ACE programs provide experiences in paid employment, apprenticeships, shadowing, and volunteering to students for credit. The Capstone Experience is available to students who wish to create and complete a community-based, career-oriented project.

For CSMATE developing outreach strategies that focus on pathways to college and STEM careers for diverse students was particularly important. Starting in middle school, students need to be aware of what kinds of math and science classes they will need to take in high school in order to get into science and related fields in college. CSMATE wants to develop “Pipeline to Science” classroom materials to help students understand the steps they have to take to achieve these goals.

Another ISE provider emphasized the importance of discussing vocational options for Latino students, especially males, and stressed that we should not exclude those goals and opportunities and find ways to build on Latino students’ prior knowledge, skills, and interests. She also described the need to help Latino students learn practical skills they need to get into college, such as how to complete college applications and write essays.

“Latino boys have the highest dropout rate. By tenth grade, 40% of Latino boys drop out, not necessarily because they don’t value education, but because they feel like they need to work to provide for their families. They aren’t equipped with the skills they need to do all the paperwork. For many of these youth, college isn’t seen as an option. They think, “Why do I need to know this? I want to fix cars.” We need to show them what career opportunities there are for them. Look at the top 100 Latino friendly companies—Disney is number one. Why? These companies tap into an innate artistic ability that is not fostered in schools. How can we tap into that prior knowledge and value those skills?”

—Yeni Garcia, Poudre Learning Center

Vignette: Providing Support for STEM Education

CSMATE has had a tutoring partnership with the Poudre School District for five years called *Triunfo*. The program brings elementary school students to CSU afterschool where college students help them with their homework and spend time doing other fun activities. About 45% of students they serve are Latino and *Triunfo* recruits many diverse and bilingual tutors. In high school, math and science classes are often too

difficult to for many parents to help their children. Expanding this program to serve middle and high school students would offer a way to support math and science education at all levels.

Meeting people where they are. Several organizations provide programming only on-site, which can limit accessibility for Latino families who may have concerns about safety and familiarity with ISE organizations and face transportation barriers.

P1: “We are required to use our open spaces as teaching places, but we may need to change that philosophy and get out into the community and schools.”

ISE providers should consider delivering programs in convenient locations in Latino communities and at convenient times, such as before or after school and on the weekends to help overcome these practical and cultural barriers. For example, the local 4H club has meetings on weekends in the neighborhoods where Latino members live. Once trust and familiarity with the staff have been established, Latinos may be more likely to visit traditional program sites.

Vignette: Bringing Programs to Students

The Little Shop of Physics (LSOP) is Colorado State University's hands-on science outreach program that brings physics to schools all over the region. Each year, LSOP shares their collection of 200+ experiments with more than 15,000 students, and share an idea that science is something anyone can do! LSOP's science experiments are designed to be used by students at all grade levels, K-16. “We don't do presentations, we don't *show* students science. We help them *do* science, to observe, experiment, and question -and discover how rewarding this can be. They learn science, but they also learn

that science is something that they can do. And we travel. We come to you. We visit schools all over the region to share our collection of fun and exciting experiments.”

Vignette: Increasing Access to Award Winning Programs

The Garbage Garage Education Center is one of ten programs from across the state that the Colorado Alliance for Environmental Education (CAEE) awarded for "leadership in developing effective, cooperative, cross-sector environmental education programs." The Garbage Garage was also presented with an award from the Environmental Protection Agency for excellence in programming. It is one of only a few education centers nationwide devoted exclusively and extensively to waste education, an issue that impacts all communities and one that all families can do something about. This is an example of a program that can involve and impact the communities where people live. With some targeted approaches to outreach and a willingness meet people where they are, these award winning programs can be more accessible to all.

Provide appropriate incentives and promote scholarships. Participants suggested collaborating to create a community-wide incentive program to encourage youth and families to participate in ISE programs. For example, the Museum and Science Discovery Center provides free membership and programs to Head Start Families. ISE providers could offer a similar membership program and offer an incentive to youth and families who participate in a certain number of programs throughout the summer or year, similar to the library’s summer reading programs or the Passport to Adventure program, a community program designed to encourage families to visit inexpensive educational places around Fort Collins during spring break. Incentives and

scholarships can promote genuine buy-in and actual engagement in programs because they encourage people to make a commitment and they receive something tangible as a result of this commitment. Gatekeepers reinforced that ISE providers should actively promote scholarships in ways that will not damage pride or feel like a handout. Programs should offer ways for Latinos to contribute and to feel that they are adding value to the program and creating a sense of community.

G1: “Don’t make it a charity or a give-away. They must not be intimidated by the application process or feel devalued by it. Going through an application process helps youth learn skills and earn the scholarship.”

G2: “Kids need the skills and tools to know how to be persuasive and get those scholarships. Scholarship recipients need to make a commitment, they should be asked to share what they believe they can contribute, why they want this opportunity, and how it would help them meet their goals.”

Finally, many ISE providers discovered that there are opportunities to get involved in existing events, for example Picnic on the Poudre, Math Science and Technology (MST) Day at CSU, the Putnum Science Carnival and similar “science nights” at other local schools. Participants wish to collaborate more and do a better job of connecting community science events to achieve more meaningful learning experiences and a broader impact on the community. While ISE providers recognized the need to engage older students, they plan to continue to reach out to young students because inspiration can come at an early age.

Priority 4: Strengthening Partnerships and Collaboration

Many strong partnerships already exist in our community, but participants felt that they need to develop a better understanding of these partnerships so that gaps can be identified. In other words, ISE providers need to know who is doing what with whom

and where there are opportunities for new programs. The workshops revealed that awareness of resources for connecting to the Latino community was low for ISE providers and vice versa: gatekeepers also had low awareness of the opportunities offered by ISE providers.

