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APPLICATION FOR GRANTS UNDER THE

NATIONAL PROFESSIONAL DEVELOPMENT PROGRAM
CFDA # 84.365Z
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Closing Date: MAY 09, 2011

Project Abstract

Name of the IHE: Texas Tech University
Title of the Program: *Proyecto* English Learner Science and Mathematics Education (*Proyecto EL SMED*)
Consortia Partners: Frenship Independent School District; Lubbock Independent School District.

Project Description: *Proyecto EL SMED* will support on-going and intensive professional development activities that are designed to improve classroom instruction for English Learners (ELs) in science and mathematics education (SMED). In-service mainstream and bilingual teachers serving ELs will be required to complete five courses designed to develop their pedagogical content knowledge in science and mathematics in relation to ELs. These courses, based on research-based methods to develop academic literacy, will serve as the basis for obtaining a TTU science and mathematics graduate certificate and could count towards a master's degree. Thus, the **purpose** is to: (1) **promote** science, technology, engineering, and mathematics education (STEM); (2) **increase opportunities** for in-service teachers to engage in high-quality, sustained professional development in STEM subjects that benefit EL students; and (3) **improve instructional practices** and student outcomes in elementary schools based on high quality data.

To address the needs of consortium districts with whom we are partnering, *Proyecto EL SMED* is designed to achieve the following Goals: **Goal #1: Increase the number of mainstream and bilingual teachers who are well prepared to meet the instructional needs of English learners** in science and mathematics education (SMED); **Goal #2**: **Improve the science and mathematics PCK** of elementary mainstream and bilingual teachers in the consortium school districts; and **Goal #3**: **Improve instructional practices, data-based decision making, and student outcomes** in elementary schools based on high quality data. The objectives and milestone outlined in the proposal correspond to *Proyecto EL SMED* key

outcomes. Key outcomes include: (1) elementary science and math methods courses that are well aligned to language proficiency standards in order to better serve the language needs of ELs; (2) elementary teachers that are well prepared to meet ELs' content and language needs; (3) elementary school teachers with strong content knowledge that enables them to create learning environments that allows ELs to take advantage of increased learning opportunities; and (4) improved EL learning outcomes.

Priorities: *Proyecto EL SMED* addresses Competitive Preference Priority 2--Enabling More Data-Based; Competitive Preference Priority 3--Promoting Science, Technology, Engineering, and Mathematics (STEM) Education; and Invitational Priority 2--Improving Preparation of All Teachers to Better Serve English Learners. Decision-Making.

GPRA Measure Targets:

The following are the expected GPRA Targets.

	Year				
GPRA Measures	1	2	3	4	5
The number of in-service teachers expected to be served	15	15	15	22	17
The number of in-service teachers expected to complete the program of study	0	15	0	15	17
The number of in-service teachers expected to complete the program of study and be certified in EL instruction	0	5	0	5	0
The number of in-service teacher completers who are expected to serve EL students	0	15	0	15	17

Contact: Zenaida Aguirre-Munoz, 806-742-1997 ext. 278 and z.aguirre@ttu.edu.

Project Narrative

Project Narrative

Attachment 1:
Title: Pages: Uploaded File: **1237-ProjectNarrative.pdf**

Texas Tech University – College of Education

***PROYECTO EL SMED*: PROFESSIONAL DEVELOPMENT GRANT PROPOSAL**

(A) Quality of the project design. (40 points)

(A.1) Introduction and Rationale

Introduction: Texas Tech University – College of Education (TTU COE) serves the educational needs of West Texas, is located in the Texas Panhandle, and borders Oklahoma and New Mexico. The TTU COE features high quality educator preparation programs substantiated by the accreditation review of the National Council for the Accreditation of Teacher Education (NCATE). The College of Education has maintained continuous NCATE accreditation since 1963 with the latest review occurring fall 2006. The TTU COE now proposes *Proyecto* English Learner Science and Mathematics Education (*Proyecto EL SMED*) in the amount of **$1,969,989 over five years** to partner with the Frenship and Lubbock Independent School Districts. *Proyecto EL SMED* will support on-going and intensive professional development activities that are designed to improve classroom instruction for English Learners (ELs) in science and mathematics education. In-service mainstream and bilingual teachers serving ELs will be required to complete five courses designed to develop their pedagogical content knowledge in science and mathematics in relation to ELs. These courses, based on research-based methods to develop academic literacy, will serve as the basis for obtaining a TTU science and mathematics graduate certificate and could count towards a master's degree. Thus, the **purpose** is to: (1) **promote** science, technology, engineering, and mathematics education (STEM); (2) **increase opportunities** for in-service teachers to engage in high-quality, sustained professional development in STEM subjects that benefit EL students; and (3) **improve instructional practices** and student outcomes in elementary schools based on high quality data.

Project Rationale. *Proyecto EL SMED* will impact ELs and Hispanic students who reside in semi-rural and rural communities with large concentrations of low-income families in Congressional District 19, served by Education Service Center, Region 17 (Lubbock-area) wherein 53% of the student population is Hispanic (compared to 48.6%), 5% receive some form of bilingual education services–compared to nearly 17.0% state-wide–and 11% receive special education services–compared to 8.5% statewide–(TEA, AEIS 2009-10 report). Both consortium school districts recognize that the EL population is woefully under-reported, due in part, to a high percentage of parent denials. Given that ELs are underreported in the region, it is important to work with mainstream teachers to improve the learning environments of ELs. Further, consortium school districts, also lament the over-representation of Hispanics, particularly ELs, in special education. School districts in Region 17 have the highest percentage of Hispanics and ELs in special education. In 2009, for example, Hispanics comprise 57% of students receiving special education across categories; 64% of students identified with a learning disability (LD); 58% of students identified as speech impaired. In addition, one third of districts in the region reported Hispanic special education populations of 6 or more percentage points above the total population of Hispanic students in a given district; 80% of these were above 10% of the total population of Hispanic students (TEA Performance-Based Monitoring Analysis System, PBMAS, Report, retrieved from http://www.tea.state.tx.us/index2). In 2009, 1.3% of ELs were identifies as requiring special education, which was comparable to the State rate of 1.3. In 2010, this percentage increased to 5.0% while the State rate decreased slightly to 1.0 (TEA PBMAS report).

While the reasons for this overrepresentation are varied, there is a clear need to train in-service teachers on the developmental patterns of EL English proficiency as well as instructional

strategies that maximize learning opportunities that benefit ELs. Despite these sobering statistics, teachers report they feel least confident in addressing the needs of ELs (NCES, 2001). *Proyecto EL SMED* is expected to increase teachers' confidence in addressing ELs' instructional needs by developing their pedagogical content knowledge (PCK) to address EL instructional needs in science and mathematics.

(A.2) Goals, Objectives & Outcomes

To address the needs of these districts, *Proyecto EL SMED* has the following Goals: **Goal #1: Increase the number of mainstream and bilingual teachers who are well prepared to meet the instructional needs of English learners in science and mathematics education (SMED)**; **Goal #2**: **Improve the science and mathematics PCK** of elementary mainstream and bilingual teachers in the consortium school districts; and **Goal #3**: **Improve instructional practices, data-based decision making, and student outcomes** in elementary schools based on high quality data. **Table 1** outlines the objective and outcomes that correspond to each goal listed above.

