

October 4, 2013

The Honorable Jay Inslee
Office of the Governor
PO Box 40002
Olympia, WA 98504-0002

Dear Governor Inslee,

I am pleased to submit Western Washington University's 2014 Supplemental Operating budget for the 2013-15 biennium.

The Next Generation STEM Teacher Preparation proposal builds on Western's nationally recognized Science, Mathematics and Technology Education (SMATE) program to create a new model for preparing elementary and middle school math and science teachers to help all of their students acquire the foundational STEM knowledge required for success in the high school, college, and life. The goal here is not only to improve the math and science competencies of these teachers, but to graduate a more diverse cadre of educators prepared to inspire the increasingly diverse student body we see in Washington K-12 schools. This research-driven model will be shared, adapted and continuously improved in collaboration with other colleges and universities in Washington over the next five years.

We at Western are grateful for the legislature's decision to reinvest in higher education with the 2013-15 budget, and the trust it represents in our ability to apply our strengths to meet the critical needs of Washington. That simple but powerful charge—to leverage our strengths to meet the state's needs—sits at the center of our strategic plan and guides the submissions before you here. We are confident that they, like the expansion of our computer science and engineering programs funded this spring, will further enable the fulfillment of that mission.

Thank you again for your consideration of these proposals, and the recognition of higher education's power to build brighter futures. We look forward to working closely with you to protect this shared commitment to deliver for the people of Washington.

Sincerely,



Bruce Shepard
President

Enclosure

CC: Brent Carbajal, Provost and Vice President for Academic Affairs
Sherry Burkey, Associate Vice President, University Relations
Linda Teater, Director, Western Budget Office

DECISION PACKAGE TITLE:

Next Generation STEM TEACHER PREPARATION (NextGen STEM TP)

Recommendation Summary Text

Building on over a decade of innovative research, practice, and proven effectiveness in STEM teaching, learning, assessment, and collaboration building, Western Washington University (WWU) proposes to create a Next Generation model for K-8 STEM (Science, Technology, Engineering, Mathematics) Teacher Preparation. WWU’s Science, Mathematics, and Technology Education (SMATE) program, which is recognized as one of the top STEM Teacher Preparation and professional development programs in the state and nation will lead this effort. NextGen STEM TP will provide future elementary and middle school teachers with the knowledge, skills, and confidence to help *all* of their students acquire the foundational STEM knowledge, experience, and interest needed to succeed in high school, college, and life. In addition, through collaborations with K-8 schools and with other Washington State institutions of higher education NextGen STEM TP will provide a platform for sharing effective practices, resources, and models so that STEM teacher preparation is improved not only at Western, but across the state.

By adding four faculty, three staff, and support for two graduate students and four undergraduate Learning Assistants, WWU will create the capacity to 1) focus elementary and middle school mathematics and science education programs on graduating every new teacher ready to effectively teach STEM to all students, 2) prepare a diverse cadre of certified specialists to support high quality elementary science and mathematics instruction in high needs schools, 3) develop a Next Generation model for K-8 STEM Teacher Preparation using research-based teaching, learning, and assessment practices and 4) share, adapt, and continuously improve this NextGen STEM TP model in collaboration with other colleges and universities across Washington state over the next five years.

Fiscal Detail:

		2014-15
RESOURCES		
Fund 001, General Fund - State		\$832,521
Fund 149, Tuition Operating Fees		\$0
Fund OTHER		\$0
Total Resources		\$832,521
USES (EXPENDITURES)		
Faculty Tenure/Tenure-Track		\$283,202
Faculty Non Tenure-Track		\$0
Graduate Teaching/Research Assistants		\$41,554
Exempt Professional		\$18,750
Classified		\$128,354
Hourly		\$25,000
Salaries and Wages - Total		\$496,860
Employee Benefits		\$110,067
Goods and Services		\$165,594
Equipment		\$60,000
Total Expenditures		\$832,521
STAFFING FTE		
Faculty		4.25
Graduate Teaching /Research Assistants		1.00
Exempt Professional		0.25
Classified		3.00
Total FTE		8.50

Package Description

1. What is the problem or opportunity WWU wants to address?

Growing and sustaining Washington's economy and quality of life depends critically on our ability to offer a world-class 21st century education for the next generation. Increasingly, success in higher education, access to family wage jobs, participation as an informed citizen, and maintenance of personal health requires knowledge and skills in science, technology, engineering, and mathematics (STEM). Therefore, excellent STEM education for all of our children is an absolute necessity. Unfortunately, as pointed out by the president of the Washington State Academy of Science in the 2011 report *STEM Education in Washington State: The Facts of the Matter*, "We knew from studies by the National Academies that the U.S. lags behind other developed and many developing countries in STEM education, but we had not realized the extent to which Washington lags behind much of the U.S." There is a crisis in Washington that the WWU Next Generation STEM Teacher Preparation (NextGen STEM TP) program can help overcome.

