A Proposal for the Establishment of

The WSU Health Science STEM Education Research Center
(HS-STEM-ER Center)

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with

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Introduction

For over 25 years, the Washington State University Spokane campus has been at the forefront of health sciences research, teaching and outreach, with a uniquely high proportion of health science professional programs, resulting in its designation by the WSU Board of Regents as Washington State University’s Health Science campus. Certainly, we recognize that health sciences are distributed throughout the entire WSU system and it is our intention that the proposed center fosters cross system collaborations. To expand these endeavors, create efficiencies and establish a greater regional identity, we are proposing to create the WSU Health Science STEM (Science, Technology, Engineering and Math) Education Research Center (HS-STEM-ER Center). This Center aims to bring together health sciences and education faculty in a critical mass to establish an effective K-20 pipeline, and to establish research and teaching programs to ensure students are well-prepared to succeed in college and career pathways in STEM fields related to the health sciences.

Spokane is host to the largest concentration of health care services between Seattle and Minneapolis. Healthcare and its supporting enterprises provide vital health services for the eastern half of Washington and constitute the single largest employment sector in the city and county. The primary mission of the WSU Spokane Health Science Campus is to provide education and research to strengthen the region’s healthcare enterprise by creating comprehensive research-intensive academic health sciences and health science professional programs including a four-year medical school and expanded residency program, dentistry programs, a four-year pharmacy college, nursing programs (bachelors through doctoral degrees), public and allied health programs, health informatics initiatives, and basic and clinical research in the health sciences. A recent study completed by Tripp Umbach (America’s Next Great Academic Health Science Center: Regional Economic and Community Benefits of the Academic Health Science Center @ Riverpoint in Spokane, WA) predicts that growth of the WSU Spokane Health Science Campus which, at full development, will represent a major comprehensive academic health science center, will be transformative in supporting regional, state and national needs in the following ways: (1) workforce needs will be addressed through expanding numbers of highly qualified graduates for healthcare, higher education and related industries; (2) Spokane will expand as a center for research and discovery in the biomedical science fields and attract external research funding; and (3) the research and education enterprise will provide a coordinated high-quality model for the community and state through preparation of the providers of the future in an integrated teaching, research and care model. The proposed Center will work with faculty throughout the entire WSU system to realize these aspirations and to meaningfully impact lives of residents throughout the state and region.

Nature and Scope of Activities

The expansion and transformation of the WSU Health Science campus is occurring at the same time as calls for state and national reforms in STEM education coupled with the growing urgency to fill the pipeline for health science professions throughout the US. By
leveraging the rich and diverse outreach, academic and research resources already established at WSU, the proposed HS-STEM-ER Center is clearly positioned to be a leader in health science STEM education research and reform. The **mission** of the WSU Health Science STEM Education Research Center (HS-STEM-ER Center) is therefore to coordinate and enhance excellence in health science STEM teaching and learning at WSU, the state, and beyond by providing, supporting, integrating, and disseminating health science STEM education research and related outreach programs and professional activity. The **vision** of the HS-STEM-ER Center is to position WSU as a leader in K-20 health science STEM education by (1) providing leadership in research, evaluation and practice to advance knowledge about successful health science STEM pipeline, professional development and academic programs; (2) working with health science faculty (throughout the WSU system) and with K-12, community college, tribal college, and other public and private sector partners to ensure students are well-prepared to be successful in college and career pathways in the STEM fields related to the health sciences; (3) creating strategies to increase the availability of campus resources to the community at large and to our education partners; and (4) addressing the challenges of diversity by supporting efforts for recruitment and retention of health science STEM students, particularly with regard to traditionally underserved student populations.

The following are examples of current Health Sciences-based resources that will immediately support pipeline initiatives and health science STEM education reform through the proposed HS-STEM-ER Center:

- The concentration of research, professional and allied health science programs on the WSU Spokane campus creates an environment of interdisciplinary and interprofessional collaboration that builds a foundation for the emergence of innovations leading to evidence-based health science STEM pipeline and education models.

- The WSU Spokane Health Science campus is unique among similar major universities with health science centers in its defining economic and professional importance to the community and its close connections to public and private schools, community organizations, private businesses, economic development organizations and healthcare organizations.

