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December 8, 2011

Dr. Randy Spaulding
Director
Academic Affairs
Higher Education Coordinating Board
P.O. Box 43430
Olympia, Washington 98504-3430

Re: Program Proposal for *Bachelor of Arts in Education: General Science – Middle Level*

Dear Randy:

Attached is a New Degree Program Proposal from Western Washington University's College of Sciences and Technology to establish a *Bachelor of Arts in Education: General Science – Middle Level* degree at the Bellingham campus effective fall 2012.

WWU looks forward to this opportunity to continue to meet the needs of Washington state students. We appreciate HECB review and would be pleased to answer questions or provide additional information about this proposal.

Sincerely,

Catherine A. Riordan
Provost and Vice President
for Academic Affairs

CAR/bj

Enclosure: New Degree Program Proposal

Cc: George Nelson, Director, Science Mathematics and Technology Education
Jeff Wright, Dean, College of Sciences and Technology
Mark Bergeson, Associate Director, Academic Affairs, HECB

COVER SHEET
NEW DEGREE PROGRAM PROPOSAL

Program Information

Program Name: Bachelor of Arts in Education: General Science – Middle Level

Institution Name: Western Washington University

Degree Granting Unit: College of Sciences and Technology

Degree: B.Ed. Level: Bachelor Type: Education

Major: General Science - Middle Level CIP Code: 13.1203

Minor: N/A Concentration(s): N/A

Proposed Start Date: September, 2012

Projected Enrollment (FTE) in Year One: 5 (# FTE) At Full Enrollment by Year: 2014: 10 (# FTE)

Proposed New Funding: N/A

Funding Source: X State FTE ____ Self Support ____ Other

Mode of Delivery / Locations

Campus Delivery: Western Washington University, Bellingham Campus

Off Site (Enter Locations): N/A

Distance Learning: N/A

Scheduling: X Day Classes ____ Evening Classes ____ Weekend Classes ____ Other

Attendance Options: X Full-Time X Part-Time

Total Credits: 82 quarter credits

Contact Information (Academic Department Representative)

Name: Dr. George D. Nelson
Title: Director, Science Mathematics and Technology Education
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Catherine Riordan — 12.8.11

Endorsement by Chief Academic Officer — Date

NEW DEGREE PROGRAM PROPOSAL
Western Washington University
Bachelor of Arts in Education: General Science – Middle Level

Background

Washington State established an integrated Middle Level Math/Science endorsement in 2003 designed around learning outcomes in each content area and in middle school pedagogy. Western Washington University determined that the level of content knowledge required to effectively teach both mathematics and science in the middle school would result in a major of 110 credits in addition to the elementary education professional program and chose not to develop an endorsement program. The Middle Level Math/Science endorsement was eliminated in 2008 and replaced with separate Middle Level Mathematics and Middle Level Science endorsements. This decoupling allowed us to focus on the development of a high-quality middle level science major of 82 core credits that in combination with the elementary professional program, will lead to endorsements in both Middle Level Science and Elementary Education. The target population for the program is elementary education students but we expect to serve some secondary education students who would otherwise have pursued a secondary level science endorsement in order to teach science in middle schools.

1. Relationship to Institutional Role, Mission, and Program Priorities

The common core of the Western Washington University educational experience is the liberal arts and sciences, including the dimensions of analysis and communication, creative and aesthetic expressions, knowledge of civilization and cultural pluralism, scientific and mathematical understanding, and a sense of perspective on the nature and processes of human development. Professional and applied programs are built upon institutional strengths and are responsive to national, state and regional needs. The University values its historical role in preparing future teachers, in preserving unique curricular emphases, and its more recent efforts to integrate new technologies in teaching and learning.

Western Washington University is the leading producer of mathematics and science teachers in Washington State. The Science, Mathematics, and Technology Education (SMATE) program housed in the College of Sciences and Technology is the unique organization responsible for the content and also the science and mathematics pedagogy preparation of future elementary (K-8) and secondary (middle and high school) teachers. The faculty that teach in these programs are scientists and mathematicians from the discipline departments and their colleagues in the Woodring College of Education who work together seamlessly to design and deliver coherent teacher education programs. Our teacher education programs routinely prepare over 50 secondary mathematics and science teachers each year, and more than 150 elementary teachers at the Bellingham campus alone.

Bellingham undergraduate elementary education students major in one of 20 approved academic majors. The General Science – Elementary major consists of 51 core credits designed to prepare future elementary teachers to be elementary science specialists but it does not result in an additional endorsement in science. The proposed degree program has been designed by the Science Education Group of SMATE to ensure that students meet or exceed the state middle level science endorsement competencies based on the knowledge and skills demonstrated through our content and education courses. The education courses draw on the strengths of both the Elementary and Secondary Education Departments, and the content courses are assembled from existing courses in the science departments and SMATE.

The proposed General Science - Middle Level major is clearly aligned with the program priorities and mission of SMATE and with the role and mission of Western Washington University and of Woodring College of Education, the unit responsible for teacher certification programs:

The Science, Mathematics and Technology Education Program mission is to:

- Be a national model of the highest quality preparation of future elementary and secondary science teachers;
- Participate in research and dissemination of new knowledge in science education and education reform to the university and K-12 communities; and
- Serve as a valuable science and education resource to the university and broader community.