G1: “Is there a network of science folks? How do you know who’s who?”

P1: “There is a lack of a comprehensive resource directory to connect ISE providers and diversity-serving organizations.”

Gatekeepers pointed out that the Science and Nature Guide distributed in fall of 2009 provided a solid directory of ISE organizations, yet it lacked connections to diversity-serving organizations. The resource directory developed in this phase of the study will provide some of those missing connections.

For one organization located outside of the immediate study area, community partnership development was an area of growth rather than strength. While the organization has strong partnerships with organizations in the Denver-Metro area, local partners have been more difficult to find. For this organization, seeking out local gatekeepers, partners, and developing their own community resource directory will be important steps.

P2: “We don’t have community partners in Estes Park—it’s a changing community. The whole service sector is Latino, but it’s like they are hidden. The kids are in the schools, but you don’t see the parents. There are lots of undocumented folks there. It’s hard to know who talk to.”

Connecting to schools. Participants recognized that there is a great opportunity to get better connected with science programming at the schools, but they need to know who to contact, what partnerships already exist, and find out about possibilities for future partnerships. Due to budget cuts, the science curriculum coordinator position was

recently eliminated, but ISE providers can connect with the math curriculum coordinator as well science and math teachers at individual schools. ISE providers also became aware of opportunities to get involved with the Parent Involvement program and the Parent and Child Together (PACT) groups at the school district to connect with parents and help them learn how to support their children's science education.

Colorado State University can be a resource for ISE providers whether or not they are affiliated with it. The Blevins Middle School principal described a partnership between PSD and CSU developing web units that are available to remote schools and explained that CSU often asks their school to partner for projects such as the Science Olympiad and other grant-funded opportunities. Many ISE providers may be currently left out of these partnerships, this is an partnership strategy that ISE providers should capitalize on. Gatekeepers also recommended partnering with Latino/a fraternities and sororities at CSU. These organizations have well established connections within the community and these students may be willing to serve as role models, mentors, staff, and volunteers. Some of the other community resources for raising awareness of ISE opportunities and cultivating partnerships discussed in the workshops include the Healthier Communities Coalition, Vineyard and Holy Family churches, and the United Way.

Vignette: Connecting ISE Providers with the Community at STEM.Colostate.edu

CSMATE has a website for CSU students and faculty, K-12 teachers, and citizens who are interested in STEM education. The site has links to professional development opportunities, information about scheduling field trips, and curriculum materials.

CSMATE director, Andrew Warnock, suggested that the website could be expanded and utilized to provide opportunities for ISE organizations to collaborate with each other, with schools, and with other community-based organizations.

Vignette: A Foundation for Strong Partnerships

The Community Organizing to Reach Empowerment (CORE) Center is a community center located in the center of the four neighborhoods where many Latino families live. The CORE Center is affiliated with the Center for Applied Human Services at CSU and provides many services to the Latino Community including GED classes, afterschool, and summer programs. Several ISE organizations have on-going partnerships with the CORE Center, including 4H, The Fort Collins Natural Areas Program, and the Environmental Learning Center. The CORE Center is an excellent resource but may suffer from “over-partnering.” ISE providers should expand their efforts to connect with other community resource providers, such as churches, La Familia/The Family Center, and the Northside Aztlan Community Center.

Funding partnerships are needed and resources are available. Partnerships are an important way to pool resources and secure funding, especially during an economic recession, and many funders encourage or require collaboration between community partners. While seeking out partnerships and resources within the community is necessary, participants emphasized that resources are available outside of our immediate area. ISE organizations should network with other ISE providers outside of

Fort Collins and Larimer County and consider private as well as state and federal funding sources.

Vignette: Small Grants for Community Partnering

The Larimer County Department of Natural Resources has Open Space Sales Tax dollars available for community projects. Larimer County citizens can apply directly for these grants to support their community projects. In 2009, ten local projects received a total of \$11,525. Projects included an educational natural area at an elementary school, maintaining a neighborhood lake, building a handicap accessible nature trail, tools and supplies for volunteer trail crews, xeriscaping and reclamation projects, and native species plantings. LCDNR also has volunteer led educational programs and can provide funds for transportation to the open spaces. This is another example of an existing structure that can serve the Latino community if there is increased communication about the opportunities available. An ISE organization working with a school or community organization on a small grant project could empower youth and families to have a valuable impact on the community.

Future Recommendations

Focus on Developing Awareness

A key issue that emerged from this process is that ISE providers generally lack the awareness, skills, and training for working effectively and comfortably with Latino audiences. This was the most recognized need for ISE providers in the study, and many

participants wanted to know more about how to share what they learned in this process with the rest of their staff and organizational leaders.

Gatekeepers emphasized that cultural competence training should include all staff and administration, not just outreach and education staff. Requiring all staff to participate in trainings will contribute to developing a culture of respect and openness within the organization and a reputation for being safe and trustworthy in the community. Ideally, time spent examining biases and stereotypes within an organization would precede more the practical, hands-on training in culturally responsive teaching strategies that would directly benefit education and outreach staff.

Participants expressed interest in scheduling a voluntary training that combined the essential elements of cultural competence with culturally responsive teaching strategies open to education staff of any ISE organization. This way the organizations could share the cost of the training and avoid the obstacles of gaining support for a mandatory, all-staff training at each of their organizations. This may be the most feasible and practical next step for ISE providers to take. ISE providers must remember that developing cultural competence is an ongoing process, not something that can be accomplished in one or two training sessions.

Face-to-Face Interaction

Participants also wanted opportunities to interact directly with Latino residents to learn more about their interests and needs and possibly to recruit Latino volunteers. While the community resource directory was an important tangible outcome of this study, participants suggested that personal interaction with Latino community leaders and residents would be even more useful for building partnerships.