- The WSU Spokane Health Science campus has embraced interprofessional education (IPE) and engages faculty and students from three universities (WSU, Eastern Washington University, University of Washington) across 12 health professions programs to promote teamwork and foster mutual understanding through connecting innovative education, collaborative clinical practice and research.

- The WSU Spokane Health Science campus supports synergistic efforts to increase effective instruction across all disciplines and professional programs through collaboration between health science faculty and College of Education faculty who are experienced in professional development and course evaluation for all educators.

- The WSU Spokane Health Science campus hosts well-established and proven models of K-12 outreach and pipeline programs serving urban, suburban, rural and tribal students including:
the Math Engineering Science Achievement (MESA) program to inspire young women and students of color to pursue STEM education and career pathways;

- the Project Lead The Way (PLTW) Biomedical Sciences program to better prepare high school students for STEM education and career pathways;

- the Upward Bound program to help underserved students gain academic skills and motivation they need for success after high school; and

- the Na-ha-shnee Health Science Institute designed to increase the number of Native Americans practicing health sciences.

The following description of a successful K-12 STEM education and health science STEM pipeline program supported through the WSU Spokane Health Science campus, *Project Lead The Way* (PLTW), demonstrates the value of these programs to WSU faculty and their research, academic and professional programs:

*PLTW* is a national nonprofit organization that partners with elementary, middle and high schools to implement courses emphasizing hands-on, inquiry-based experiences in STEM in an effort to prepare students for academic and professional success in these disciplines. The PLTW Biomedical Science Program (BMS) is a four-year high school course sequence program designed to provide students with an understanding of the role biomedical sciences play in the modern world and prepare students for careers in the rapidly growing fields of biomedical and health sciences. The four BMS courses represent a broad foundation in science and healthcare and include specialized knowledge in such areas as: biomedical engineering, molecular biology, genetics, bioinformatics, biochemistry, microbiology, physiology, anatomy, and public health. Students who complete the BMS courses will graduate not only with a rich content background in the biomedical sciences, but importantly they will have become proficient in the following skills that will prepare them for rigorous postsecondary education and career explorations: thinking critically and applying problem solving skills, communicating effectively both orally and in writing, practicing professional conduct, and working effectively in teams.

The BMS program is currently offered in high schools throughout the state of Washington, including all high schools in the greater Spokane region. It is being demonstrated that students enrolled in PLTW courses are: (1) better prepared for high school biology, math and AP biology courses; (2) better prepared for on-campus enrichment programs (e.g. blood borne pathogen training, health science campus shadow experiences including lectures and clinical labs); (3) are better prepared for matriculation to WSU (PLTW students receive tuition waiver scholarships; PTLW students receive preferential acceptance to the College of Pharmacy Save a Seat Program where WSU freshmen can apply for and save a seat in their doctoral program; PLTW students are eligible to receive credit for Biol 107).

