Integrating STEM, Literacy, and Language to Prepare All Teachers to Teach English Language Learners

Teacher Quality Partnership Program (TQP); New Award; CFDA 84.336S

Absolute Priority 1: Partnership Grants for the Preparation of Teachers

Competitive Preference Priority: Competitive Preference Priority 1: Promoting Science, Technology, Engineering, and Mathematics (STEM) Education

July 15, 2014

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Note to the Reviewers re: ELL terminology

In this application, we have used the term English language learners (ELLs) to refer to students who are in the process of learning English. We recognize that the term *ELLs* may depersonalize the students and fail to acknowledge the diversity of this group of learners. Some educational advocates prefer the term *emergent bilingual* for any student learning a second language. Other terms in recent history include *limited English proficient students* and *language minority students*. The U.S. Department of Education is currently using the term *ELL,* as is much of the current scholarly literature. For consistency with the U.S. Department of Education, we are using the term ELL in this proposal. We have also included a list of acronyms used in this proposal for your convenience.

Acronym	Definition
AIMS	Arizona Instrument to Measure Standards
ASU	Arizona State University
AZELLA	Arizona English Language Learner Assessment
BLE	Bilingual Education
CREO	College Research & Evaluation Operations
EBP	Evidence Based Practice
EC	Early Childhood
ECSE	Early Childhood Special Education
EED	Elementary Education
ELD	English Language Development
ELL	English Language Learner
ESL	English as a Second Language
IGA	Intergovernmental Agreements
IQWST	Investigating and Questioning our World through Science and Technology
MLFTC	Mary Lou Fulton Teachers College
OKED	Office of Knowledge Enterprise Development
PBL	Project-Based Learning
PD	Professional Development
PLL	Professional Learning Library
SEI	Structured English Immersion
SPA	Student Placement Agreements
SPE/EED	Special Education/Elementary Education
STEM	Science, Technology, Engineering, Mathematics
SYR	Senior Year Residency
TAP	TAP System for Teacher and Student Achievement

SIGNIFICANCE

As a nation it is crucial that a high quality public education is provided for English language learners (ELLs) in schools. Students whose primary language is not English have been a part of the education landscape in the U.S. since the nation's earliest days (Crawford, 2004; Duran, 2008; Jimenez, Garcia, & Pearson, 1995; Lee & Luykx, 2005; Vaughn et al., 2006). Although American teachers have always had ELLs in their classrooms (even though students were not always labeled as such), the population of ELLs in schools has been increasing steadily for the last three decades (Shin & Kominski, 2010). From 1994 to 2010, the percentage of ELLs in the U.S. grew over 63% and has grown steadily since then (National Clearinghouse for English Language Acquisition, 2011). Overall, the population of non-English speaking people also has increased. According to recent census data, nearly 40 million people, or 13% of the total population, are foreign born and nearly 20% of the U.S. population report that they do not speak English well (Shin & Kominski, 2010). These data have important implications for schools and, consequently, for teacher education programs that prepare teachers who will meet the needs of this growing population of students and their families. In this project, Arizona State University's Mary Lou Fulton Teachers College (MLFTC) is taking on the challenges associated with preparing teachers for the growing population of ELLs.

MLFTC is one of the largest teacher preparation programs in the country and is the largest preparation program in the state, graduating approximately 1,500 new teachers each year. Situated in a state where ELLs are among those with the poorest achievement outcomes (CDF, 2013; Annie E. Casey Foundation, 2013; U.S. Department of Education, 2014), the MLFTC has the opportunity to address the significant challenges associated with education for English language learners, and, in doing so, to become a model for other teacher preparation programs which cannot meet the needs of these students.

Furthermore, MLFTC in partnership with the National Institute for Excellence in Teaching recently obtained a three-year SEED grant (Supporting Effective Educators

Development) from the U.S. Department of Education (2013-2016). The grant activities prepare over 200 new teachers in STEM fields (focus on participants from groups that are traditionally underrepresented in STEM). The grant also provides professional development to thousands of undergraduates and in-service teachers around the state on teaching writing standards. Resources from the SEED grant are available to help support this project.

The Extent to Which the Proposed Project is Likely to Build Local Capacity to Provide, Improve, or Expand Services That Address The Needs of The Target Population

Recent data indicate an imperative to prepare teachers who can face the ongoing issues of ELL education in Arizona. For example, only 25% of ELLs graduate from Arizona high schools, a figure that is well below the 60% graduation rate defined by the U.S. Department of Education, (Stetser & Stillwell, 2014) as a failing high school. In addition, in the 2012-2013 school year only 40% of ELLs passed the Arizona elementary math assessment and only 53% passed the reading assessment (Arizona Department of Education, 2013). As can be seen in Table 1, ELLs in Arizona also did not fare well on the National Assessment Education Progress (NAEP).

Table 1. *Arizona Students with Limited English Proficiency on NAEP*

Achievement	Year	Below Basic	Basic	Proficient	Advanced
Math Grade 4	2013	60	37	3	0
Reading Grade 4	2013	92	7	1	0
Science Grade 4	2009	84	14	2	0
Math and Reading Grade 8	2013	*	*	*	*

*Reporting standards not met

In Arizona, students who are identified as not proficient in English are removed from most content classes for four hours a day during each school day to receive English language instruction. While well-intentioned, this policy results in the unfortunate consequence of ELL

students having restricted access to the general curriculum. Many ELLs do not enter schools in Arizona until their middle childhood or adolescent years; a situation that creates even more disadvantage for access to the general curriculum because ELL students are removed from core content instruction, to receive second language instruction, at a time when they should be engaged in learning rigorous content. Hence, ELLs in Arizona may struggle to acquire math and science content knowledge due to a lack of access rather than English proficiency per se. Further complicating an already complex issue are varying definitions of English proficiency, both in Arizona and across the Nation (Linquanti & Cook, 2013), with proficiency criteria often tied to communication ability rather than the ability to use language for learning. This can result in a situation where teachers create lessons to enable development of content (e.g., science, math) not realizing that these lessons also need to include opportunities for use of language to learn, also known as academic language.

The challenges for ELLs in Arizona are not unique; such issues arise in a number of states that have similar policies and procedures to establish English proficiency in ELLs (Wright, 2010). The result is that ELLs in Arizona and across many of the Nation's schools often miss opportunities to acquire (a) content knowledge (e.g., language arts, math, social studies, sciences, technology); (b) academic language skills required for learning (e.g., higher level vocabulary, verbal hypothesis generation); and (c) higher level literacy skills (e.g., expository text comprehension) that are essential for academic success (Gándara & Orfield, 2010; Martinez-Wenzl, Pérez, & Gándara, 2010; Ríos-Aguilar, González-Canche, & Moll, 2010). In sum, ELLs do not consistently have access to the general curriculum and therefore have restricted opportunities to develop knowledge and skills essential for high school graduation, access to postsecondary opportunities, and productive participation in the 21st century workplace. There is also the assumption that "best teaching practices" for general education teachers are best for all students. While this may be true, it is also true that there are specific instructional practices to

promote language and literacy skills development that should be part of every teacher's knowledge, irrespective of their content expertise.

MLFTC Curriculum Reforms and Enhancements to Improve Education Services for English Language Learners in Arizona

When designing preparation programs that are responsive to needs of ELLs, we believe that teacher educators need to think in new and innovative ways about how to build knowledge and skills for preservice teachers so they can implement lessons that will support English acquisition and development of content knowledge. In our iTeach ELLs project, the MLFTC at ASU will continue to reform its programs for early childhood and elementary (PreK-8) preservice teachers by integrating strategies to promote English language and literacy skill development in all math and science methods classes. Our specific goals (discussed in more detail in the subsequent Quality of Project Services) are as follows:

GOAL ONE: *The MLFTC will implement a number of key reforms in our PreK-8 certificate teacher preparation programs so our graduates will be measurably more successful in understanding and implementing strategies for teaching ELL students in math and science content areas.* It is well known that teacher education programs reside in silos defined by faculty expertise. For example, a faculty member with a PhD in mathematics education teaches math methods; literacy experts teach reading and writing; science experts teach science; bilingual specialists teach second language acquisition courses, and so on. iTeach ELLs will prepare teachers to integrate all of these courses for the benefit of the students. Of course to accomplish this significant reform is not without challenges because it calls for a culture of change. However, our college (MLFTC) has successfully implemented a series of reforms and innovations, and based on these experiences we are confident that our planned improvements are not only necessary, but can be attained to meet the needs of the community.

GOAL TWO: *Design methods courses in math and science to include materials and instructional strategies that promote development of language (including academic language) and literacy skills.* We believe that the prevailing model of removing ELLs from content classes for decontextualized second language instruction is a barrier rather than a facilitator of second language competence required to participate in content classes. Even after months or years of participation in such classes, ELLs may still lack essential skills to use language to learn such as higher level vocabulary, verbal analysis, hypothesis generation, and comprehension of expository discussion and text. In iTeach ELLs we propose to remove this barrier through integration of science and math content with practices for English language acquisition and literacy instruction and, after initials reforms are brought to scale, continue integration across literacy and assessment courses.

GOAL THREE: *Use project-based learning (PBL) pedagogy and design principles to establish knowledge and skills that teacher candidates can apply to "real world" classrooms.* The promise of project-based learning lies in its potential for students to develop competencies and skills that are required for the 21st century (Bell, 2010) and to instill a high degree of cultural relevance as students learn to leverage and use their prior experiences to scaffold new learning and skill acquisition (Nunez, 2014). Project-based learning is competency rather than course-based and has been shown to enhance learners' ability to integrate and apply their knowledge in real-world settings (Capraro & Slough, 2013). The potential of PBL to meet the needs of diverse students, including ELLs, is significant because it offers the opportunities for ELLs to be involved in projects that offer long-term and meaningful learning, and it also provides a rich context for development of both basic and higher level skills in language and literacy (Diaz-Rico, 2004, Foulger & Jimenez-Silva, 2007). In iTeach ELLs we use project-based learning (PBL) to enable teacher candidates to acquire knowledge and skills that are ready for classroom application. We anticipate that our teacher candidates will not only acquire relevant skills for

themselves, but they will also learn how to design PBL experiences for their students in science and math lessons that specifically address language acquisition for ELL students.

GOAL FOUR: *Integrate an understanding of evidence-based practice and scientifically-validated research related to the teaching and learning of ELL students including evidence-based assessment and data-driven decision-making within project-based learning to improve differentiated instruction.* The importance of differentiated instruction to meet learner needs, for ELLs in particular and all students in general, is well documented (Tomlinson, 2005). However, teachers' ability to accomplish this is a direct result of the extent to which a teacher has skill in accessing and understanding the research evidence, progress monitoring, and data driven decision-making. It is critical for teacher preparation programs to provide opportunities for teacher candidates to develop these skill sets within the context of designing and implementing lessons for their students during their senior year residencies. We will provide teachers with multiple and authentic opportunities to develop these skill sets as they develop and complete projects focused on the integration of ELL teaching strategies within math and science lessons.