Building the dynamic, adaptive STEM workforce needed by Washington State's businesses, government agencies, and NGOs, requires a strong foundation in science and mathematics for all elementary and middle school students. Yet, while research shows that young students are born investigators actively exploring their world, asking questions, and attempting to make sense of the world around them, by middle school many of these students believe they are not good at science and mathematics and do not see how it is relevant or important to their lives. US students' performance on international and national examinations such as PISA and NAEP illustrate this problem as US students are in the middle of the pack compared to other countries of similar socio-economic status, and between 4th and 8th grades, the number of US students achieving proficient or highly proficient scores in science and mathematics decreases. This trend is even more pronounced for students from economically disadvantaged communities and for Latino, African American, and Native American students, and consequently many of these students never even consider careers in STEM fields. This is a trend that must be reversed if we want our children to be prepared to succeed in a fast-paced, STEM-driven, global economy.

In recent years, Washington State has made significant investments to improve high school STEM education and STEM workforce development in 2- and 4-year colleges. However, since many students have already decided whether they are good/not good at math and science prior to high school, the key to addressing this growing STEM education crisis is to ensure that every K-8 student is taught science and mathematics effectively every day, every year by knowledgeable, confident, and passionate teachers. Research shows that when K-8 teachers learn science and mathematics using high quality curricula, student-centered learning strategies and the formative assessment process, they can help all students learn science and mathematics while also promoting student literacy in reading, writing, and other subjects (Duschl, et.al, 2007). However, currently many preservice teachers in Washington State are not prepared using research-based courses, curricula, or learner-centered strategies. In addition, ***many elementary schools in Washington spend an hour or less per week teaching science and only 8% of fourth grader teachers reported spending more than four hours/week on science (OSPI report, 2011).***

Given, that science typically receives minimal attention in Washington's elementary schools, it is not surprising that there is a shortage of new K-8 certified teachers, ready to teach science and mathematics effectively. This shortage will become even more evident as the Common Core State Standards in Math (CCSS-Math) and the Next Generation Science Standards (NGSS) are integrated into the Washington State K-12 curriculum. We believe that all preservice K-8 teachers in Washington State deserve state-of-the-art preservice training and support in order to ensure that all K-8 students have the preparation, opportunities, and encouragement they need to pursue advanced STEM classes in high school and college. The primary objective of NextGen STEM TP is to help solve the problem pointed out by UW professor Ed Lazowska that "too many of the scientists and engineers we hire in Washington are not our own children."

Now is the time to increase the number of high quality, well-prepared K-8 STEM teachers in the pipeline. As Linda Darling-Hammond points out, "An equitable and adequate system will need to address the supply of well-prepared educators—the most fundamental of all resources—by building an infrastructure that ensures high-quality preparation for all educators and ensures that well-trained teachers are available to all students in all communities." Our challenge is to increase significantly the diversity of STEM teachers certified while simultaneously improving the quality of their preparation to teach effectively.

Washington State's adoption of the CCSS-Math and the anticipated adoption of the NGSS this fall present both an opportunity and a challenge to improving K-12 STEM education in Washington State. These new standards represent a once in a generation opportunity to rethink our approach to STEM education. The new standards are based on current research about how students learn, how to use assessments to improve learning for every student, and how systemic changes in K-12 schools, colleges, and universities can support improved student achievement. The challenge is to overcome entrenched STEM education practices, attitudes, and programs at both the K-12 and college/university levels that are difficult to change on a large scale.

Western's NextGen STEM TP model is designed to address this challenge by fundamentally changing the way K-8 teachers are prepared to teach math and science. NextGen STEM TP is based on more than a decade of research and development funded by grants from the National Science Foundation, Washington State, and other funding sources. Promising results of this work include: (a) a new, research-based, student-centered science curriculum for elementary preservice education students at Western, (b) a regional network of in-service elementary and middle school teachers and principals working collaboratively on whole school (i.e. science and mathematics plus other subjects) educational reform, and (c) a powerful and proven model for improving student achievement through the use of Assessment for Learning strategies (William, 2011). In addition, through our work with teachers, the principal, and students in Neah Bay, and other rural schools, student achievement has risen steadily over the past five years, showing that these strategies work for diverse as well as mainstream students.

