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Closing Date: MAY 09, 2011

ESOL for STEM Educators

Abstract

IHE: Pacific University College of Education

Title of the Program: ESOL for STEM Educators (ELSTEM)

LEA Consortia Partners: Oregon LEAs Forest Grove School District 15, Woodburn School District 103, and Bethel School District 52.

Project Description

ESOL for STEM Educators (ELSTEM) is an innovative program in which Pacific University, in collaboration with three partner school districts (LEAs), will design, implement, and evaluate an ESOL endorsement program for STEM (Science, Technology, Engineering, and Mathematics) educators. This newly implemented STEM-focused curriculum will maximize the educational achievement of English learners (ELs) in STEM subjects, while enhancing STEM educators' awareness and understanding of the special needs and challenges that second-language learners face in academic settings. This program will be designed, implemented, and evaluated as an integral new component of Pacific University's teacher education programs, serving a large region of northwest Oregon.

ELSTEM will directly serve three school districts in the high EL communities of Forest Grove, Woodburn, and Eugene, OR, resulting in the addition of 120 highly trained ESOL/STEM teachers to the workforce. ELSTEM participants will include a) 40 highly motivated pre-service National Science Foundation Pacific Noyce Scholars, and b) 80 experienced in-service STEM teachers, recruited from partner districts. All participants receive full tuition support for earning the Oregon ESOL endorsement; in-service teachers will receive a \$1000 incentive stipend upon successful program completion.

ELSTEM will also provide professional development and research opportunities for project faculty, a framework for new curricula, and significant revision to the university's existing teacher education programs. ELSTEM's ultimate goal is to create teacher education programs that lead to long-term improvement of the STEM literacy of ELs in high-needs partner school districts.

Program Priorities

- Competitive Preference Priority 1 -- Novice Applicants.
- Competitive Preference Priority 2 -- Enabling More Data-Based Decision-Making.
- Competitive Preference Priority 3 -- Promoting STEM Education.

- Invitational Priority 1 -- Improving Achievement and High School Graduation Rates.
- Invitational Priority 2 -- Improving Preparation of All Teachers to Better Serve English Learners.

GPRA Measure Targets By Year

GPRA Measure	Year				
	1	2	3	4	5
The number of pre-service teachers expected to be served	10	10	10	10	0
The number of pre-service teachers expected to complete the program of study	0	10	10	10	10
The number of pre-service teacher completers expected to be placed in instructional settings serving ELs	0	10	10	10	10
The number of pre-service teachers expected to complete the program of study and be certified in EL instruction	0	10	10	10	10
The number of in-service teachers expected to be served	20	20	20	20	0
The number of in-service teachers expected to complete the program of study	0	20	20	20	20
The number of in-service teachers expected to complete the program of study and be certified in EL instruction	0	20	20	20	20
The number of in-service teacher completers who are expected to serve EL students	0	20	20	20	20

Contact:

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PROJECT NARRATIVE
Project Title: ESOL for STEM Educators (ELSTEM)
Applicant: Pacific University

(a) PROJECT DESIGN

(1) GOALS, OBJECTIVES, OUTCOMES

GOALS:

ESOL for STEM Educators (ELSTEM) is an innovative program in which Pacific University, in collaboration with three partner school districts (LEAs), will design, implement, and evaluate an ESOL endorsement program for STEM (Science, Technology, Engineering, and Mathematics) educators for grades 6-12. This newly implemented STEM-focused curriculum will maximize the educational achievement of English learners (ELs) in STEM subjects, while enhancing STEM educators' awareness and understanding of the special needs and challenges that second-language learners face in academic settings. This program will be designed, implemented, and evaluated as an integral new component of Pacific University's teacher education programs, serving a large region of northwest Oregon.

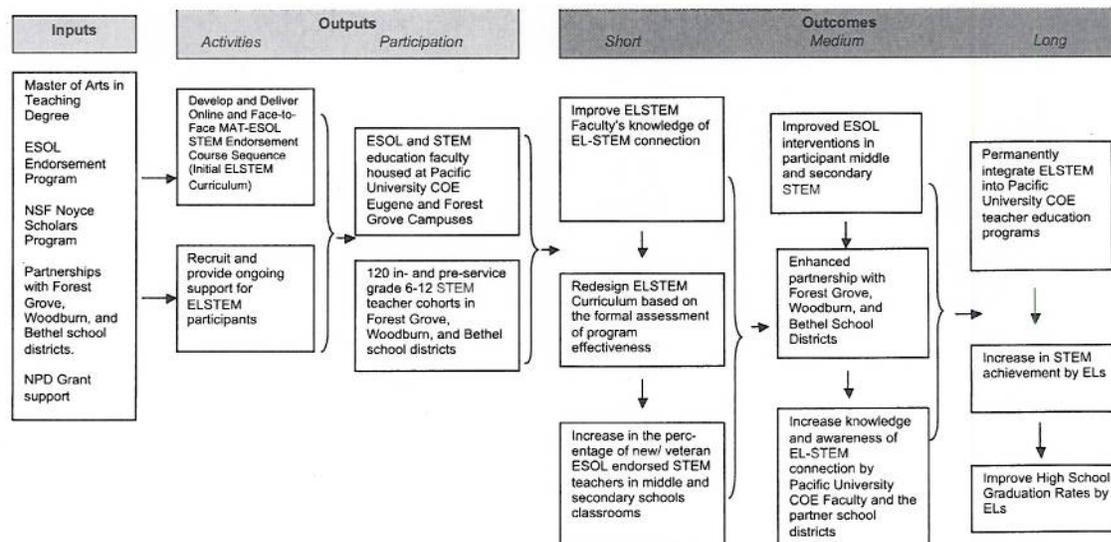
ELSTEM will directly serve three school districts in the high EL communities of Forest Grove, Woodburn, and Eugene, OR, resulting in the addition of 120 highly trained ESOL/STEM teachers to the workforce. ELSTEM participants will include a) 40 highly motivated pre-service National Science Foundation Pacific Noyce Scholars, and b) 80 experienced in-service STEM teachers, recruited from partner districts. All participants receive full tuition support for their coursework leading to the Oregon ESOL