Table 1. *Proyecto EL SMED* Goals, Objectives, and Outcomes.

Goal 1: Increase the number of mainstream and bilingual teachers who are well prepared to meet the instructional needs of English learners in science and mathematics education (SMED)	
Objective 1: Align course content with EL language proficiency standards and linguistic needs.	**Outcome 1: All five** SMED courses will be aligned to up-to-date research-based EL effective practice
Objective 2: Utilize technology-enhanced teacher training tools that promotes effective SMED practice for ELs.	**Outcome 2a: Fifty percent** of each course will utilize web-based tools to develop teachers' PCK and moment-by-moment actions and interactions. **Outcome2b: One** interactive web-based simulation tool will be developed to enhance

	teachers' moment-by-moment actions and interactions with ELs.
Goal 2: Improve the science and math PCK of elementary mainstream and bilingual teachers in the partner school districts.	
Objective 3: Monitor growth in participant teachers' instructional effectiveness and efficacy to teach ELs.	**Outcome 3a: At least 75%** of program teachers will obtain positive yearly gain scores on MASIR & CREDE instruments. **Outcome 3b: At least 75%** of program teachers will report higher levels of teach efficacy by the end of the program completion.
Objective 4: Monitor growth in participant teacher content knowledge.	**Outcome 4: At least 75%** of program teachers will obtain positive yearly gain scores on the PCK instruments.
Goal 3: Improve instructional practices, data-based decision making, and student outcomes in elementary schools based on high quality data.	
Objective 5: Increase the number of teachers who can effectively teach SMED content to ELs.	**Outcome 5a: At least 80%** of program teachers will demonstrate instructional effectives (MASIR & CREDE). **Outcome 5b: 100%** of program participants serve at least one EL.
Objective 6: Enable teachers to conduct data-based decision making.	**Outcome 6a: At least 75%** of program teachers will obtain positive yearly gain scores on the case study response scores. **Outcome 6b: At least 75%** of program teachers will demonstrate ability to conduct data-based decision making by the end of program participation.
Objective 7: Determine project impact on student learning outcomes.	**Outcome 7a:** Students enrolled in program participant classrooms will have significantly higher self-efficacy in science and math than matched comparison group students. **Outcome 7b**: Students enrolled in program participant classrooms will have significantly

	test scores in science and math assessments than matched comparison group students.

(A.3) Proyecto EL SMED Design

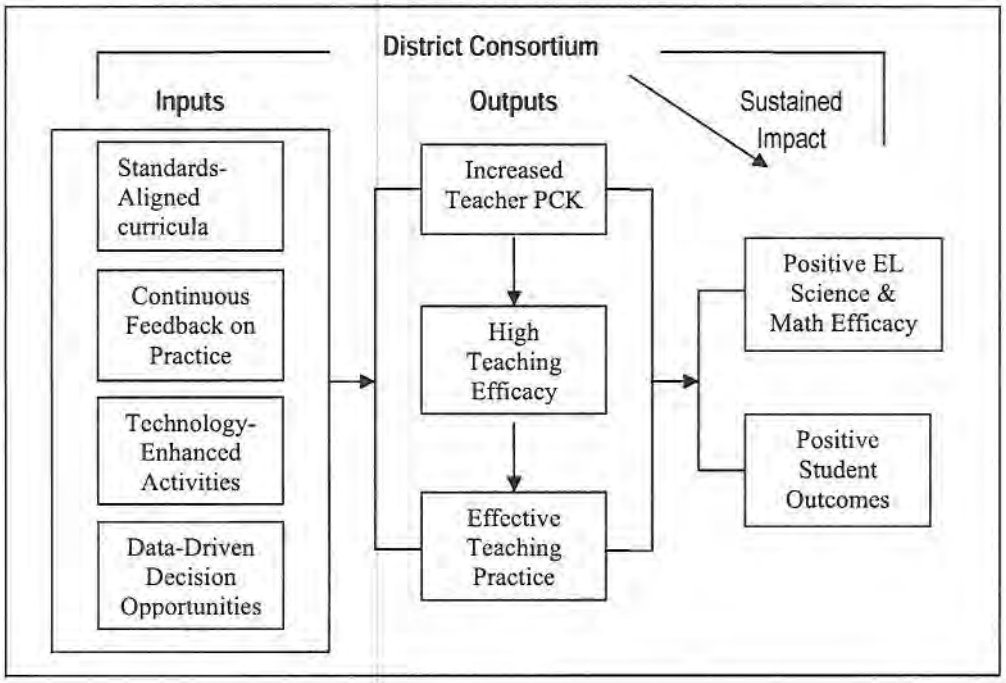
Clearly, well prepared teachers affect student outcomes (Darling-Hammond, 2000). Consequently, there is a critical need for focused professional learning to foster a shared responsibility for the achievement of ELs from all teachers. As noted earlier, most ELs in west Texas are placed in mainstream classrooms. Training all teachers on effective strategies for developing EL science and math content knowledge is therefore necessary, particularly since these students are almost exclusively dependent on the classroom teacher to help them acquire the knowledge and skills necessary for academic success (Dutro & Moran, 2001; Scarcella, 2003). Despite teachers' intuitive sense that current programs need substantial supplementation in order to further the development of English proficiency, mainstream teachers rarely have the preparation to do so. *Proyecto EL SMED* is designed to address this need directly.

In order to address the needs identified by our consortium partners, we are proposing a comprehensive approach to teacher training. The key inputs the program (See **Figure 1**) will provide are (1) content and language proficiency standards-aligned curricula, (2) continuous feedback to teachers on instructional practice, (3) technology-enhanced activities, and (4) opportunities to engage in data-based decision making. These are described next.

Standards-Aligned Curricula: TTU COE offers graduate certificate programs aimed at deepening professional knowledge and skills. *Proyecto EL SMED* will provide in-service teachers an opportunity to complete a series of five courses that will deepen their science and mathematics PCK in relation to the needs of ELs in elementary grades. As such these courses will be aligned to State and national content standards (e.g., NCTM), State and national English

proficiency standards (e.g., Teachers of English Speakers of Other Languages (TESOL) professional standards).

Figure 1: Proyecto EL SMED Design.



In addition to **existing research-based EL instructional strategies** (e.g., those highlighted in the Sheltered Instructional Observation Protocol), focused attention will be given to more recent and promising strategies that target students with intermediate English proficiency and above (e.g., Aguirre-Munoz et. al., 2005; Gibbons, 2003; Schleppegrell, 2004). These strategies go beyond graphic displays and modified text to providing ELs with a framework for coping with academic language necessary in science and math curricula in order to fully benefit from the current standards-based reform. Teachers who successfully complete the five-course series will receive a TTU certificate in bilingual science and math education. To situate teacher learning in real-world teacher practice, each course will engage teachers in case study examination to fortify their learning of course material. Case-based instruction is a learning pedagogy anchored in

practice that can be used to provide teachers with multiple opportunities to consider the complexities of teaching and learning, including a variety of viewpoints and potential outcomes (Andrews, 2002). **Table 2** (page 8) identifies the five courses teachers will take and a short description of each.