The Likelihood That the Proposed Project Will Result in System Change or Improvement

Through iTeach ELLs we are building on past successes for creating meaningful improvements in teacher preparation that have had a national impact. Over the past four years we have successfully reformed our teacher preparation programs through a redesign of professional coursework and implementation of a full year residency for all teacher candidates. These reforms achieved impact well beyond our university through our systematic changes in the way teachers are prepared, matching instruction to learning theory, and improving outcomes for Arizona PreK-12 students. The MLFTC has also received national attention as evidenced by representatives from 14 colleges and universities visiting our program within the past two years for an overview of our model, site tours, and resources to support replication nationally. As further evidence of MLTC's success, the dean was invited to testify, in February, 2014, before

the HELP subcommittee about the TQP grant's impact and central importance to reforming teacher education. In addition, our staff has presented information regarding our impact to the Senate HELP Committee, deans of education colleges or schools in South Carolina, and state departments of education in Iowa, Florida, and Tennessee. Along with visits and inquiries from other IHE's, the National Council on Teacher Quality (NCTQ) recently ranked MLFTC teacher preparation programs among the best in the nation.

At present we have partnerships with 20 Arizona school districts (see Appendix G) where the entire district is classified as high need or schools within the district are classified as such. Most of these schools have significant populations of ELLs. These existing relationships will allow us to build local capacity and shift the thinking and practices of preservice teachers, inservice teachers, and university faculty to transform teaching and learning opportunities for ELLs. Building on the strength of this collaborative model we are ready for the next curriculum transformation for expanding teacher preparation to meet the needs of Arizona ELLs. We fully expect that our curricular reforms and our teacher candidates' residency experiences will have a positive and substantial impact on our district partners, resulting in local and state systems change for teaching, assessment, and learning while also serving as a national model. Because we are the largest teacher preparation in the state and are recognized for the quality of our graduates (please see http://education.asu.edu/iteachaz), we are in a strong position to immediately and positively impact the lives of students in schools. Finally, on average we graduate about 800 teachers per year in our PreK-8 preparation programs. Over the five year project we will have experience and outcome data for 2,000 iTeach ELLs graduates (Years 3-5); a situation that allows us to easily scale successful components of our iTeach ELLs program.

The Extent to Which the Proposed Project Will Prepare Personnel for Fields in Which Shortages Have Been Demonstrated

At present, one in four children in the U.S. come from immigrant families and speaks a language other than English when they go home (Mather, 2009). This number is projected to increase to one in three by 2060 (U.S. Census Bureau, 2012). Roughly half of the nation's language minority student population is in the process of learning the English language and, therefore, considered as ELLs. Given these realities of contemporary classrooms, teachers at all levels must be ready to address the needs of their ELL students.

The U.S. Department of Education (2014) has identified shortages in Arizona of teachers with endorsements in English as a second language (ESL) or bilingual education (BLE). This is of great concern; however, in iTeach ELLs we believe that an increase in BLE or ESL endorsements is not the only way to meet the education needs of ELLs. Rather, we propose that the best way to address shortages of teachers prepared to educate ELLs is to prepare ALL teachers to educate this population of students. In a recent study, Okhremychouk, Sellu, & Gillis, (2014), found that, statewide, Arizona teachers reported a lack of preservice experience with ELLs, a lack of district-led professional development for addressing the unique needs of ELLs, and inadequate knowledge of language acquisition beliefs, foundations of ELL curriculum, and language assessment and evaluation. We acknowledge that the teacher preparation that we propose in iTeach ELLs is not the norm in preparing teachers for educating ELLs. Currently, teachers pursue specialized endorsements in bilingual education, teaching English as a second language, or structured English immersion (SEI). This approach has not and is unlikely to meet needs for an expanding population of English language learners in our nation and more specifically in Arizona. For example, of the Mary Lou Fulton Teachers College (MLFTC) graduates, only 25 to 28 teachers per year graduate with BLE/ESL endorsements, representing less than 2% of our annual graduates. We cannot adequately address the educational needs of our increasing population of ELLs through the limited supply of teachers

who elect to pursue BLE/ESL endorsements, many of whom assume specialist or trainer roles in school districts and do not become the primary teachers for ELL students. More importantly, the most common endorsement model (SEI) is of limited value when considering the need to prepare teachers who are highly qualified to structure and orchestrate content and English language learning opportunities for ELLs throughout the school day. In other words, adding domain specific courses that focus on teaching ELLs without a content context is not likely to result in teachers who are prepared to shift the academic outcomes for ELLs.

In iTeach ELLs, we propose to prepare ALL PreK-8th grade teachers to deliver math and science content instruction while also teaching academic language development and literacy skills. iTeach ELLs focuses on preparing teachers who are able to diminish content silos (e.g., literacy, science, math, technology) in favor of integrated content lessons that are organized in a way to build ELLs' knowledge and skill in English and multiple content areas simultaneously (Green & Anid, 2013). The ability to integrate learning and develop knowledge and skill across content areas is regarded as essential for functioning in the 21st century social and workplace environments (Kay & Greenhill, 2011). Given the increasing population of students who are learning English as a second language, it is important that that these types of integrated learning opportunities are accessible. However, access to such opportunities for ELLs is highly dependent upon a supply of qualified teachers who understand how to teach content while also promoting English language acquisition, academic language development and literacy skills. Our proposed project, iTeach ELLs directly addresses this shortage of qualified personnel.

QUALITY OF THE PROJECT DESIGN

iTeach ELLs is a comprehensive program designed to raise student achievement for ELLs through curriculum reforms and enhancements which will prepare our graduates to address the education needs of ELLs with integrated, project-based lessons, that support science and math content acquisition as well as addressing language and literacy skill development for this

population. A primary goal of iTeach ELLs is to diffuse barriers and segmented thinking of teachers by preparing all preservice teachers in evidence-based practices (EBP) for ELLs. Goal 1 of iTeach ELLs focuses on these reforms including the collaborative work of faculty to engage in a culture of change. The program reforms and enhancements will prepare our PreK-8 teacher preparation graduates to be equipped with the skills, knowledge, and dispositions to teach ELLs with special focus on STEM content areas of math and science (CPP a). In this project, our preparation goals focus on competencies and skills required for effective instruction that promotes English language learning, literacy and content rich instruction specifically within the context of STEM lessons. Math and science educators typically are prepared with a focus on content and not necessarily on the diverse needs and abilities of the students they will teach, this project's efforts will first focus on STEM classes that are required of all teacher candidates in our PreK-8 programs before scaling up to include literacy and assessment courses.

The Extent to Which the Proposed Project is Supported by Strong Theory

iTeach ELLs is grounded in Situated Learning theory (Lave & Wagner, 1991) where learners are participants in a community of practice where learning is contextualized (Barab, Squire, & Dueber, 2000). This is in contrast to more traditional approaches to instruction where professors are viewed as primary transmitters of knowledge, students as receivers, and learning is assessed through recall of transmitted knowledge (Herrington & Herrington, 2008).

At the MLFTC, we deliberatively have moved away from this traditional model but within the university and state certification course and credit structure. We increased teacher candidates' time in field experiences, specifically student teaching, from a single semester of 15 weeks to over 30 weeks of co-teaching throughout an entire academic year. Our teacher candidates have the opportunities to work alongside professional educators from their entrance into the professional program to the senior-year residency (SYR). They also participate in professional development and professional learning communities in concert with practicing

teachers in our partner districts. Onsite university supervisors provide formative and summative feedback to teacher candidates throughout the year. We have established partnerships with multiple LEAs across Arizona serving a diverse and high need population of students to ensure our teacher candidates learn in classrooms that represent the complexities of today's schools.

With these structures in place, we now have the capacity and experience to expand learning opportunities to move toward authentic learning environments that will prepare graduates to meet the demands of the 21st century workplace (Herrington & Herrington, 2008). iTeach ELLs proposes to meet this call by establishing a learning framework where preservice teachers engage in increasingly complex learning activities through a PBL pedagogical framework. PBL enacts Situated Learning theory and is based on constructivist findings that students gain more sophisticated understandings of content when they have the opportunity to construct their understandings by engaging with and using ideas (Blumenfeld et al., 1991; Krajcik, et al., 1994; Krajcik, Czerniak & Berger, 2002; Krajcik & Blumenfeld, 2006). Moreover, knowledge is a product of the situation and activities from which they originate and meaning is derived from the context of their use.

The curricular reforms and enhancements begin with our math and sciences methods courses with focus on practices for addressing the complex needs of ELLs and redesigning course assignments using PBL design principles for authentic learning experiences. These reforms will allow our teacher candidates to integrate content and practices guided by MLFTC faculty, iTeach ELLs coaches, and partner district mentor teachers. As the logic model below indicates (Table 2), our plan will establish a foundation for sustained learning and impact on ELLs and STEM education that will extend well beyond the term of the funding. We will build upon specific evidence-based practices that have been found to support the learning of ELLs.

Extensive reviews of the literature identified program factors and instructional characteristics that promote academic success of ELLs (Genesee, 2005). Aggregating across the

corpus of research, Genesee et al. (2005) report that programs that were relatively effective in improving the academic achievement of ELLs shared the following characteristics:

(1) a positive school environment (Battistich, Solomon, Watson, & Schaps, 1997; Berman, Minicucci, McLaughlin, Nelson, & Woodworth, 1995; Montecel & Cortez, 2002);

(2) a curriculum that was meaningful and academically challenging, incorporated higher order thinking (Berman et al., 1995; Doherty et al., 2003; Montecel & Cortez, 2002; Tikunoff, 1985), was thematically integrated (Montecel & Cortez, 2002), established a clear alignment with standards and assessment (Doherty et al., 2003; Montecel & Cortez, 2002), and was consistent and sustained over time (Ramirez, 1992)

(3) a program model that was grounded in sound theory and best practices associated with an enriched, not remedial, instructional model (e.g., Montecel & Cortez, 2002), and

(4) teachers in bilingual programs who understood theories about bilingualism and second language development as well as the goals and rationale for the model in which they were teaching (Berman et al., 1995; Montecel & Cortez, 2002).

The use of cooperative learning and high-quality exchanges between teachers and pupils is beneficial for ELLs in learning content and language when teachers engages ELLs in meaningful ways (e.g., Berman et al., 1995; Calderón, Hertz-Lazarowitz, &Slavin, 1998; Doherty et al., 2003; Montecel & Cortez, 2002; Tikunoff, 1985). By creating cadres of teachers who understand and believe that all ELLs can learn academic content while simultaneously developing language, we can move towards creating positive school environments. Through STEM instruction that is meaningful, integrated and has incorporated effective strategies for developing STEM knowledge and English language and literacy skills, teacher candidates will contribute to a number of factors that can lead to ELLs' academic and language development.