endorsement; in-service teachers will also receive an incentive stipend upon successful program completion.

ELSTEM Logic Model

A large gap in academic achievements in STEM subjects exists between ELs and non-EL students in Oregon. ELSTEM will seek to improve the teaching effectiveness of new and veteran middle and secondary STEM teachers with in-depth preparation in teaching English to Speakers of Other Languages (ESOL) through renovated teacher education programs that better meet the needs of pre- and in-service teachers and middle and secondary ELs in STEM classrooms. ELSTEM will also seek to increase the awareness of EL-STEM connection by Pacific university's College of Education Faculty, which will then lead to the permanent integration of ELSTEM into our teacher education programs. The ultimate goal is to increase secondary student achievement in STEM literacy to improve high school graduation rates by ELs.

The ELSTEM project will accomplish its short-, medium-, and long-term goals based on the following logic model:



OBJECTIVES:

ESOL for STEM Educators (ELSTEM) will directly serve three school districts in Forest Grove, Woodburn, and Eugene, OR, resulting in the addition of 120 highly trained ESOL-STEM teachers serving these high EL communities.

This proposed project will lead Oregon's response to the critical needs of a better education for our ELs in K-12 school system. By the end of the project approximately 120 pre- and in-service teachers will have participated in this project. The project will also lead to curricular renovations for the existing pre-service teacher education programs at Pacific University that serves its partnering school districts. The more substantive impact of the project will evolve as the outcomes of this endeavor become permanently integrated into the pre- and in-service teacher education programs at Pacific University. The university's partnering school districts have the greatest population of ELs in the region, and it is extremely critical that Pacific University renovates its teacher education programs that can meet the imperative needs of these local ELs.^[1] Oregon's demographic profile mirrors that of the majority of states in the country that reports ELs are the fastest growing segment of the school age population, and that there are correspondingly limited resources to address the evolving challenges and opportunities linked to this growing population.^[2] Both of the programs proposed in this project will be designed via a comprehensive collaborative process to include the resources from Pacific University, local school districts, and regional and national experts on sheltered content instruction for ELs.

OUTCOMES:

Alignment of Project Objectives with Program Measures

The expected outcomes of ELSTEM include: (1) Development, testing, and implementation of a pre-service teacher education program leading to initial teaching licensure in STEM subjects combined with an ESOL endorsement; (2) ESOL endorsement programs for in-service STEM educators; and (3) Professional development and research studies published by the COE faculty. The expected outcomes of the proposed project are aligned with NPD Program/GRPA Measures (see Table 1).

<Table 1> Alignment of the Proposed Project with NPD Program/GRPA Measures

Project Activity/Outcome	NPD Program/GRPA Measure
<p>1(a). Develop, test, and implement, in partnership with high-need LEAs, a pre-service teacher education program leading to initial teaching license in STEM subjects and ESOL endorsement.</p> <p>1(b). Provide cost-of-tuition support for highly motivated and prepared pre-service teachers to complete a pre-service teacher education program leading to initial teaching license in STEM</p>	<p>1.1 The percentage of pre-service program completers who are State and/or locally certified, licensed, or endorsed in EL instruction.</p>

subjects and ESOL endorsement.	
2. Include the provision that program completers serve for 2-years in instructional settings serving EL students.	1.2 The percentage of pre-service program completers who are placed in instructional settings serving EL students within one year of program completion.
3. Provide for program completers an induction extending through the first two years of service teaching EL students.	1.3 The percentage of pre-service program completers who are providing instructional services to EL students 3 years after program completion.
4(a). Develop, test, and implement, in partnership with high-need LEAs, an in-service STEM teacher education program leading to ESOL endorsement. 4(b). Provide cost-of-tuition support for highly motivated and prepared in-service STEM teachers to complete teacher education program leading to ESOL endorsement.	1.5 The percentage of in-service teacher completers who complete State and/or local certification, licensure, or endorsement requirements in EL instruction as a result of the program
5. Include the provision that program completers serve for 2-years in instructional settings serving EL students.	1.6 The percentage of in-service teacher completers who are providing instructional services to EL students.