A K-12 STEM-focused health science program like PLTW Biomedical Sciences better prepares students for both college and career pathways. BMS students are well-prepared academically with a focus on health science programs of study. With their education goals established, BMS students are much more likely to be motivated to succeed in rigorous programs of study leading to higher retention and graduation rates. This, in turn, will lead to increased enrollment in professional and graduate programs in STEM areas related to the health sciences.
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<th>GOALS</th>
<th>OBJECTIVES</th>
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<td>1. Establish the WSU Health Science Campus as a leader in research on effective health science STEM instructional practices resulting in greater opportunities for faculty to secure research funding.</td>
<td>Promote opportunities for collaborative efforts between health science and education faculty to conduct interdisciplinary and interprofessional research on K-20 health science STEM education, such as faculty seed grants for this type of work.</td>
<td>Articles, books and other publications related to health science STEM education. Presentations on health science STEM education at national and international meetings. Presentations at WSU Research Showcases and other events in the area of health science STEM education.</td>
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<td>Develop a collaborative WSU infrastructure to facilitate external funding in support of health science STEM education initiatives (current database of over 25 WSU statewide faculty and clinical professors with interests in STEM education)</td>
<td>Grants and other awards in interdisciplinary and interprofessional health science STEM education research (e.g. WSU Seed Grant program to facilitate education research between the Colleges of Education and Veterinary Medicine; 2015 federal solicitations: Dept of Education First in the World Program, NSF EHR Core Research, NSF Innovative Technologies for Students and Teachers, ITEST, NSF Discovery Research K12)</td>
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<td>Establish formal partnerships between the HS-STEM-ER Center and K-12 school districts, community colleges, regional universities and tribal colleges to facilitate external funding in support of health science STEM education initiatives.</td>
<td>Identification and support of needs of K-12 and community and tribal colleges, including professional development and curricular support. Models of campus experiences to inspire and better prepare K-16 students for the rigors of postsecondary education and career pathways (e.g., MESA,</td>
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<td>2. Establish the WSU Health Science Campus as a leader in health science STEM education partnerships and outreach resulting in better prepared students enrolling</td>
<td>Establish formal partnerships between the HS-STEM-ER Center and K-12 school districts, community colleges and tribal colleges to improve STEM education curriculum, teaching, and learning through outreach and pipeline programs such as PLTW.</td>
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<td><strong>in WSU health science academic and professional programs.</strong></td>
<td><strong>Establish and support pathways throughout the K-20 system to increase student transitions and retention into health science STEM-related areas with special support for traditionally underserved student populations, like those provided by Upward Bound, Na-Ha-Shnee, and MESA.</strong></td>
<td><strong>Establish formal partnerships between the HS-STEM-ER Center and business and industry to improve STEM education curriculum, teaching, and learning.</strong></td>
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<td><strong>Support efforts to increase the visibility of health science STEM education at WSU.</strong></td>
<td><strong>PLTW, Upward Bound, Na-Ha-shnee). Professional development opportunities within programs on the WSU Health Science campus for K-20 education partners.</strong></td>
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<td><strong>K-12 and community and tribal college STEM-related programs of study leading to health science certifications or high school/college dual credit (e.g., PLTW)</strong></td>
<td><strong>Improved connections between outreach, admissions, financial aid and retention for K-12 and community college students (e.g., MESA, Upward Bound, Na-ha-shnee)</strong></td>
<td><strong>Frameworks for local businesses, STEM professionals and community partners to offer jobs, mentorships or internships to students and teachers to extend classroom learning and mobilize advocacy in support of health science STEM education (e.g. connections with Spokane STEM and other STEM organizations).</strong></td>
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<td><strong>Sponsored campus events focused on recruitment of students interested in health science STEM education and career pathways (e.g., Junior Preview Day).</strong></td>
<td><strong>Sponsored campus events to develop health science STEM interest amongst K-12 and community and tribal college students and their families.</strong></td>
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<td>Establish health science outreach and pipeline activities as an integrated part of the WSU Spokane Health Science campus mission.</td>
<td>Outreach initiatives integrated with college and departmental research, instructional and public service programs and mission. Avenues for formal recognition of the importance of faculty efforts to create outreach and pipeline activities and programs.</td>
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| **3. Establish WSU as a leader in providing high-quality, innovative, and effective collaborative health science STEM education resulting in more effective teaching practices and better prepared students graduating from academic and professional programs.** | Promote and provide professional development for faculty and graduate students to increase instructional effectiveness in the health sciences STEM education. |

| Provide ongoing health science and education course and program assessment and evaluation. For example, measurement of student outcomes and critique of this evidence can be used to guide targeted professional development to address identified issues that can lead to improved student learning. | Collaboration between WSU health science and education faculty regarding curriculum, teaching and learning in the health sciences STEM education. Sponsored workshops, symposia, or other university events related to consideration of common curricula across the professions, techniques for supporting active learning and other aspects of effective pedagogy, curriculum and assessment in health science and STEM education. |

| Attract graduate students interested in health science STEM education research to. | Ongoing improved pedagogy and student outcomes in health science STEM education. |

| Increased number of undergraduate, graduate and professional students interested in health science STEM education. |
Work with health science faculty to encourage the perseverance and success of under-represented students in health science STEM education.

Increased graduation rates of under-represented students in health science STEM education.

4. Provide a strong and concerted voice in health science and STEM education public policy.

Disseminate policy recommendations and opinions on health sciences STEM education in the state, region, and beyond.

Participation in discussions with state and national agencies about health science STEM education. Presence on state and national STEM education committees. Published commentary on critical issues in STEM education. Maintenance of a WSU Spokane HS-STEM-ER Center website.

Response to Items 1-11 of “Establishing New Units” in Guidelines for Establishing New Centers, Institutes, and Laboratories at Washington State University

1. Name of the Unit

The proposed center will be called:

The WSU Health Science STEM Education Research Center (HS-STEM-ER Center)

Note: STEM = Science, Technology, Engineering, Mathematics. Foundational knowledge of these disciplines, their application to the field of health sciences, and the importance of their integration to all STEM fields has been shown to be critical to the success of students in their college and career pathways.