Table 2. iTeach ELLs Logic Model (**CPP b**)

Problem Statement: Improve educational outcomes for PreK – grade 8 Arizona ELL students through preparing teachers to meet the needs of a diverse student population for the 21st century.				
INPUTS	ACTIVITIES	TIMELINE	OUTCOMES	
Where we invest	What we do	When	Short Term[1]	Long Term[2]
• LEA Partners • Graduates • Faculty • Staff • University partners (Honors College and College of Liberal Arts and Sciences) • ELL and PBL coaches • ELL and PBL consultants • Internal funding • External funding • Research findings • Materials • University Resources • Technology • Independent Evaluator	**Build capacity** for PBL, ELL practices through STEM content: 1) Professional development for faculty 2) Reform courses/ programs with ELL practices and design projects using PBL 3) ELL and PBL coaches co-teach with faculty 4) Fidelity of implementation instrument for PBL design **Reform and enhance curricula** through an iterative process (pilot, revise, evaluate, install): 1) Integrate learning across course content and field experiences (PBL) 2) Enhance math and science courses with focus on ELLs 3) Scale up across content areas 4) Measure teachers knowledge and practices for ELLs 5) Create resources on the PLL and through Quest to Teach **Induction** Sustain and continue learning through induction experiences **Program evaluation** Conduct formative and summative evaluations	Begin Oct 2014 (annually) Yr 1 (iteration 1) Begin Oct 2014 Begin Oct 2014 (annually) Years 1- 5 Years 1-5 Years 3-5 Years 2-5 Years 1-5 Years 3-5 Years 1-5	• Math and science methods courses redesigned to include ELL practices • Signature assignments redesigned using PBL • Faculty and coaches co-teach math, science, and field experience courses. • New signature assignments done by teacher candidates with passing scores • Signature assignment project rubrics refined and completed • Fidelity tools for elements of redesigned courses completed • Course syllabi and signature assignment projects refined and ready for next iteration or scale up • Quest to teach modules completed for piloting • Teacher candidates demonstrate use of evidence-based practices data-driven decision making • Teacher candidates share learning with stakeholders in poster sessions • Graduates engage in inductions experienced teacher mentors • Teacher candidates report a high sense of efficacy for teaching ELLs • Teacher candidates report that iTeach ELLs prepared them to meet the needs of ELL students	• Faculty keep course content and projects current with newest evidence for ELLs • Increased number of ASU teacher graduates in AZ prepared to teach ELLs from 25 to 800 per year • Practices for ELLs and PBL designed projects are scaled up • ≥90% of candidates meet/ exceed excellence in student teaching • Induction camp completed by 400 teacher candidates and mentors • Induction camp participants report high level of satisfaction with supports • Quest to Teach modules fully integrated into program curricula • PLL resources completed and accessible for teacher candidates and mentor teachers **Impact**[3] • Reduce AZ state shortage of teachers prepared to teach ELLs • Increase percentage teachers with BLE/ ESL endorsements by 50% • 90% or more of graduates will meet highly qualified status • ELLs will demonstrate basic proficiency in reading, math, and science at levels equivalent to their peers who are not ELL

[1]Short term: During the course of the grant; [2]Long term: Sustained program outcomes and post-graduation for teacher candidates; [2]Impact: Graduates' effect on current state and student needs.

The Extent to Which the Training or Professional Development Services to be Provided by the Project are of Sufficient Quality, Intensity, and Duration to Lead to Improvements in Practice Among the Recipients of Those Services

We have designed iTeach ELLs to build on the strong foundation of teacher preparation reform and innovation at ASU MLFTC. These innovations are designed to transform teacher education at the university level by building faculty capacity to prepare both inservice and preservice teachers, which will lead to better outcomes across content areas for all students, especially those that are ELLs. In the significance section of this proposal we delineated four goals; Table 3 provides an overview of the goals, objectives, timeline, and personnel involved. As can be seen, the first goal serves as the foundation for all the reforms as it seeks to change the culture of teacher preparation at MLFTC to include, as standard practice, strategies for students who speak a language other than English as their first language. Goal two focuses on the reforms and enhancements of math and science methods courses which promote the development of academic language and literacy skills for ELLS; with integration of literacy and assessment courses after the initial reforms are brought to scale. We will use an iterative process for reforming and enhancing the curriculum and programs. Goal Three focuses on use of PBL pedagogy and design principles to establish knowledge and skills that teacher candidates can apply to “real world” classrooms through enhanced signature assignments.

Goal Four will facilitate teacher candidates’ skill for integrating scientifically-validated research related to the teaching and learning of ELL students, including evidence-based assessment and data-driven decision-making within PBL to improve differentiated instruction. Each goal and reform, including the iterative process for attainment, is summarized below. Tools for measurement will be developed as part of the project so that at the end of Year 5, a complete model for meeting the unique learning needs of ELLs across curricular areas of STEM, language, literacy and assessment will be achieved. The theory, practices and tools for the model will be sustained as MLFTC seeks to meet the changing needs in Arizona’s schools.

It is understood that the success of this project rests in the goals, reforms activities, and evaluation to demonstrate that our teacher candidates gain increased knowledge and skills and, ultimately and most importantly, their students achieve improved school outcomes to prepare them to be successful in the 21st century world, where literacy and access to information is key to adult success. Taking a backward lesson planning approach (Wiggins & McTighe, 1998), the project goals, reforms and activities, and evaluation are framed around the desired outcomes (outcomes reported in Table 2 and Tables 7-10).

Table 3. *Goal 1: Build Capacity*

Goal 1: The MLFTC will implement reforms in the PreK-8 certificate teacher preparation programs so graduates will be measurably more successful in understanding and implementing strategies for teaching ELL students in math and science content areas.		
Objectives	**When**	**By Whom**
Objective 1.1: MLFTC faculty organized into program enhancement teams for changing the culture of how programs prepare teachers to meet the needs of ELLs.	Begin October, 2014 9 Meetings per year	PI & Project Director MLFTC Faculty Coaches & Consultants Data Manager Technology Specialist
Objective 1.2: Maintain partnerships with high-need/high ELL districts/schools through Intergovernmental Agreements (IGA) and Student Placement Agreements (SPA) for data-sharing. Agreements will be approved though the Institutional Review Board at ASU and partner district research and evaluation offices to evaluate the impact of iTeach ELLs on graduates' effectiveness/ student achievement.	Begin October, 2014 Annual Review	ASU Office of Field Experience PI & Project Director Faculty Dev. Team
Objective 1.3: MLFTC faculty reform and enhance courses in math and science integrating practices for effectively teaching ELLs [Also see Goal 2, Objective 2.1 below] and Signature Assignments using PBL.	Begin October, 2014 9 meetings per year	PI & Project Director MLFTC Faculty Coaches Ed. Tech Specialist Technology Specialists
Objective 1.4: MLFTC review and refine the role of site coordinators, program faculty, and partner district mentors within the senior year residency (SYR) project design, implementation and evaluation.	Begin October, 2014 Annual Review	Office of Field Experience PI & Project Director Faculty Dev. Team

Objective 1.5: Mentor teachers participate in professional development with MLFTC faculty and coaches. Content focuses on integrating ELL practices into math and science content and the use of PBL.	Fall 2014 Annually	PI & Project Director Coaches & Consultants Technology Specialists
Objective 1.6: Review and make recommendations on course reforms, Signature Assignments, Quest to Teach ELLs virtual learning modules, induction, and PLL, in partnership with faculty from (1) Barrett, The Honors College, (2) College of Liberal Arts and Sciences, (3) partner district educators and (4) MLFTC graduates.	Summer Annually	PI and Project Director Faculty Coaches & Consultants District Partners Program Graduates

GOAL ONE: The MLFTC will implement reforms in the PreK-8 certificate teacher preparation programs so graduates will be measurably more successful in understanding and implementing strategies for teaching ELL students in math and science content areas.

Faculty professional learning. First, to achieve educational reform, we must work collaboratively across disciplines to reform and enhance coursework to draw on the expertise of faculty creating a change in culture – moving away from the discipline-bound silos. Further, we will bring in additional expertise in coaches on the two key features of the reform – practices for English language learners and project-based learning (see Table 3, Objectives 1.1 and 1.2). We will implement a sustained and supported model of professional development for implementing new practices with fidelity (Fixsen, Naoom, Blasé, Friedman, & Wallace, 2005). This process adheres to core features of effective professional development (Desimone, 2009). The ELL and PBL coaches will co-teach with MLFTC faculty in targeted courses during iterations 1 (Year 1) and 2 (Year 2) in math and science. Further, coaches will co-teach with site coordinators who teach and supervise teacher candidates in partner schools. Coaches will support faculty and students in the implementation and evaluation of these practices.

To accomplish this, we will begin by engaging faculty in program enhancement teams, using the principles of the professional learning communities' framework, to cultivate a culture of change for how we prepare teacher candidates to meet the needs of ELLs (DuFour, Eaker &

DuFour, 2005). MLFTC will engage faculty to be able to integrate evidence-based practices for language and literacy skill development in math and science methods courses. The program enhancement teams will provide the forum for faculty to work together around the common goals of iTeach ELLs, where all faculty will have ownership and contribute to program reforms and enhancements (see Appendix H for a listing of professional learning topics and sequence). In sum, faculty will engage in nine annual meetings as work groups for developing the following content and practices (a) establishing a culture of change, (b) second language acquisition and academic language development, (c) project-based learning design principles, (d) academic language acquisition and literacy, in content areas – STEM, (e) diverse learning characteristics of ELLs: giftedness and disability, and (f) clinically embedded projects, evaluation, and fidelity of implementation. There are three expected deliverables – 1. Science and math methods course enhancements, 2. Signature Assignments redesigned using project-based learning principles and integrating content across disciplines (math, science, language development, and literacy), and 3. Program map revisions specifying the integration of ELL practices and PBL within each elementary and early childhood program.

District partnerships. District partners play a key role in program reforms. We will engage with district partner educators to (a) review reforms and enhancements annually, (b) examine student data from our graduates' PreK-8 students, (c) engage in professional development of mentor teachers for the integration of ELL practices and application of PBL projects, and (d) invite practicing teacher to engage in professional learning alongside graduates for the continued learning and sustained use of these evidence-based practices for ELLs through iTeach ELLs Camp and PD (see Table 2 and evaluation and Goal 2 below for description of the Camp and PD). The iTeach ELLs Camp & PD addresses a major concern of Arizona principals, the need to have teachers prepared to teach science and math (Heasley & Partners, 2011).

University learning resources. ASU has made a major investment in virtual and online resources for teacher candidates and practicing educators. We capitalize on these developing

resources. First, Quest to Teach was began with substantial funding from the National Science Foundation and MacArthur Foundation. These virtual learning modules engage learners in academic content to solve meaningful and socially significant problems. Learners gain valuable information that not only helps solve the quest but also is consistent with K-12 state academic standards. The platform uses video game technologies to teach content by utilizing a multi-user environment requiring collaboration among participants. Through game play, learners become agents of change using real-world knowledge, skills and concepts to make sense of a situation and then making choices that actually transform the play space and themselves. Capitalizing on current and future development and investments by ASU, Quest to Teach will develop a suite of virtual learning modules designed, piloted and installed for iTeach ELLs. The suite is the fifth in a series and will include the following modules: (1) Teacher candidates teaching students who are ELLs, (2) Engaging learners through project-based learning, (3) Integrating science, literacy, and language for ELLs, (4) Integrating math, literacy, and language for ELLs.