(2) RESEARCH-BASED EFFECTIVE PRACTICE

Curricular Renovations for the Pre- and In-Service ELSTEM Programs

The ELSTEM project involves curricular renovations and adaptations of both STEM initial teaching license and ESOL endorsement courses already established at the university to tailor the curriculum to the special needs of STEM teachers educating ELs. The curriculum will be designed to introduce the participants to theoretical foundations of classroom second-language instruction and research-based interventions for language and literacy education. Special efforts will be made to design the curriculum based on the best-researched curricular development model for sheltered instruction in STEM. The major sheltered instructional models developed for content-based English language teaching at K-12 such as SIOP (Sheltered Instruction and Observation Protocols), GLAD (Guided Language Acquisition Design), SDAIE (Specially Designed Academic Instruction in English), and Systematic ELD will be consulted in course and curricular design (Echevarria, Vogt, & Graves, 2010; Echevarria, Vogt, & Short, 2009; Freeman & Freeman, 2007; Project GLAD, n.d.; Short, Vogt, & Echevarria, 2010; Systematic ELD, n.d.).

Pre-Service ELSTEM Curriculum

This pre-service curriculum will have a concrete set of goals and objectives, and aim to provide informative knowledge and tools about teaching ELs in STEM subjects. Special attention will be given on how to respond to the special needs of ELs in developing language and literacy skills in these content areas. There will also be an emphasis for pre-service teachers to gain knowledge about the overall second language acquisition

process and the characteristics of academic English development. Upon completion of this teacher education program, the participants will be expected to earn their ESOL endorsement along with their initial teaching license in STEM and gain knowledge and skills in ESOL education as follows:

- Individual, psycholinguistic, and sociolinguistic factors associated with second language acquisition;
- Research-based academic interventions for ELs and their application in actual classroom teaching;
- Oregon ELP standards and their application in developing course curricula for STEM subject area teaching;
- Characteristics of academic English development;
- Instructional models for EL students to accelerate their competency in science, technology, engineering, and mathematics (STEM)
- STEM lesson planning and assessment that are responsive to culturally and linguistically diverse needs of ELs.

<Table 2> shows the initial curriculum layout for this pre-service program. The effectiveness of this curriculum will be annually evaluated to make an assessment for the needs of curriculum revisions for the following year.

<Table 2> Initial Curriculum for Pre-Service ELSTEM Program

Number of Courses	Terms offered	Courses (ESOL endorsement courses are highlighted in blue.)
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1	Spring 2012 (Feb-May): Foundations in STEM Education for ELs	<ul style="list-style-type: none"> ● Cultural Constructs and Diversity in ESOL Education*
5	Summer 2012 (June - August): Foundations in STEM Education for ELs II	<ul style="list-style-type: none"> ● Educational Linguistics for ESOL Teachers* ● Literacy and English-Language Learners* ● Learning Communities I: Personal Awareness and Diversity ● School and Society ● Teachers as Consumers of Research
8	Fall 2012 (Sep-Dec): Methods in STEM Education for ELs	<ul style="list-style-type: none"> ● Learning Communities II: About Diversity ● Teaching and Assessment in the Middle and High School ● Reading and Writing Across the Curriculum ● Technology Across the Curriculum ● Practicum ● Curriculum Design: Middle and High

		<p>School **</p> <ul style="list-style-type: none"> ● Teaching Science in the Middle School and High School** OR ● Teaching Mathematics in the Middle School and High School **
3	<p>Spring 2013 (Feb-May): Applications in STEM Education for ELs</p>	<ul style="list-style-type: none"> ● Learning Communities III: Reflection and Practice ● Student Teaching ● Supervised ESOL Practicum*
1	<p>Summer 2013 (June): Language policy Issues in STEM Education for ELs</p>	<ul style="list-style-type: none"> ● Language Policy in ESOL Education*

* These courses are part of the current ESOL endorsement coursework established in the COE and will be specially re-designed for STEM pre- and in-service teachers.

** The curriculum of these courses, which are currently part of STEM initial teaching licensure coursework, will be renovated and revised to prepare pre-service teachers to provide effective sheltered STEM instruction for ELs.

In-Service ELSTEM Curriculum

This program will prepare in-service STEM teachers to become endorsed in ESOL in order to be better prepared for teaching ELs. It will be a 5 semester-long cohort program and will be designed based on the college's established ESOL endorsement curriculum with adaptations for in-service STEM teachers.

Upon completion of this in-service ELSTEM program, the participants will be expected to earn their ESOL endorsement and gain knowledge and skills as follows:

- Individual, psycholinguistic, and sociolinguistic factors associated with second language acquisition;
- Research-based academic interventions for ELs and their application in actual classroom teaching;
- Oregon ELP standards and their application in developing course curricula for STEM subject area teaching;
- Characteristics of academic English development;
- Instructional models for EL students to accelerate their competency in science, technology, engineering, and mathematics (STEM);

- STEM lesson planning and assessment that are responsive to culturally and linguistically diverse needs of ELs;
- Leadership in ESOL education and advocacy for ELs

Curriculum for the Initial Program in Year 1

The coursework will be combination of online and face-to-face classes. <Table 3> shows the initial curriculum layout for this in-service program. The effectiveness of this curriculum will be annually evaluated to make an assessment for the needs of curriculum revisions for the following year.