2. Nature and Scope of Activities

2a. Mission. The mission of the WSU Health Science STEM Education Research Center (HS-STEM-ER Center) is to guide continued and expanded excellence in health science STEM education research, teaching and learning at WSU, the state, and beyond by providing, supporting, and disseminating health science STEM education research and related outreach programs and professional activity.
2b. Goals and Activities.

**Short-term goals** (for the 2014-15 academic year)

Building on the health science and STEM education resources already established at WSU Spokane and the rich history and experience of health science research and education on all WSU campuses, the HS-STEM-ER Center will seek to establish itself as a hub for health science STEM education research, outreach and professional activity at WSU. Immediate goals are to:

- Steer current university, public and private partnerships and collaborations to a full-fledged WSU Center, acquiring Administrative and Faculty Senate approval.
- Nurture and develop key partnerships inside and outside the university to assist in the attainment of the Center’s mission and long-term goals.

**Long-term goals** (5-year goals)

The HS-STEM-ER Center will serve as nexus for health science STEM education research, outreach, and educational activity amongst all health science and STEM colleges, departments, programs, and the College of Education across all WSU campuses. Specific goals, objectives, and outcomes are found above. An overview of our goals and objectives include:

- Increase the quality, visibility, rigor and coherence of the health science STEM education enterprise within the WSU state-wide system including research, outreach, and public policy.
- Increase the visibility of the health science STEM education enterprise regionally and nationally through annual conferences on best STEM and health science STEM teaching practices (e.g. active learning techniques) and student learning outcomes.
- Encourage and support the formation of interdisciplinary and interprofessional health science STEM education research teams to develop, enhance, deliver, and evaluate innovative health science STEM education programs, courses, and other instructional activities.
- Establish and nurture pathways throughout the K-20 system for increasing student understanding, interest, and retention in health science STEM-related areas of study, with a particular focus on traditionally under-represented students.
- Promote and support reciprocal collaborations amongst state-wide WSU health science STEM education research professionals, K-12 schools, community colleges, businesses, and community organizations.
- Develop a collaborative WSU infrastructure to facilitate external funding in support of health science STEM education initiatives. Attract graduate students interested in health science STEM education research to WSU such as the current College of Education Mathematics and Science Education Ph.D. students or students earning Ph.D.’s related to health science professions.
- Provide a strong and concerted voice in public policy related to STEM education.
As previously mentioned, the WSU Health Science campus (and other WSU campuses) is currently engaged in numerous outreach and externally-funded activities with a variety of research foci. Activities range from nationally recognized in-school (MESA, PLTW) and out-of-school (Na-ha-shnee Health Science Institute, Upward Bound) health science and STEM programs for middle and high school students with a special focus on traditionally under-represented students; laboratory-based health science and STEM enrichment instruction for middle and high school students and teachers; research on the development and impact of STEM-focused middle and high schools; and collaborative mathematics education professional development projects involving K-12 and postsecondary STEM faculty (Riverpoint Advanced Mathematics Project [RAMP]). Each of these existing programs will be enhanced by the HS-STEM-ER Center.

Additionally, many funding agencies now require an educational outreach component connected to “pure” scientific research. The establishment of a formal HS-STEM-ER Center will increase both the number and synergistic nature of such projects and enhance all WSU faculty’s capacity to fully engage in research on health science STEM educational initiatives.

2c. Integrated Approach. The HS-STEM-ER Center will provide an integrated approach to University-based research, outreach, and educational enhancements in health science STEM education. The activities of the Center will bring together faculty from interdisciplinary and interprofessional health science STEM disciplines with faculty from the College of Education. With this combination of human resources, the HS-STEM-ER Center will serve as a mechanism for connecting health science STEM education activity at WSU with K-12 schools, community and tribal colleges, businesses, and other agencies and stakeholders. Thus, the HS-STEM-ER Center will serve both internal and external functions, serving as a lever for establishing partnerships within WSU and with external entities.