Western Washington University is committed to engaged excellence in fulfilling its tripartite mission of teaching, scholarship, and community service in a student-centered environment, with a liberal arts foundation and opportunities to develop professional skills. As a public institution of higher education, Western serves the needs of the citizens of the state of Washington by providing undergraduate and select graduate programs in Bellingham and at selected locations elsewhere in the state. Western provides students with a personalized teaching and learning environment of the highest quality. Through engaged excellence:

- Western instills in graduates a life-long passion for learning and fosters individual curiosity, intellectual rigor, critical thinking, and creativity.
- Western promotes scholarly and creative work of significance and applies that scholarship in regional, national, and global communities.
- Western creates opportunities for students to display leadership, civic engagement, social responsibility, and effective citizenship.
- Western brings together an increasingly diverse and talented student body, faculty, and staff to form a learning community that, along with community partners, involves its members in active learning, scholarly discourse, and reflection.
- Western provides a high quality environment that complements the learning community on a sustainable and attractive campus intentionally designed to support student learning and environmental stewardship.

Woodring College of Education facilitates learning that prepares and advances quality educators and human services professionals throughout their careers. As academic leaders, educators, mentors, and scholars, we seek to:

- Model best practices in teaching and learning which, in turn, lead graduates to use best practices in their professions;
- Cultivate student competence through extensive field experiences with exemplary practicing professionals;
- Construct, transform, and convey knowledge by integrating research, theory, and practice;
- Act with respect for individual differences;
- Develop collaborative partnerships that promote the learning and well-being of individuals, families, and the community; and
- Evaluate processes and outcomes to assure continual program improvements.

2. Documentation of Need for the Program

Employer and Community Demand for Highly Qualified Middle School Science Teachers

The Professional Educator Standards Board (PESB) study *Ensuring an Adequate Supply of Well-Qualified Math & Science Teachers* (2008) responds to a charge from the state legislature to quantify the current and projected supply and demand for math and science teachers, provide information on differential pay for teachers in high-demand subjects like math and science, and make recommendations on how to meet the expected demand, including strategies for improving the rigor and productivity of current teacher preparation programs. The study presents an endorsement profile of Washington State middle level science teachers that at a summary level shows 86.4% of fulltime equivalency (FTE) is taught by endorsed teachers. However, of the total 1033.8 FTE:

- Only 32.3% is endorsed in a science subject;
- 43.5% is endorsed in Elementary Education but not in a science subject;
- 10.6% is taught by teachers holding a pre-1987 second tier Standard certificate that did not require content preparation for classroom assignment; and
- 13.6% is taught by teachers who do not hold an endorsement considered appropriate by the PESB.

The study also reports data on the production and capacity of Washington's current approved teacher preparation programs in math and science. Of particular note:

- Although enrollment has increased at a number of institutions only one preparation program - Western Washington University - is enrolling at capacity with plans for increased math and science enrollment.
- Half to three-quarters of the annually issued endorsements in math and science are to teachers coming from out-of-state.

Western's commitment to increase enrollment in math and science teacher preparation programs is supported by a number of initiatives including the proposed middle level science program.

The Office of Superintendent of Public Instruction (OSPI) biennial educator supply and demand studies provide data intended to inform and shape decisions and actions of Washington State policy makers and agencies and to cultivate dialogue between educator stake-holders and community groups. The 2006 *Educator Supply and Demand in Washington State* (2007) report includes data on the perception of teacher shortage areas gathered through a survey of school districts in Washington State on a scale of 1 (considerable surplus) to 5 (considerable shortage). Survey results indicate "some shortage" of middle level math/science teachers based on a mean rating of 4.19, reflecting an increased in shortage from 3.78 in 2004. An even greater demand was reported by school districts in the Northwest Educational Service District catchment area served by Western Washington University. On the basis of a 4.40 mean rating there is "considerable shortage" of middle level math/science teachers in this region of the state, an increase from 4.13 in 2004.

The report also contains data on the number of Washington teachers in the 2005-2006 school year who were reported as not meeting the federal *No Child Left Behind* highly qualified teacher (HQT) requirement. Data collected by OSPI indicate122 general education middle school science teachers as compared to 33 general education high school science teachers did not meet HQT in 2005-06. The report also notes that the HQT requirement imposes a new demand for teacher quality that has impacted the employability of elementary-prepared teachers. Although authorized by the state to teach any subject grades K through 8, they are less likely to have demonstrated their content knowledge in core academic subjects through the equivalent of a major or state-validated test as required by the federal regulations.

Meeting HQT is not the only challenge for newly prepared elementary teachers given "some surplus" found by the 2006 OSPI supply and demand study and the more recent state budget crisis. Input solicited by Woodring College of Education over the past four years from district administrators during semiannual job search seminars and annual Washington Educator Career Fairs is clear - elementary and middle school teachers who hold an endorsement in a core academic subject are considered more prepared and employable than those who do not.

According to the HECB *State and Regional Needs Assessment* (2006) "...the state higher education system must develop strategies to increase the number of qualified K-12 teachers and administrators in key shortage areas," which includes both science and middle level math and science. The report also identifies middle school teacher as a key occupation requiring a bachelor's degree and higher in the Northwest region of Whatcom, Skagit, Island and San Juan counties where Western Washington University serves as the only four-year institution of higher education. In addition, the report cites the need for a 31% increase in public college and university enrollment to meet student demand at the state average level in the Northwest region, and a 21% growth to meet student demand at the state average level in the combined regions of Northwest and nearby Snohomish. Employer demand for science teachers is not unique to the state of Washington, as captured in the U.S. Department of Education *Teacher Shortage Areas National Listing* (2009).

Improving Student Achievement in Science

According to the synthesis of research conducted by the Education Trust,

> *...teacher effectiveness is the single biggest factor influencing gains in achievement, an influence bigger than race, poverty, parent's education, or any of the other factors that are often thought to doom children to failure.* – Thinking K-16, Education Trust (2004)

The final *Washington Learns* report issued in 2006 cites the need to increase the effectiveness of teachers in order to increase the achievement of middle school students in science. One of the initiatives for a world class education (Math & Science: A Competitive Edge) is to increase the preparation of K-12 students through a strategy for building expertise in math and science teaching, including these actions:

- Increase math and science course requirements for all prospective teachers.
- Ensure that teachers assigned to teach math and science in middle and high schools are prepared to do so.
- Provide professional development and training for teachers to use the state curricula materials.