Second, the Professional Learning Library (PLL) is an online venue that allows teacher candidates and practicing educators to connect, collaborate, share and learn. A search engine makes the content easy to find, with secure communities for members to participate in inter- and intra-institution collaboration. Currently, more than 1,200 educational resources, including presentations, learning modules, course materials, videos and professional learning trainings are posted on the PLL. New content is constantly being added by partners, such as MLFTC, ASU TQP NEXT Grant, Arizona Ready-for-Rigor Project, Ecology Explorers, Inside the Academy, Learning Forever, ASU Mars Education Program, and Technology Infusion. The PLL includes both a free public-facing site and a secure login area for members to access additional role-restricted materials and learning opportunities. Members create communities for collaboration of ideas and materials and participate in private discussion forums amongst invited users.

Annually after each iteration of iTeach ELLs, MLFTC faculty, district partner educators, ELL and PBL coaches, Barrett The Honors College faculty, and College of Liberal Arts and

Sciences faculty, along with program graduates, will come together during summer work sessions to evaluate the course reforms and enhancements, the feasibility and applicability of Signature Assignments, Quest to Teach, and PLL materials. Using a broad range of stakeholder viewpoints will assist MTFTC faculty in refining across courses and programs.

The Extent to Which the Proposed Activities Constitute a Coherent, Sustained Program of Training in the Field

iTeach ELLs is designed with an iterative approach for developing faculty knowledge for ELL practices and PBL design, implementing this knowledge into math and science courses in a small number of course sections initially and then scaling up across all sections after review and refinement (see Table 4 for full sequence of iterative approach). We will begin with one section each of the math and science methods course (**CPP c)** for the elementary and early childhood programs. Faculty experts in math and science will work closely with ELL and PBL coaches to develop content, practices, and learning experiences for teacher candidates to develop content knowledge and evidence-based practices for ELLs allowing for access to language and literacy skill development within math and science content areas (Goal 2). Teacher candidates will then develop, implement, and evaluate, using data-driven approaches, the projects that integrate these practices within the authentic learning contexts of their clinical field experiences (Goal 3 and 4). Teacher candidates will experience the applications of PBL through these projects and examine the learning outcomes for their students (Goals 3 and 4). Previous MLFTC reforms have already developed the structure for these applications of learning by establishing district partnerships and increased teacher candidates' time in Arizona classrooms.

As described previously, all MLFTC teacher candidates have extensive training in field experiences prior to graduation. Teacher candidates take concurrent content and methodology courses which require assignments to be completed in field experiences. By enhancing math and science discipline methods course with ELL practices and PBL assignments, teacher candidates

will be well prepared for classrooms of the 21st century. During senior year residency (SYR), teacher candidates become members of classrooms within the schools with our 20 district partners. Each LEA has a Site Coordinator that serves as the SYR seminar instructor and the supervisor for performance assessments using the TAP and Professionalism Rubrics (see Appendix H). Performance assessments evaluate the teacher candidate on the extent to which they integrate and infuse evidence-based practices for ELLs into content areas, and use data-driven decisions for guiding instructional planning for the class and for individual students.

With the assistance of ELL and PBL coaches and project staff, we will build a coherent and sustained model for meeting the instructional needs of ELLs in general education classrooms rather than separating these students for language learning. Our iterative approach to program development will allow for piloting with a co-teaching approach by the faculty and coaches in a small number of sessions so that the program reforms and enhancement will be thoughtful, well formulated, and ready for formative evaluation and scale up. At the end of the project, we will have prepared 2,000 teachers for Arizona students increasing access to important STEM content and addressing their language and literacy learning needs. Further, in partnership with our graduates, we will extend the reach of the grant's goals by partnering our graduates with nearly 600 mentors at their teaching sites to work together during to induction years through the iTeach ELLs Induction Camp and Professional Development (see Appendix H).

Table 4. *Goal 2: Increase Language and Literacy Skills of ELLs in Content Courses*

Goal 2: Design methods courses in math and science to include materials and instructional strategies that promote development of language (including academic language) and literacy skills.		
Objectives	**When**	**By Whom**
Objective 2.1: Refine SYR with at least two formal observation cycles (pre-conference, observation with video, post-reflection and conference) and monthly walk through for on-the-spot coaching for implementing strategies for ELLs.	Begin January, 2015 Annual Review	SYR Faculty PI & Project Director Data Collectors

Goal 2 (cont.) **Objectives**	**When**	**By Whom**
Objective 2.2: MLFTC faculty establish program pilot in math and science methods courses (1) syllabi enhancement with integration of ELL strategies for language and literacy skill development, and (2) Signature Assignments use of PBL design principles. Iteration 1: Developed	Begin October, 2014 Bi-Annual Review Years 1, 2 Annual Reviews Years 3 – 5	PI & Project Director MLFTC Faculty Faculty Dev. Team Coaches District Partners
Objective 2.3: Implement with fidelity the first iteration of iTeach ELLs in one section of math and science methods courses for each program. Iteration 1: Implemented Impact: 2 courses per program x 4 programs = 8 sections	Begin January, 2015	MLFTC Faculty PI & Project Director Faculty Dev. Team Coaches
Objective 2.4: Course syllabi revised and second iteration developed with fidelity monitored. Course content for ELL practices and Signature Assignments aligned with current evidence and PBL design principles. Iteration 2: Developed	Summer 2015	PI & Project Director MLFTC Faculty Faculty Dev. Team Coaches District Partners Program Graduates
Objective 2.5: MLFTC faculty implements the second iteration of iTeach ELLs with fidelity. Iteration 2: Implemented Impact: 2 courses per program x 4 programs = 8 sections	Begin August, 2015 Bi-Annual Review in Year 2	MLFTC Faculty PI & Project Director Faculty Dev. Team Coaches
Objective 2.6: Course content for ELL practices and evaluation measures of Signature Assignments projects finalized for scale up. Course fidelity measures reviewed and professional development for faculty designed. Signature Assignment examined for consistent scoring across projects. Final Iteration: Refinement	Summer 2016	PI & Project Director MLFTC Faculty Faculty Dev. Team Coaches District Partners Program Graduates
Objective 2.7: Implement final iteration of iTeach ELLs in EED, SPE/EED, BLE, and EC/ECSE programs for all sections. Teacher candidate Signature Assignments examined for consistent scoring across program courses. Scale Up: Program Integration Impact: 2 courses per program, all sections = 32 sections per year	Begin August, 2016 Annual Review	PI & Project Director MLFTC Faculty Faculty Dev. Team Coaches

Goal 2 (cont.) **Objectives**	**When**	**By Whom**
Objective 2.8: Course content for ELL practices and evaluation measures of Signature Assignments finalized for scale up. Course fidelity measures reviewed and professional development for faculty designed. Teacher candidate Signature Assignment communicated with stakeholders and examined for consistent scoring across projects. Scale Up Reviewed	Summer 2017 Annual Review	PI & Project Director MLFTC Faculty Faculty Dev. Team Coaches District Partners
Objective 2.9: iTeach ELLs provides induction supports for graduated teachers and a paired mentor for their first and second year teaching sites through iTeach ELLs Camp (see Appendix H and project design for full description).	Summer 2017 Annually Years 3-5	PI & Project Director Jimenez-Silva Coaches, Consultants Faculty Dev. Team Technology Specialist
Objective 2.10: MLFTC faculty work within programs to scale up across one section for each PreK-8th grade program's math, science, literacy and assessment courses to include (1) syllabi revisions completed with integration of ELL strategies for language and literacy skill development, and (2) Signature Assignments use PBL design principles (see Appendix H for program courses). Scale Up 2: Iteration 1: Developed Impact: 3 additional courses/ program x 4 programs = 12 sections	Begin August 2016 Summer 2017	PI & Project Director MLFTC Faculty Faculty Dev. Team Coaches District Partners
Objective 2.11: MLFTC faculty implement with fidelity Scale Up 2 of iTeach ELLs. Scale Up 2: Iteration 1: Implemented Impact: 3 additional courses/ program x 4 programs = 12 sections	Begin August, 2017 Bi-Annual Review in Year 4	PI & Project Director Faculty Dev. Team Coaches
Objective 2.12: Course syllabi and outcomes reviewed and revised and second iteration of Scale Up 2 developed. Scale Up 2: Iteration 2: Revised	Summer 2018	PI & Project Director MLFTC Faculty Faculty Dev. Team Coaches District Partners Program Graduates
Objective 2.13: MLFTC faculty implement with fidelity Scale Up 2 of iTeach ELLs. Scale Up 2: Iteration 2: Implemented Impact: 3 additional courses/ program x 4 programs = 12 sections	Begin August 2018	PI & Project Director Faculty Dev. Team Coaches

Goal 2 (cont.) **Objectives**	**When**	**By Whom**
Objective 2.14: Course syllabi and outcomes reviewed, revised and a final iteration developed. [Scale Up 2: Final Iteration: Refined]	Summer 2019	PI & Project Director MLFTC Faculty Faculty Dev. Team Coaches District Partners Program Graduates
Objective 2.15: MLFTC faculty implements the Scale Up 2 final iteration of iTeach ELLs in across courses and programs. Scale Up 2: Program Integration Impact: 3 additional courses/ program x 4 programs x all section = 43 sections	Begin August 2019 (Post Grant Funding) Annual Review	PI & Co-PI Faculty Dev. Team Coaches
Objective 2.16: Course syllabi and outcomes will be reviewed and revised and a final iteration developed that will serve as standard practice in the College. [Scale Up Reviewed]	Summer 2017 Annual Review	PI & Project Director MLFTC Faculty Faculty Dev. Team Coaches District Partners Program Graduates

GOAL TWO: Design methods courses in math and science to include materials and instructional strategies that promote development of language (including academic language) and literacy skills (**CPP c)**.

iTeach ELLs Goal 2 focuses on strengthening teacher candidate knowledge and practices for teaching STEM content, specifically math and science to ELLs. Through previous and recent reforms, teacher candidates are now required to earn 15 credits of mathematics and 15 credits of science, in addition to coursework in literacy and social sciences. Now that content knowledge has been strengthened, the next step is to prepare our teacher candidates to make that content accessible to ELLs with diverse abilities and background knowledge. We plan to accomplish this by engaging preservice teachers, through PBL and EBP, to incorporate effective strategies into the design of their lessons and projects, not as an afterthought but as integral and intentional. In other words, teacher candidates will not be adapting lessons for those with diverse learning characteristics; rather, they will be creating lessons, through the principles of universal design for

learning, which allows ELLs with diverse abilities to access content and demonstrate knowledge and competence through multiple means.

Currently, all teacher candidates in Arizona are required to complete two Structured English Immersion (SEI) courses which have to follow Arizona's SEI Frameworks. The courses require less than 1 hour total for learning about language acquisition, with the majority of the time (49 hours) spent on general SEI strategies. The strategies are generally taught outside of content and teacher candidates have expressed that although they feel efficacious about working with ELLs immediately after completing their program (Jimenez-Silva, Olson, Jimenez Hernandez, 2012; Olson & Jimenez-Silva, 2009), once they are out in classrooms trying to apply the strategies learned to content area, they feel much less prepared (Jimenez-Silva & Olson, under review). Through partnerships between iTeach ELLs, coaches, faulty, and district partners, we can remedy our current disconnect between detached strategies and specific content areas.