P1: “A workshop getting those people in the same room would be great. More than just a list, we need face time with leaders.”

The gatekeepers who attended the workshops, as well as others who are listed in the directory are people who may be willing to act as a cultural mediator or mentor to help ISE providers connect to the Latino community. Others who have done targeted outreach to Latinos in the community have found that community barbeques or picnics are a culturally effective way to meet and engage Latino residents. The researchers recommend this strategy as a way to facilitate the opportunity to interact with Latino residents to learn about their interests and concerns and possibly recruit Latino volunteers or staff. The “Picnic on the Poudre” annual event provides a good example of this strategy.

Vignette: A Strategy for Engaging Latinos

Inspired by a visit to Fort Collins by Richard Louv, the author of *Last Child in the Woods*, the local Children and Nature Connection group planned an event to get parents and children outside to explore nature. “Picnic on the Poudre” has taken place on a Saturday in September for the past two years at a natural area near the neighborhoods where many Latino families live. Food is provided by a local Mexican restaurant and outdoor activities are led by Master Naturalists and ELC staff. In the past, kids got to keep their own fishing poles donated by the Colorado Division of Wildlife. Families have enjoyed the interaction between the facilitators and the children. In addition to sending flyers home with students at neighborhood elementary schools, ELC staff went door to door to invite people to the event. Last year over 100 people attended, even on a chilly, rainy day. This event explicitly embraces many of the considerations outlined in

the assessment tool and provides an opportunity to talk with families face-to-face in an informal, no-pressure environment.

Continuing Collaboration

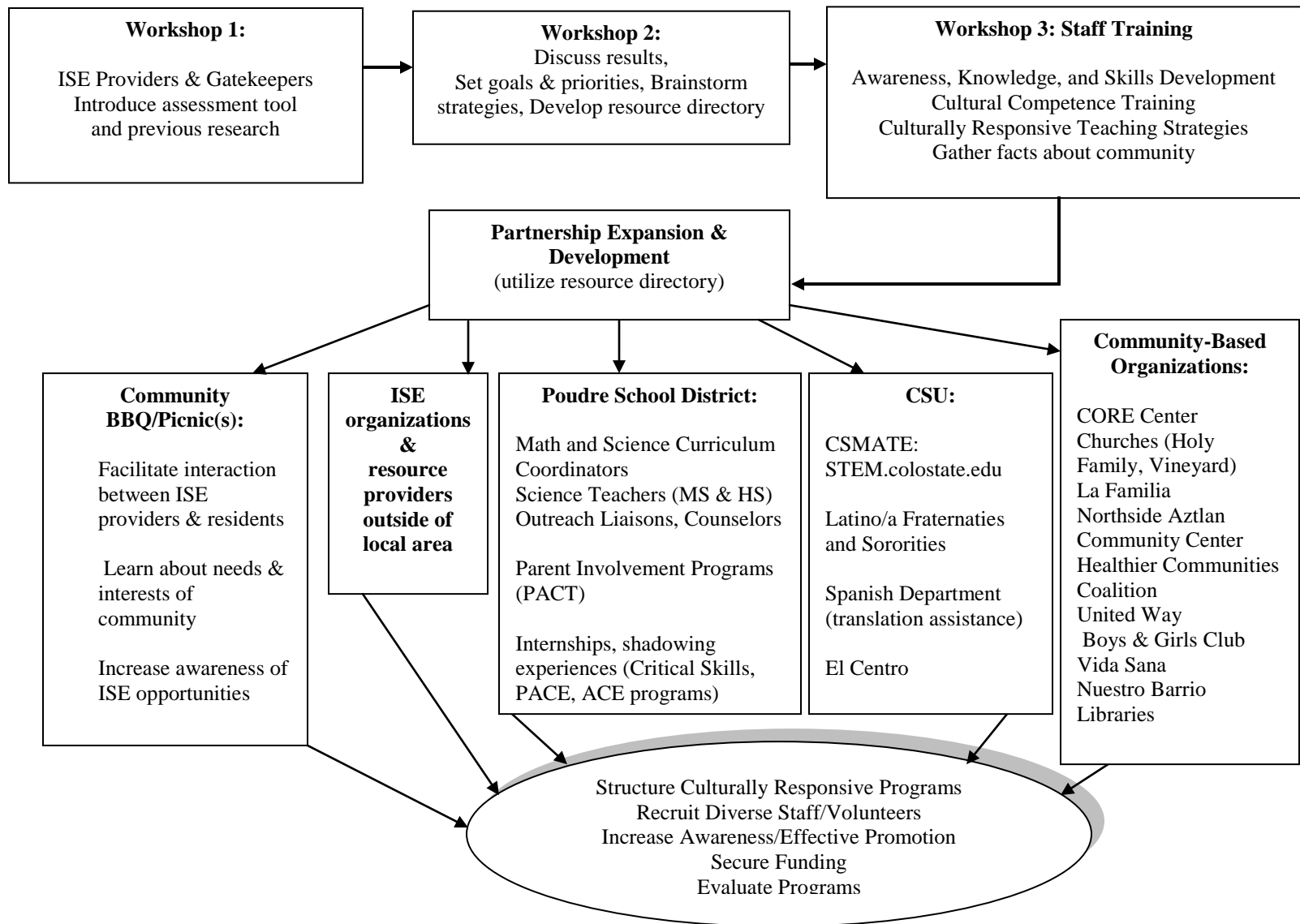
In the workshops participants began to see themselves as a community of ISE providers, rather than single entities doing similar, yet disconnected work. Participants began to think of ways that they could pool their resources and efforts to have a broader impact on the community. The best chances for continuing this community effort to improve access to ISE for Latinos would involve securing funding to continue this project. A graduate research assistant could facilitate workshops to implement and evaluate the next steps outlined by the participants. Without a central guiding force, the community of ISE providers will be more likely to return to doing similar yet disconnected work.