Continuous Feedback on Practice: In addition to increased opportunities for teachers to build their content and pedagogical knowledge, effective professional learning experiences provide opportunities for teachers to reflect on their practice critically (Loucks-Hoursley, et. al, 2010). Course instructors, the project bilingual SMED coach, and participating teachers will utilize **Teachscape *Reflect*** technology and web-based resources to record enacted lessons at multiple time points during program participation. This system also allows teachers to receive continuous feedback on their practice, reflect on their evolving ability to engage ELs meaningfully in science and math lessons, and share their successes and challenges with other teachers. In this way, *Proyecto EL SMED* will also provide participating teachers with opportunities to work with colleagues and other experts to continually enhance their practice.

Teachscape *Reflect,* was developed by the Measures of Effective Teaching (MET) project, funded by the Bill & Melinda Gates Foundation, to develop and test multiple measures of teacher effectiveness. It is a revolutionary system that integrates immersive, panoramic video, and online collaboration tools with research-based frameworks to support professional growth and strengthen teaching practice. **Teachscape *Reflect*** provides the tools to develop a common language and vision of excellent SMED teaching and to share concrete and tangible visual examples. Immersive video capture provides teachers and administrators with the tools to develop a visual "dictionary" for identifying, discussing, and promoting effective SMED practices for ELs.

Table 2 *Proyecto EL SMED* Course Descriptions and Sequence

Course	Description	Credits
MATH 5360 Advanced Mathematics for Teachers	Inquiry-based course in elementary school mathematics with a focus on conceptual algebraic functions and geometric concepts. Attention is also devoted to relationships to science applications.	3
EDCI 5373 Designing Project-Enhanced Environments for Science and Mathematics	Introduces interdisciplinary pedagogies, technologies tools, instructional strategies, and appropriate assessments for designing and developing project-enhanced environments in science and mathematics classrooms. The course examines differentiated instruction as well as assessment to determine content knowledge throughout the process.	3
PHYS 5371 Conceptual Physics for Teachers	Inquiry-based course in elementary physical principles of mechanics, heat, electricity, and magnetism. The course emphasizes the relationship between motion, forces, and simple physics. Attention is also devoted to the mathematical relationships. Some discussion of pedagogy is provided to facilitate the teaching of this type of physics.	3
EDBL 5306 Seminar on Enhancing Academic Literacy in Science & Mathematics	Introduces instructional approaches inspired by post-constructivist theories for developing academic literacy in elementary school science and mathematics. The focus is on innovative approaches to maximizing diverse students' learning growth potential, particularly academic language development.	3
EDCI 5372 Assessment Issues in Science and Math Education	This course guides exploration of current issues related to assessment, multiple dimensions of assessment, and the processes of assessment in mathematics and science education. Attention is devoted to differentiated instruction, ways of knowing, and alternative assessments.	3

Technology-Enhanced Activities: In addition to the web-based resources provided by **Teachscape *Reflect*,** the web-based classroom interaction simulation currently developed for a middle school project with which the PI's are also involved will be used to allow teachers to hone questioning techniques and language moves (see section A.4) that develop students' reasoning and critical thinking in science and math before trying it out with their students. This simulation application was funded by the Greater Texas Foundation's Middle School Math and Science $(MS)^2$: Learning by Design project.

Data-Driven Decision Making Opportunities: Throughout the five-course series teachers will be provided with opportunities to make instructional decisions based on student learning data. Participating teachers will use classroom, district, and state assessments to document content and relevant background and language proficiency information, to inform decisions related to planning and implementing instructional strategies at the classroom and individual student levels. Participating teachers will come to understand that assessment of student performance is integral in the planning, implementation, assessment, and revision of instruction. Both consortium districts have adopted a curriculum (C-Scope) with common unit assessments. These assessments will be used to build a culture in which student information is considered essential to improving student results.

(A.4) Research Background for Project

Although the standards-based reform was intended to close persistent achievement gaps and lead towards greater educational equity, the introduction of high stakes testing has resulted in a trend toward standardization of 'standards-based' curricula which may grossly limit ELs learning opportunities (Lee & Luykx, 2008). The narrowing of learning opportunities stems, in part, from teachers' insufficient knowledge of the content *in relation to* students' cultural and

linguistic diversity to guide ELs toward conceptual understanding (Aguirre-Muñoz & Amabisa, 2010; McNeil, 2000). Standardized curricula simply cannot predict every potential student response to instruction; responses from which teachers base their moment-by-moment interactions with students. Drawing on a substantial body of work from the learning sciences (socio-cultural and situated learning theory), we contend that it is through these moment-by-moment interactions with students that teachers can develop ELs critical thinking skills, particularly mathematical reasoning (Aguirre-Muñoz, 2010). Although curricula are important, it is insufficient for developing ELs' reasoning skills because it does not provide the full spectrum of scaffolding and differentiation necessary for developing higher-order thinking skills (Aguirre-Muñoz, Ortiz, Lamp, & Williams, 2011; Walqui & van Lier, 2010). The *Proyecto EL SMED* extends the innovative work conducted in projects the PIs are involved with that aim to develop teachers' science and mathematical knowledge to teach funded by the National Science Foundation and the Greater Texas Foundation.

Scaffold the Unpredictable

Central to teaching approaches that target ELs is the explicit planning and incorporation of supports or scaffolds that enable students to take advantage of learning opportunities (Aguirre-Muñoz & Amabisca, 2010). To be effective, scaffolding should be different from simply helping students complete tasks they cannot do independently. The challenge for all teachers is in creating the contexts and supports that allow students to maximize their learning potential (Walqui & van Lier, 2010). Walqui and van Lier (2010) remind us that both task design and *feedback to students* comprise important aspects of scaffolding. Yet, scaffolding discussions tend to focus on the design, or more predictable, aspects of instruction. Scaffolding happens when new and unpredictable behaviours

emerge and the teacher channels the student's ongoing responses and behaviours, making it possible to maximize growth potential (Walqui & van Leir, 2010). A teacher who scaffolds successfully (the predictable and unpredictable) can identify signs of an emerging new skill and use it to provide an opportunity to engage the student in higher-level functioning. Two promising approaches for scaffolding science and math reasoning are questioning and language moves that model cognitive processes.

Language Moves that Scaffold the Unpredictable in Mathematical Reasoning

Thinking Questions. Asking better questions has implications for the overall quality of instruction. Appropriate questioning techniques help students to make sense of math concepts, while developing their conceptual understanding because they reveal and monitor what students know and understand. Students also become more comfortable with multiple ways of using important math ideas because they are rewarded for posing multiple solutions based on alternative, accurate math reasoning. Using different kinds of questions for different purposes helps to differentiate instruction and tailors instruction to the specific needs of students. Bright and Joyner (2004) identified three types of questions that are well suited for monitoring mathematical understanding and reasoning while increasing the proportion of students who remain engaged in math conversations: (1) engaging questions, (2) refocusing questions, and (3) clarifying questions. Due to space constraints these question types are not elaborated here.