2. Exactly how does WWU want to address this problem or opportunity?

The NextGen STEM TP program at WWU will help the state meet its critical need for quality K-8 STEM teachers. More specifically, we will:

- Expand and improve our science and math education courses to ensure that all of Western's elementary and middle school education graduates are prepared to be effective mathematics and science teachers.
- Deepen the STEM understanding of future K-8 teachers beyond the content and methods courses offered as part of the traditional elementary certification program.
- Certify 10-15 graduates each year ready to serve as science specialists in high needs elementary and middle schools.
- Recruit interested, motivated, diverse STEM students to fill newly approved programs to produce a cadre of exceptional middle school STEM teachers.
- Create a Next Generation model for K-8 STEM Teacher Preparation that can help to improve STEM Teacher Preparation across Washington State.
- Work directly with our K-12 and higher education colleagues in Washington State to adapt, implement and improve this NextGen STEM TP model over the next five years to ensure that all Washington education graduates are prepared to be effective mathematics and science teachers.

Western Washington University, with over 14,000 undergraduate students, 800 graduate students and 1,800 STEM majors, is already the largest producer of elementary teachers and secondary mathematics and science teachers in the State. The unique Science, Mathematics, and Technology Education (SMATE) program at Western is a national leader in producing high quality teachers with deep knowledge of both content and pedagogy in the disciplines. NextGen STEM TP builds on the existing close collaboration between the College of Sciences and Technology, the Woodring College of Education, and the local K-12 schools. Collectively, we work across grades K-16, to increase the quantity, diversity, and quality of STEM teachers at all levels graduating each year from Western Washington University. In addition, through Western's leadership of the NSF funded North Cascades and Olympic Partnership and other Math-Science partnership grants, teacher leaders have been prepared and Professional Learning Communities have been established in over 150 buildings in 28 regional school districts. These teachers are available today to serve as mentors to WWU student teachers and first-year teachers for the NextGen STEM TP program.

To recruit new, diverse middle school teachers from the ranks of students interested in majoring in mathematics or science, we will incorporate elements from the successful Learning Assistant program at the University of Colorado-Boulder (<http://laprogram.colorado.edu/content/evidence-success>), the UTeach program at the University of Texas at Austin (<https://uteach.utexas.edu/>), and from Western's Compass2Campus program (<http://wce.wvu.edu/c2c/compass-2-campus>). We will recruit future middle school teachers by identifying successful students in introductory science and mathematics courses and hire them to experience teaching by participating as Learning Assistants for those same courses in a carefully designed program. In addition, working with our existing Compass2Campus program, we will recruit and support a cohort of STEM undergraduate students each year to work with first generation and diverse students in high needs schools to encourage them to consider going to college and pursuing STEM degrees.

To create the capacity to achieve the goals of NextGen STEM TP, we will hire three new faculty members in the College of Sciences and Technology, with two in mathematics education and one in science education. We will also hire one new faculty member in the College of Education, and one full time program manager/diversity specialist. The program manager/diversity specialist will support faculty with the integration of CCSS-Math and NGSS standards and practices into the preservice K-8 curriculum and proactively recruit and support the success of diverse students in STEM and STEM education majors. In addition, we will hire an information technology specialist and an administrative assistant to support course development, resource sharing, and the recruitment and success of diverse students. A quarter time evaluator and two, half-time graduate students will lead program evaluation and data collection efforts. Finally, we will hire four undergraduate students each year to serve as Learning Assistants in introductory science and mathematics courses.

With the increased capacity provided by this decision package, WWU will:

- Recruit future middle and elementary teachers from the ranks of students interested in majoring in mathematics, science, or engineering technology.
- Engage these students in our successful Compass2Campus program to provide them an early, hands-on teaching/mentoring experience in the schools and have them participate in a seminar on effective teaching supervised by Master K-8 Teachers.
- Increase the number of veteran, Latino, African American, and Native American students majoring in STEM/STEM Education by developing specific strategies to recruit students from these different underrepresented groups.
- Recruit successful and interested STEM students to learn about and engage in teaching by serving as Learning Assistants for a small group of students and participating in a seminar on effective teaching. Again, we will develop specific strategies to recruit students from different underrepresented groups.
- Recruit diverse students from the pool of STEM and education majors into the new General Science Middle School major to prepare a substantial number of middle school STEM teachers.
- Enhance the current General Science Elementary degree to include computational thinking and engineering practices components and create an Elementary Science Specialist Certificate.
- Expand WWU's mathematics in-service role with elementary schools. This increased in-service role will include coordinating lesson studies, on-site professional development support, creation of grant-supported partnerships with local elementary schools, and working with mentors to strengthen mathematics experiences for both student teachers and first-year teachers.
- Strengthen our preservice mentoring model, originally designed and tested at WWU as part of the NSF funded Noyce Master Science Teachers New Educators Research and Development Support Group and by the NSF funded "MORE for Teachers" research grant. A large cadre of existing Teacher Leaders prepared through the North Cascades and Olympic Science Partnership (NSF-MSP 2002-2012) and other grants will serve as mentors to WWU student teachers and early career teachers.