A Model for Building the Capacity to Increase Access to ISE

The researchers created a model summarizing the process implemented in this study including the recommendations for next steps and specific agencies to connect with to continue the process of increasing inclusiveness begun in the workshops (see Figure 7). To address the future needs identified by participants, the researchers recommend that ISE providers coordinate a community workshop open to any ISE staff members to develop skills and competence for working with Latinos. Outreach and education directors should continue to build relationships with gatekeepers and together organize a community barbeque or picnic to facilitate culturally appropriate face-to-face interaction

with Latino residents. ISE providers should network and partner with the specific agencies listed in the diagram to meet the priorities they described in the workshop.

Figure 7. Model for Building the Capacity of ISE Providers in Northern Colorado for Effective Latino Outreach



Final Thoughts

ISE providers have an important role to play in improving science education and in inspiring a new generation of scientists and informed citizens. To achieve this goal, ISE organizations must adapt to the cultural and linguistic changes that are occurring in our community and across the country. Formal educators have been struggling to close the science achievement gaps for decades and ISE providers must do their part.

In any community, successful Latino outreach depends first and foremost on cultivating trusting relationships and creating a sense of community. It requires listening and learning before acting. There is no quick fix or easy ways achieve to the goals and objectives outlined in the assessment tool and suggested in the literature. Implementing changes will require time, trial and error, and continuous evaluation to see if ISE organizations are actually succeeding in engaging Latinos. Not every organization will become an expert in connecting to Latinos. But by working together as a community, all ISE providers can take steps to creating more accessible, inclusive, and welcoming environments that support science learning for all.

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Appendices

Appendix A. *The Assessment Tool*



ASSESSING CULTURAL RESPONSIVENESS IN INFORMAL SCIENCE EDUCATION

FEBRUARY 11, 2010 **NAME OF ORGANIZATION:**

Introduction

This assessment tool has been created to help informal science education (ISE) providers recognize and develop inclusive, culturally responsive practices in their programming and organizations. The rapidly changing demographics of our communities, the persisting academic achievement gap, and the national push for higher science education achievement are all evidence of the need to continually reflect on and adapt our practice.

ISE programs can have many positive benefits for participants, but many programs face challenges in reaching diverse audiences. These same audiences are the ones most under-represented in science-related fields in higher education and careers. In Colorado and across the United States, Latinos are the largest and fastest growing ethnic group. Therefore, this tool is focused on understanding and implementing best practices for engaging Latinos in science learning opportunities.

This document brings together the key recommendations for connecting Latinos with science collected from an extensive review of current research, focus groups with Latino parents in our area, and interviews with local professionals who serve Latino youth and families in northern Colorado. These recommendations are grouped into the four themes listed in the box to the right.

For each objective listed under each of the four themes, consider whether your organization has procedures in place to meet that objective. Rate the strength of your procedures on a scale from 0-3.

3=Evident. This is a strength in our organization.

2=Emerging. We have actions in place but we could improve it.

1=Weak. We have begun, but this an area of growth for us.

0= Not Present. We do not presently meet this objective at all.

In the Notes box, describe anything that comes to mind as far as how you're meeting this objective, past efforts, and so on.

KEY THEMES IN DEVELOPING A CULTURALLY RESPONSIVE PROGRAM:

- ◆ **Develop organizational awareness, readiness, and skills for working with our target audience.**
- ◆ **Build strategic partnerships with schools and Latino-serving community programs.**
- ◆ **Use culturally effective promotion strategies.**
- ◆ **Structure programs to meet the needs of diverse audiences.**

THEME 1: *Organizational Awareness, Readiness, and Skills*

Objective	Score 0-3	Notes
Cultural competency training is required of staff who do outreach to Latino groups.		
Diversity is reflected in our mission statement and/or organizational goals.		
We have staff/volunteers who can work effectively with the Latino community (e.g., bilingual).		
Our staff is skilled in culturally responsive teaching strategies.		
We provide training in language support strategies for staff/volunteers.		
We regularly attend meetings and events of Latino-serving organizations.		
We collect participant data that helps us know if we are reaching the Latino community.		
We know our Latino community, including common countries of origin and levels of acculturation.		
We adjust evaluation methods when serving diverse groups.		
Total (/27)		

CULTURALLY RESPONSIVE TEACHING:

- ◆ is an approach that empowers students intellectually, socially, emotionally and politically by using cultural referents to impact knowledge, skills, and attitudes. (Gloria Ladsen Billings, 1995)
- ◆ validates the values, prior experiences and cultural knowledge of students. (Geneva Gay, 2000)

"If you don't start with awareness the rest won't work. It is the first, most important step."