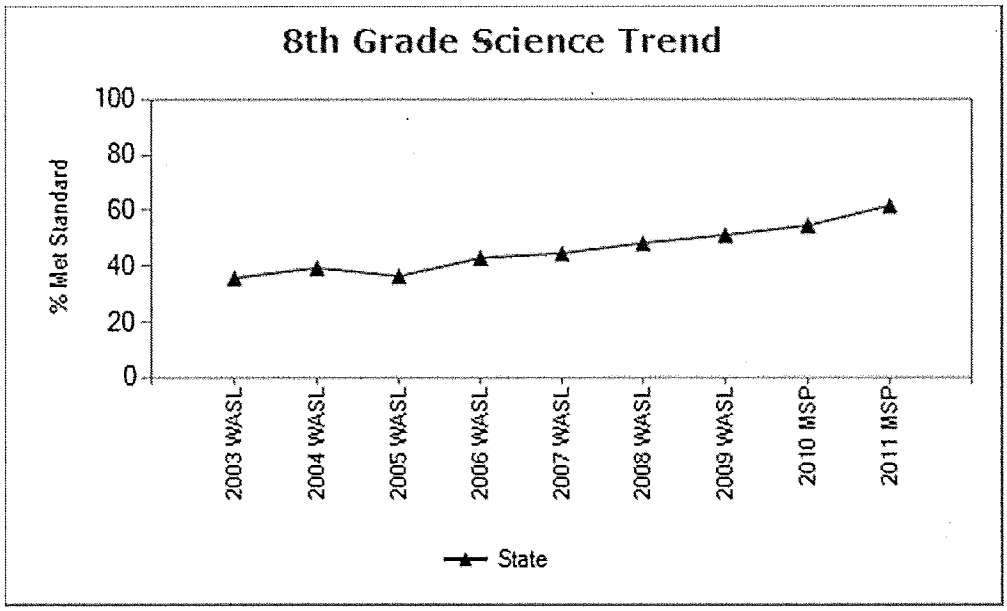
The strategies identified in *Washington Learns* are consistent with needs identified in the previously cited PESB study *Ensuring an Adequate Supply of Well-Qualified Math & Science Teachers* (2008) and Western's commitment to increase the state's supply of well-qualified math and science teachers through pre-service and in-service teacher preparation programs.

The need to increase the effectiveness of middle school science teachers is also supported by state and national data on the performance of 8th grade students in standardized assessments. Following are Washington State Report Card data on the science Washington Assessment of Student Learning (WASL) and Measure of Student Progress (MSP) since its inception.

Table 1: Science WASL/MSP Results for 8th grade

Testing Year	Percent Meeting Standard
2010-11	61.6%
2009-10	54.5%
2008-09	51.1%
2007-08	48.2%
2006-07	44.6%
2005-06	42.9%
2004-05	36.4%
2003-04	39.4%
2002-03	35.8%

The graph below better illustrates the trend of 8th grade students who have met standard by scoring proficient or above on the science WASL.



While the percentage of students meeting standard is increasing, the slope is very shallow. Unless we can increase the slope of this curve it will be decades before most 8th grade students reach proficiency in science. The key to improving student performance in science is to improve teacher effectiveness. In the short term we need to work with in-service teachers but in the intermediate and long term, if we are going to meet and sustain our goal of science literate high school graduates, we must prepare and graduate new teachers who can effectively teach science to middle school students.

The National Assessment of Educational Progress (NAEP), often called the "Nation's Report Card," is the only measure of student achievement in the United States that compares the performance of students across the nation. Based on 2005 NAEP scores, only 33% of Washington State 8th grade students scored proficient or higher on the NAEP science assessment as compared to 27% nationwide.

Table 2: 2005 NAEP Science Results for 8th grade

	Washington State	**Nation**
Advanced	4%	3%
Proficient	29%	24%
At Basic	33%	30%
Below Basic	34%	43%

Student Interest

Western Washington University elementary students have been expressing interest in a middle school science major for many years. That interest increased in 2006, when the U.S. Department

of Education determined the Washington State Elementary Education endorsement is not sufficiently rigorous to demonstrate subject matter competency required to meet the HQT requirement at the middle level. Because we could not support the offering of a large interdisciplinary major to meet the Math/Science Middle Level endorsement competencies, elementary students wishing to teach science at the middle level were advised to complete the General Science – Elementary major or other science-related major. Some did not declare a science major but rather, took the state's subject knowledge test in middle level science in order to meet HQT. With the uncoupling of math and science content to two distinct endorsements we now have the opportunity to quantify and respond to student interest.

When developing a new program it is difficult to capture reliable data on the interest of first and second year college students who may not yet have decided on a major or even an academic direction. However, over the past year we have routinely advised students on the curriculum and outcomes of the proposed program with a positive response. Our primary source of data for student interest is elementary education students seeking specialization in the content area of science. A total of 12 Western Washington University elementary education students earned a BAE with a major in General Science – Elementary over the last five academic years. As indicated by the table below, student interest in this major has increased dramatically over the last three years. In 2011-2012 an additional eight students will graduate.

Table 3: Non-endorsable General Science – Elementary Major

	2006-07	2007-08	2008-09	2009-10	2010-11
Active General Science – Elementary Majors	9	11	22	21	22
Graduated with General Science – Elementary Major	2	2	0	4	4

There are currently three students that have indicated an interest in the General Science—Middle Level major in anticipation of the program's implementation. A survey of approximately 100 current elementary and secondary science education students resulted in a projected interest in the new major of approximately 5 students. This is consistent with our projections in Form 7.