These efforts can make a significant contribution, but they cannot satisfy the total anticipated state need for highly-qualified K-8 STEM teachers. Therefore, though our primary effort is to build a Next Generation K-8 STEM teacher preparation program on Western's campus, an equally important goal is to share effective STEM teacher preparation practices, curricula, and assessments with other two- and four-year colleges in Washington State. By broadly sharing what we learn locally with our partner institutions and by incorporating their best practices and ideas into the NextGen STEM TP model, we can collectively and continuously improve the model and produce all of the high quality mathematics and science teachers Washington State needs to create a dynamic, well-prepared and adaptable STEM workforce.

3. What will the package funding actually buy? Describe what the money would purchase (e.g. x FTEs to do X, consultant services to do X, X kind of equipment for X).

Constructing the Model

During the first year, current STEM education faculty will work to restructure K-8 STEM education courses to include CCSS-Math and NGSS standards and practices, develop a new, student-centered mathematics course designed specifically for K-8 preservice teachers, and create a next generation, integrated elementary science methods/science practicum course that can be taught both face-to-face and online. New faculty members, the Program Manager/Diversity Specialist, the administrative assistant, and the half-time information technology specialist will be recruited and hired. We will establish a cross-disciplinary steering committee during the first year to help NextGen STEM TP stay on track. The STEM TP Steering Committee (8-10 individuals) will consist of the director of SMATE, the chair of the Department of Elementary (K-8) Education, and the Head of Mathematics Education at WWU, plus representatives from K-8 schools, preservice STEM teacher preparation programs at other Washington State institutions of higher education, and STEM businesses.

Roles of new faculty and staff

Two new tenure track assistant professors in mathematics education (2 FTE) will be hired to work with the current faculty members to: advise students; teach the extra sections of the mathematics and mathematics education courses required to meet current demand and accommodate increased enrollment of elementary mathematics education majors; develop and implement new courses; and design and deliver in-service professional development to practicing teachers in the local schools that aligns with the vision and content demands of the Common Core State Standards for Mathematics.

WWU's Mathematics Department has an increasingly strong and visible involvement with the professional development of elementary and middle grades teachers at both the pre-service and in-service levels. As more pre-service elementary teachers are recruited into mathematics education majors, the mathematics department will expand its advising and teaching capacity, to recruit and serve these additional majors. These elementary mathematics education majors will be encouraged to consider teaching mathematics in the middle grades to meet the persistent demand for qualified middle school mathematics teachers.

Current mathematics education faculty will work with the new mathematics education faculty to design and implement a new College Algebra course that not only will meet the prerequisite requirement of the elementary mathematics education course sequence, but will be taught in a way commensurate with the rigorous expectations of the CCSS-Math. Many students in this course will engage in mathematics in a new and meaningful way, which will not only substantially develop their content knowledge, but may also transform their views of what it means to do and understand mathematics. This course will be taken early in elementary education students' programs, with the premise that interaction with mathematics education faculty and a potentially different view of mathematics may prompt interest in pursuing an emphasis in mathematics or science. Additional curriculum development will include courses in assessment, curriculum, and leadership, jointly focused in mathematics and science.

To increase the capacity of practicing elementary teachers, WWU will expand its role in working on the in-service levels with elementary and middle schools. This increased in-service role will include on-site professional development support aligned with the state's transition to the CCSS-Math and assessments developed by the Smarter Balanced Assessment Consortium (SBAC); additional creation of grant-supported partnerships with local elementary and middle schools; and working with mentors and mathematics specialists to strengthen mathematics experiences for both student teachers and first-year teachers.

One new tenure track assistant professor in science/engineering education (1 FTE) will be hired with joint appointments in the physics/astronomy department and SMATE or in the engineering department and SMATE, to teach science content courses for future elementary teachers. A unique physics course for future elementary teachers, *Physics in Everyday Thinking*, the first of a four course sequence, is now required for all early childhood, special education, and elementary students seeking an elementary certification which greatly increased the number of students in the sequence each quarter, necessitating a new position. In addition, this new Physics or Engineering Education faculty will work with the program manager/diversity specialist to recruit more students into physical science teaching majors and work to support the integration of NGSS engineering practices and computational thinking into the science education course sequence.