<Table 3> Initial Curriculum for In-Service ELSTEM Program

Number of Courses	Terms offered	Courses (Based on the existing ESOL courses)
1	Spring 2012 (Feb-May): Awareness: Culture and Diversity	<ul style="list-style-type: none"> • Cultural Constructs and Diversity in ESOL Education
1	Summer 2012 (June-July): Foundations I: Linguistics	<ul style="list-style-type: none"> • Educational Linguistics for ESOL Teachers

2	Fall 2012 (Sep-Dec): Foundations II: Methods	<ul style="list-style-type: none"> • Foundations of ESOL Methods* • Literacy and English-Language Learners
2	Spring 2013 (Feb-May): Applications	<ul style="list-style-type: none"> • ESOL Methods, Assessment, and Technology* • Supervised ESOL Practicum*
1	Summer 2013 (June): Leadership	<ul style="list-style-type: none"> • Language Policy in ESOL Education

* These courses will be jointly taught or supervised by STEM and ESOL specialists.

Description of the Initial Pre- and In-Service ELSTEM Courses

<Table 4 > illustrates a brief description of each ESOL course that will be modified for the pre- and in-service ELSTEM programs.

<Table 4 > ELSTEM Course Descriptions*

* Curricular revisions are highlighted in red.

Course	Description
Cultural Constructs and Diversity in ESOL	This course is designed to equip ESOL teacher candidates with competency in cultural, linguistic, educational, and ethnic issues

Education	present in educating English learners (ELs). <i>This course involves service-learning, observations, and interviews of ELs enrolled in STEM subjects to raise awareness of ELs' diverse and special needs in learning STEM subjects.</i>
Educational Linguistics for ESOL Teachers	This course is designed to introduce candidates to linguistic aspects of teaching ESOL, and to build a solid foundation in theories of first and second language acquisition, as they are relevant in teaching ESOL students. <i>This course intends to build solid linguistic foundations for STEM subject teaching and focuses on integration of language features into STEM subjects.</i>
Literacy and English-Language Learners	Candidates will discuss theories and issues in reading and writing in English-as-an-additional language and their implications for instructional practice. Candidates will explore effective reading and writing instructional practices with multilingual learners, and children's and adolescent literature as they pertain to diversity within a multicultural classroom. <i>The course specifically focuses on how to promote literacy in STEM subjects.</i>
Curriculum Design: Middle and High School	Understands the process of curriculum development and encourages reflection on the nature of one subject and its potential for integration with other subject areas. Reviews and reflects on previous learning, and uses the resources, skills, readings, and concepts acquired to design a semester- or year-long course in one content area. <i>Special attention is given to design a sheltered content course of study for English learners in MS/HS setting. Co-taught by STEM and ESOL faculty members.</i>

<p>Teaching Science in the Middle School and High School</p>	<p>Introduces aspiring educators to the theories, strategies, resources, and technology applications appropriate to science curriculum and instruction at the middle and high school level. Emphasizes research-based teaching and evaluation methods as well as an in-depth analysis of national and state science standards. <i>Special attention is given to design a sheltered content course of study for English learners in MS/HS setting. Co-taught by STEM and ESOL faculty members.</i></p>
<p>Teaching Mathematics in the Middle School and High School</p>	<p>Introduces educators to the theories, strategies, resources, and technology applications appropriate to mathematics curriculum and instruction at the middle and high school level. Emphasizes research-based teaching and evaluation methods as well as an in-depth analysis of national and state mathematics standards. <i>Special attention is given to design a sheltered content course of study for English learners in MS/HS setting. Co-taught by STEM and ESOL faculty members.</i></p>
<p>Foundations of ESOL Methods</p>	<p>This course is designed to equip <i>in-service STEM teachers</i> with theoretical bases, concepts, research, and best practices to plan classroom instruction in a supportive learning environment for ESOL and bilingual students. <i>Special attention is given to design a sheltered content course of study for English learners in MS/HS setting. Co-taught by STEM and ESOL faculty members.</i></p>
<p>ESOL Methods, Assessment, Technology</p>	<p>This course is designed to apply theoretical foundations built in Foundations of ESOL Methods, in actual lesson planning and unit development for <i>sheltered STEM</i> instruction. It also aims to promote <i>in-service STEM teachers'</i> knowledge and understanding</p>

	of inquiry- and standards-based practices and strategies in sheltered STEM instruction. In-service STEM teachers will learn how to plan, manage, and implement standards-based <i>sheltered STEM</i> lessons and curricula including second language assessment and technology-incorporated instruction. <i>Co-taught by STEM and ESOL faculty members.</i>
Supervised ESOL Practicum	Complete a 90-hour supervised clinical experience in <i>STEM classrooms</i> working with students identified as English learners (ELs).
Language Policy in ESOL Education	Candidates will gain knowledge of local, state, and federal laws pertaining to educating English speakers of other languages. Theory and research will be studied and applications to bilingual classroom setting will be emphasized. <i>Implications for STEM classrooms will be focused.</i>

(b) PROJECT PERSONNEL

QUALIFICATIONS: PROJECT DIRECTOR AND KEY PROJECT PERSONNEL

Dr. Catherine Kim, the project director, is the College of Education, Forest Grove Campus' ESOL Endorsement Program Coordinator. She is a specialist in second-language acquisition and bilingualism and has over fifteen years of teacher education and research experience in second-language pedagogy at the undergraduate and graduate levels. She coordinates and teaches ESOL endorsement courses. She maintains an active agenda of research and has carried out and published many funded

research projects. ELSTEM will strengthen our partnership with high-needs schools in our partner school districts to endorse STEM teachers in ESOL and also provide classroom-based research opportunities for our faculty.