3. Support of the Statewide Strategic Master Plan for Higher Education

The proposed program clearly supports the goals of the HECB 2008 Washington Strategic Master Plan for Higher Education as evidenced by employer and community demand studies and K-12 student achievement data cited under Section 2 of this proposal. The goals and a summary of how the program addresses them are listed below.

Goal 1: Create a high-quality higher education system that provides expanded opportunity for more Washingtonians to complete postsecondary degrees, certificates, and apprenticeships.

The HECB Plan cites strategies for raising educational attainment to create prosperity and opportunity, including "Create higher expectations for K-12 students by preparing

educators for the 21st century" and this supporting policy goal: "Invest in teacher preparation (pre-service and in-service) to produce early learning providers, K-12 school teachers and administrators who can effectively engage families and communities to close the achievement gap, raise student proficiency in math and science, provide high-quality academic advising, and increase college attendance." The proposed program will add to the postsecondary educational opportunities available to Washingtonians and increase K-12 student proficiency in science through a rigorous content curriculum that combined with the elementary professional program, leads to a bachelor of arts in education and Residency teacher certificate endorsed in the teaching shortage area of middle level science.

Goal 2: Create a higher education system that drives greater economic prosperity, innovation and opportunity.

The HECB Plan describes a vision of promoting economic growth and innovation, including filling unmet needs in high-demand fields and promoting student enrollment in STEM fields. The rigorous science curriculum of our program responds to this vision and to the *Washington Learns* initiative to "... hold our students to math and science standards that are at least as high as those in other states and nation." By doing so, we will be preparing a workforce that can compete in the global economy, respond to state and regional employer demand, and contribute to the economic prosperity of Washington State.

4. Relationship to other Institutions and Uniqueness of the Program

Institutions seeking to offer the new middle level science endorsement were required to gain program approval from the PESB, which considers a program to be a comprehensive set of learning opportunities developed to help the candidate demonstrate the competencies. Program approval applications must cite strategies for assessing candidate capacity and performance relative to the new competencies but the PESB does not review or approve specific courses or curriculum. According to the OSPI certification website there are now 15 institutions approved to offer the middle level science endorsement including Western Washington University.

Of the 14 other public and private institutions, six offer the endorsement in conjunction with an elementary education undergraduate program – two through middle level science majors and four through additional coursework beyond the major. The remaining institutions were not included in our analysis for at least one of these reasons: does not offer an undergraduate elementary education program; offers the endorsement primarily through performance-based assessment rather than coursework; does not appear to offer a program. One institution is seeking HECB approval for a new integrated major that combines middle level math and science minors but the program does not include elementary education.

The two institutions delivering a major in middle level science are located in Eastern and South Central Washington. The four institutions delivering a program through additional coursework beyond a major are located in Central Washington and in the greater Seattle area to Olympia. Most require coursework in designated sciences through the program or through general

university requirements (GURs) prior to program entry, and some require a course specific to middle level pedagogy or programming.

The Western Washington University major is unique on two levels: the depth and breadth of science content and the strength of the Science, Mathematics, and Technology Education (SMATE) program. Western is the highest producer of new teachers earning secondary level science endorsements in Washington State and is well-positioned to deliver a middle level science major. SMATE is a visionary and practical program designed to enrich the training and education of K-12 pre-service and in-service teachers and through them, their students. From a collaboration of the disciplines of education, chemistry, geology, biology, physics/astronomy, mathematics, and engineering technology SMATE offers an opportunity for current and future teachers to gain specific skills and broaden talents within their chosen discipline. Our strong relationships with K-12 school partners contribute to the successful field experiences of our pre-service teachers, and to the professional development of science and math teachers through projects exemplified below.

- With funding from the National Science Foundation, Office of Superintendent of Public Instruction, and the Higher Education Coordinating Board SMATE faculty members are working as partners with seven regional school districts to improve science instruction in K-12. These partnerships have a profound impact on teacher retention. Activities include support for building-based professional learning communities, intensive summer science content immersion experiences, professional development and technical assistance for state-funded science coaches, development of new K-5 science curriculum for the Bellingham School District, collaboration with Western Washington University and local community college scientists to prepare new biology and geology course materials for future elementary teachers for commercial publication, and development of resource materials and professional development for mentor teachers and new teacher induction.
- College Readiness in Science Partnership: CRISP is a three-year, $776,000, grant funded by the HECB involving 39 middle and high school science teachers and seven principals in three school districts. The partnership will 1) improve students' science content knowledge and habits of mind that will enable them to succeed in post secondary education and 2) increase teachers and administrators understanding of effective science instruction and the support necessary for high functioning professional learning communities.
- Sustaining Partnerships Enhancing Collaboration K-8: SPECK-8 is a three-year, $746,000, state math science partnership grant involving 75 elementary teachers and 15 principals in four school districts. The partnership will 1) increase administrators' knowledge, dispositions, and practices to create and sustain effective science professional learning communities, 2) increase teachers' knowledge, skills, and dispositions needed to improve their instructional effectiveness and participate effectively in science PLCs, and 3) increase all students' science content knowledge and decrease the achievement gap.

5. Curriculum

Program Description

The curriculum for the proposed major demonstrates a coherent design, depth, breadth, and sequencing. The major is designed around performance-based learner outcomes aligned with state competencies for the middle level science endorsement. Coursework in the major includes 72-73 credits in science content, five credits in math (plus a pre-requisite course or appropriate math placement test score) and a course specifically designed to address middle school curriculum and instruction, developmental issues concerning middle school students, and cognitive skill development strategies. Of the 20 courses included in the major, four were designed to prepare prospective elementary and middle school teachers in the inquiry, issues, and nature of science with focus on physical, earth, and life systems and on investigative science. Completion of this major along with the elementary professional program will lead to recommendation for a Residency teacher certificate endorsed in Elementary Education and Middle Level Science.