One Elementary Science Education Faculty (1 FTE) with experience teaching K-8 mathematics or science successfully in the public schools will be hired to work with existing STEM TP faculty and staff to develop and deliver a new integrated science methods/science practicum course. The integrated science methods/science practicum course will be a hybrid course with both virtual and face-to-face components. Adding a new elementary science education faculty will also help WWU to handle the growing demand for our science methods/science practicum courses. This new education faculty member will also work closely with the program manager/diversity specialist to identify and support the success of elementary science specialists in high needs schools. The elementary science education faculty will advise students considering teaching, help supervise student teachers, and serve as an advisor to the pre-service programs. She/he will be responsible for coordinating with the K-8 schools to provide classrooms and mentor teachers for the early field experiences.

One full-time Program Manager/Diversity Specialist (1 FTE). To demonstrate genuine commitment to recruiting a new generation of math and science teachers who are also from under-represented backgrounds, a fulltime program manager/diversity specialist will be employed. The goals for this specialist will be to assure a broad range of prospective students, but most especially veterans, ethnic and linguistic minority students, and first-generation students are made aware of the program, including understanding the requirements for program admission and completion. The specialist will also work to assure that students from these targeted backgrounds have a strong social network support system. In addition, the program manager/diversity specialist will work with other Western faculty and staff to develop policies and practices within the programs and college that are responsive to the needs of these students. Finally, the specialist will work closely with the Director of the SMATE program in an advisory capacity around existing and new initiatives that are likely to increase the diversity of the pool of candidates who enter and remain in the program until they graduate. We will find an individual (ideally a Master Teacher) with experience working with diverse student populations who will be an enthusiastic cheerleader for teaching science and mathematics, and assist diverse students at all stages who may have an interest in becoming mathematics and science teachers. In addition, we will establish an organization of K-8 STEM TP students to build an identity for the program and provide a voice for students. This will build on the current student chapter of the National Science Teachers Association that has been growing for the past five years and a future mathematics teacher organization that will be established. The two groups will periodically participate in joint activities. The Director of SMATE, the Head of Mathematics, and the Chair of Elementary Education will work with the Program Manager/Diversity Specialist to organize regular events for students, faculty, and staff to build a sense of identity and camaraderie in the program and give the students a forum to provide feedback to program decision makers.

One full-time administrative assistant (1 FTE) will be hired to support the NextGen STEM TP team. Duties will include general administrative support, as well as support for new course development and recruitment and support of diverse students through graduation.

One full-time information technology specialist (1 FTE) will be hired to help with creation of the hybrid science methods/science practicum course, the creation of online tools to support diverse students via social networks, mentoring services, and connections to master teachers, and the development of a NextGen STEM TP resource portal to support the sharing of effective practices, resources, and innovative ideas among STEM TP programs across Washington State

Program evaluator (.25 FTE) to plan assessments, assemble data collection tools and instruments, oversee graduate student work, analyze data and provide annual reports to the Steering Committee that will be used to continuously improve the program. Current plans for data collection include tracking student demographics, individual student progress, enrollments, class evaluations, student teaching evaluations, graduate placement, graduate retention, mentor evaluations, and school evaluations of new STEM TP teachers.

Two half-time graduate student/research assistants (1 FTE) will be hired to collect and reduce data under the supervision of the evaluator. The data will be used to evaluate the program to measure successes and identify problems to be addressed.

Four undergraduate student Learning Assistants will be recruited each quarter to support faculty who are implementing active, student-centered learning strategies in introductory STEM courses.

The SMATE Director position will be increased from 9 to 12 months (0.25 FTE) to support the year round work of the SMATE faculty, the program manager/diversity specialist, the information technology specialist, and the administrative assistant. The SMATE Director will oversee the sharing of NextGen STEM TP resources, models, and findings with K-12 and higher education colleagues involved in STEM TP and Professional Development efforts across the state and nation. This increase in time will also allow the SMATE director to generate additional external funding to support continuous improvements in K-16 STEM TP and Professional Development models so that each new generation of teachers and students in Washington State will benefit from these efforts.

Additional expenses associated with new faculty, staff, and students include modest start-up packages for new faculty, computers for faculty and staff, and funding to support a STEM focused cohort group each quarter to be part of the Compass2Campus program.