~Norma Huerta-Kelley
PSD Equity and Diversity Coordinator

LANGUAGE SUPPORT STRATEGIES:


- ◆ Total Physical Response
- ◆ Cooperative Learning
- ◆ Scaffolding
- ◆ Native Language Support
- ◆ Accessing Prior Knowledge
- ◆ Realia

THEME 2: *Building Partnerships*



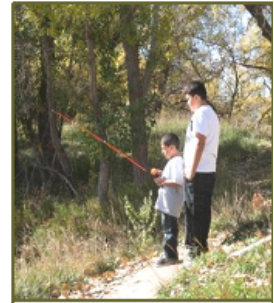
- POSSIBLE PARTNERS:
- ◆ ~ PSD Schools
 - ◆ ~ CORE Center
 - ◆ ~ Northside Aztlan Recreation Center
 - ◆ ~ The Family Center "La Familia"
 - ◆ ~ Head Start
 - ◆ ~ Salud Health Clinic
 - ◆ ~ Holy Family Church

Objective	Score 0-3	Notes
We have good relationships with community leaders who can help provide access and understanding about our Latino community.		
We have good relationships with school personnel (e.g., teachers, counselors, administrators & family liaisons) to help us reach the Latino community.		
We work with Latino -serving community organizations to develop programs with shared goals and responsibilities.		
Our board/advisory groups include people from diverse backgrounds.		
We involve older Latino/a youth and/or community members to help with our programs and serve as role models for young participants.		
Total (/15)		


"Building relationships is key in Latino culture. Latinos want to feel connected to and valued by the community; like they have something to offer and contribute."
 ~Tawa Ellis
 PSD Parent/Community Liaison Coordinator

THEME 3: *Culturally Effective Promotion*

Objective	Score 0-3	Notes
Our marketing messages are clear and direct; the benefits of participation are made explicit.		
Our marketing materials are available in Spanish and we ensure that quality translation is done.		
We send our messages via trusted people and places in the community.		
We consider dialect and level of literacy in our marketing strategies.		
We use preferred communication methods such as word of mouth networks and in-person appeals.		
Our advertising appeals to families and is relevant to their personal lives and emotions.		
Diversity is reflected in photos for our advertising and marketing materials.		
We involve local media and utilize community resources whenever possible.		
Total (/24)		



Participants fishing at the Picnic on the Poudre event (September, 2009).

“The headings of marketing materials must be provoking. There needs to be a hook that catches the students’ and the parents’ attention and a gives a compelling reason to participate.”

~Guadalupe Salazar
El Centro

THEME 4: Program Structure



Latina scientists leading an activity at "Fathers and Daughters Day" at the ELC. October, 2009.



“When children see themselves represented it helps them believe science is something they can do.”

~Norma Huerta-Kelley
PSD Equity and Diversity Coordinator

Objective	Score 0-3	Notes
We appeal to the centrality of family in Latino culture and design programs for whole families.		
Our programs involve and impact the neighborhoods where Latino families live.		
We design programs that build on prior knowledge and relate to Latino culture.		
We integrate messages of opportunity and empowerment, such as how to become a scientist.		
Our programs include experiences where youth and families can “do” science and discuss different types of scientists.		
We deliver programs in Spanish led by Latinos and provide educational materials in Spanish.		
We provide programs at low-cost and offer scholarships.		
We offer multiple points of access for families at convenient locations. (e.g. after-school, Saturdays)		
Total (/24)		



Totals and Evaluation

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Theme 1 (/27)

In the space below please list the three specific objectives you found to be the greatest strengths of your organization. Describe the practices your organization has implemented to meet these goals.

Theme 2 (/15)

Theme 3 (/24)

Next, list and describe the three specific areas where your organization needs the most improvement. What are the challenges you face in those areas? What community resources could you utilize to help meet these objectives?

Theme 4 (/24)

Total (/90)

If you need more space please use the back of this page or attach another sheet.

Greatest Strengths:

- 1.
2.
3.

Areas of Growth:

- 1.
2.
3.

Appendix B. *Recommendations and Strategies for Engaging Latinos in ISE found in the Literature*

Recommendation	*Study Number																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Awareness Development																			
Reflect diversity on staff, in marketing, and mission.																			
Diverse, bilingual staff/volunteers	x		x		x	x			x	x	x	x			x	x	x	x	
Provide cultural competence training, CRT strategies	x					x						x			x	x			
Include diverse role models, mentors	x	x	x		x	x	x								x				
Safe, welcoming atmosphere, diversity is valued				x	x		x		x	x				x	x	x			
Partnership Development																			
Long-term relationships with schools, community orgs.																			
Develop shared goals & responsibility			x			x			x	x		x		x	x	x	x	x	x
ID/build relationships with gatekeepers to learn about social structures, values, needs.						x						x				x	x		
Address language barriers in program delivery and advertising	x		x		x	x			x			x			x	x	x	x	x

Recommendation	Study Number																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Program Structure-Cultural																		
Address language barriers in program delivery and advertising	x		x		x	x			x			x			x	x	x	x
Support cultural values, social relationships, include families, parental involvement, create a sense of community support for science		x	x	x	x	x	x	x	x			x	x	x	x	x	x	x
Programs relate to/impact local community, make connections w/ real world,take action, "do" science		x	x	x	x	x		x	x			x	x	x	x			
Messages of empowerment, opportunity, self-efficacy, build confidence, science careers		x	x	x	x			x						x			x	x
Program Structure-Practical																		
Hands-on activities, appeal to various learning styles				x				x	x				x	x				
Flexible facilitation, convenient times, locations, schedule, provide multiple points of access			x		x	x			x		x				x			
Address socioeconomic issues				x						x		x				x		x

***Study Number and Corresponding Author(s)**

1	2	3	4	5	6	7	8	9
Allison & Hibbler, 2004	Basu & Calabrese-Barton, 2007	Bell et al., 2009	Borden et al., 2006	Cooper et al., 1995	Correa-Zeigler, 2009	Fadigan & Hammrich, 2004	Fusco, 2001	Garibay, 2009
10	11	12	13	14	15	16	17	18
Hong & Anderson, 2006	Jones, 1997	Lozar-Glenn, 2009	Quimby, 2007	Sanchez & Arce, 2009	Sherman, 2006	Springer et al., 2009	Tedrow, 2009	Torres & Marquez, 2005