2d. Website. In addition to providing a general overview and membership lists, the HS-STEM-ER Center website will serve as a critical regional clearinghouse for health science STEM education outreach programs, professional activities, and related health science STEM education research opportunities. Portals will be established for school district and community members seeking campus experiences for elementary, middle and high school students; for faculty and graduate students seeking grant funding opportunities including links to colleagues interested in collaborations; for faculty, graduate students and community members seeking information about seminar series and workshops at WSU and other educational partner campuses; and for description of, and research results from, ongoing health science STEM education research projects.

3. Criteria and Method of Selection of Director and the Director’s Term of Office

3a. Administrative Details. The WSU HS-STEM-ER Center will be led by a Center Director and Associate Director who will be responsible for running the Center, with input from an Advisory Board and Program Advisory Committee. The HS-STEM-ER Center will be housed in the WSU Spokane Chancellor’s Office and the Chancellor and Senior Vice Chancellor for Academic Affairs and Research will be primarily responsible for administrative oversight. The Advisory Board will be composed of 6-12
people and meet yearly. The Vice Chancellor for Academic Affairs and Research and the Dean from the College of Education as well as health sciences faculty from WSU will serve on the Advisory Board. Other professionals from both inside and outside the institution will also serve, including representatives from K-12, community colleges, tribal colleges, business and community organizations, foundations, and state educational agencies. The WSU Spokane Senior Vice Chancellor for Academic Affairs and Research, the Dean of the College of Education or Dean of one of the health sciences colleges will chair the board and will serve as the lead to whom the Directors report. Advisory Board membership for non-WSU members will consist of three-year, renewable terms; however, initial term limits will range from 1-3 years to ensure both variety and stability over time.

A second body, the Program Advisory Committee, will also be constituted to provide support and oversight for day-to-day functioning and specific HS-STEM-ER Center activities. The Program Advisory Committee will be composed of 7-10 WSU education and health sciences faculty members with 3-year, renewable terms (initial term limits will also range from 1-3 years). Program Advisory Committee members will be nominated by the HS-STEM-ER Center Directors and the Deans of participating colleges (e.g., Nursing, Pharmacy) and be appointed by the Directors. Broad representation from participating colleges will be sought.

3b. Director Selection and Term of Office. The proposed HS-STEM-ER Center initial Director, Sylvia Oliver, and Associate Director, Janet Frost, were appointed by the WSU Spokane Chancellor’s office. Subsequent Directors will be selected by the Advisory Board. The Director(s) will serve a three-year renewable term; exceptions to this length of tenure can be made but must be approved by a majority vote of the Program Advisory Committee.

3c. Membership. Membership in the Center will be open to any WSU and affiliate faculty or student wishing to be actively engaged in Center activities. A membership list will be maintained and reviewed by Center staff on an annual basis. Eligible HS-STEM-ER Center faculty will maintain “active participant” status by being listed on the Affiliate page of the website and being actively engaged in some aspect of the work of the Center. Such participation may involve administrative roles, health science STEM education research collaborations, educational innovations in WSU health science STEM programs and courses, and STEM education outreach activities, to list a few.

Core Faculty

Sylvia Oliver, PhD, Office of Research and College of Education, Co-Director
Janet Frost, PhD, College of Education, Co-Director
Science Education Faculty position, College of Education
Education Psychology Faculty position, College of Education

Affiliated Faculty (to date)
Brenda Bray, Director of Assessment, College of Pharmacy (Spokane)
William Davis Associate Dean for Undergraduate Education, College of Veterinary Medicine (Pullman)
Jonah Firestone, Science Education, College of Education (Tri-Cities)
Mike Gibson, Allen I. White Distinguished Professor, Chair of Experimental Systems Pharmacology, College of Pharmacy (Spokane)
Steve Hines, Associate Dean for Teaching & Learning, College of Veterinary Medicine (Pullman)
Richard Lamb, Science Education, Learning Performance and Research Center, College of Education (Pullman)
Andrea Lazarus, Assistant Vice President for Research, College of Pharmacy (Spokane)
Kristin Lesseig, Mathematics Education, College of Education (Vancouver)
Judy Morrison, Science Education, College of Education (Tri-Cities)
George Novan, Associate Dean, College of Medical Sciences (Spokane)
Janet Purath, College of Nursing (Spokane)
Connie Remsberg, Director, Advancement of Teaching and Learning Excellence, College of Pharmacy (Spokane)
Barb Richardson, Director, Riverpoint Interprofessional Education & Research, College of Nursing (Spokane)
Amy Roth McDuffie, Mathematics Education, College of Education (Tri-Cities)
David Slavit, Boeing Distinguished Professor of Mathematics Education and Mathematics, College of Education (Vancouver)
Lisa Woodard, College of Pharmacy (Spokane)

3d. By-laws. The Director(s), the Program Advisory Committee and the Advisory Board will construct by-laws to govern the work of the Center. Once established, changes to the by-laws will require a 2/3 agreement by Program Advisory Committee members.