An iterative approach to course reform and enhancements. The iTeach ELLs coaches will assist faculty, district partners, Barrett Honors College faculty, College of Liberal Arts and Sciences faculty, and teacher candidates in infusing strategies for accessing academic content across math and science courses. They will also assist in creating projects that engage all learners in literacy, language development, and STEM content through the use of scientifically valid practices for all students and specifically for ELLs. Coaches will also facilitate the use of a parallel rubric for key components of the TAP rubric used for the teacher candidate evaluation that are particularly germane to ELLs (see Appendix H for TAP and Professionalism rubrics). In other words, STEM projects will be designed to also increase content language and literacy skills of ELLs with diverse abilities. Faculty from Liberal Arts and Sciences and the Honors College will be included in iterations because some of the courses are "co-owned" by MLFTC and another college. For example, MTE 301 may be taught by math faculty from MLFTC or College of Liberal Arts and Sciences. Likewise, many courses offer honors contracts for students who are in Teachers College majors, but are also members of the Honors College.

We will begin in science and math method courses in the PreK – 8 teacher preparation programs. In Elementary education (EED), Elementary Bilingual Education (BLE), and Special Education/Elementary Education (SPE/EED) Dual, those courses are EED 411 Science Methods in Elementary Education and EED 412 Mathematics Methods in Elementary Education. In Early Childhood/Early Childhood Special Education (ECSE) program, the courses are ECS 412: Mathematics Curriculum, Instruction and Assessment and ECS 411: Instructional Methodologies for Young Children: STEM.

So that the project can effect meaningful and lasting change, we will employ an iterative approach. The course content and evaluation measures of Signature Assignments will be reviewed to ensure alignment with current evidence-based practices for ELLs. Signature Assignments will be examined for consistent scoring across program courses. Course fidelity measures will be reviewed and professional development for faculty designed. Teacher candidates will communicate their learning to stakeholders through a culminating activity hosted by MLFTC. Partner district administrators and teachers, ASU faculty, and community leaders will be invited to attend an event where teacher candidates present their work in poster sessions. This event will serve as a showcase and a networking opportunity to connect graduating candidates with high need school districts looking for highly qualified teachers.

Next, we scale up integration of ELL practices and PBL to math and science content, assessment, and literacy courses. The EED, BLE, and SPE/EED courses are EED 433 Language Method Management and Assessment; MTE 301 Investigating Change, Pattern, Functions, and Modeling; and SCN 400 Sustainability Science for Teachers. EC/ECSE courses are ECS 321 Emerging Language and Literacy; ECS 316 Assessment/ Evidence-Based Practice; and ECS 420 Evaluation and Intervention Strategies for Infants, Toddlers, and Preschoolers with Disabilities.

These classes will intentionally integrate project-based learning and data-based decision making in order to provide the best learning experience for ELLs in content areas. Science and mathematics classrooms that are based on inquiry, projects, and problem solving hold

exceptional promise for supporting English language development and content knowledge acquisition in literacy and STEM areas (Shaw, Lyon, Stoddart, Mosqueda, & Menon, 2014). They also provide a natural context for PBL and the attention to language and literacy development. Content course are rich in academic language (Wright, 2010). For example, scientific inquiry and mathematical problem-solving have myriad opportunities to access expository text and talk that includes questions, explanations, hypothesis generation, debates, clarifications, elaboration, and verification and sharing of results. Certainly the language demands in such classes may be considerable, but the potential is strong for students to learn critical English language skills while also building their STEM and literacy knowledge base (August, Branum-Martin, Hagan, & Francis, 2009; Buxton & Lee, 2014; Crawford, 1995; Y. Freeman & Freeman, 2008; Gómez, Kurz, & Jimenez-Silva, 2011; Jimenez-Silva & Gomez, 2010; Lee, 2004; Quinn, Lee & Valdez, 2013, Rosebery & Warren, 2008).

In order to do this, the programs will have to work closely on professional development for all faculty instructors in order for them to understand how to integrate ELL methods into science and math education courses (see Goal 1). Fully engaging early childhood and elementary students through PBL will further increase their skills in language and literacy. Treating each student as an individual through data and assessment will further break down the barriers for ELLs who are often seen as one uniform group. Teachers having these skills will benefit all students – not only ELLs and build preservice teachers knowledge in language acquisition; integrating literacy, math and science content; and project-based learning.

Table 5. *Goal 3: Project-Based Learning* ***(CPP d)***

GOAL 3: Use project-based learning pedagogy and design principles to establish knowledge and skills that teacher candidates can apply to "real world" classrooms.		
Objectives	**When**	**By Whom**
Objective 3.1: Professional development for faculty and mentors on PBL. PBL models designed for STEM content and language and literacy development for ELLs.	Year 1	PI & Project Director PBL & ELL Coaches MLFTC Faculty Mentor Teachers
Objective 3.2: Integrate PBL into STEM courses. Signature Assignments redesigned to address real-world problems so that teacher candidates can engage in PBL as learners (See sample science PBL lesson in Appendix H).	Years 2 – 5	PI & Project Director MLFTC Faculty Coaches
Objective 3.3: MLFTC faculty and staff will design, pilot and install a Quest to Teach suite of virtual learning modules for using PBL in the classroom.	Begin October, 2014 Bi-Annual Review	ASU Center for Games and Impact PI & Project Director Consultants Faculty Dev. Team District Partners
Objective 3.4: Teacher candidates implement PBL in SYR projects which include a unit plan, instruction, data collection, analysis, and recommendations.	SYR Year 4 – 5	Coaches Site Coordinators Mentor Teachers
Objective 3.5***:*** MLFTC faculty and iTeach ELLs partner districts create, scale, and continuously refine virtual professional development technologies using the PLL platform.	Begin January, 2015 Bi-Annual Review	Ed. Tech. Specialist Tech. Specialist Consultants District Partners

GOAL THREE: Use project-based learning pedagogy and design principles to establish knowledge and skills that teacher candidates can apply to "real world" classrooms **(CPP d).**

The first feature of PBL is the driving question. The development of a driving question (Krajcik & Blumenfeld, 2006) serves to produce a context for students to learn about scientific phenomena. The development of the driving question also serves to anchor students learning within a context relevant to their daily lives. For example, the driving question and title for the sixth grade *Investigating and Questioning our World through Science and Technology* (IQWST)

chemistry unit (Krajcik et al., 2012) is *How can I smell things from a distance?* (see Appendix H for a sample lesson).

The second feature of PBL is the active construction of knowledge. The creation of an anchoring activity provides a great context for exploration throughout a unit that can be revisited so students can apply both their real-world experiences and what they have learned from their answers of the driving question (Krajcik & Blumenfeld, 2006). The anchoring activity of the sixth grade IQWST chemistry unit has students smell different objectives and then create models (student models are defined as their drawing plus explanation) to explain why they think they can smell an object from a distance. Students' collaborate to develop their models, which are revisited throughout the curriculum so that students can apply both their real-world experiences and what they have learned to their answering of the driving question, which also provides them the opportunity to learn the practices of a domain.

The third feature of PBL is collaboration. Collaboration provides the opportunity for students, teachers, and members of society to work together to investigate questions and ideas. In this case, members of society are those who have expertise around a particular area of exploration. Through collaboration, students develop shared understanding of the content and practices of a discipline while engaging in discourse amongst themselves and members of society (Krajcik & Blumenfeld, 2006). For example, in Lesson 2 (see Appendix H), a purpose is given for each discussion, with suggested prompts to aid in discussion.

The fourth feature of PBL is learning technologies. Learning technologies provide additional opportunities for students to actively construct their knowledge (Krajcik & Blumenfeld, 2006). For example, in the sixth grade IQWST chemistry unit, students need to understand the relationship between temperature and movement of particles – a process that cannot be seen with the naked eye. Thus, students view simulations of particle movement to understand how molecules move in relationship to temperature.

The final feature of PBL is the creation of artifacts. Artifacts allow students to construct and reconstruct their knowledge in support of answering the driving question (Blumenfeld et al., 1991; Krajcik & Blumenfeld, 2006). They also provide the opportunity for teachers to examine student learning over time. Moreover, artifacts allow students to share their knowledge with peers, teachers, parents and other community members. For example, Lesson 2, Activity Sheet 2.1 (see Appendix H) provides students' opportunities to collect and observe data, make predictions and write conclusions based on their evidence.

By engaging teacher candidates in PBL, they gain knowledge and skills for supporting student learning. By engaging teacher candidates in the development of driving questions, they can learn how to situate learning in meaningful contexts for all students. Quest to Teach modules utilize PBL theory in their construction and implementation. We will create modules that introduce PBL to faculty, teacher candidates and district partners. The games will be developed and refined so that they are one of a menu of tools that teacher candidates can access during the preservice experiences and through induction.

Teacher candidates can learn the skills necessary for engaging students in collaboration as well as developing discourse communities in their classroom. Through PBL, teacher candidates can learn how to integrate and use learning technologies to enhance student learning within lessons. Finally, teacher candidates can learn how to use student artifacts as a gauge of student learning, as a tool for developing discourse as well as practices of a domain and how to provide feedback to students on their learning. All of these ideas, questions, and artifacts can be packaged into modules for use by others through the Professional Learning Library, an electronic tool available to all teacher candidates in the program (automatic) and district partners through registered accounts (requested).

Table 6. *Goal 4: Evidence-Based Practice and Data-Driven Decisions*

GOAL 4: Integrate an understanding of evidence-based practice and scientifically-validated research related to the teaching and learning of ELL students, including evidence-based assessment and data-driven decision-making within project-based learning to improve differentiated instruction.		
Objectives	**When**	**By Whom**
Objective 4.1: Professional development for faculty integrating evidence-based practices for ELLs in course reforms.	Year 1	PI & Project Director ELL Coaches MLFTC Faculty
Objective 4.2: Design and install three of four Quest to Teach iTeach ELLs virtual learning modules including (1) Teacher candidates teaching students who are ELLs; (2) Integrating science, literacy, and language for ELLs; and (3) Integrating math, literacy, and language for ELLs.	Begin October, 2014 Bi-Annual Review	ASU Center for Games and Impact PI & Project Director Consultants Faculty Dev. Team District Partners
Objective 4.3: Integrate evidence-based practices for ELLs into STEM courses (Years 1 – 5), literacy, and assessment courses (Years 3 – 5 scale up).	Years 1-5	Faculty ELL & PBL Coaches PI & Project Director
Objective 4.4: Teacher candidates integrate evidence-based practices for ELLs into SYR projects using PBL for instruction and assessment.	Years 3 - 5	ELL Coaches Site Coordinators PI & Project Director
Objective 4.5: Teacher candidates demonstrate proficiency in data-driven decision through field experiences that include taking data and analyzing the effectiveness of evidence-based practices for ELLs.	Years 2 - 5	Field Experience Instructors PI & Project Director
Objective 4.6: Teacher candidates use data-driven decision-making to improve instruction in SYR projects for all assigned PreK – 8 students.	Years 3 - 5	Site Coordinators Mentor Teachers

GOAL FOUR: Integrate an understanding of evidence-based practice and scientifically-validated research related to the teaching and learning of ELL students, including evidence-based assessment and data-driven decision-making within project-based learning to improve differentiated instruction (**CPP e)**.