Talking Science and Mathematics. Training teachers to ask certain kinds of questions however may not provide sufficiently explicit information for ELs about valued ways of knowing and interacting in science and math classrooms. An additional challenge in teaching mathematics is developing a sense of significance in "doing math". Past research, in math education for example, demonstrates that students must understand that math is a process of thinking and

reasoning rather than a set of steps to go through to get the correct answer (Weis et al., 2003). ELs need explicit instruction in *articulating principles*, not just focusing on the description, sequence, and choice that are the more practical aspects of math knowledge (Huang, Normandia, & Greer, 2005). One strategy for scaffolding principled science and math discussions to ELs is using language to explicitly model ways of thinking and reasoning about mathematics (Herbel-Eisenmann, 2000). Language modeling enables ELs students to adopt ways of "talking" science and mathematics that are valued by and important to the science and mathematical community (Herbel-Eisenmann & Scheleppegrell, 2008). Strategies that make language of math reasoning transparent to students enables teachers to develop and reinforce norms for talking science and mathematics in valued ways. Over time, students appropriate these ways of doing and talking science and mathematics, thereby affecting students' science and math beliefs and self-efficacy (Cobb, Yackel, & Wood, 1993).

Researchers have identified two important ways teachers expose students to modeling that directs their attention to valued ways of talking and thinking about principles and relationships between concepts: (1) stepping out, (2) revoicing. Stepping out refers to more explicit language moves such as reflection on math actions; talking about math. The teacher momentarily 'steps out' of the discussion to explicitly state thought processes and questions s/he would ask while solving a math problem or identifying aspects of an appropriate mathematical explanation. Revoicing refers to less explicit language moves that allow the teacher to reformulate a student's response by either clarifying or extending what a student has said. Revoicing is a way for the teacher to clarify students' statements, make connections, or fill in missing elements of an explanation, thus helping other students to understand the significance of the contribution.

Making language transparent is a complex process especially for teachers who work with ELs. In PI's work with math and science teachers, questioning and talking mathematics are developed by engaging teachers in structured self-reflection based on the use of language moves tasks, which have helped math teachers improve their teacher talk to develop reasoning and promote meaningful participation (Steven's et al., 2011). Classroom interaction is a unique way of giving all students opportunities to observe math reasoning in action and to develop their own abilities with reasoning. When teachers make language moves a regular feature of their teaching and interactions, it sends the message that science and math are flexible, make sense and have meaning, require reasons for their procedures, and require particular kinds of explanations (Herbel-Eisenmann & Scheleppegrell, 2008).

(B) Quality of project personnel. (10 Points)

The management team assembled by TTU College of Education for *Proyecto EL SMED* reflects experienced faculty, researchers, and staff dedicated to equity in education and quality teacher preparation. The following presents the qualifications of senior personnel and key staff.

Principle Investigator: *Zenaida Aguirre-Munoz, Ph.D.*

Zenaida Aguirre-Muñoz earned her Ph.D. in Educational Psychology from UCLA. She provides training to pre-service and in-service teachers with an emphasis in first- and second-language acquisition, assessment design, cognitive models for the assessment of content understanding of English learners, and quantitative and qualitative research methods. Dr. Aguirre- Muñoz was previously a senior research associate at the UCLA Center for Research on Evaluation, Standards, and Student Testing (CRESST). While at CRESST, Dr. Aguirre-Muñoz managed and oversaw the development and implementation of multiple million dollar projects including the investigation of the impact of assessment-driven reform on the achievement of ELs. Most

recently, Aguirre-Muñoz serves as Co-PI to large-scale middle school teacher training projects funded by the National Science Foundation and the Greater Texas Foundation where she directs the research and evaluation components. She also directs the evaluation of Project TEACH, a Title III National Professional Development project aimed at improving the quality of pre-service and in-service bilingual and English-as-a-Second language teachers. Aguirre-Muñoz has been recognized for her research in teacher training and EL education and assessment by Texas Tech University, was awarded a distinguished international scholar by the University of San Carlos in Guatemala, and received the runner up for the Mid-Career Award by the American Education Research Association Second Language Research Sig. Her work related to learning opportunities for English learners and academic language development has been published in numerous scholarly journals and other publications.

Co-Principle Investigator, *Rebecca Ortiz, Ph.D.*

Dr. Rebecca Ortiz joined the Texas Tech faculty in fall 2008 as an assistant professor. Prior to that, she taught at Sam Houston State University. Dr. Ortiz holds a masters in Elementary Education and Ph.D. in Curriculum and Instruction from Texas Tech University. Her research focuses on integration of mathematics and science, pre-service and in-service teacher education, in addition to mathematics and English language learners. Dr. Ortiz Co-directs the Middle School Math Science $(MS)^2$: Learning by Design program. She currently teaches math education, math and science integration with an emphasis on differentiated instruction. At the collegiate level, she has supervised field experiences, student teachers, and worked with in-service teachers. Dr. Ortiz has taught in both urban and rural settings at both the elementary and middle level, and has been in the field of education for 15 years. During her tenure in the classroom, she has worked with struggling student populations to increase their performance in

the classroom. By creating experiential opportunities, she provided students the ability to examine math and science in real world situations and assisted students in making connections between content and their world. She continues to focus on this at the collegiate level, emphasizing the need to address special populations.

Co-Principle Investigator, *David Lamp, Ph.D.*

Dr. David Lamp received his Ph.D. in physics from the University of Missouri in 1984, and joined the Texas Tech faculty in 1988. He is currently the Co-Director for the Middle School Math Science $(MS)^2$: Learning by Design program. He teaches courses on 'how to teach science' for pre-service teachers mainly at the primary level. Dr. Lamp is a science liaison for the Lubbock Cooper Independent School District where he serves as a demonstration teacher. He also presents many workshops on using inquiry in the teaching of science for in-service teachers at all grade levels, as well as teaches courses on physics and astronomy for the Multidisciplinary Master of Science Program. Dr. Lamp has been involved in teacher education for 20 years and has received several awards for excellence in teaching.

Co-Principle Investigator, *Brock Williams, Ph.D*

Brock Williams came to Texas Tech in 1999 after earning a Ph.D. from the University of Tennessee and a B.S. from Mississippi State University. Dr. Williams primary research interests are discrete conformal geometry and geometric function theory. In particular, he is especially interested in the application of circle packing techniques to Riemann surfaces and quasiconformal maps. He is currently a Co-Principle Investigator on a math and science integration instructional program for middle school teachers and a lead instructor for a Math, Science Partnership grant funded by the National Science Foundation.

Dr. Williams has worked with math and science teachers for several years to develop their math content knowledge.

Program Coordinator, *Yerko Sepulveda, M.A.*

Yerko Sepulveda received his B.A. from the University of La Serena, Chile where he double majored in English (ESL/EFL) and Teaching (Pedagogy). Sepulveda received his master's degree in Bilingual Education and Diversity Studies from Texas Tech University (TTU) in 2011. He has ten years experience in language teaching settings in the US and internationally. Sepulveda has taught at all the levels of the educational system in Chile (from Kindergarten to 12th grade, and college level). He also taught at a national language institute. Yerko holds Graduate Certificate in Teaching English in International Contexts from TTU and Graduate Certificate student in International Baccalaureate from Bethel University. He is currently a research assistant for Project TEACH, a Title III professional development project, where he is responsible for literature reviews involving international funding opportunities and research dissemination outlets, recruitment of new undergraduate and graduate students for the program, grant writing, online course design (blackboard), technology assistance for online students in the Dallas area, and administrative duties.

External Evaluator, *Rich Brown, Ph.D.*

Dr. Rich Brown received his Ph.D. in Quantitative Research Methodology from UCLA. He is an Associate Research Professor at the University of Southern California. Dr. Brown has extensive experience in evaluation, has managed large-scale projects as a Senior Research Associate at CRESST and is the President of West Coast Analytics, LLC, a company that provides consulting services in research and evaluation and technology integration.