4. The College(s) and Department(s) to be involved

The College of Education and all WSU colleges, departments, and programs can be involved in the HS-STEM-ER Center. Membership is open to all WSU faculty interested in health sciences STEM education, regardless of college or department affiliation. Students working with these faculty are also eligible. Additionally, colleges and programs from educational institutions will be invited to be involved.

5. Amount of Budgetary Support Requested

The goal for HS-STEM-ER Center is to be self-sustaining within five years, mainly through a combination of external funding for the Center through regional, state and federal grant programs and foundations; indirect cost returns; and gifts. Specific funding needs for the HS-STEM-ER Center include the following:

- The equivalent of a 0.5 FTE Director and a 0.5 FTE Associate Director. Funding for both currently provided by WSU Spokane and Project Lead The Way, and the
College of Education, respectively. Funding eventually to be provided by Center resources.

- The equivalent of two research or clinical faculty positions.
- The equivalent of a 0.5 FTE Administrative Assistant for the first three years; full-time thereafter. Funding will be provided by WSU Spokane.
- The equivalent of two Research Assistant positions to be funded through research grants.
- Operations, supplies and equipment. Bridge funding to be provided by WSU Spokane, Project Lead The Way, and the College of Education with funding eventually to be provided by Center resources.

The Directors, and research/clinical faculty member will design and conduct research, outreach events, and professional development activities held on the WSU Spokane campus and on K-14 sites. Additionally, the Center Directors and faculty will provide course and program evaluation support to the WSU health sciences faculty as well as K-20 faculty. Administrative support staff will support travel, purchasing, copying, payroll, and other routine clerical work. In addition, support is needed for logistics and purchasing related to special events such as conferences and showcases. Research Assistants will provide faculty research support, assistance in preparation of scholarly manuscripts and proposals for external funding, and support for Center functioning.

6. Expected Funding Needed from University, State, External Awards, or Gift Sources

During the initial phase of the Center, funding for Directors and administrative support staff will be provided by the WSU Spokane Chancellor’s Office, the WSU Spokane Student Services office, Project Lead The Way, and the WSU College of Education. Additional funding will be sought from the Washington Student Achievement Council, Washington STEM and Spokane STEM. Once Center activities are established and preliminary data on the effects of outreach and professional development are gathered, external funding will be sought from national funding agencies such as the National Institutes of Health and National Science Foundation. We expect that with external funding, F&A returns to the Center, and supporting donors, the HS-STEM-ER Center will be self-supporting within a five-year period.

7. Needs for Space, Equipment, and Supplies

The HS-STEM-ER Center will occupy physical space on the WSU Spokane campus and will serve as a visible reminder of WSU’s focus on, and commitment to, health science STEM education. Specific office space has already been identified and dedicated on the WSU Spokane campus for the Director and Associate Director. However, efforts will be made to locate a dedicated main office for the Director(s) and administrative support personnel. The HS-STEM-ER Center will be a highly-visible physical and virtual space across the entire state where state and national legislators, business leaders, and alumnae can direct funds that will immediately benefit the health science STEM education outreach, professional activity and research enterprise.
The Center requires space in order to be a visible and viable presence at WSU Spokane and in the state. The Center will immediately require the follow spaces with additional space allocations based on the growth of the Center:

- administrative office(s) for the Center Director(s) (identified),
- office(s) for Center administrative support staff,
- office(s) for research and/or clinical faculty,
- shared office space for Research Assistants,
- storage space, and
- appropriate furnishings, computers and other equipment for their intended uses (identified as available on the WSU Spokane campus).