Dr. Karren Timmermans has served as the College of Education, Eugene Campus' ESOL Endorsement Program Coordinator since 2008 and supervised many K-12 pre-service and in-service teachers working toward their ESOL endorsements. She is a specialist in intervention literacy, and has presented and published many of her work in this area. Additionally, Dr. Timmermans teaches several courses in the current ESOL Endorsement Program. ELSTEM will add value to our teacher education programs and strengthen our connections with our partner school districts.

Dr. Kevin Carr has served as PI/Co-PI of several significant STEM teacher education projects including a *North Coast Highly Quality Science Teacher Initiative*, a Title IIB Math/Science Partnership (2005-2008), *Woodburn STEM Partnership*, a Title IIA Teacher Quality Enhancement project (2010-2012), and *Pacific STEM Teaching Pathways*, a National Science Foundation NOYCE Program Grant (2009-2014). ELSTEM will build on prior professional development partnerships, especially our current NSF NOYCE scholarship program, providing vital, in-depth EL training to highly motivated STEM teachers who are committed to continued service in high-needs schools.

QUALIFICATIONS: COLLEGE OF EDUCATION, PACIFIC UNIVERSITY

For over one hundred and sixty years, teacher education has been an integral part of Pacific University's mission. Our institutional commitment is to prepare transformative STEM teachers who will become leaders in creating educational equity and eliminating systemic barriers to learning in high-needs schools. The university currently offers both undergraduate and graduate initial-teaching licensure programs, graduate degree programs, and various endorsement and certificate programs including ESOL, Reading, TAG (Talented and Gifted), Cultural Competence, and Technology. In addition to these pre- and in-service teacher education programs, the College of Education at Pacific University has just launched two undergraduate minor programs in TESOL (Teaching English to Speakers of Other Languages) and CSD (Communication Sciences and Disorders) and an MS (Master of Science) degree in SLP (Speech Language Pathology). The university has significantly grown in the areas of second-language, literacy, and science education over the last two decades in both number of programs and enrollments in each program.

(c) PROJECT MANAGEMENT PLAN

(1) Responsibilities of the Project Personnel

- Dr. Catherine Kim: Dr. Kim will be the project director and designated point of contact for the NPD grant. Dr. Kim will also serve as co-principal investigator. She will coordinate in-service teacher recruiting and retention, assume a lead role in pre- and in-service curriculum design, implementation and evaluation, and

serve as an ELSTEM liaison between Pacific University and Forest Grove School District administration.

- Dr. Karren Timmermans will serve as co-principal investigator. Dr. Timmermans will coordinate in-service teacher recruiting and retention, assume a lead role in in-service curriculum design, implementation and evaluation, and serve as an ELSTEM liaison between Pacific University and Bethel School District administration.
- Dr. Kevin Carr (STEM Education Director, NFD). Dr. Carr will serve as director of the ELSTEM pre-service cohort as part of his duties as NSF Noyce Principal Investigator, and Director of the Pacific Woodburn STEM initial license program.

(2) Time commitment of the project director and principal investigators

- Time commitment by the personnel: Equivalent to 1 month of full-time work hours per year by the key personnel (Project director, principal investigators/in-service district cohort directors, and pre-service district cohort director). It will be 160 hours of commitment per person per year (480 hours for the entire personnel per year) including planning, managing, evaluating, and reporting (a total of 2,400 hours for the entire funding period).

- Time commitment by the evaluators: The outside evaluators, Education Northwest, will be contracted to perform systematic evaluation of the project. They will perform annual evaluations of the project, make an assessment of the project effectiveness, and prepare for the annual reports for the NPD program effectiveness reports.

Timelines, and milestones (YEAR1-YEAR5: Schedule of activities)

The College of Education at Pacific University will capitalize on the resources of the University and its partnering school districts to develop and implement renovated STEM teacher education programs that will advance the understanding of and the strategies for teaching ELs and assist in better preparing pre- and in-service teachers for their classroom teaching. The project will be planned and implemented along a five-year strategic trajectory in collaboration with its partnering school districts, and pursue the two programs as outlined below. Also, what is proposed in Program I and II will be permanently implemented as part of the existing teacher education programs for initial teaching license and ESOL endorsement.

1. Program I: Pre-service STEM Teacher Education with ESOL Endorsement

This program aims to develop a pre-service teacher education program designed to equip middle and secondary school STEM teacher candidates with effective teaching strategies for ELs and understanding and application of Oregon.

This program will proceed as follows:

Year 1: Program Development/Design and Participant Recruitment

Faculty members in STEM and ESOL education will jointly develop and coordinate this pre-service teacher education program in the College of Education at Pacific University for the first half of Year 1. There will be a designated program director for this pre-service program. The program will be developed in such a way that it can be eventually implemented as part of the pre-service teacher education program for initial teacher

licensure after piloting, evaluating, and refining the initially developed program. STEM and ESOL faculty members will jointly teach this pre-service ELSTEM program. It will be a 5-semester program that prepares pre-service teachers to be licensed in both STEM and ESOL.