Additional Program Elements

Library support is an essential component of WWU STEM TP because effective teachers and teachers to be in this program need access to the latest pedagogical research, teaching materials, content area needs, and assessments. Collections will be built specifically to address the needs of 21st century educators to provide equitable access in a changing demographic climate.

Building on our strengths

One of the unique strengths of Western Washington University's programs is the strong collaboration at all levels between the College of Sciences and Technology and the Woodring College of Education including the substantial participation of mathematicians and scientists in teacher preparation. Scientists from the departments of biology, geology, chemistry, and physics, along with science educators from the college of education, form the Science Education Group. Mathematicians and mathematics educators in the mathematics department have a comparable Mathematics Education Group. Science and Mathematics Education faculty members are actively engaged in research and teaching in their disciplines *and* mathematics and science education. In addition, former classroom teachers work closely with the faculty in teaching the methods/practicum courses bringing their perspectives and experiences to improve the courses.

Both programs have long histories of successful interactions with the schools. The SMATE program was awarded a \$12 million Mathematics and Science Partnership grant by the National Science Foundation (NSF-2002-2012). This grant involved a collaboration of 28 regional school districts and four two-year colleges. In the past three years, the Mathematics Education group received a state Mathematics and Science Partnership grant to provide content and pedagogy training for regional middle school and high school mathematics teachers, as well as a recent (August, 2013) NSF research grant to study the impact of different types of elementary mathematics and science specialist models on student achievement. WWU/SMATE continues to work closely with regional school districts through state-funded Math-Science Partnership grants that focus on whole school education reform built around a STEM core. NSF is also funding "MORE for Teachers", a \$3 million research grant to explore the impact of our innovative elementary preservice program in science on the practice and beliefs of pre-service teachers. And

in September, 2013 NSF awarded WWU a \$2 million, three-year grant to support the campus-wide improvement of *undergraduate* STEM teaching and learning so that more students of all types are attracted to and have the opportunity to succeed in STEM majors.

Working with the community beyond Western

We will work closely with the campus community, the business community, the Governor's office, the state legislature, the Washington Student Achievement Council, other 2- and 4-year colleges and universities, and K-8 schools to establish NextGen STEM TP as an important initiative focused on helping the state meet the goals described in Washington Learns. These collaborations will be formalized through Steering Committee that will insure communication about the program to all of our constituents and will involve our K-8 partners in the design, implementation, evaluation, and improvement of the NextGen STEM TP model.

The Woodring College of Education, the College of Sciences and Technology, and SMATE have long-standing mutually beneficial relationships with our P-12 school partners characterized by the sharing of knowledge and resources to support the preparation and ongoing professional development of teachers. Western faculty and P-12 educators collaborate to design, implement, and evaluate programs for the preparation of teachers through the practicums and internship experiences for our teacher education students and through professional development for practicing teachers. Through these numerous school and district collaborations, Western profoundly impacts the knowledge and skills of future and current STEM teachers. NextGen STEM TP will enable us to expand that influence. Moreover, through NextGen STEM TP, we will collaborate with our STEM TP colleagues across the state to create a model for the preparation of STEM teachers that will serve as an exemplar for other teacher education institutions across the nation. More specifically, we will utilize Washington State's Teachers of Teachers of Science (ToToS), and Teachers of Teachers of Mathematics (ToToM) networks to promote the sharing of best practices, curricula, and models for improving the knowledge, skills, and confidence of K-8 preservice teachers to teach math and science. We will also collaborate with the Office of the Superintendent of Public Instruction (OSPI), the Education Service Districts (ESDs), and our extensive network of partner schools/school leaders to promote the integration of CCSS-Math and NGSS concepts and practices into K-8 schools.

Honoring students who choose to teach

We will work with the administration, the Deans of the College of Sciences and Technology and the Woodring College of Education, and the Office of University Communications to honor those students that choose to become STEM teachers by recognizing them at special events on campus (luncheons or dinners), in the local and hometown media, and at graduation. The NextGen STEM TP Task Force will work with the community and the state to recognize students as they graduate and in the schools.

Supporting teachers after graduation

New teachers graduating from Western Washington University will have full access to the resources and materials in Western's STEM Education Resource Center during their first year of teaching. NextGen STEM TP will implement a program to enhance the induction experience for graduates by connecting new science teachers with STEM Teacher Leaders or mathematics mentors and the professional learning communities in their buildings. STEM Teacher Leaders and Professional Learning Communities have been developed in several buildings in the region over the past ten years through the NSF funded North Cascades and Olympic Science

Partnership and other state grants. Close coordination with the Woodring College will provide a high quality model for student and novice teacher support.