8. Expected Contribution to, and Impact on, Instructional Programs

We anticipate the HS-STEM-ER Center will have the following impacts on instructional programs:

- Research and funding opportunities will attract graduate students interested in studying the design and outcomes of health sciences STEM education, including, but not limited to, the College of Education Mathematics and Science Education Ph.D. students.
- A proposed Seed Grant program modeled after a similar program instituted by the Colleges of Education and Veterinary Medicine will result in improved instructional practices and improved student learning.
- K-12 outreach and professional development activities will result in increased numbers of better prepared students enrolling in the health science STEM undergraduate, graduate, and professional programs at WSU.
- As a result of improved student preparation, health science STEM course and program evaluation, and health science faculty professional development, student outcomes in health science STEM undergraduate, graduate, and professional programs will improve.

9. Expected Contribution to University and Other Clients

The benefits to the research, teaching, and outreach/service mission of WSU involve:

**Research:**

- Federal grant programs increasingly require interdisciplinary and interprofessional collaborative research teams (e.g. requirements by NSF to include educational outreach programming within all grants, both research-intensive and education-based). To meet this need, a clearinghouse for collaborative funding opportunities for faculty and others will be established within the HS-STEM-ER Center resulting in more competitive grant submissions.
- A proposed Seed Grant program will support targeted professional development to learn how to critique the evidence to address identified issues related to effective pedagogy and student learning.
Data obtained through research projects will be provided for campus and statewide support for health science STEM education. In addition, data will be used to inform and improve health science STEM Education at WSU.

Greater numbers of doctoral students interested in health science STEM education, such as the College of Education Mathematics and Science Education Ph.D. students, and supported through externally-funded graduate assistantships will be attracted to WSU to increase the research capacity of the institution.

Current examples of health science STEM education funding:


Oliver, S. (Grant writer and PLTW Consultant) (2012-2016) STEM Pipeline to the Future. $1.2M. US Department of Education, Indian Education Demonstration Grant.

Proposed WSU/EWU/CWU/Whitworth/Rural Alliance 2015 Rural Mathematics Professional Development Project, focused on increasing teaching effectiveness and student outcomes related to Algebra preparedness in grade 4-7.

Proposed 2015 NSF EHR Core Research (ECR) and ITEST, Fundamental Research in STEM Education. In collaboration with regional K-12 rural school districts with PLTW; Colleges of Education, Nursing and Veterinary Medicine.

Outreach/Service:

- New partnerships will be created between WSU and K-12 schools and community and tribal colleges to mutually support the overall K-20 health science STEM education mission of the collective institutions.
- Improved K-12 student preparation and interest in health science professional programs and research will lead to increased intentional enrollment in WSU and other institutions of higher education in health science STEM programs. Intentional enrollment will ensure students are motivated to succeed in rigorous programs of study leading to higher retention and graduation rates. This, in turn, will lead to increased enrollment in professional and graduate programs in STEM areas related to the health sciences (e.g. PLTW Biomedical Sciences program).
- Improved support systems and pathways throughout the K-20 system will lead to increased transitions and retention of traditionally under-represented student populations in health science STEM education programs of study.
- New partnerships with businesses and other agencies will be created that will enhance the state and region’s capacity to develop a viable work force in health science STEM-related fields.

Teaching:

● The HS-STEM-ER Center will provide assistance implementing innovations in health science STEM teaching into related academic and professional courses using current research-based evidence of effective curriculum and pedagogy.
● Doctoral students in the health sciences STEM education programs will participate on Center research teams, including study of effective pedagogy and curricula, thereby gaining expertise for their future work as educators.

Benefits to Faculty:
● Facilitated interprofessional collaboration, such as discussions of common curriculum, possible seed grants, and conferences on active learning techniques in the health sciences.
● Increased numbers of students from K-12 programs such as PLTW that provide strong academic preparation and health science career awareness
● Measurement of student outcomes, examination of evidence, and targeted professional development to address identified issues

10. Supporting Letters from Chairs, Deans, Vice Provosts, and/or other individuals to whom the Unit Director will Report (attached).
11. Grant Support Since 2006 Related to HS-STEM-ER Center Goals and Objectives.

Oliver, S. (Grant writer and PLTW Consultant) (2012-2016) *STEM Pipeline to the Future*. $1.2M. US Department of Education, Indian Education Demonstration Grant.

Oliver, S., Kingrey, J. (Co-PIs) (2012) *PLTW Rural School Models*, $15,000. Empire Health Foundation, Spokane, WA.

Oliver, S., Kingrey, J., (Co-PIs) (2011-2012) *PLTW Rural Schools Assistance*, $10,000. Empire Health Foundation, Spokane, WA.