Recruitment of the Pre-service ELSTEM Participants

Pre-service ELSTEM participants will be recruited in conjunction with Pacific University's *Noyce Scholarship* program, using direct mailing, website announcements, information meetings, print, and television media. Pre-service Noyce/ELSTEM candidates will complete their teacher preparation in an innovative clinical program based in high-needs Woodburn School District, completing coursework on-site in close partnership with both university and district personnel. The strong support provided in clinical teacher education programs enhances the ability of new teachers to successfully teach in high-needs schools after program completion. Noyce/ELSTEM candidates sign a promissory note indicating a commitment to two years of teaching in high needs schools after program completion; non-compliance results in the need to repay scholarship funds.

Successful candidates for Noyce/ELSTEM are admitted with the following characteristics and qualifications:

- Exemplary science and math teaching candidates whose background, skills, and future career goals demonstrate the ability to meet the challenges of teaching science and math in high needs classrooms and schools;

- Strong commitment to working in high-needs schools where there are high percentages of ELs;
- Be academically qualified to earn an Oregon secondary subject area endorsement in Advanced or Basic Mathematics, Physics, Chemistry, Biology, or Integrated Science;
- Have a 3.0 or higher cumulative grade point average;
- Be U.S. citizens, nationals, or permanent residents;
- Submit a 2011-2012 *Free Application for Federal Student Aid* (FAFSA, www.fafsa.ed.gov, use Pacific's code 003212)

Curriculum for the Initial Program in Year 1

This 16 credit hour pre-service ELSTEM program will be launched in Year 1 based on the existing pre-service STEM teacher education and ESOL endorsement programs with curricular modifications that are tailored to the needs of STEM pre-service teachers. It will be a 5 semester-long cohort program and the participants will start in February 2012 and end in June 2013. The coursework will be a combination of both online and face-to-face classes.

Year 2-4: Implementation, Evaluation, and Refinement

At the conclusion of the initial program, the program director and program coordinators will evaluate and assess the ELSTEM program for validation and re-designing/refining of the curriculum. An outside assessment specialist (Education Northwest) will be

contracted to conduct a systematic evaluation on the effectiveness of the program using both quantitative and qualitative assessment measures.

Year 2 will be the second year that this program is delivered. Participants for this training program will be recruited using the same criteria and method as described in the Year 1 plan. A systematic, formal assessment by an assessment specialist will continue in Year 2, and the evaluation will be utilized in planning, readjusting, and further refining the curriculum for Year 3. This year will also be spent on initiating the permanent implementation of this program into the university's existing pre-service teacher education programs.

The strategies developed in the first three years will be incorporated into the university's existing pre-service teacher education programs after the cross-validation of successful interventions. The new and revised courses and curricular development created in the Year 3 will be implemented in the pre-service teacher education program in Year 4. The assessment on the effectiveness of the program by the outside reviewers (assessment specialists) will continue.

Year 5: Integration and Institutionalization

The newly developed program will be permanently established and the outcomes of the project will be published and distributed. The effectiveness of the newly implemented teacher education program will be assessed by multiple measures, including the

percentage of pre-service graduates placed in instructional setting and the learning outcomes of the ELs they teach.

2. Program II: In-service STEM Teacher Education

This in-service program will be launched during the second half of Year 1 (February 2012) based on the existing in-service ESOL endorsement programs with curricular modifications tailored to the needs of in-service STEM teachers. Special focus will be given on how to provide effective sheltered instruction in STEM subjects to ELs. It will be a 5 semester-long cohort program. The initial cohort will start in February 2012 and end in June 2013.

This program will proceed as follows:

Year 1: Program Development/Design and Participant Recruitment

This in-service ELSTEM program will be developed by redesigning the university's current ESOL endorsement program to meet the specific needs of STEM teachers. Faculty members in STEM and ESOL education will jointly develop this in-service teacher education program for the first half of Year 1. Special efforts will be made to redesign the ESOL curriculum for in-service STEM teachers. Part of this in-service ELSTEM courses (Methods courses) will be jointly taught by STEM and ESOL faculty members. It will be a 5-semester cohort program that prepares in-service teachers to be endorsed in ESOL.

Recruitment of the In-service ELSTEM Participants

In-service teachers will be recruited through the district offices and schools, and the admissions office in the College of Education following the admission procedures established for endorsement programs. Information will also be available on the College of Education website. In-service candidates for the ELSTEM will hold an endorsement in a STEM subject and enter the program to add an ESOL endorsement. In-service ELSTEM candidates sign a promissory note indicating a commitment to two years of teaching in high-needs schools after program completion; non-compliance results in the need to repay scholarship funds.

Successful candidates will have following characteristics and qualifications:

- Exemplary science and math teachers whose background, skills, and career goals demonstrate the ability to meet the challenges of teaching science and math in high-needs classrooms and schools
- Strong commitment to working with ELs
- Highly recommended by their supervisors and administrators for their potential to grow as leaders in ESOL education at their schools

Year 2-4: Implementation, Evaluation, and Refinement

At the conclusion of Year 1 initial program, the project director and program coordinators will evaluate and assess the ELSTEM program for validation and re-designing/refining of the curriculum. An outside assessment specialist (Education

Northwest) will be contracted to conduct a systematic evaluation on the effectiveness of the program using both quantitative and qualitative assessment measures.

Year 2 will be the second year that this program is delivered. Participants for this training program will be recruited using the same criteria and method as described in the Year 1 plan. A systematic, formal assessment by an assessment specialist (Education Northwest) will continue in Year 2, and the evaluation will be utilized in planning, readjusting, and further refining the curriculum for Year 3. This year will also be spent on initiating the permanent implementation of this specialized in-service program into the university's existing teacher education programs.