Appendix C. Resource Directory for ISE Providers

	Contact	e-mail	Phone	Website
CSU Project Coordinators				
Associate Professor	Brett Bruyere	bruyere@lamar.colostate.edu	9-491-1360	
Graduate Research Assistant	Kate Sorensen	ekates22@yahoo.com	3-589-3153	
ISE Providers				
Colorado Division of Wildlife				www.wildlife.state.co.us/
CSMATE	Andrew Warnock	andrew.warnock@colostate.edu	9-491-2845	csmate.colostate.edu/
FC Audubon Society	Joann Thomas	Jthomas91@aol.com		www.fortnet.org/Audubon/
FC Museum and Discovery Science Center	Treloar Bower	tbower@fcgov.com	9-416-2768	www.fcmdsc.org/index.php
	Katie Bower	kbowell@fcmdsc.org	9-416-2706	
FC Natural Areas Program	Sue Kenney	skenney@fcgov.com	9-224-6118	www.fcgov.com/naturalareas/
	Zoe Whyman	zwhyman@fcgov.com	9-221-6311	
	Susan Schafer	sschafer@fcgov.com	9-416-2480	

FC Utilities Education Programs	Marcee Camenson	mcamenson@fcgov.com	9-416-2248	www.fcgov.com/utilities/edu-index.php
Garbage Garage Education Center	Maureen McCarthy	mmcarthy@larimer.org	9-498-5775	www.larimer.org/solidwaste/GG/gargar.htm
Gardens on Spring Creek	Christine Ginnity	cgininity@fcgov.com	9-416-2486	www.fcgov.com/horticulture/index.php
Environmental Learning Center	Nicole Stafford Ally Eden	ntimmons@warnercnr.colostate.edu edenally@gmail.com	9-491-1661	warnercnr.colostate.edu/elc-home/
Larimer County 4H	Kathy Wolfe	kwolfe@larimer.org	9-498-6000	www.colostate.edu/Depts/CoopExt/LARIMER/4h.htm
Larimer County Department of Natural Resources	Rob Novak Kerri Rollins	rnovak@larimer.org krollins@larimer.org	9-679-4561	www.co.larimer.co.us/nreducation/
Little Shop of Physics	Nisse Lee	missphizniss@gmail.com	9-491-5131	littleshop.physics.colostate.edu/index.htm
Leave No Trace Poudre Learning Center	Sarah Folzenlogen Yeni Garcia	sarah@lnt.org yen_gar@yahoo.com	9-352-1267	lnt.org www.plc.greeleyschools.org/

Rocky Mountain National Park	Mark DeGregorio	mark_de_gregorio@nps.gov	9-586-3777	www.nps.gov/romo/index.htm
Rocky Mountain Raptor Program	Carin Avila	carin@rmrp.org	9-484-7756	rmrp.org/
Wild Birds Unlimited	Lauren DeRosa		9-225-2557	fortcollins.wbu.com/
Community Organizations & Resources				
Access Center (CSU)	Oscar Felix	oscar.felix@colostate.edu	9-491-6473	accesscenter.colostate.edu/eoc/index.aspx
Boys & Girls Club	Pam Rudd (Dir.)		9-484-5198	bgclarimer.org/
	Carissa Robinson	FCEducation@BGCLarimer.org	9-484-5198	
	Christy Doyon	LVEducation@BGCLarimer.org	9-663-5450	
	Brian Edwards	WPrograms@BGCLarimer.org	9-568-7338	
Catholic Charities			9-484-5010	
Celebra la Ciencia		http://www.ccdenver.org/home.aspx http://www.celebralaciencia.org/		
Channel 10 (PSD TV)	Herb Saperstone	herbs@psdschools.org	9-490-3641	www.psdschools.org/services/channel10/schedule.aspx

CORE Center	Marilyn Thayer	mathayer@cahs.colostate.edu	9-484-2580	www.cahs.colostate.edu/CORE/
CSMATE Outreach Website	Possible location for ISE Community Calendar?	STEM.colostate.edu		
Education and Life Training Center		info@eltcenter.org	9-482-4357	www.eltcenter.org/
El Centro	Guadalupe Salazar Rich Salas	guadalupe.salazar@colostate.edu Richard.salas@colostate.edu	9-491-1476 9-491-0590	www.elcentro.colostate.edu/home.aspx
Food Bank of Larimer County			9-493-4477	www.foodbanklarimer.org/
Fort Collins Community Calendar		http://www.fcgov.com/events/		
Fort Collins Regional Library District	Jimena Pena	jpena@fcgov.com	9-221-6740	www.poudrelibraries.org/
Healthier Communities Coalition	Kim Sharpe	krs4@pvhs.org	9-495-7503	www.healthylarimer.org/
Hickory Village Mobile Home Park			9-493-3089	

Holy Family Church	Maria Fuerte	holyfamilychurc1@qwest.net	9-482-6599	www.archden.org/parishes/parish.php?p=41
La Familia/ Family Center	Kiersten Guerrero	info@thefamilycenterfc.org ; kguerrero14@gmail.com	9-221-1615	www.thefamilycenterfc.org/
Larimer County Maternal Assistance Program	Claudia Nichols	cpnichols@larimer.org	9-498-6798	www.larimer.org/health/chs/maternity.asp
<i>Multicultural Greek Organizations at CSU</i>				www.csumgc.com/page.php?page_id=124862
Alpha Phi Gamma (Asian)	Melanie Tran	Melanie.k.tran@gmail.com	9-227-0224	lamar.colostate.edu/~aphig/
Delta Xi Nu (Multicultural)	Barbara Hillman	babshillman05@yahoo.com	7-810-6525	csudxn.webs.com/
Lambda Theta Nu (Latina)	Cynthia Martinez	cmm.alazar08@yahoo.com	9-809-6390	www.lambdathetanu.org/lambda/about.html
Nu Alpha Kappa (Latino)	Paul Richards	Paul_twlj@hotmail.com	3-261-5575	naknet.org/2007/
Pi Lambda Chi (Latina)	Maria Reyes	e24reyes@yahoo.com	9-412-2739	www.pilambdachi-latina.com/