Teacher candidates at ASU already have a foundation in using evidence-based practices for teaching and learning within the context of field experiences; however, the application of such practices to ELLs is needed. Currently, strategies for ELLs are housed in two courses, BLE

220 Structured English Immersion, and a second course in SEI that varies by program (BLE 408 for EED or SPE 317 for SPE/EED and EC/ECSE). This practice is insufficient for meeting the language needs of ELLs across the curriculum. Therefore, we will infuse evidence-based practices into courses and field experiences for all our teacher candidates so that these practices are part of the planning of lessons rather than modifications after the fact.

The Center for Gaming and Impact at ASU will develop modules that will facilitate teacher candidate learning in the context of a game that teaches the benefits and consequences of effective vs. poor teaching strategies for ELLs. With the assistance of coaches and consultants for content, the center will develop three modules for Goal 4. The first module will focus on general strategies for teaching students who are ELLs. The second module will allow teacher candidates to explore options for integrating science, literacy, and language for ELLs, while the third module with teach and reinforce integrating math, literacy, and language for ELLs. These modules will provide teacher candidates and district partners the opportunity to make data-driven decisions within the context of a game. The modules will allow participants to make decisions within the game that have natural consequences.

To facilitate the use of evidence-based practice and scientifically-validated research, teacher candidates will show mastery of these strategies through Signature Assignments in methods courses and field experiences. Furthermore, these practices will be evaluated in performance assessments during the senior-year residency. Because each teacher candidate spends a full year in a residency model, s/he has ample opportunity to gather data by which s/he can make data-driven decisions. These decisions will be evaluated for efficacy with all students, including ELLs. Teacher candidates will assess their own students and plan for differentiation based on the data they collect and analyze. This will establish a firm foundation in which preservice teachers graduate to become practicing teachers with the skills, knowledge and dispositions to positively impact the learning outcomes for ELLs in their classrooms. Through their experiences with collaborative work on real-world problems, using PBL, enhanced clinical

experiences, use of evidence-based practices, and data-driven instructional decisions, MLFTC iTeach ELLs graduates will be prepared to teach a new generation of PreK-8 students with confidence and efficacy.

The Extent to Which the Services Provided in the Project Involve Collaboration of Appropriate Partners

The proposed services provided by iTeach ELLs capitalize on our strong, existing relationships with district partners in Arizona (**CPP f)**. These district teachers, mentors, and administrators will be invited, and compensated, for their partnership in building capacity for using evidence-based strategies for ELLs, creating and revising courses to apply project-based learning, and working alongside our teacher candidates to provide high-quality educational experiences for PreK – 8 students during the grant period and beyond. Our district partners are fully invested in the iTeachAZ model for preparing future teachers. Our teacher candidates spend a year in the host district co-teaching alongside an experienced teacher.

Nationwide, practicing teachers have stated that they lack resources that help them make content accessible for ELLs (Jimenez-Silva, Hinde, & Jimenez Hernandez, 2013). As part of iTeach ELLs' efforts to support teacher candidates as well as teachers working with ELLs in our district partners, ASU's Professional Learning Library (PLL) will be used to house a number of resources and serve as a platform to exchange data and ideas between ASU and our district partners. ASU faculty, district partners, and teacher candidates can upload and download lesson ideas, recent articles, and reflections on PBL, strategies and practices for meeting ELLs' needs across STEM and which develop language and literacy skills. The PLL will also house a Community in which teachers can share ideas of what works for them or what they are struggling with in the classroom and interact with other teachers across the state or around the country. As PBL, STEM for ELLs, and other modules and lessons are developed within this project, they will be posted on the PLL and serve as a repository that can aid later reiterations of projects beyond

the duration of the grant.

A survey by the National Center for Education Information documented that 87.5% of the teaching force has little or no training in teaching linguistically diverse students (NCELA Newsline Bulletin, 2005). We also know that in order for professional development to make a difference, it needs to be continuous, job-embedded, data driven, and targeted to the specific needs of students and staff (Fullen, 1991; Reitzug, 2002; Sparks, 2002). In order to meet the need of continued support of recent graduates during induction and teachers' professional development in our partner districts, iTeach ELLs will begin offering Induction STEM Camp and Professional Development (PD) over the summer beginning in 2017 (**CPP g)**. This five day event will require recent graduates to attend with a partner teacher from their school site and engage in field experiences that bring STEM and PBL to life in academic and commercial settings. They will also engage with ASU faculty and community entities (e.g. Phoenix Zoo, Salt River Project) who will help them develop STEM content knowledge, develop PBL activities, and learn specific strategies that will help make STEM content accessible to ELLs (e.g. mural method, 10 Important Sentences; see Appendix H for sample agenda). The STEM Camp and PD will provide networking opportunities to share resources and ideas with other educators. Teachers will develop lessons and modules that teach STEM and Arizona College and Career Ready ELA and Arizona Early Learning standards with ELL strategies. These resources will be added to the PLL for others to access. ELL and PBL coaches will provide on-site supports four times per year during induction supporting PLL and practices. We will also ask participating teachers share what they have learned with teachers back at their school sites or at the district level, thus creating a local culture of collaboration around meeting the needs of ELLs in our schools.

The Extent to which the applicant demonstrates that it has the resources to operate the project beyond the length of the grant, including a multi-year financial and operating model and

accompanying plan.

MLFTC provides access to the PLL, an online venue that allows pre-service and in-service educators to connect, collaborate, share, and learn. A search engine makes the content easy to find, with secure communities for members to participate in inter- and intra-institution collaboration. This platform will house a number of resources and opportunities for collaboration that will be available and further developed beyond the length of the grant. As a key player in educational reform, ASU is committed to transforming teacher preparation with the PLL providing additional support for graduates and practicing teachers. See Adequacy of Resources below for a multi-year financial and operating model and accompanying plan.

QUALITY OF THE MANAGEMENT PLAN

The Adequacy of the Management Plan to Achieve the Objectives of the Proposed Project on Time and Within Budget, Including Clearly Defined Responsibilities, Timelines, and Milestones for Accomplishing Project Tasks

ASU as a research extensive, very high research activity institution, has substantial resources that will be available for use by project investigators and staff, including access to our extensive digital library, state of the art technology and technology support, and office space for all project staff. MLFTC offers world class academic programs that blend nationally-ranked research with outstanding teacher preparation. As one of the largest, most influential colleges of education in the nation, our Teachers College is dedicated to preparing the next generation of education leaders and bringing Arizona's schools and children to the forefront of academic achievement. Challenging programs are provided to prepare successful and highly qualified elementary, middle, and high school teachers, as well as programs for those interested in advanced study and research activities leading to careers in school leadership, education policy, education technology, higher and post-secondary education, and many other fields. ASU offers

resources to ensure student success such as the Disability Resource Center, The Writing Resource Center, and The Technology Lounge.

MLFTC benefits from a legacy of excellence in scholarship and research. For the 13th consecutive year, ASU's graduate education programs are ranked among the best by U.S. News & World Report. In fact, the Elementary Education and Special Education dual program earned a ranking of number 1 this year. ASU's Mary Lou Fulton Teachers College continues to build on this legacy by focusing on scholarship that positively impacts local, national and global communities, and influences all levels of education. As a key player in educational reform, ASU is committed to transforming teacher preparation and contributing to the educational knowledge base. MLFTC works collaboratively with the College of Liberal Arts and Sciences by co-developing and teaching the math (MTE) and science (SCI) courses, increasing the content rigor for teacher candidates. Our graduates represent a diverse population, specifically 34% of teacher candidates are of Hispanic or Latino ethnicity (U. S. Department of Education, 2013; **CPP g**). They achieve success. For example in 2012, early childhood and elementary programs pass rates ranged from 91- 97% on state certification exams with scores exceeding the state average and 87% of our undergraduates pursuing jobs were employed 90 days after graduation (MLFTC Annual Report, 2013; U.S. Department of Education, 2013). Teacher College teacher candidates exceed the entry GPA of 2.5 with the median GPA of 3.1 and they graduate with a median GPA of 3.62 (U.S. Department of Education, 2013). We appreciate the opportunity to collaborate and work within the local communities, and are committed to making a difference through excellence in partnerships, programs, and preparation.

MLFTC employs a staff that provides administrative support through each stage of grant management, from proposal through activity and close out. ASU's Office of Knowledge Enterprise Development (OKED) provides additional support to researchers and staff regarding policies and procedures for research activities. MLFTC and ASU provide adequate space for

project personnel and basic office needs, as well as space and equipment for storage of related project materials.

Resources available from this team include research management and expertise in intervention research design, knowledge of curriculum development and key analytics, knowledge of retention, persistence and success challenges nationally and at ASU, and experience with adaptive learning technologies and analytics. Other resources available through ASU include CREST: College Research and Evaluation Services Team with the infrastructure to collect and manage project data, online virtual learning platforms, and technological infrastructure for the Professional Learning Library as well as capacity to expand that infrastructure as required for this project.

ASU has an active recruitment department. A team of nine recruiters work with high schools and community colleges across Maricopa County, the Greater Phoenix area, the state of Arizona, and out of state to recruit the highest quality candidates to MLFTC as incoming freshman and transfer students. Recruiters are active participants in the Future Educators of Arizona and National Future Educators Association. Several events are hosted at ASU including hundreds at the ASU Undergraduate Admissions Events, and interactive conferences such as Becoming a Teacher 101 and the Hunnicutt Future Educators Academy. To recruit top candidates, this project will work with the recruitment teams representing MLFTC. Specifically, we will work with recruiters and follow the ASU Affirmative Action guidelines. Our goal is to continue to recruit high quality teacher candidates from diverse backgrounds.

Using existing resources, including the project PIs, project director, and staff, we have the experience and capacity to manage the activities and products of the grant in a timely manner and within budget (see Table 3, Budget Justification, and Appendix H Commitment Charts). Principal Investigator Harris will commit 50 percent of her time and effort to managing the activities of the grant including reporting on progress. As Assistant Director of Teacher Preparation, she has extensive experience organizing ASU MLFTC faculty groups around goal-

oriented projects. Co-PI Oakes will use her expertise in managing previous grants, at Vanderbilt University and ASU, to guide the team in timely use of grant resources for goal attainment. The investigator team is comprised of faculty members that specialize in one of the areas critical to making content accessible to ELLs. Dr. Jimenez-Silva will work with faculty and grant staff to infuse evidence-based practices for ELLs. Dr. Merritt will guide the activities and projects in science content, while Dr. Kurz will oversee the math content area. The PI and investigators, along with the Project Director Grijalva, will work collaboratively to meet project milestones detailed in Tables 3 – 6.