Program Administrative. (to be hired)

The administrative assistant will perform all clerical duties for the project staff and assist with Teachscape unit management. This position requires a high school diploma or equivalent. In addition, the assistant will be responsible for day-to-day consortium outreach and recruitment activities, maintain office files, calendar, grant documentation.

(C) Quality of the management plan. (20 points)

(C.1) Adequacy of the management plan: Responsibilities, timelines, and milestones.

Proyecto EL SMED will be housed in the TTU COE Center for Leadership in Education and will operate with a PI/project director who will provide leadership and guidance to project activities. Representatives from each school district of the consortium will be identified to serve on the *Proyecto EL SMED* executive council. The project key personnel and partners will participate in a two-day retreat at the outset of the project to review the management plan and schedule the years' activities. There will be quarterly electronic updates among the partner members via e-group and an end-of-the-year convening to review progress to date, major challenges encountered, lessons learned, and review evaluation results to determine modification to program design. **Table 3** (pages 18-19) describes the management plan for *Proyecto EL SMED*. **Table 4** (page 20-23) presents those responsible for each milestone (key project activity).

(C.2) Time commitments of the PI/project director and key personnel

The project personnel responsibilities and time commitments are provided in **Table 5** (page 23-24).

Table 3 Management Plan, Timeline, and Milestones By Project Objectives

Years	Year 1 1'11-12'11			Year 2 1'12-12'12			Year 3 1'13-12'13			Year 4 1'14-12'14			Year 5 1'15-12'15		
Semester/Intersession	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
OBJ.1: Align courses o EL language standards & needs															
1A) Hire bilingual SMED coach & administrative assistant.	X														
1B) Identify targeted course content for EL Strategies	X	X	X												
1C) Train faculty on EL strategies	X	X	X												
1D) Identify and incorporate case studies	X														
OBJ.2: Utilize technology-enhanced tools to promote effective practice															
2A) Train key staff on Teachscape *Reflect*	X														
2B) Identify/adapt simulation content for elementary content	X	X													
2C) Coordinate observation plan with district partners	X	X			X			X			X			X	
OBJ.3: Monitor growth in instructional effectiveness															
4A) Adapt qualitative observation protocols to elementary school context (MASIR & CREDE)	X														
4B) Coordinate classroom observations with Consortium	X	X			X			X			X			X	
4C) Collect baseline data on qualitative protocols (adapted MASIR & CREDE)	X						X						X		
4D) Provide continuous feedback to teachers on science & math instructional practice	X		X	X		X	X		X	X		X	X		X
4E) Collect time interval data on instructional change	X			X		X			X			X			X
4F) Analyze instructional practice	X	X		X	X	X	X		X	X		X	X		
4G) Report results on practice to Consortium		X			X		X			X			X		
4H) Determine program improvement plan		X					X			X			X		
OBJ.4: Monitor growth in PCK															
3A) Adapt middle school instruments to reflect elementary school content	X														
3B) Collect baseline data on content measures	X						X						X		
3C) Analyze PCK assessment performance		X						X						X	
3D) Report results on PCK assessments to Consortium		X						X						X	
3E) Determine program improvement plan		X						X						X	

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Years	Year 1 1'11-12'11			Year 2 1'12-12'12			Year 3 1'13-12'13			Year 4 1'14-12'14			Year 5 1'15-12'15		
Semester/Intersession	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
OBJ.5: Increase the number of teachers who work effectively with ELs															
5A) Conduct observations to document instructional change	X			X		X			X			X			X
5B) Provide ongoing support to program completers who need continued feedback on practice							X		X	X		X	X		X
OBJ.6: Enable teachers to conduct data-based decisions															
6A) Identify C-scope unit and district benchmark assessments to focus data-based decisions making	X														
6B) Develop case studies to develop teacher data literacy	X														
6C) Implement case study lessons in courses.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6D) Monitor & analyze participant responses to case study assignments	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6E) Report case study assignment summary findings to Consortium		X			X			X			X			X	
6F) Determine program improvement plan		X			X			X			X			X	
OBJ.7: Determine program impact on student learning															
7A) Adapt science efficacy from Stevens, et al.	X														
7B) Administer science and math self-efficacy surveys to students in teacher participant classrooms and from match comparison students				X						X					
7C) Collect benchmark assessment data from students in teacher participant classrooms and from match comparison students				X						X					
7D) Collect STAAR assessment data from students in teacher participant classrooms and from match comparison students					X						X				
7E) Analyze performance on benchmark assessments					X						X				
7F) Report benchmark assessment results to Consortium						X						X			
7G) Analyze performance on STAR assessments					X						X				
7H) Report STAAR assessment results to Consortium						X						X			
7I) Determine program improvement plan		X			X			X			X			X	

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Table 4. Key Milestones by Project Objectives and Responsible Parties

Key Milestones by Project Objectives	Responsible Party
OBJ.1: Align courses o EL language standards & needs	
1A) Hire Bilingual SMED coach & Administrative Assistant	PI Consortium input
1B) Identify targeted course content for EL Strategies	PI & Ortiz
1C) Train faculty on EL strategies	Ortiz
1D) Identify and incorporate case studies	All Co-PIs
OBJ.2: Utilize technology-enhanced tools to promote effective practice	
2A) Train key staff on Teachscape *Reflect*	Teachscape Representative
2B) Identify/adapt simulation content for elementary content	All Co-PIs
2C) Coordinate observation plan with district partners	Consortium
OBJ.4: Monitor growth in PCK	
3A) Adapt middle school instruments to reflect elementary school content	PI
3B) Collect baseline data on content measures	GRAs with direction from PI and Coordinator
3C) Analyze PCK assessment performance	GRAs, with PI direction
3D) Report results on PCK assessments to Consortium	PI & Ortiz
3E) Determine program improvement plan	Consortium
OBJ.3: Monitor growth in instructional effectiveness	
3A) Adapt qualitative observation protocols to elementary school context (MASIR & CREDE)	PI with assistance from Ortiz
3B) Coordinate classroom observations	Consortium, Coordinator
3C) Collect baseline data on qualitative protocols (adapted MASIR & CREDE)	GRAs with direction from PI and Coordinator
3D) Provide continuous feedback to teachers on science & math instructional practice	Coach & Instructors
3E) Collect time interval data on instructional change	GRAs with direction from PI and Coordinator
3F) Analyze instructional practice	Ortiz
3G) Report results on practice to Consortium	PI & Ortiz
3H) Determine program improvement plan	Consortium
OBJ.5: Increase the number of teachers who work effectively with ELs	
5A) Conduct observations to document instructional change	GRAs with direction from PI and Coordinator
5B) Provide ongoing support to program completers who need continued feedback on practice	Coach