Sigma Lambda Beta (Multicultural)	Kevin Torres	Kevinfloresaguayo@gmail.com	9-301-7511	www.sigmalambdabeta.com/index2.html
Museo de las Tres Colonias	Betty Aragon- Mitotes	blaragon@msn.com	9-416-9376	poudrelandmarks.com/plf_museo.shtml
Neighbor 2 Neighbor (Coachlight Plaza)	Wendy Robinson	wrobinson@n2n.org	9-484-7498	www.n2n.org/
Northside Aztlan Community Center	Debra Bueno Oscar Molina	dbueno@fcgov.com omolina@fcgov.com	9-221-6741 9-491-6473	www.fcgov.com/recreation/north-aztlan.php
Nuestro Barrio Neighborhood Council	Angelica Stoll	acstoll@cahs.colostate.edu	9-484-2580	
Poudre Valley Mobile Home Park			9-482-8224	
Spanish Radio Stations	KGRE 1450 AM KJJD 1170 AM	kgre@msn.com secretarial170@yahoo.com	9-356-1452 3-651-1199	
Salud Health Clinic	Fort Collins & Estes Park	www.saludclinic.org	9-490-4040	

Society for
Advancement of
Chicanos and
Native Americans
in Science

<http://www.sacnas.org/>

United Way 211

Gloria Kat

gkat@uwaylc.org

9-407-7049

www.uwaylc.org/

Vida Sana

Summer Laws

slaws@larimer.org

9-631-5825

Vineyard Church

David Brooks,
Youth Minister/
Outreach

www.vineyardotr.org/main/

9-484-5999

Women's
Resource Center

Tina Chavez

TChavez@womens-resource.org

9-484-1902

womens-resource.org

**Cultural
Competence/
CRT Training
Providers**

CORE Center

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mthayer@cahs.colostate.edu

9-484-2580

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Rocky Mountain
Intercultural
Institute

Carol Miller
Chuck Luna

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www.rockymountainintercultural.com

Sheltered
Language Instruct.

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Poudre School District

www.psd.k12.co.us/

Career & Tech Ed Coordinator

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9-490-3652

Distribution of Information Guidelines

www.psd.k12.co.us/services/communication/flyers.aspx

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Equity and Diversity Coordinator

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ELA Coordinator

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ELA Personnel Directory

Contact information for outreach mentors

www.psd.k12.co.us/programs/pupilservices/esl/staff.aspx

Math Facilitator

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Parent
Involvement
Coordinator/ Adult
ESL Clare Barquero cbarquer@psdschools.org 9-490-3235

Partnerships &
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Coordinators Kris Cord kcord@psdschools.org 9-490-3207
Cyndi Gile cynthiag@psdschools.org 9-490-3208

Science Facilitator Lisa Pitot lpitot@psdschools.org 9-490-3105

**Program
Evaluation**

JVA Consulting Guadalupe Torres 3-477-4896 www.jvaconsulting.com

Special Events

Cesar Chavez
Events Rich Salas www.fc-cesarchavez.org 9-491-0590

Cinco de Mayo Crystal Gonzales ftc5vendorcoordinator@yahoo.com 9-581-1701

Holy Family
Winter Carnival Maria Fuerte 9-482-6599

MST Day (CSU)	Rich Salas	richard.salas@colostate.edu	9-491-0590
	Andrew Warnock	andrew.warnock@colostate.edu	
Picnic on the Poudre	Brett Bruyere	bruyere@lamar.colostate.edu	9-491-1360
	Sue Schafer	sschafer@fcgov.com	9-416-2480
Putnum Science Carnival	Steve Apodaca (Principal)		9-488-7700
Shepardson Science Night	Mary Kay Sommers (Principal)		9-488-4525
Translation Resources			
PSD Outreach Staff (summer)	Tawa Ellis	tellis@psdschools.org	9-490-3023
Spanish Department at CSU	Anna Fairchild	atello@lamar.colostate.edu	

Resources for Developing Culturally Relevant Programs**Website**

Brown University Diversity Kit

www.alliance.brown.edu/pubs/diversity_kit/

Brown University Teaching Diverse Learners

www.lab.brown.edu/tdl/

Celebra la Ciencia

www.celebralaciencia.org/

Center for Advancement of Informal Science Education

www.caise.insci.org/

Children, Youth and Families at Risk (CYFAR)

www.csrees.usda.gov/nea/family/cyfar/cyfar.html

ConCiencia/Latino Science Newswire

www.conciencianews.com/

Latino College Fund

hcf-info@Latinofund.org

National Clearinghouse for Spanish-Language Educational Resources

extensionespanol.net/

National Center for Culturally Responsive Educational Systems

www.nccrest.org/about.html

National Latino Children's Institute

www.nlci.org

NWREL Report: *What Teachers Should Know About Instruction for ELLs*

www.k12.wa.us/MigrantBilingual/pubdocs/NWREL-Report-ELLInstruction-Nov2008.pdf

Oregon State University Extension

oregon.4h.oregonstate.edu/successful-latino-outreach-practice-0

Oregon State University Diversity Center
Self Reliance Foundation
Society of Latino Professional Engineers