The proposed major is listed in the table below, followed by the existing 106-credit elementary education professional program that includes science teaching methods and field experience courses designed and delivered by SMATE faculty.

Table 4: General Science – Middle Level Major (81-82 Credits)

Course	Title	Qtr. Credits
SCED 201	Matter and Energy in Physical Systems	4
SCED 202	Matter and Energy in Earth Systems	4
SCED 203	Matter and Energy in Life Systems	4
SCED 294	Investigative Science	4
SCED 370	Science and Society	3
ASTR 103 or	Astronomy for the Liberal Arts	4 or
ASTR 113	Sun, Moon, and Planets	3
BIOL 204	Intro to Evolution, Ecology and Biodiversity	4
BIOL 205	Intro to Cellular and Molecular Biology	5
BIOL 206	Into to Organismal Biology	5
CHEM 121	General Chemistry I	5
CHEM 122	General Chemistry II	5
CHEM 123	General Chemistry III	4
GEOL 211a	Physical Geology Review	2
GEOL 212	Historical Geology	4
GEOL 252	The Earth and it's Weather	4
MATH 115	Precalculus II	5
PHYS 101	Physics Analysis	4
PHYS 104	Physics Applications	4
300 Level	Elective	4
SEC 450	Introduction to Middle School	4

Table 5: Elementary Education Professional Program (106 Credits)

Course	Title	Qtr. Credits
	Professional Studies Core	
EDUC 301	Educational Psychology I: Development & Individual Differences	4
EDUC 302	Educational Psychology II: Motivation, Learning, and Assessment	4
EDUC 310	Teacher and the Social Order	4
SPED 364	Teaching All Students	4
ELED 370	Introduction to Teaching	5
IT 344	Basic Instructional Technology Skills	1
IT 442	Classroom Use of Instructional Technology – Elementary	3
	Methods, Curriculum Content, and Field Experiences	
ART 380	Art Educating the Child	3
ELED 425	Social Studies for the Elementary School	5
ELED 470	Developing Teaching	5
ELED 471	Documenting Teaching	5
ELED 480	Literacy II: Beginning Communicators	5
ELED 481	Literacy II: Fluent Communicators	5
ELED 491	September Experience	2
ELED 492	Practicum: Experience in Literacy Methods	4
ELED 494	Internship – Elementary (MS placement)	14
HLED 455	Health Education Grades K-8	2
MATH 381	Teaching K-8 Mathematics I	4
MATH 382	Teaching K-8 Mathematics II	4
MATH 383	Teaching K-8 Mathematics III	4
MATH 491	Mathematics Internship Seminar	2
MUS 361	Music for Elementary Teachers	3
PE 345	Physical Education for Elementary School	3
SCED 480	Science Methods & Curriculum for the Elementary School	5
SCED 490	Laboratory/Field Experience Elementary Science (MS placement)	3
SPED 430	Problem Solving for Diverse Needs	3

Model schedule

The major must be accompanied by the professional preparation program in elementary education. Table 6 provides a model schedule, combining major course work with required course work from the professional preparation program.

Table 6: Example of a Model Schedule with Professional Preparation Program (with the following course equivalents taken as GURs: SCED 201, SCED 202, SCED 203, MATH 381, MATH 382)

Year	Quarter	Recommended Courses	Total Credits
Freshman	Fall	ASTR 113 (3) SCED 201(4)	17

Year	Quarter	Recommended Courses	Total Credits
		GUR (Comm 1) (5) *GUR (CGMS)(5)*	
	Winter	PHYS 101 (4) SCED 202 (4) *GUR (Comm 2)* (5) *GUR(Hum 1)* (5))	18
	Spring	SCED 203 (4) MATH 115 (5) *GUR(Soc Sci 1)* (5) *GUR(Hum 2)* (5)	19
Sophomore	Fall	CHEM 121 (5) GEOL 211a (2) *GUR(Soc Sci 2)* (5) *GUR(Hum3)* (5)	17
	Winter	BIOL 204 (4) CHEM 122 (5) GEOL 212 (4) SCED 294 (4)	17
	Spring	BIOL 205 (5) CHEM 123 (4) GEOL 252 (4) *GUR(Soc Sci 3)*	16
Junior	Fall	PHYS 104 (4) BIOL 206 (5) 300 Level Elective (4) SCED 370 (3)	16
	Winter	EDUC301 (4) EDUC 302 (4) EDUC 310 (4) EDUC 370 (4)	16
	Spring	IT 344 (1) SCED 480 (5) ELED 464 (4) SEC 450 (4) SPED 364 (4)	18
Senior	Fall	ELED 425 (5) IT 442 (3) MATH 381 (4) SCED 490 (3)	15
	Winter	ART 380 (3) ELED 470 (5) MATH 382 (4)	12
	Spring	ELED 480 (5) HLED 455 (2) Math 383 (4) MUS 461 (3)	14

Year	Quarter	Recommended Courses	Total Credits
Professional Year 1	Fall	ELED 481 (5) ELED 491 (2) PE 345 (3)	15
	Winter	ELED 471 (5) ELED 492 (4) Math 491 (2) SPED 430 (3)	14
	Spring	ELED 494 (14)	14

Articulation with Community Colleges

Western Washington University endorses the HECB *Policy on Intercollegiate Transfer and Articulation among Washington Public Colleges and Universities*. Students who complete the Direct Transfer Agreement Associate Degree at a Washington State community college prior to initial enrollment at Western will satisfy all of Western General University Requirements (GURs). In addition, Western is a party to the Statewide Elementary Education DTA Major Ready Pathway agreement dated 2005. Western Washington University and Woodring College of Education Admissions directors participate in numerous events and activities on community college campuses and on the WWU campus in order to inform and advise community college students about our programs and the availability of the MRP.