Narrative Justification and Impact Statement:

a) What specific performance outcomes does the agency expect?

The NextGen STEM TP program at Western Washington University will help the state meet its critical need for highly-qualified teachers by (a) expanding our efforts to improve our education program to ensure that *all* elementary and middle school education graduates are prepared to be effective mathematics and science teachers, (b) creating new cohorts of science specialists to serve in high needs elementary schools and (c) preparing a substantial number of middle school teachers to earn one of the new endorsements in middle school science or mathematics. While numbers for middle school endorsements and elementary specialists graduating each year are difficult to predict, a conservative estimate based on the current number of students with expressed interest in middle school and elementary general science majors is 10-15 elementary science specialists, and 10-20 middle school endorsements in mathematics and science per year.

As a result of the quality of their preparation and early career support, we expect our graduates to have a higher retention rate than typical teachers. Western currently collects end-of-course instructor surveys from students. During the first year, WWU will develop and plan the implementation of entry surveys and midterm evaluations. As the first cadre of students approaches graduation, WWU will implement common evaluations of the NextGen STEM TP program and students' university experience.

Woodring College of Education at WWU collects and reports data on the characteristics of students in the program including enrollment statistics, grade point averages, demographics, graduation rates, placement statistics, and retention rates in the schools. In addition, the College collects data on student performance on state-mandated assessments and conducts follow-up surveys with alumni and employers. Western will follow up with students who do not enroll in NextGen STEM TP courses on time to see if they are still in the program. Students who leave the program will be interviewed to assess their reasons for dropping out and provide feedback to the program.

The Director of SMATE, Head of Mathematics, and Chair of Elementary Education will prepare an annual report each year summarizing progress, challenges, and changes to the original plan, to be used as feedback to continuously improve the NextGen STEM TP program. The report will include: The number of certificates and endorsements awarded, the number of certificates and endorsements awarded to students of color, the percent of graduates employed in 3-6 months, the average score on the WEST E test compared with statewide mean, as well as the data listed in the project evaluator description above.

b) Performance measure detail.

Through targeted investment in this decision package, most of Western's accountability measures should be positively impacted: time to degree; credits to degree; fall-to-fall retention rate; 4-year graduation rate; 6-year graduation rate; number of bachelor's degrees awarded, number of bachelor's degrees awarded in high demand, number of advanced degrees awarded; percent bachelor's degree recipients employed or continuing education; percent bachelor degree recipients with no loan debt, 6-year graduation rate for students of color.

c) Is this decision package essential to implement a strategy identified in Western's strategic plan?

NextGen STEM TP embodies the strategic goals of (1) “building upon Western's strengths to address critical needs in the State of Washington”, and (2) “applying Western's expertise and collaborative approach to scholarship, creativity, and research in ways that strengthen communities beyond the campus.” *NextGen STEM TP* will also enhance the participation and success of underrepresented minority students in STEM, and create an innovative model for STEM TP that can help to improve STEM TP across the state. *NextGen STEM TP* brings the faculty and students in two colleges together to pursue the critical goal of improving K-8 math and science instruction by increasing the science and mathematics knowledge, teaching, and assessment of teachers graduating from WWU. We intend to instill in our students a life-long passion for learning and sharing their knowledge with future generations of children through an innovative program that fully engages the broader off-campus community as collaborative partners. The proposed project will increase the funding in a key area—STEM teacher preparation at the elementary and middle school levels. Our commitment to clear outcomes and scholarship around the program will enhance the learning experience for all participants.

d) Does this decision package provide essential support to one of the Governor's priorities?

The Strategic Master Plan Update 2012 recognizes “the need to improve our entire education system – early learning through graduate school – so that a greater percentage of K-12 students earn diplomas and continue further education.” The WWU *NextGen STEM TP* decision package supports this fundamental concept in that there is no better way to create expanded opportunities for Washingtonians than to address the need for highly qualified, diverse expert K-8 teachers in STEM. The need for the package is clear and has been outlined in previous sections. Only students who are well prepared and engaged in STEM learning in elementary and middle school will be able to succeed in challenging STEM courses in high school and enter postsecondary STEM programs and be successful. The WWU *NextGen STEM TP* decision package directly addresses the new mix of diverse and promising students by preparing effective, expert K-8 STEM teachers. The STEM education research already carried out at WWU tells us how to prepare teachers and their students for STEM success. It is imperative to expand these opportunities now before more students are lost to STEM careers before they reach high school.