The strategies developed in the first three years will be incorporated into the university's existing teacher education programs after the cross-validation of successful interventions. The new and revised courses and curricular development created in the Year 3 will be implemented in the in-service teacher education program in Year 4. The assessment on the effectiveness of the program by the outside reviewers (Education Northwest) will continue.

Year 5: Integration and Institutionalization

The newly developed in-service ELSTEM program will be permanently established and the outcomes of the project will be published and distributed. The effectiveness of the newly implemented teacher education program will be assessed by multiple measures, including the assessment of teacher effectiveness, the learning outcomes of the ELs

they teach, and high school graduation rates of the schools where the graduates of this program teach.

(d) PROJECT EVALUATION

Evaluation of Pacific University's ELSTEM project will be conducted by the Center for Research, Evaluation, and Assessment at Education Northwest. Education Northwest is home to a community of professional program evaluators with expertise in both formative (implementation) and summative (outcome) evaluation. Evaluation staff members who will be working on this grant have over twenty years of experience in evaluation design; instrument development; and the collection, management, and analysis of both quantitative and qualitative data. Extensive experience gleaned from current evaluation work with complementary projects will strengthen the rigor of the evaluation. Members of the evaluation team have deep knowledge of instructional practices for ELs, having authored summaries of research-based practices for ELs (Deussen, Autio, et. al, 2008) and participated in other EL evaluation projects (e.g., Autio, Greenberg-Motamedi, & Deussen, 2010). In addition, the evaluation team brings a wealth of experience in evaluation STEM projects, including numerous grants awarded through the National Science Foundation. The combined expertise of this team will bring experience and knowledge of EL and STEM content, pedagogy, and rigorous evaluation to the project.

(1) The extent to which the methods of evaluation are thorough, feasible, and appropriate to the goals, objectives, and outcomes of the proposed project.

The evaluation methods of the ELSTEM project have been designed to match project goals, objectives and outcomes as well as build an understanding of how the project is working. The mixed-methods design enables evaluators to draw from a variety of evidence derived from diverse data collection techniques. Specific evaluation measures and their alignment with program goals are presented in Table 5.

<Table 5> Alignment of Program Goals and Evaluation Measures

Goal	Evaluation Measure	Timeline
Add 120 highly-trained ESOL-STEM teachers to three high-EL districts	<i>Observations</i> of a sample of participants, pre- and post-ELSTEM	Years 1 through 5
	<i>Surveys</i> about instructional practices from all participants, pre- and post-ELSTEM	Years 1 through 5
	<i>GPRA indicators</i> 1.1, 1.2, 1.5., 1.6	Years 1 through 5
	<i>GPRA indicator</i> 1.3	Year 5
Integrate ESOL and STEM curricula at Pacific University	<i>Interviews</i> with a sample of Pacific University faculty members in Year 5	Years 1 and 5
	<i>Document review</i> , including course syllabi, catalog descriptions, and requests for course approval	Years 1 through 5

These evaluation measures will provide concrete documentation of changes that occur during project implementation. Among participating pre-service and in-service teachers, pre- and post-ELSTEM surveys will capture changes in their knowledge of ELSTEM strategies (aligned with those strategies included in the ELSTEM curricula), self-

reported instructional practice, and perceptions of their preparedness. Pre- and post-ELSTEM observations of a sample of participants will enhance these quantitative survey findings by providing rich descriptions of classroom practice before participation and after. At the university level, a review of course offerings, including descriptions and syllabi, will map curricular changes that occur during implementation of the grant. Interviews with a sample of faculty members will provide additional qualitative descriptions of how the project has affected course offerings at the College of Education and changed perceptions among faculty members about the connection between EL and STEM education.

Data will be synthesized and in annual reports including both implementation and outcome measures. In combination, these quantitative and qualitative methods will generate more meaningful findings, triangulate results, and improve data collection instruments with the aim of continuous improvement and maximizing outcomes.

(2) The extent to which the methods of evaluation include the use of objective performance measures that are clearly related to the intended outcomes of the project and will produce quantitative and qualitative data to the extent possible.

The evaluation measures have been selected to be comprehensive, objective, systematic, and targeted to project objectives and outcomes. Strategies will provide project leaders with reliable and valid data generated through quantitative data from participant surveys and classroom observation rubrics, as well as qualitative data from observations, interviews and document review.

The evaluation team will work with the project staff on an ongoing basis to connect project activities to evaluation strategies and data sources. A logic model has been developed to clarify the project's theory of action. This will serve as a living document to align the evaluation with project activities, monitor progress toward achieving objectives, and build a common understanding of the role of evaluation in the project implementation.

The evaluation team values the use of multiple measures allowing various lines of inquiry to complement each other. Interpretation of findings is strengthened by converging results from different sources enabling evaluators to triangulate information. Evaluation staff will collaborate with project staff to ensure that the project evaluation is systematic, and to develop instruments to measure baseline conditions and ongoing pre-post implementation. Regular contact with program staff will track the development of ELSTEM activities/resources. At least monthly and more frequent updates during active parts of the years will keep the evaluation team apprised of activities and project staff up to date on evaluation activities.