Frost, J.H. (PI), Lindeblad, K.K., & Coomes, J. (Co-PIs) (2009) $11,700 supplemental funding for RAMP from the Mathematics Content Collaboration Communities (MC^3) project.

Frost, J.H. (PI) & Lindeblad, K. K. (Co-PI)  

Stevens/Ferry Upward Bound Project, $1.25M. US Department of Education

Stevens/Ferry Upward Bound Project, $1.25M. US Department of Education

Zeiger, J. (PI) (2010-present)  
Spokane Math Engineering and Science Achievement (MESA), $165,000 annually. University of Washington

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12. Evaluation Plan

The WSU Health Science STEM Education Research Center located in Spokane, WA will conduct both formative and summative evaluations to ensure the goals and objectives of the Center are being met.

Evaluation questions will include:

• To what extent has the leadership team met project goals and objectives?
• To what extent has the leadership team met project timelines? What were the challenges and successes for meeting the timelines?
• How many members are affiliated with the HS-STEM-ER and what Colleges and Departments do they represent? What proportion of these members are actively involved in HS-STEM-ER activities and programs?
• Were outreach programs, professional development programs and research studies implemented with fidelity and integrity?
• What steps were taken to ensure sustainability of the HS-STEM-ER activities and programs? To what extent are these activities and programs being sustained
• To what extent are the outcomes broadly disseminated in scholarly, professional, and practitioner venues?

Evaluation of Research activities:

Evaluation questions will include:

• What external funding proposals have been submitted and what grants have been obtained? What proportion of these grants are nationally competitive?
• To what extent were the grant teams interdisciplinary, interprofessional and/or inter-institutional? To what extent did they include business or industry partners?
• How were research findings disseminated? How many peer-reviewed publications and presentations resulted from the grant research? What venues were used to share the
findings with national and international health science professionals and STEM education practitioners?
• To what extent are graduate and postdoctoral students involved in HS-STEM-ER research?

Evaluation of K-12 Outreach programs:
In addition to consulting with an advisory review panel, HS-STEM-ER staff will conduct annual surveys or interviews with HS-STEM-ER constituents including teachers, school district administrators, and students. Feedback will be incorporated into iterative improvements in K-12 outreach programs.
Measures of success of K-12 Outreach programs will include:
• Levels of participation of school districts in the greater Spokane region.
• Levels of participation of middle and high school students in HS-STEM-ER-directed outreach programs with special emphasis on participation of students typically underrepresented in health science careers.
• Levels of participation of undergraduate and graduate students as near-peer mentors in HS-STEM-ER-directed outreach programs.
• Levels of participation of middle and high school students in MESA, PLTW and Na-Ha-Shnee programs.
• Numbers of students in MESA, PLTW and Na-ha-shnee who pursue STEM related areas of postsecondary study with special emphasis on the health sciences (e.g. community college and university enrollment data; numbers of students enrolling in the College of Pharmacy Save A Seat Program; etc.).
• Levels of participation of or contributions by Spokane and Eastern Washington business and industry partners?

Evaluation of Professional Development programs:
In addition to consulting with an advisory review panel, HS-STEM-ER staff will conduct annual surveys or interviews with HS-STEM-ER constituents including K-20 educators in the health sciences and STEM education. Feedback will be incorporated into iterative improvements in professional development (PD) programs.
Evaluation questions will include:
• What PD projects were conducted and at what educational levels? What was the focus of each project? How were existing partnerships across K-20 and with regional businesses and industry leveraged in this project?
• To what extent has each PD project met its goals and objectives?
• How many K-12 teachers, students, and school districts participated from the Spokane region? How many K-12 teachers, students, and school districts participated from rural regions in Eastern Washington?
How many WSU faculty participated and what Colleges and Departments were represented?
What proportion of the students served were from underrepresented populations?
• What effect did the PD project have on K-12 or postsecondary instructional approaches? What effect did it have on measures of student productive dispositions, engagement, knowledge and skill development, and ability to transfer learning to new contexts?
• What effect did the PD project have on K-12 student health science career awareness? What effect did it have on measures of student college and career readiness?
• What effect did the PD projects have on undergraduate and graduate student recruitment and retention in health science STEM postsecondary study?
• What effect did it have on discipline, profession, or program-specific desired outcomes?
• To what extent were sustainability efforts included and what were the effects?