The Qualifications, Including Training and Experience, of Key Project Personnel

Pamela J. Harris, Ph.D., PI (50 % AY; 2 months summer; Years 1-5) is the Assistant Director of Teacher Preparation at MLFTC. In this role, she oversees undergraduate programs in early childhood, elementary education, secondary education, and special education. She is also the Program Coordinator for MLFTC students in Barrett, the Honors College. In this role she teaches honors courses, matches students with faculty mentors for research, and serves on multiple committees focusing on undergraduate research. She has taught university courses in special education and elementary social studies method and designed courses for the ECSE program and online programs. Prior to teaching at the university level, she was a psychometrist in public schools (grades PreK – 12) for 6 years, and taught for 10 years in special education (grades PreK – 6). As a researcher, she served as a site coordinator for a multistate project that focused on assessing academic needs and services for incarcerated youth and projects that focus on effective reading instruction for students at-risk for EBD in the early grades. She has published peer-reviewed articles and has published articles with Dr. Oakes related to three-tiered models of support. She is on the editorial board for *Remedial and Special Education and a regular reviewer for Education and Treatment of Children and Behavioral Disorders* (see **Budget Justification** for the responsibilities of all project staff).

Wendy Peia Oakes, Ph.D., Co-PI (20% AY; 2 months summer; Years 1-5) is an Assistant Professor in Early Childhood Special Education at ASU. She currently teaches ECS 430 Systems, Policy, and Advocacy in Early Childhood Special Education and ECS 315 Classroom Organization and the Guidance of Young Children and is piloting an honors course, Undergraduate Projects and Research in Education, in Fall of 2014. Prior to her appointment at ASU, Dr. Oakes was a Research Associate at Vanderbilt University in the Department of Special Education in Peabody College where she served as the project director for a large-scale, technical assistance and research project supporting 17 school districts in the design, implementation, and evaluation of comprehensive, integrated three-tiered models of prevention (integrating Response to Intervention and Positive Behavioral Interventions and Supports). She also served as project director in the last two years of an IES funded Goal 2 grant, Project WRITE, including day to day management, monitoring of completion of project goals, dissemination activities, and closing out procedures. Dr. Oakes taught in public schools for 13 years as a special educator. Currently, Dr. Oakes is the PI (with Dr. Jimenez-Silva) of an OSEP funded personnel preparation grant, now entering funding year two. Dr. Oakes has published 30 articles, 10 chapters, and a book. Dr. Oakes serves as an Associate Editor for *Remedial and Special Education* and as an executive board member of the Council for Exceptional Children – Division for Research and the Council for Children with Behavior Disorders.

Margarita Jimenez-Silva, Ed.D., Investigator (20% AY; 2 months summer; Years 1-5) is an Associate Professor in Teacher Preparation at ASU. She is currently serving as the Bilingual and English as a second language Program Coordinator. Dr. Jimenez-Silva teaches courses that prepare early childhood special education teachers, general elementary school teachers, and preservice elementary teachers seeking a BLE/ESL endorsement. She currently teaches BLE 220 Foundations of Structured English Immersion and SPE 317 Special Education for Culturally and Linguistically Diverse Children and Youth. In 2013, she earned the MLFTC Integrating Scholarship with Teaching Award. She has over 40 publications and has developed various on-

line curricula for teachers working with English language learners. She also has presented at numerous national conferences and focuses on helping teachers support ELL in their classrooms. Her most recent teaching experience prior to university teaching was as a Math and Science middle school teacher in a newcomer program servicing recent Spanish-speaking immigrant students in Oakland, CA.

Joi Merritt, Ph.D., Investigator (20% AY; 2 months summer; Years 1-5) is an Assistant Professor at MLFTC. Dr. Merritt currently teaches sections of the pre-service elementary science method course, EED 411. One of her foci has been to help pre-service teachers to use and develop formative assessments to provide richer information about students' conceptual understanding of science content as well as to inform their practice. In addition, she is utilizing her engineering background to infuse engineering into the science method course in collaboration with a colleague in the Ira A. Fulton Schools of Engineering. Prior to her appointment at ASU, Dr. Merritt has worked on several curriculum development research projects, as a postdoctoral scholar at Michigan State University in East Lansing, MI and as a graduate research assistant at the University of Michigan in Ann Arbor, MI. She has several publications from these projects and has developed project based science curricula for elementary and middle grades. She is a former high school chemistry and physics teacher in Charlotte, NC. Prior to teaching, she designed, developed and tested graphic user interfaces (GUI) for energy companies in the United States and Canada.

Terri L. Kurz, Ph.D., Investigator (20% AY; 2 months summer; Years 1-5) is an associate professor of mathematics education at ASU. Dr. Kurz's primary area of expertise is mathematics education with a specific emphasis on tools—broadly defined to include manipulatives and technology in various forms. Research activities highlight students' changes in thinking in relation to tool use and how these tools can help students discover concepts and develop ideas on a deeper level by enhancing learning above and beyond traditional teaching methods. She currently is co-editor (with Jorge Garcia) of iSTEM: Integrating Science, Technology, and

Engineering into the Mathematics Classroom department in *Teaching Children Mathematics*. In addition, she has written several articles examining how ELLs make sense of mathematical word problems and she has examined the effective uses of Bloom's taxonomy with ELLs in mathematics courses. Prior to teaching at ASU, Dr. Kurz taught middle school mathematics at a Title I school in the William S. Hart Union High School District and has first-hand experience working with ELLs. She currently teaches mathematics content courses to preservice teachers.

Other key personnel include **Project Manager, Giovanna Grijalva** who will devote 1.0 FTE to her role. Dr. Grijalva has over 16 years of experience in coordinating, teaching, and facilitating school partnerships. She is currently serving as an English Language Acquisition Director in an urban Phoenix K-8 school district. As director, she is utilizing research-based practices and conducting professional development to support the district leadership team and assisting teachers to implement effective strategies in the classroom. She previously held a faculty appointment at ASU, as a Lecturer in the MLFTC, where she taught ESL Methods and SEI to pre-service teachers. Dr. Grijalva's research focused on policies affecting English language learners and implementation of language policy. As a Senior Curriculum Developer and Researcher for Pearson Education, she developed a profound understanding of how to effectively integrate rigorous curriculum, guide, and prepare teachers for a technology-rich teaching and learning environment. She conducted research using various methods such as online tutorials, product orientation, fused online, onsite presentations, webinars, and self-paced courses. Based on her findings, Dr. Grijalva created innovative PD and product orientation materials. Her most recent publication, focused on school principals' concerns on the complex case of the English-only movement and educational language policy in Arizona.

Alicia DiDonato, Data Manager, will devote 1.0 FTE to the project and oversee data collection and analysis for the project. She works with the CREST team at ASU to collect and manage data for all large projects in Mary Lou Fulton Teachers College. Her current research includes positive emotion; social and emotional well-being in early childhood; parent and teacher roles in

emotion socialization; adjustment to school and early education; problem-oriented and intervention research.

Heidi Blair, Ph.D., Educational Technology and Instructional Design Specialist, will devote 0.10 FTE to the project and lead the development of the Professional Learning Library (PLL) structures for supporting teacher candidates with the design, implementation, and evaluation of Projects; modules on utilizing and generating research; mentor teacher modules for supporting teacher candidates in project-based learning, and induction modules. Dr. Blair is the Director of Educational Technology for the MLFTC. She served as the Director of Technology for the ASU NEXT Teacher Quality Partnership Grant. In that role she directed the design, development and implementation of the PLL. In her current role, Dr. Blair continues to lead the evolution of the PLL in the Teachers College. To this effort she brings 24 years' experience as an educator. In her career Dr. Blair has taught kindergarten through graduate level students, served as Digital Media Coordinator for a large school district, worked in the educational technology private sector and served as a university faculty member. She earned her Ph.D. in Educational Technology and Masters of Learning and Instructional Technology from Arizona State University.

Melissa McGehee, MAS, Technology Specialist, will devote 0.10 FTE to the project. Ms. McGehee will create and maintain online learning modules (the Professional Learning Library, PLL) for iTeach ELLs to support the integration and infusion of ELL practices and project-based learning (PBL) into STEM courses, field experiences, and iTeach ELLs induction and professional development activities. She has served as Senior Program Coordinator in MLFTC within Information Technology Integration Services. She also brings experiences as a middle school lead teacher in the Phoenix area.

Ester de Jong, Ed.D, will serve as the **ELL Project Consultant** and inform professional development for coaches, faculty, and induction activities. Dr. de Jong is a Professor in English Speakers of Other Languages (ESOL)/Bilingual Education in the School of Teaching and Learning in the College of Education at the University of Florida. She teaches courses in

bilingual and bicultural education and in curriculum, methods, and assessment for English speakers of other languages. Her research includes two-way bilingual education and other integrated models for language minority schooling, educational language policy, and teacher preparation for bilingual students. She has published extensively in the field of teacher preparation and was the 2013 recipient of the Award for Excellent in Research on Bilingual Education from the Association of Two-Way and Dual-Language Education.

Joseph Krajcik, Ph.D., will serve as the **Project-Based Learning Consultant** and will inform professional development for coaches, faculty, and induction activities. Dr. Krajcik is director of the CREATE for STEM Institute and a faculty member in science education at Michigan State University. Dr. Krajcik is a former high school chemistry and physical science teacher. During his career in higher education, he has focused on working with science teachers to reform science teaching practices to promote students' engagement in and learning of science. He currently heads of the Physical Science Design Team developing the Next Generation Science Standards. Dr. Krajcik is currently a co-editor of the *Journal of Research in Science Teaching*. He has authored and co-authored curriculum materials, books, software and over 100 manuscripts, and makes frequent presentations at international, national and regional conferences. He is a fellow of the American Association for the Advancement of Science and has served as president of the National Association for Research in Science Teaching (NARST), from which he received the Distinguished Contributions to Science Education through Research Award in 2010.

Dr. Edward Crowe, **Ph.D.,** will serve as the **Independent Evaluator** for this project. He will provide consultation on measures in the first year of the grant and will oversee all formative and summative evaluations. Dr. Ed Crowe is a consultant on teacher quality and K-16 policy issues for several organizations. He currently works as a consultant to the Academy for Educational Development and the Carnegie Corporation of New York on the *Teachers for a New Era* Program. He also is Senior Consultant on Higher Education Initiatives for the National Commission on Teaching and America's Future, where he works on teacher preparation projects,

research on the cost of teacher turnover, and efforts to improve how the United States identifies and develops high achieving students for careers in science, mathematics, engineering and technology (STEM) disciplines. Dr. Crowe's background and policy experience include higher education information systems, K-16 policy initiatives, academic, finance and strategic planning issues in higher education, and teacher quality reform. He is a graduate of Boston College and holds masters and doctoral degrees in political science from UNC-Chapel Hill.

Other key personnel will be hired for the project including a **Data Collection and Support Specialist**, budgeted at 2.0 FTE, and **PBL and ELL Coaches** budgeted at 8.0 FTE. Faculty who will participate in curriculum development will vary and they will be offered supplemental pay or summer salary to give them time for curriculum development and revision.

<u>The extent to which performance feedback and continuous improvement are integral to the design of the proposed project.</u>

We will be utilizing an iterative process that will assess goals, objectives and outcomes in a systematic way. Both short-term and long-term outcomes will be assessed on a regular, predetermined schedule (see Table 2 & 3). Data will be collected by faculty, program staff, and district partners in terms of quality, quantity, and social validity (see Table 3). Feedback from participants and staff are integral to the development and implementation of the proposed project. The project evaluation is based on an iterative process that systematically assesses goals, objectives, and outcomes. Expected project outcomes (and new findings) will be used on an ongoing basis to measure progress and determine strategies for improvement. The external evaluator in conjunction with the PIs and project director will develop a formative feedback evaluation/timeline for project goals and outcomes. For replication and sustainability, an annual summative and a final grant evaluation report will also be developed.