Data on project progress and impact will be gathered using the following major qualitative and quantitative evaluation methods.

- Document review will be used to acquire comprehensive and historical information on objectives including recruitment, program development, licensure, enrollment, changes in syllabi and curricula, products (e.g., brochures, handbooks) and activity

records. It will also include a review of course offerings, including descriptions and syllabi, to map curricular changes during implementation of the grant.

- Annual surveys of all pre-service and in-service participants will gather data on participant perceptions of changes in their understanding, skills, and knowledge through participation in the project. Surveys will be administered online to each participant at two points: first, pre-ELSTEM participation, and second, post-ELSTEM participation. Education Northwest has extensive experience administering online surveys and regularly reports response rates of 90 percent and higher.
- Classroom observations of a sample of pre-service and in-service participants from each cohort will provide an objective measure of classroom-level implementation of the research-based instructional practices taught in the ELSTEM curricula. They will also enhance survey findings by providing rich descriptions of classroom instruction before and after ELSTEM project participation. These observations will be conducted by a trained, experienced member of the evaluation team staff with expertise in both classroom observations and EL instruction. The observation protocol will be developed utilizing aspects of the Sheltered Instruction Observation Protocol (SIOP) checklist (Echevarria, Vogt & Short, 2007), a tool for documenting the use of 30 instructional features; elements of research-based literacy instruction for STEM classrooms (e.g., Douglas, Klentschy, and Worth, 2006; Lee & Luykx, 2006); and a protocol capturing elements of sheltered instruction that has been developed and is currently being piloted by Education Northwest evaluators. Each selected participant will be observed twice: once at the start of their ELSTEM participation, and once at the conclusion of their ELSTEM participation. Four participants will be randomly

selected from each cohort – two pre-service and two in-service – for a total of 20 participants and 40 observations.

- Interviews with College of Education faculty members from Pacific University will gather information regarding progress towards the goal of an integrated, institutionalized ELSTEM program. These interviews will be conducted with program staff, as well as a sample of non-program faculty, probing for their perceptions of the connection between EL and STEM education.
- Annual reports will capture formative and summative findings, recommendations, and conclusions. During the last grant year the annual report will serve as a final report documenting effective strategies and components suitable for replication as well as overall impact of the project.

Table 6 presents the design and timeline of data collection from cohort participants (surveys and observations).

<Table 6> Timeline of Data Collection from Cohort Participants

Year	Semester	Cohort 1	Cohort 2	Cohort 3	Cohort 4
Year 1	Fall 2011				
	Spring 2012	survey all, observe sample			
	Summer 2012				
Year 2	Fall 2012				
	Spring 2013		survey all, observe sample		
	Summer 2013	survey all, observe sample			
Year 3	Fall 2013				
	Spring 2014			survey all, observe sample	
	Summer 2014		survey all, observe		

			sample		
Year 4	Fall 2014				
	Spring 2015				survey all, observe sample
	Summer 2015			survey all, observe sample	
Year 5	Fall 2015				
	Spring 2016				
	Summer 2016				survey all, observe sample

Methods of data collection and statistical analyses will be appropriately matched to evaluation data and strategies used. Analyses involving frequency distributions, cross-tabulations, and tests of significance will be conducted for reporting quantitative data from surveys and the observation rubric. Graphical representations of data will be generated wherever appropriate and useful for data interpretation. Ethnographic techniques (thematic and content analyses) will be employed to handle qualitative data from interviews and observations. By carefully matching measures, data analyses, and interpretation, evaluators will be able to provide solid evidence of the effectiveness of project implementation strategies and broader impact.

(3) The extent to which the methods of evaluation provide performance feedback and permit periodic assessment of progress toward achieving intended outcomes.

The evaluation will provide performance feedback to project staff through two primary mechanisms. The first of these is annual reporting, which will include formative evaluation findings. Annual reports will be accompanied by discussion between the

evaluation team and project staff regarding progress towards intended outcomes. Formative evaluation strategies will monitor progress and will be integrated with program development fostering continuous reflection and improvement on implementation. Annual reports will be synchronized with federal reporting timelines to provide timely and high-quality data for federal Performance Measure reporting.

Second, ongoing communication between the evaluation and project teams will include an annual in-person meeting and regular email and telephone contact. Evaluation activities throughout the year will offer timely feedback throughout the grant to identify areas of potential improvement and provide support for the development and success of the project. Data will be shared with the project management team for consideration in planning changes or revisions to the project through regular evaluation meetings, memos, and conversations. The evaluation team will work with project staff to engage in discussions around data use and continuous improvement.

NOTES

[1] Data obtained from the assessment offices in Forest Grove, Woodburn, and Bethel School Districts on the percentage of ELs and ESOL-endorsed teachers: In Woodburn, where over 60% of the entire student population is identified as ELs, only 50% of the in-service STEM teachers are endorsed in ESOL. In Forest Grove, where over 20% of the entire student population is identified as ELs, there is only one middle school STEM teacher who is endorsed in ESOL in the entire district. In Bethel where the percentage

of ELs is rapidly increasing in Lane County, OR, there is currently no STEM teacher endorsed in ESOL.

[2] This statement was reported in OELA Resources for NPD program applicants on January 26, 2007.

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APPENDIX

Letters of Consortia Agreement from the partnering LEAs are attached in a separate file.