Courses in the program are highly accessible. Three of these courses (SCED 201, 202, 203) were developed in conjunction with Everett, Skagit Valley, and Whatcom community colleges and are delivered at these institutions and on the Western Washington University Bellingham campus as GURs. Twelve of the remaining courses are directly articulated with most Washington State baccalaureate and community colleges. Hence, undergraduate students in institutions across Washington State who wish to complete a rigorous middle science major may take a significant number of credits before transferring to Western Washington University.

Program Admission

Students will declare the major through SMATE once they are admitted to the Woodring elementary education program. Transfer students with 45 credits+ or an associate degree apply to Western and the elementary professional program concurrently or to the elementary program soon after admission to the University. Admission to the elementary professional preparation program requires the following:

- Admission to Western Washington University
- Completion of a minimum of 45 credits
- Cumulative grade point average of 2.75 or higher for the last 45 credits
- Acceptable West-B (basic skills) scores
- Completion of an English composition course with a grade of B- or higher
- Completed application and proctored essay

Program Delivery

Courses in the proposed program are delivered weekdays at the Bellingham campus location via face-to-face instruction. Many courses include hand-on practicum experiences in diverse settings in Whatcom or Skagit County.

6. Infrastructure and Resources

All resources for delivery of the proposed major are in place. There are no new courses to develop, no new faculty or staff positions to hire, and the facilities are state-of-the-art. The SMATE facility is designed to accommodate its academic vision. The 15,000 square foot facility contains four state-of-the-art classrooms and laboratories, one each specially tailored to elementary and secondary education. They surround a Learning Resource Center with more than 15,000 books on standards, assessment, curriculum and activities. The Center also contains collections of classic and current materials, laboratory resources, educational technology, and expertise that students, faculty, the local community and teachers from around the state can draw upon either on-site or in the schools. In both its approach and facilities, the SMATE program in a national model for teacher training in undergraduate mathematics, science, and technology education. In addition, SMATE faculty are engaged in a number of research projects that connect the pre-service program to the K-12 schools and offer students the opportunity to gain unique experiences. Numerous scholarships and paid research experiences are available each year for future teachers of science as noted in Section 9 of this proposal.

7. Faculty

There are 10 fulltime permanent science education faculty associated with SMATE including the director drawn from science discipline departments and from Woodring elementary and secondary education programs. All hold terminal degrees in their respective disciplines and most have extensive experience teaching in the K-12 schools. The existing faculty, along with other faculty who teach content for the science discipline departments, is sufficient to support the proposed middle level science program. Key program faculty members are listed below. Due to the small increase in the number of students, we estimate that the increased faculty time is approximately three hours per month for each faculty member. Detail on faculty FTE assigned to this program may be found in Form 6: Key Program Personnel, available by request.

ALEJANDRO ACEVEDO-GUTIÉRREZ (2002) Associate Professor. BSc, Universidad Autonoma de Baja California Sur, Mexico; PhD, Texas A&M University.

EMILY BORDA (2005) Associate Professor. BS-Chemistry, Gonzaga University; MEd-Educational Leadership and Policy, MS, PhD-Chemistry, University of Washington.

ANDREW BOUDREAUX (2008) Assistant Professor, BS University of California-Berkeley, PhD, University of Washington.

DONALD BURGESS (2004) Assistant Professor. MS Education-Biology, State University of New York, Cortland, PhD, University of British Columbia.

SUSAN M. DEBARI (1998) Professor. BA, Cornell University; PhD, Stanford University.

DEBORAH A. DONOVAN (1998) Professor. BSc, MSc, University of California-Davis; PhD, University of British Columbia.

STEVEN GAMMON (2002) Professor. BA, Bowdoin College; PhD, University of Illinois at Urbana-Champaign.

SCOTT R. LINNEMAN (2000) Professor. BA, Carleton College; PhD, University of Wyoming.

GEORGE D. NELSON (2002) Professor. BS, Harvey Mudd College; MS, PhD, University of Washington.

CHRIS OHANA (1999) Associate Professor. BA, University of California-Berkeley; MA, University of Oregon; PhD, Iowa State University.

8. Administration

Administration of the program will be led by Dr. George D. Nelson, Director of SMATE. Dr. Nelson will collaborate with SMATE faculty including the Elementary Education Department Chair to continuously evaluate and oversee the content of the program. Dr. Nelson will also plan and coordinate the collection of student performance data and analyze data for program improvement. The Assistant Director of SMATE has responsibility for the SMATE facility and Learning Resource Center including operations, and will provide associated support to students and faculty in the program. Since this work is already done for SMATE programs, we estimate that this will only require an additional two hours per month for both the Director and Assistant Director. The SMATE Administrative Assistant will support administrative efforts including advertising, recruitment, and general support to faculty and students. Support for additional students will require approximately nine hours per month for the Administrative Assistant. Detail on administration and staff FTE assigned to this program may be found in Form 6: Key Program Personnel, available by request.

9. Students

Student Population and Financial Resources

The targeted population of this program is undergraduate students completing the elementary education preparation program who wish to serve as science specialists and to be highly qualified for teaching science at the middle level. By earning the middle level science endorsement students will demonstrate in-depth preparation as a highly qualified teacher at the middle level and extend the grade level in which they are authorized by the state to teach science to Grade 9.

Enrollment is conservatively projected at five FTE per year with full enrollment at 10 FTE in Year 3 and each year thereafter. With the support of the following financial resources available to students completing the program and associated recruitment efforts the actual FTE may be greater.