Key Milestones by Project Objectives	Responsible Party
OBJ.6: Enable teachers to conduct data-based decisions 6A) Consortium identifies C-scope unit and district benchmark assessments to focus data-based decisions making	Consortium
6B) Develop case studies to develop teacher data literacy	Ortiz
6C) Implement case study lessons in courses.	Instructors
6D) Monitor & analyze participant responses to case study assignments	Instructors; GRAs with direction from Ortiz
6E) Report case study assignment summary findings to Consortium	PI & Ortiz
6F) Determine program improvement plan	Consortium
OBJ.7: Determine program impact on student learning outcomes 7A) Adapt science efficacy from Stevens, et al. to align with *Proyecto EL SMED* PCK targets.	GRAs with direction from PI
7B) Administer science and math self-efficacy surveys to students in teacher participant classrooms and from match comparison students	Participating Teachers
7C) Collect benchmark assessment data from students in teacher participant classrooms and from match comparison students	Partner Districts
7D) Collect STAAR assessment data from students in teacher participant classrooms and from match comparison students	Partner Districts
7E) Analyze performance on benchmark assessments	GRAs with direction from PI
7F) Report benchmark assessment results to Consortium	PI & Ortiz
7G) Analyze performance on STAAR assessments	GRAs with direction from PI
7H) Report STAR assessment results to Consortium	PI & Ortiz
7I) Determine program improvement plan	Consortium

Table 5. Personnel Responsibilities and Time Commitments

Key Personnel	Responsibilities	Time commitments
Co-PI/Project Director, Dr. Zenaida Aguirre-Muñoz; Associate Professor	Direct overall project management, internal evaluation, and will ensure that budget and timetable targets are met, prepare project reports and dissemination material, as well as provide expertise in up-to-date knowledge	Teach 1/1 load and 15 percent in Summer

	from research and effective practice for ELs	
Co-Principal Investigator, Dr. Rebecca Ortiz	Manage course delivery and refinement to integrate up-to-date knowledge from research and effective practice for ELs in science and math instruction; assist with internal data collection, analysis, and preparation of project reports and dissemination material.	Teach 2/1 load and 15 percent in Summer.
Co-Principal Investigator, Dr. David Lamp	Ensure quality of the science content integrated into all courses participants will be taking; update science-related course content and instructional processes as needed based on continuous program monitoring from internal and external evaluations.; assist with dissemination of evaluation findings.	Teach 2/2 load and 10 percent in Summer.
Co-Principal Investigator, Dr. Brock Williams	Ensure quality control of the math content integrated into all courses participants will be taking; update math-related; course content and instructional processes as needed based on continuous program monitoring from internal and external evaluations.; assist with dissemination of evaluation findings.	Teach 2/2 load and 10 percent in Summer.
Project External Evaluator, Dr. Rich Brown (USC)	Assist PIs with Evaluation: Make on-site visits and facilitate grant meetings with stakeholders to outline progress reports and incorporate results of internal evaluation for annual reports.	One on-site visit per funding period; available on as needed basis to assist with project activities via phone, Skype sessions, and email
Bilingual Science & Math Coach (to be hired)	Provide leadership to elementary science and math teachers; assist with continuous monitoring of program impact on participant	100 percent

	teaching practice and student learning; provide ongoing pedagogical support to participating teachers; provide support to completers on an as needed basis	
Graduate Research Assistants (to be hired)	Assist PIs in gathering, analyzing, transcribing data	YearS 1-3 & 5 – 12 months; Year 4, 9 months (20 hrs/week)
Project Coordinator Yerko Sepulveda	Coordinate all project activities; assist PI in monitoring budget and timetable targets, preparing project budget and annual reports, coordinating data collection for internal evaluation (including Teachscape *Reflect* unit management), supervising project staff, recruiting and assisting with the training of graduate research assistants.	100 percent
Project Assistant (to be hired)	Support office staff, consultants, and PIs.	100 percent

Table 6 reflects the partner support provided to the Project:

Partners	Support for the Project
College of Education, Texas Tech University (also TTU TLTC, ORS staff)	Use of COE building, Center resources, classrooms, computer labs, and administration/faculty/technology support.
Lubbock Independent School District (Region 17)	Assist with program improvement decisions; provide training rooms; assist with recruitment of teachers; provide access to classrooms; disseminate information to parents about project and garner parent support; assist with identification of comparison group classrooms for program evaluation; provide student level data on district assessments and STAR test scores; identify potential bilingual SMED coach and release from

	duty to conduct project work
Frenship Independent School District – (Region 17)	Assist with program improvement decisions; provide training rooms; assist with recruitment of teachers; provide access to classrooms; disseminate information to parents about project and garner parent support; assist with identification of comparison group classrooms for program evaluation; provide student level data on district assessments and STAR test scores; identify potential bilingual SMED coach and release from duty to conduct project work

(D) Quality of the project evaluation. (30 points)

(D.1) The methods of evaluation are thorough, feasible, and appropriate

The evaluation is comprised of three components (facets). In **Facet I**, conducted in year one, the evaluation will focus on obtaining information regarding context, progress on alignment of course content, recruitment, and faculty training as well as obtain baseline data for each of the program objectives and pilot performance measures (i.e., survey instruments). **Facet II**, conducted in years one and two, will focus on program implementation for program improvement to gather information that will inform programmatic changes including course content and process activities. **Facet III**, conducted in each year of the project, information will be collected for accountability purposes, particularly instructional effectiveness. A mixed methods approach is proposed to allow for triangulation of results and thus generate more robust conclusions about program process and effectiveness in meeting stated goals and objectives (see **Table 7** for overview). The following are the specific questions that will guide the evaluation of the proposed professional development program.

Program Improvement: To what extent is the program implementing the components as intended?

1. To what extent are courses used in *Proyecto EL SMED* aligned with K-12 State standards and assessments, including English language proficiency standards and content standards? (Goal 1)
2. What aspects of the *Proyecto EL SMED* activities do participants find most important to their increased content and pedagogical knowledge in science and mathematics? (Goal 1)
3. To what extent is *Proyecto EL SMED* increasing in-service teachers' content knowledge, instructional practice, and teaching efficacy in elementary science and mathematics? (Goal 2 & 3)
4. To what extent is the program utilizing technology to enhance professional development activities and increase opportunities for program participation? (Goal 1)
5. How effective is the program coordination with program partners? (Goal 1)

Accountability: To what extent is the program meeting its stated outcomes?

6. What percentage of program participants serve ELs? What percentage of program completers serve ELs (Goal 1)
7. Do program completers provide more effective instruction than comparison group teachers? (Goal 3)
8. Do students in participating teachers' classrooms perform higher on district benchmark and STAR assessments than students in comparison group classrooms? (Goal 3)

(D.2) Methods of evaluation include use of goals, objectives, and outcomes of the project.

Evaluation methods are based on the program goals, objectives and outcomes. See **Tables 7 and 8** on pages 31-32.

(D.3) Methods of evaluation include objectives, performance measures related to outcomes.

In addition to the performance measures required by the funding agency, the performance measures described below will be designed to collectively assess the effectiveness of project implementation strategies in providing professional learning as well as determine impact on outcomes. Reports on these training activities will be provided for informing further program development needs and program improvement. All survey instruments will be conducted online to streamline data entry procedures.

Alignment Index: Course syllabus will be examined for evidence of alignment with K-12 State standards and assessments, including English language proficiency standards with an expert review panel utilizing a validated alignment methodology originally developed by Herman, Webb, and Zuniga (2003) and modified by Aguirre-Muñoz (2008, included in Salazar & Aguirre- Muñoz, 2008). The process involves experts assigning values for primary topic, secondary topic, item/topic centrality, depth-of-knowledge, and source of challenge and provides a more accurate and detailed picture of the degree of alignment than simple matrices that utilize check off marks to designate alignment.