The 2018 vision called for three broad efforts. The first of these is to “get more people into postsecondary education, and to do more to help them succeed once they get there.” It is obvious that one of the most important ways to get more people to postsecondary education, especially in STEM, is to have young students taught by expert and effective STEM teachers. If we are to grow capacity in high employer demand fields, expert STEM educators are needed throughout the entire pipeline. Students will not be able to succeed in STEM disciplines without effective, knowledgeable, STEM teachers who reflect and understand the 21st century pipeline.

e) Does this decision package make key contributions to statewide results? Would it rate as a high priority in the Priorities of Government process? If so, please describe. The WWU *NextGen STEM TP* decision package does make key contributions to statewide results according to the Priorities of Government in the Statewide Results area of Postsecondary Learning. This package addresses either directly or indirectly, all 5 indicators. The first indicator, increasing the educational attainment of adults, is an indirect benefit in that the benefit from having effective STEM teachers, will, in the long run, affect the educational attainment of all adults. A highly prepared pipeline for STEM success will produce more, well-educated adults in STEM

disciplines. The second indicator of success is the freshmen retention rate. Highly prepared students succeed in STEM. Highly prepared students result from highly effective teachers. WWU has carried out research that demonstrates that success is possible for both teachers and students in STEM disciplines when teacher preparation and development is appropriately focused and structured. The third indicator of success is degree conferred in high-demand STEM disciplines. Highly prepared students succeed in STEM disciplines. The reasons why WWU can uniquely address these issues are outlined above. Indicator 4 is to help more people be successful in the workplace. Highly prepared individuals will perform better in the STEM workforce. Highly prepared individuals mean that students deserve highly prepared and effective STEM teachers. The last indicator concerns the linkage between research and Washington's economy. While this is an indirect measure, it is obvious that the more we provide rich STEM learning opportunities for younger students in the K-12 pipeline, the more we can expect them to be interested in taking challenging STEM courses in high school and college, and pursuing careers that contribute to the research and economic engine in our state.

f) What are the other important connections or impacts related to this proposal?

In many ways, the stakeholders for the NextGen STEM TP package are all the citizens of Washington. All stakeholders will certainly understand the potential impact of the NextGen STEM TP package in that increasing the success of students in the STEM pipeline is fundamentally an issue of effective teaching in STEM. WWU is in a unique position to contribute having success in teacher preparation, teacher professional development and the creation of innovative methods to enhance STEM teacher effectiveness. WWU is also known for building strong and effective collaborations with K-12 schools and with STEM colleagues at two- and four-year institutions across the state.

g) What alternatives were explored by the agency, and why was this alternative chosen?

As part of Western's six-year Strategic Planning process, Western identified its top institutional priorities by examining all college, interdisciplinary and multi-college proposals through a series of campus-wide hearings and planning sessions. The NextGen STEM TP decision package emerged as one of the top three institutional priorities. Western's commitment to highly effective teachers was again demonstrated in the process.

h) What are the consequences of not funding this package?

While WWU is committed to the goals of this project, local funds are not available to fulfill the breadth of goals outlined in this proposal. Because so much has been learned at WWU from outside funding of STEM education research, it is imperative to expand the circle of influence of this work for all Washingtonians. Otherwise, we will need to continue our recruitment of qualified STEM candidates from other states, as the local supply of STEM graduates does not meet current or anticipated future demand by Washington's STEM businesses.

i) What is the relationship, if any, to the state's capital budget?

There is no link to WWU's capital budget for WWU NextGen STEM TP. Our facilities are adequate to perform the work. The existing SMATE facility will be more fully utilized at the completion of this project.

j) What changes would be required to existing statutes, rules, or contracts, in order to implement the change.

None.

k) Expenditure and revenue calculations and assumptions.

This proposal relies solely on support from state appropriations. Fortunately, the proposal is not research intensive, so the costs for hiring new faculty to meet the needs of the proposal are calculated at average salaries for the assistant professorial level, with minimal amounts for startup and relocation costs. The research to complete the assessment portion of the program will be handled with an Evaluation and Assessment Specialist (0.25 FTE) and two Graduate Teaching/Research Assistant comprising 1.0 FTE combined.

l) Which costs and functions are one-time? Which are ongoing? What are the budget impacts in future biennia?

Approximately 90% of the \$892,661 requested from the state are recurring expenses into future biennia. Salaries and benefits comprise 72% of the recurring budget, with additional recurring costs of \$38,000 to support the recruitment and success of diverse STEM students and to support the new faculty and staff hires in the form of student support, library support, and technological support. One-time costs for recruitment of new faculty and staff, relocations, and computer equipment total 10%.