www.extension.org/pages/Diversity_Center

www.selfreliancefoundation.org/

oneshpe.shpe.org/wps/portal/national

University of Wisconsin Steven's Point:
Making EE Relevant Online Course

www.uwsp.edu/natres/eetap/makeEErelevant.aspx

Appendix D. *Overview of Events and Activities in Phase Three*

Date	Activity	Purpose
Aug.-Dec. 2009	Literature review, develop draft of the assessment tool	Gather background information, integrate prior research
Nov.-Dec. 2009	Interviews with gatekeepers: Tawa Ellis: PSD Outreach coordinator, ELA dept. (11/16/2009) Oscar Felix: Education Access Center (11/16/2009) Guadalupe Salazar: El Centro (11/17/2009) Norma Huerta-Kelley: PSD Equity & Diversity Coordinator (12/2/2009)	Member checks to confirm literature review and prior research findings. Edit assessment tool, and plan first workshop
Jan. 2010	Finalize assessment tool Invite participants	Attempt to include 14 local ISE providers
Feb. 11, 2010	Workshop 1	Introduce prior research and the assessment tool
Feb.-March, 2010	Participants complete assessment tool	Participants reflect on current practices, determine strong and weak areas.
March 9, 2010	Interview with Marilyn Thayer : CORE Center	Learn about CEY grant: cultural competence training, developing outreach plans. Learned about other community resources (HCC, N2N, Nuestro Barrio)
March 25, 2010	Workshop 2 (some original participants cannot attend)	Collect assessment results. Identify strengths, weaknesses, and community priorities. Evaluate process.
April 7, 2010	Meeting with Kim Sharpe: Healthier Communities Coalition	Expand partnership network, learn about Vida Sana group, United Way, N2N contacts
April 12, 2010	Contact Wendy Robinson: Neighbor to Neighbor (N2N)	Discuss project background, add to resource directory.
May 4, 2010	Meeting with Gloria Kat: United Way	Present project background info, network and brainstorm
May 20, 2010	Contact Summer Laws about meeting with Vida Sana Group (cancelled)	Present project background info, network and brainstorm
June-July, 2010	Complete write up of study	Distribute report

Glossary

Cultural Awareness: Developing sensitivity and understanding of another ethnic group. This usually involves internal changes in terms of attitudes and values. Awareness and sensitivity also refer to the qualities of openness and flexibility that people develop in relation to others. Cultural awareness must be supplemented with cultural knowledge (Adams, 1995).

Cultural Competence: An ongoing process of developing awareness, behavior, structures, and practices that allow an organization or program to engage diverse groups and communities (Sherman, 2006). Also, a set of congruent behaviors, attitudes, and policies that come together in a system, agency, or among professionals and enables that system, agency, or those professionals to work effectively in cross-cultural situations (Cross, Bazron, Dennis, & Isaacs, 1989).

Cultural Knowledge: Familiarization with selected cultural characteristics, history, values, belief systems, and behaviors of the members of another ethnic group (Adams, 1995).

Cultural Responsiveness: Cultural responsiveness is being aware of and capable of functioning in the context of cultural difference. It requires building capacities and skills to communicate effectively with individuals from any culture. Four main focal points of program design that can facilitate the development of culturally responsive services are organizational structure, policies, and procedures; the training curricula; supervisory and staff roles and responsibilities; and the development of community-based resources as reliable contacts for culture-specific information and services. A continuous examination process for bias in policies, practices, and personal philosophies is required to implement and sustain culturally relevant program efforts and must be considered one of the primary goals of the entire agency. (Cook, 1997)

Cultural Sensitivity: Knowing that cultural differences as well as similarities exist, without assigning values (i.e., better or worse, right or wrong) to those cultural differences (National Maternal and Child Health Center on Cultural Competency, 1997).

Culture: A culture can be described as a group of people with common origins, customs and styles of living, who share a sense of identity and language. Their common experiences shape their values, goals, expectations, beliefs, perceptions and behaviors. People belonging to a unique racial, ethnic, or religious group typically share a similar culture.

Exploratory Mixed Methods Design: A research method that consists of first, gathering qualitative data to explore a phenomenon, and then collecting quantitative data to test relationships found in the qualitative data (Creswell, 2008).

Free Choice Learning: Free-choice learning is a well-documented approach to enhancing science learning (see Falk, 2005; Jones, 1997; Kola-Olusanya, 2005). It is usually voluntary, socially mediated, and stimulated by the needs and interests of the learner, who typically exercises a large degree of choice and control over the what, when, and why of learning (Falk, 2005). ISE programs can often promote free-choice learning.

Gatekeepers: Individuals who have an official or unofficial role at a study site, provide entrance to a site, help researchers locate people, and assist in the identification of places to study (Creswell, 2008).

Informal Science Education (ISE): ISE describes science learning that occurs outside of formal schools. ISE venues include zoos, nature centers, museums, environmental education programs and other community-based programs such as 4H and Scouts.

Latino/Latino: The U.S. Census Bureau (2009) defines *Latino* or *Latino* as a person of Cuban, Mexican, Puerto Rican, South or Central American or other Spanish culture or origin regardless of race. These terms refer to ethnicity, not race. The terms are used interchangeably throughout this document. However, it is important to note that a great amount of diversity and cultural variation exists within this ethnic group as a whole.

Member Checking: A qualitative process during which the researchers asks participants in the study to check the accuracy of the account (Creswell, 2008).

STEM: The related fields of science, technology, engineering and mathematics are collectively referred to in the literature as STEM, or occasionally SMET.

Thematic Narrative Analysis: A qualitative data analysis approach commonly used in applied settings, where the primary focus is on content, or *what* is said rather than *how*, to *whom*, or *for what purposes*. Data are interpreted in light of themes developed by the investigator, influenced by prior and emergent theory, the concrete purpose of an investigation, the data themselves...and other factors (Riessman, 2008). Thematic analysis differs from grounded theory (with which it is often confused) due to this reliance on *a priori* themes and theory. In thematic analysis prior theory serves as a resource for interpretation of spoken and written narratives.