- The federal TEACH Grant program is available to students who have been admitted to one of Western's undergraduate or graduate programs leading to endorsement in a teaching shortage area. In exchange for receiving a TEACH Grant, program completers must teach in a high need subject area for at least four years at a school serving low income students.
- Through the Washington NASA Space Grant Consortium, SMATE offers five to seven $1500 scholarships to undergraduate students who wish to pursue teaching in K-12 and are majoring in a designated or general science.
- The Double Eagle Scholarship for Future Science, Mathematics and Technology Teachers offered by SMATE awards $1500 scholarships to undergraduate students who wish to pursue teaching in K-12 and are majoring in a designated or general science.
- Western Washington University was recently awarded a five-year, $900,000 grant from the National Science Foundation's Robert Noyce Teacher Scholarship Program to encourage talented science, technology, engineering, and mathematics (STEM) majors and professionals to become middle- and high-school mathematics and science teachers.

Student Diversity and Recruitment

Our overarching commitment to the recruitment of a diverse student body may be found in the *Western Washington University Strategic Action Plan* that calls for the recruitment and retention of high qualified students. High quality and diverse students enhance the Western Experience for all. Western remains committed to continuing to recruit highly talented students, despite an increasingly competitive environment. Therefore:

- The University should enhance the financial resources available for student recruitment.
- The University should enhance recruitment efforts for targeted populations.
- The University should improve delivery of advising services, especially for undecided and transfer students.
- The University should improve international, cross-cultural, and interdisciplinary opportunities for students.

The *College of Science and Technology Strategic Plan* includes the following actions related to diversity: We seek to create an open and welcoming environment that attracts and supports diverse and traditionally underrepresented groups and participates in the process of internationalization. To achieve this we will:

- Engage in sustained outreach to underrepresented groups in K-12 schools and community colleges.
- Recruit more international and non-resident students and offer sister university student/faculty exchanges.
- Offer more diversity-focused scholarships and coordinate with the Provost's Diversity Scholarship program.
- Recruit and retain faculty, staff and students from underrepresented groups.

- Develop, where appropriate, curricula in CST that expose students to the intersection of science, technology and culture.

The *Woodring College of Education 2008-2010 Diversity Action Plan* includes these long-term goals:

- Assist all students entering Woodring in developing an understanding of and appreciation for diverse perspectives.
- Ensure that all graduates of Woodring College of Education have a comprehensive understanding and experience with diverse perspectives.
- Actively support recruitment/retention activities that enhance candidate diversity within Western Washington University and Woodring College of Education.
- Actively support recruitment/retention activities that enhance faculty and staff diversity within WWU and WCE.
- Encourage and promote a wider distribution of knowledge about diversity.
- Cultivate relationships with diverse University and community groups.
- Assure that the Diversity Committee functions effectively within the Woodring College of Education.

Following are some program-specific examples of efforts planned to recruit and retain diverse students:

- Recruitment of current Western Washington University students will include those targeted through 12 active ethnic student organizations across campus and through the Woodring Student Recruitment and Retention Coordinator, who is charged with supporting diverse students prior to and during their teacher education program.
- Recruitment of community college students will target regions of underrepresented populations, including but not limited to nearby Skagit Valley College.
- Woodring administers private donor funding of a scholarship program to support freshman and sophomore students of color seeking to enter a teacher preparation program.
- The Center for Education, Equity and Diversity (CEED) resource center supports the Woodring College of Education mission in its commitment to an education that promotes cultural understanding and social justice in a pluralistic, democratic society. The Center focuses on issues related to equity, diversity, self-exploration and identity, inter-group relations, multicultural education and democratic empowerment and civic engagement and particularly focuses on issues of retention and success for historically underrepresented populations.
- Through field experiences, students will gain opportunities to apply their knowledge, skills, and dispositions in a variety of diverse settings including service organizations and K-12 schools.

10. Accreditation

Western Washington University is accredited by the Northwest Commission on Colleges and Universities. Accreditation was reaffirmed following a comprehensive evaluation in 2008.

Western Washington University teacher education programs are approved by the Washington State Professional Educator Standards Board. The most recent program approval site visit was conducted in 2005. The middle level science endorsement program was approved in 2009.

Woodring College of Education as the "unit" responsible for educator preparation programs offered by Western Washington University is accredited by the National Council of Accreditation of Teacher Accreditation. Continuing accreditation was most recently approved following a site visit in 2005.

11. Program Assessment

Consistent with state program approval and regional and national accreditation standards, we have designed a comprehensive assessment system by which student performance relative to learning outcomes (endorsement competencies) will be aggregated, analyzed, and used for program improvement.

The proposed program was designed by SMATE faculty, including faculty from each of the science disciplines and the chair of the elementary education department who also teaches science methods courses, and a secondary education faculty member with expertise in middle level pedagogy. No new courses are required and all student assessments are in place. SMATE faculty will routinely review candidate performance data from content, methods, and practicum courses and access candidate performance and survey data from the Woodring Information System (WIS) through summary reports generated by the Woodring assessment coordinator. Decisions about program improvements will be made following review and discussion at bi-monthly meetings of science education faculty. Woodring College of Education evaluates student performance in the professional program by analyzing data gathered at four decision points in the program: admission, continuation, qualification for the internship and program completion. Data from key assessments of candidate performance are entered into the WIS. In addition to data on candidate performance, reports are generated on the results of course evaluations, exit surveys of interning students, and placement surveys of completers.

Completed annually, the *Closing the Assessment Loop* report serves as a mechanism for documenting the discussion and use of data for continuous improvement. The example below from the 2009 report cites program improvements made to the science education teaching methods and field experience courses completed by all students in the elementary professional program.