Q-Sorts: In order to solicit perceptions pertaining to program implementation in relation to teacher learning, participants will participate in a sorting procedure known as the Q-methodology. The Q-methodology employs the Q-sorting technique, which is a forced rank order procedure in which items or statements are clustered in dichotomized categories in an order from a person's point of view (Brown, 1986). The data is analyzed using a form of factor analysis.

Unlike traditional factor analysis, Q factor analysis reduces the many individual viewpoints of the subjects down to a few "factors," which represent shared ways of thinking. Another advantage of the sorting procedure is that it demands closer attention to each item by participants than might occur if the same items were simply rated on a scale. The data produced from forced distribution results in equivalent means and standard deviation between the sorters. As a result, errors and biases are substantially reduced and there is less likely to be differences in the sorting arrangements of comparing categories between sorters.

Focus groups: In order to obtain more nuanced information regarding training content and processes, focus groups will be conducted on a sample of each type of in-service teachers. To center the focus group discussion, a protocol will be used to elicit information from areas consistent with the post-training surveys. Focusing the discussion on the same areas of the survey will also serve to validate survey findings.

Pre– and post tests of knowledge and skills: To gather information about how well the program is increasing pre-service and in-service teachers' knowledge of bilingual/ESL theory, teaching, and assessment strategies, all participating teachers will complete 60-item multiple-choice tests designed to capture their knowledge of the content addressed in the courses and workshops.

Pre– and post self-efficacy ratings: Likert-scale ratings of teachers perceived self-efficacy to teach ELs under various teaching conditions to determine the relationship between self-efficacy and teaching effectiveness. This instrument will be based on that used in Stevens et. al., 2008.

Structured Interviews: Interviews with Consortium partners will target their perceptions of overall efficiency, degree of satisfaction with partnership activities and level of coordination, the

extent to which the project can be maintained and sustained, and how the program can be improved. To ensure objectivity, the external evaluator will conduct these interviews.

MASIR Protocol: Since integration of math and science is a key feature of the course content, the Math and Science Integration Rubric (MASIR; Aguirre- Muñoz et. al., 2011b) will be used to analyze teachers' ability to effectively integrate math and science content. The rubric is comprised of nine-dimensions; six of which are based on the Berlin-White Integrated Science and Mathematics Model (BWISM) (Berlin & White, 1994). A dimension targeting lesson objectives was added to reflect the degree of preparation of the integrated lesson as well as how integration was conceived (i.e., math with science, math and science, science with math). Two dimensions were developed to capture feedback and questioning that foster subject matter concept development. These instructional processes are important elements of PCK, support the development of conceptual understanding of diverse learners (National Council of Teachers of Mathematics, 2008), and are consistent with the goals of integrated instruction and effective EL content instruction (Aguirre-Muñoz et. al., 2011a, 2011b).

Each dimensional score is comprised of a sum of individual items that represent distinct instructional process qualities corresponding to a given dimension. Across all nine dimensions there are a total of 32 items. Each process item is scored on a three point scale ranging from "0" which represents "not observed" to "2" which represents a high quality observation of the process. Two items range from "0" to "3." Thus, total scores for each dimension ranged from 6 to 11; the sum of all dimensional scores is 66. Judgments for each process item are based on an entire lesson using detailed scoring guidelines. Exact score agreement and kappa coefficients indicate that these scores are reliable (Aguirre- Muñoz et. al., 2011a, 2011b).

EL Instructional Strategy Rubric/Protocols: To monitor growth in instructional effectiveness that promotes EL learning, an adapted version of the Project TEACH observational protocol (PTOP) (Salazar & Aguirre-Munoz, 2011) will be used. This protocol was developed based on the Sheltered Instruction Observation Protocol (SIOP) (Echevarria, Short, & Powers, 2006). Modifications will incorporate two dimensions (language literacy development and contextualization) of the Standards for Effective Teaching Performance Assessment developed by the Center for Research on Equity, Diversity, and Excellence (Dalton, 1998). Like the CREDE and SIOP instruments, the PTOP assess the extent to which practices reflect the features of effective sheltered instruction such as comprehensible input, building background, and metacognitive strategies. Unlike the other instruments however, the PTOP also integrates recent conceptualizations of academic language instruction (see Aguirre-Munoz & Amabisca, 2010).

Program Participant Placements: The percentage of participating teachers who serve ELs will be calculated.

(D.4) Extent methods of evaluation provide for examining effectiveness of project: The analysis plan will provide information regarding program effectiveness (see **Table 8** on page 28). Qualitative data will be coded utilizing the Atlas.ti qualitative software to document emerging themes relating to program process and impact. The most prevalent themes will be summarized and reported to the Consortium partners. In addition, descriptive statistics will be calculated and summarized for each of the survey and measures of PCK. Appropriate inferential statistics (e.g., Analysis of Variance, regression) will be conducted to answer questions that involve comparisons across groups or determining the relationships between program inputs and outputs. To answer evaluation questions 8 and 9, program participants will be matched to non-

participants based on level of experience. Their students will also be matched based on socio-economic status and ethnicity.

(D.5) The adequacy of procedures for ensuring feedback and continuous improvement. Online data collection from all key stakeholders at multiple time points during the academic year (pre- and post surveys and instruments) will provide feedback and results pertaining to program process. When needed, modifications for improvement will be conducted based on the recommendations from the executive council. The project coordinator will maintain this database and the PI will summarize the information and report to the Consortium after each semester (fall, spring and summer) during the Project Executive Council meetings and progress reports will be shared and recommendations will be presented.

Table 7 Evaluation Plan for Each Facet of *Proyecto EL SMED*

Evaluation Questions	Data Collection Method	Performance Measures	Timeline
1. Alignment to standards (G1)	Quantitative	▪ Alignment Index	Facet 1: Year 1
2. Teacher perceptions of *Proyecto EL SMED* in relation to content and pedagogical learning (G1)	Mixed Methods	▪ Q-sort Methodology (Based on short interviews)	Facet I: Years 1-3
3. Impact on knowledge, self-efficacy, and teaching (G2)	Mixed Methods	▪ Pre– and post surveys (PCK measure, self-efficacy) ▪ Ratings on adapted MASIR and CREDE protocols	Facet II: Year 2
4. Use of technology (G1)	Mixed methods	▪ Program records (syllabus content, course activity review); ▪ Participant surveys on technology use	Facet II: Years 1 & 2
5. Program coordination (G1)	Qualitative	▪ Structured Interviews (by external evaluator)	Facet II: Years 1 & 3
6. Impact on ELs served by program participants and completers (G1)	Quantitative	▪ Percentage of participating teachers who serve ELs ▪ Percentage of program completers who serve ELs	Facet III: Years 3-5
7. Impact on instructional effectiveness (G2 & G3)	Mixed methods	▪ MASIR & CREDE Observation Protocols	Facet III: Each year
8. Impact on student learning (G3)	Quantitative	▪ Scores on district assessments (science and math all grades): Scores on STAR science (grade 5 only) & mathematics (all grades) STAR	Facet III ,Years 3-5

Note: G = Goal.

Table 8 outlines the anticipated data analysis for each evaluation question.