QUALITY OF PROJECT EVALUATION

The Extent to Which the Methods of Evaluation Provide Reliable and Valid Performance Data on Relevant Outcomes

iTeach ELLs will employ a rigorous evaluation design in order to best demonstrate the impact of the reforms on both MLFTC students and their PreK-8 grade students. To ensure a rigorous evaluation, evaluators will collect data on an ongoing basis, thus allowing for formative evaluation, to inform continuous program improvement and ensure fidelity to the proposed program model. iTeach ELLs has a robust evaluation system for each of the goals, objectives, and required performance measures. Each component of the project will be evaluated annually to determine adequacy of progress and to provide feedback to our faculty, project staff, district partners and teacher candidates. Progress data on each goal will be overseen by the project director, collected and analyzed by the project evaluator, and reported by the project director and PI. Tables 7-10 specify the means by which we will evaluate the objectives and outcomes of iTeach ELLs.

Table 7. *Evaluation of Goal 1*

Goal 1: The MLFTC will implement reforms in the PreK-8 certificate teacher preparation programs so graduates will be measurably more successful in understanding and implementing strategies for teaching ELL students in math and science content areas.	
Objectives	**Measures**
Objective 1.1: Faculty program enhancement teams	(1) PLC agendas for assessment of topics covered (2) Fidelity rubric of PLC practices (3) Measure of Self-efficacy (4) Faculty focus groups (5) Fidelity of Course and assignment enhancements (review of syllabi) (6) Rubric score of progression of program revisions and enhancements (Major Mapping)
Objective 1.2: LEA partnership	(1) Current IGAs and SPA (2) Current Institutional Review Board Protocols

Objective 1.3: Course and assignment revisions math and science.	(1) All course and Signature Assignment outcome data (2) Course Revision Checklist (3) PLL feedback and evaluation surveys
Objective 1.4: SYR project implementation	(1) Site Coordinator Evaluation (2) Project Mentor Evaluation (3) Completion of SYR Projects (rubric scored at poster session by two trained raters) (4) Monitor TAP certification of all site coordinators
Objective 1.5: Mentor teacher professional development	(1) Percentage of partner LEAs, School sites, and Mentor teachers participating. (2) Fidelity of professional development checklist for key elements to meet goal.
Objective 1.6: Stakeholders review measures and revise accordingly	(1) All Course and Signature assignment outcome data (2) Course Revision Checklist (3) PLL feedback and evaluation surveys (4) Quest feedback and evaluation surveys

GPRA Performance Measure 1 Graduation (for Goal 1)

As evidenced by annual review of student retention and graduation data, teacher candidates will attain the following outcomes:

1. At least 90% of entering iTeach ELLs teacher candidates will persist to graduation, earn state certification, and accept teaching position within 6 six year of beginning the program.

2. At least 90% of entering iTeach ELLs early childhood program teacher candidates will complete the program in early childhood and early childhood special education receiving bachelor's degree, a state teaching certification attaining highly competent early child educator status.

3. iTeach ELLs will produce 2,000 highly effective teachers from the reformed teacher education programs before the end of the grant period.

GPRA Performance Measure 2 Employment Retention (for Goal 1)

As evidence by annual review of graduate exit surveys, district hiring patterns, and retention survey data:

1. At least 90% of iTeach ELLs program graduates will be hired by partner districts and other school districts.

2. At least 88% of iTeach ELLs program graduates will persist in in teaching and be retained for three years from hire.

Table 8. *Evaluation Goal 2*

Goal 2: Design methods courses in math and science to include materials and instructional strategies that promote development of language (including academic language) and literacy skills.	
Objectives	**Measures**
Objective 2.1: Monitor teacher candidate progress	(1) TAP Rubric (2) Professionalism Rubric (3) Walk through data sheets (4) Mentor teacher evaluations (5) PBL fidelity measure
Objective 2.2 – 2.8 Developed, pilot, and scale up for math and science methods	(1) iTeach ELLs scoring rubric review of course syllabi (2) iTeach ELLs scoring rubric review of Signature Assignments projects using project-based learning principles (3) iTeach ELLs fidelity observation and coaching tool (4) Fidelity measure for signature assignments design implementation (5) Teacher candidate and faculty feedback survey (social validity of content and projects)
Objective 2.9: Induction camp for graduates and mentor teachers	(1) Fidelity of induction activities – checklist of completion (2) Participant evaluations and attendance (3) Implementation of projects and teaching practices (surveys) (4) Completion of deliverables – project based learning lessons in math and science with ELL practices – posted on the PLL (5) TAP Rubric sore for math and science lessons and Professionalism rubric (With adapted criteria for ELL practices) (6) Student outcomes on standardized achievement tests of math, science, and literacy outcomes (developmental assessments for EC)
Objective 2.10 – 2.16 Developed, pilot, and scale up for math, science, literacy and assessment courses	(1) iTeach ELLs scoring rubric review of course syllabi (2) iTeach ELLs scoring rubric review of Signature Assignments projects using PBL principles (3) iTeach ELLs fidelity observation and coaching tool (4) Fidelity measure for signature assignments design implementation (5) Teacher candidate and faculty feedback survey (social validity of content and projects)
GPRA Performance Measure 3 Improved Scores (for Goal 2)	

As evidenced by an annual review of TAP and professionalism rubric data, teacher candidates will attain the following outcomes: 1. At least 90% of iTeach ELLs teacher candidates will meet or exceed the standard of excellence during student teaching. 2. iTeach ELLs graduates attending the induction camp will be rated higher than their peers on an annual principal survey based on TAP and professional rubric indicators of preparedness and effectiveness to teacher students who are ELLs (e. g., designing instruction to meet the needs of diverse learners, and use of data to make instructional decisions).

Table 8: Goal 2 evaluation cont'd

GPRA Performance Measures 4 Student Learning (for Goal 2)
As evidenced by an annual review of Arizona Instrument to Measures Standards (AIMS), Arizona English Language Learner Assessment (AZELLA) and developmental measures of early numeracy and literacy for pre-K: 1. iTeach ELLs teacher candidates' and mentor teachers' students will demonstrate basic proficiency in reading, math, and science at levels equivalent to their peers who are not ELL. 2. iTeach ELLs graduates' ELL students will demonstrate basic proficiency in reading, math, and science at levels equivalent to their peers who are not ELL.

Table 9. *Evaluation Goal 3*

GOAL 3: Use project-based learning pedagogy and design principles to establish knowledge and skills that teacher candidates can apply to "real world" classrooms.	
Objectives	**Measures**
Objective 3.1: Faculty professional development for PBL	(1) Percentage of partner LEAs, School sites, and Mentor teachers participating. (2) Fidelity of professional development checklist for key elements to meet goal
Objective 3.2: Revise assignments with PBL	(1) iTeach ELLs scoring rubric review of course syllabi (2) iTeach ELLs scoring rubric review of Signature Assignments Projects using PBL principles
Objective 3.3: Design, pilot and install a Quest to Teach	(1) Evaluation surveys (2) Embedded Quest assessment of PBL in math/science content
Objective 3.4: Teacher candidates implement PBL projects	(1) Performance assessment (2) TAP and Professionalism rubric (3) Teacher candidate social validity survey

Objective 3.5***:*** Professional Learning Library	(1) Fidelity measure of PLL content (2) Social validity survey for refinements
GPRA Performance Measure	
Goal three's GPRA performances measures are in in goals subsumed in the other goals.	

Table 10. *Evaluation Goal 4*

GOAL 4: Integrate an understanding of evidence-based practice and scientifically-validated research related to the teaching and learning of ELL students, including evidence-based assessment and data-driven decision-making within project-based learning to improve differentiated instruction.	
Objectives	**Measures**
Objective 4.1: Faculty professional development	(2) Fidelity rubric for program enhancement teams (3) Measure of self-efficacy (4) Faculty focus groups (5) Fidelity of course and assignment enhancements (review of syllabi) (6) Rubric score of progression of program revisions and enhancements (Major Mapping)
Objective 4.2: *Quest to Teach* modules	(1) Evaluation surveys (2) Embedded Quest assessment of ELL strategies in math/science content
Objective 4.3, 4.4 Evidence-based practices	(1) All course and signature assignment outcome data (2) Course Revision Checklist (3) Performance assessment (4) TAP and Professionalism rubric (5) Teacher candidate social validity survey
Objective 4.5, 4.6: Data-driven decision making	(1) Performance assessment (2) TAP and Professionalism rubric (3) Teacher candidate social validity survey
GPRA Performance Measures 2 Student Learning	
As evidenced by an annual review of teacher candidate, mentor teachers, and graduate scores on efficacy scales: 1. At least 90% of iTeach ELLs teacher candidates will meet or exceed the standard of excellence during student teaching. 2. iTeach ELLs graduates attending the induction camp will be rated higher than their peers on an annual principal survey based on TAP and professional rubric indicators of preparedness and effectiveness to teacher students who are ELLs (e. g., designing instruction to meet the needs of diverse learners, and use of data to make instructional decisions).	

<u>The Extent to Which the Methods of Evaluation are Thorough, Feasible, and Appropriate to the Goals, Objectives, and Outcomes of the Proposed Project</u>

<u>iTeach ELLs</u> is a comprehensive program for training all preservice teachers PreK-8 to increase the outcomes of ELLs. The methods for evaluation are thorough, feasible and

appropriate. We will be utilizing an iterative process that will assess goals, objectives and outcomes in a systematic way. Both short-term and long-term outcomes will be assessed on a regular, predetermined schedule (see Tables 2 & 3). Data will be collected by faculty, program staff, and district partners in terms of quality, quantity, and social validity (see Table 3). At the end of the grant period, we plan to have integrated into regular practice methodologies that are effective for improving the knowledge and skill levels of our preservice teachers, enhance the skills and knowledge of inservice teachers in our partner sites, and ultimately improve the academic outcomes of ELLs in classroom where we partner daily with educators in our schools to prepare students for the 21st century workplace and community.

The Extent to Which the Evaluation will Provide Performance Feedback and Permit Periodic Assessment of Progress Toward Achieving Intended Outcomes

The external evaluator will work closely with project staff and the PIs to ensure that program components/activities are being delivered as proposed. Feedback loops on a regular (monthly) basis will be instituted to monitor implementation of the program, address challenges as they occur, and modify program elements as necessary to meet the grant proposal.

Dr. Ed Crowe is an experienced consultant on teacher quality, teacher preparation, and K-16 policy. Dr. Crowe will work with PIs and the project director to provide formative and summative feedback on program goals and outcomes on an annual basis, with onsite visits in Years 1, 3 and 5. During Year 1, he will provide consultation on evaluation measures. In Years 2 and 3, he will perform formative evaluations. In Years 3 and 4, Dr. Crowe will perform an initial summative evaluation on project outcomes. In Year 4, he will provide additional formative evaluation so that project PIs and staff will have feedback on goals/objectives prior to the final summative evaluations in Year 5.