Evaluation Questions	Data Analysis
1. Alignment to standards (Goal 1)	Alignment percentage; Kappa coefficients;
2. Teacher perceptions of *Proyecto EL SMED* in relation to content and pedagogical learning	Qualitative: Identification of themes; Quantitative data: Descriptive statistics on level of satisfaction
3. Impact on knowledge, self-efficacy, and teaching	Descriptive statistics on teacher knowledge, OTL, self-efficacy and SIOP mean; Multiple regression: dependent variable (OTL mean) independent variables (knowledge mean, self-efficacy mean, SIOP mean)
4. Use of technology	Qualitative: Identification of themes; Quantitative: Descriptive statistics of program attendance
5. Program coordination	Qualitative: Identification of prevalent themes
6. Impact on ELs served by program participants and completers	Qualitative: Identification of themes; Quantitative: Analysis of variance: independent variable (participation) dep. variable (OTL mean ratings -pre-service)
7. Impact on instructional effectiveness	Quantitative: Descriptive statistics
8. Impact on student learning	Qualitative: Identification of prevalent themes; Quantitative: correlations, Analysis of variance: independent variable (participation) dep. variable (SIOP mean, survey means)

References

Aguirre-Muñoz, Z. (2010). *Teaching math to diverse adolescent learners: Instructional equity guide.* West Texas Middle School Math Science Partnership, Texas Tech University, Texas. Available at www.wtmsmp.math.ttu.edu/ProjectActivities.htm.

Aguirre-Muñoz, Z. & Amabisca, A. A. (2010). Defining opportunity to learn for English language learners: Linguistic and cultural dimensions of ELLs' instructional contexts. *Journal for the Education of Students Placed at Risk, 15(3),* 259-278.

Aguirre-Muñoz, Z., Park, J. E., Amabisca, A. A. & Boscardin, C. K., (2008). Developing teacher capacity for serving ELLs writing instructional needs: A case for systemic functional linguistics. *Bilingual Research Journal, 31. 295-322.*

Aguirre-Muñoz, Z., Ortiz, B., & Lamp, D. (2011a, under review). Building teachers' capacity to integrate math and science content: Implications for professional learning models. *Journal of Science Teacher Education.*

Aguirre-Muñoz, Z., Ortiz, R., Lamp, D. & Williams, B. (2011b, April) *Inciting innovation in math and science teaching through meaningful content integration: Developing teachers' content and pedagogical knowledge.* Paper presented at the annual meeting of the American Educational Research Association conference, New Orleans, LA.

Andrews, L. (2002). Preparing pre-service teachers for inclusion: Web-enhanced case-based instruction. *Journal of Special Education Technology, 13(3)*, 27-37.

Berlin, D. F., & White, A. L. (1994). The Berlin-White integrated science and mathematics model. *School Science and Mathematics, 94*(1), 2-4.

Boscardin, C. K., Aguirre-Muñoz, Z., Stoker, G., Kim, J., & Kim, M. (2005). Relationship between opportunity to learn and student performance on English and Algebra assessments. *Educational Assessment Journal, 10(4),* 147-172.

Cobb, P., Yackel, E., & Wood, T. (1993). "Theoretical Orientation." In *Rethinking elementary school mathematics: Insights and issues*, Journal for Research in Mathematics Education Monograph No. 6 (pp. 21-32). Reston, VA: National Council of Teachers of Mathematics.

Darling-Hammond, L. (2000). Teacher quality and student achievement: A review of state policy evidence. *Education Policy Analysis Archives, 8*, 1-50.

Dalton, S. S. (1998). *Pedagogy matters: Standards for effective teaching practice*. CREDE Research Report No. 4, Berkeley: CA.

Dutro, S., & Moran, C. (2001). Rethinking English language instruction: An architectural approach. In G. Garcia (Ed.), *Reaching the highest level of English literacy* (pp. 227-258). Newark, DE: IRA.

Echevarria, J., & Colburn, A. (2006). Designing lessons: Inquiry approach to science using the SIOP model. In A. K. Fathman & D. T. Crowther (Eds.), *Science for English language learners: K-12 classroom strategies, (pp. 95-108)*. Arlington: NSTA

Gibbons, P. (2003). Mediating language learning; Teacher interactions with ESL students in a content-based classroom. *TESOL Quarterly, 37(2)*, 247-273.

Herbel-Eisenmann, B. (2000). *How discourse structures norms: A tale of two middle school mathematics classrooms."* Doctoral dissertation, Michigan State University, East Lansing, Mich.

Herbel-Eisenmann, B. & Schleppegrell, M. J. (2008). "What questions would I be asking myself in my head?": Helping all students reason mathematically. In XXXX (Ed.) *Responding to Diversity: Grades 6-8*, National Council of Teachers of Mathematics.

Huang, J., Normandia, B. & Greer, S. (2005). Communicating Mathematically: Comparison of knowledge structures in teacher and student discourse in a secondary math classroom. *Communication and Education, 54(1)*, 34-51.

Lee, O. & Luykx, A. (2008). Science education and student diversity: Race/Ethnicity, language, culture, and socioeconomic status. In S. K. Abell & N. G. Lederman (Eds.), *Handbook of Research on Science Education*, Routledge: New York

Loucks-Horsely, S., Stiles, K. E., Mundry, S., Love, N., & Hewson, P. W. (2010). *Designing professional development for teachers of science and mathematics*. Thousand Oaks, CA: Corwin.

McNeil, L. M. (2000). Creating new inequalities: Contradictions of reform. *Phi Delta Kappan, 81,* 729-734.

National Council of Teachers of Mathematics. (2008). *Responding to diversity: Grades 6-8. NCTM*, Washington, DC: National Academy Press.

National Council of Teachers of Mathematics (NCTM), (2000). *Principles and standards for school mathematics*. Reston, VA: NCTM.

Salazar, D. & Aguirre-Muñoz, Z (2008). *Project TEACH Year 1 Report*, DOE Office of English Language Acquisition.

Scarcella, R. (2003, April). Academic English: A conceptual framework. Technical 2003-1 Report. Irvine, CA: University of California Linguistic Minority Research Institute.

Schleppegrell, M. J., Achugar, M., & Oteíza, T. (2004). The grammar of history: Enhancing content-based instruction through a functional focus on language. *TESOL Quarterly, 38*(1), 67-93.

Stevens, T. To, H., Harris, G., & Dwyer, G. (2008). The LOGO project: Designing an effective continuing program for teachers. *Journal of Computers in Mathematics and Science Teaching, 27(2)*, 195-219.

Stevens, T., Harris, G., Aguirre-Muñoz, Z., Higgins, R., & Parnell, K. (2011, April) *Teacher perceptions of effective professional development strategies: Typical representations of different viewpoints.* Paper presented at the annual meeting of the American Educational Research Association conference, New Orleans, LA.

Walqui, A. & van Lier, L., (2010) *Scaffolding the academic success of adolescent English language learners: A pedagogy of promise*. San Francisco, CA: WestED.

Wei, R. C., Darling-Hamond, L., Andree, A., Richardson, N., & Orphanos, S. (2009). *Professional learning in the learning profession: A status report on teacher development in the U. S. and abroad.* Oxford, OH: National Staff Development Council.

Weis, I. R., Pasley, J. D., Smith, S. P., Balinower, E. R., & Heck, D. J., (2003). *Looking inside the classroom: A study of K-12 Mathematics and science education in the United States.* Chapel Hill, NC: Horizon Research.