Program element	Data for program change	Process for considering program data	Potential or actual improvements based on analysis of data
SCED 480: Science Methods & Curriculum for the Elementary School SCED 490: Lab/ Field	√ 480 assessments in curriculum (CTS) and lesson planning √ 490 – lesson study data	√ Discussion of student performance on CTS √ Discussion of student strengths and	√ Change in more individual performance data √ Improve student

Experience for Elementary Science		weaknesses in using student evidence	connection of learning objective to assessment

12. Student Assessment

Student learning outcomes of the proposed program are defined by the middle level science endorsement competencies that articulate state-required content and pedagogical knowledge and skills. The program will use both formative and summative assessments to assess student work in relation to the learning outcomes. Alignment of learning outcomes with program courses/field experiences and sources of evidence of proficiency are provided in the following table.

Table 6: General Science – Middle Level Student Learning Outcomes and Assessments

Competency	Courses and Evidence of Meeting Competency
1.0 Common Core- Life Science Content: *Middle level teacher candidates demonstrate an understanding of the characteristics of and interactions between and among living systems. As a result, candidates:*	WEST – E and the course-based assessments listed below
1.1 Distinguish features of living from nonliving systems.	BIOL 204, SCED 203: Problem sets, discussion, laboratory activities, exams
1.2 Identify similarities and differences among animals, plants, fungi, protists and bacteria, and viruses.	BIOL 204, SCED 203: Problem sets, discussion, laboratory activities, exams
1.3 Demonstrate understanding of principles and practices of biological classification.	BIOL 204, 206: Laboratory activities, exams
1.4 Demonstrate understanding of ecological systems including the interrelationships and dependencies of organisms with each other and their environments.	BIOL 204, SCED 203: Problem sets, discussion, laboratory activities, exams
1.5 Demonstrate understanding of the ways organisms are interdependent.	BIOL 204, SCED 203: Problem sets, discussion, laboratory activities, exams
1.6 Identify the reproductive patterns and life cycles of cells and organisms.	BIOL 204, 205, 206: Laboratory activities, exams
1.7 Demonstrate understanding of growth, change, and interactions of populations to form communities.	BIOL 204: Laboratory activities, exams
1.8 Recognize factors governing the structures and functions of living systems.	BIOL 206: Laboratory activities, exams
1.9 Classify organisms using multiple systems.	BIOL 204: Laboratory activities, exams
1.10 Explain cycles of matter and flow of matter and energy through living and nonliving pathways.	BIOL 204, SCED 203: Problem sets, discussion, laboratory activities, exams
1.11 Explain scientific theory and principles of biological evolution.	BIOL 204, SCED 203: Problem sets, discussion, laboratory activities, exams
1.12 Demonstrate understanding of the organization and functions of cells and multicellular systems.	BIOL 205, 206: Laboratory activities, exams
1.13 Demonstrate understanding of basic concepts of genetics and heredity, including human reproduction.	BIOL 204, 205: Laboratory activities, exams
1.14 Analyze the regulation of biological systems including homeostatic mechanisms.	BIOL 206: Laboratory activities, exams
1.15 Demonstrate understanding of the applications of biology in environmental quality and in personal and community health.	BIOL 204, 206: Laboratory activities, exams
1.16 Describe population dynamics and the impact of population on its environment.	BIOL 204, SCED 203: Problem sets, discussion, laboratory activities, exams
2.0 Common Core- Physical Science Content: *Middle level teacher candidates demonstrate an understanding of the*	WEST – E and the course-based assessments listed below

characteristics of and interactions of matter and energy between and among physical systems. As a result, candidates:	
2.1 Identify properties of matter such as mass, solubility, and density.	CHEM 121; SCED 294: Problem sets, discussion, laboratory activities, projects, exams
2.2 Understand how combinations of matter form solutions, mixtures, and compounds with different properties.	CHEM 121, 122; SCED 294: Problem sets, discussion, laboratory activities, projects, exams
2.3 Describe the physical and chemical changes of matter.	CHEM 122: Problem sets, laboratory activities, exams
2.4 Demonstrate understanding of Newtonian principles and laws.	PHYS 101: Problem sets, laboratory activities, exams
2.5 Analyze the factors affecting the position, motion and behavior of objects.	PHYS 101; SCED 201: Problem sets, laboratory activities, exams
2.6 Analyze forces in simple machines such as levers and screws.	PHYS 101: Problem sets, laboratory activities, exams
2.7 Identify major forces working in a system.	PHYS 101; SCED 201; ASTR 103: Problem sets, laboratory activities, exams
2.8 Identify properties of light, electricity, sound, and magnetism.	PHYS 101; SCED 201: ASTR 103: Problem sets, laboratory activities, exams
2.9 Identify types of simple energy transfers and transformations.	PHYS 101; SCED 201; ASTR 103: Problem sets, laboratory activities, exams
2.10 Apply wave theory to sound, light, the electromagnetic spectrum and optics.	PHYS 101; ASTR 103: Problem sets, laboratory activities, exams
2.11 Analyze potential and kinetic energies and concepts of work and power.	PHYS 101; SCED 201; ASTR 103: Problem sets, laboratory activities, exams
2.12 Describe energy flow in physical and chemical systems, including simple machines.	PHYS 101; SCED 201; PHYS 104: Problem sets, laboratory activities, exams
2.13 Apply kinetic-molecular theory to change of state and bonding.	CHEM 121; SCED 294: Problem sets, discussion, laboratory activities, projects, exams
2.14 Explain conservation of matter, energy, momentum and charge.	PHYS 101; SCED 201; PHYS 104: Problem sets, laboratory activities, exams
2.15 Demonstrate understanding of classification of elements and compounds.	CHEM 121; SCED 294: Problem sets, discussion, laboratory activities, projects, exams
2.16 Distinguish physical and chemical properties and classification of elements including periodicity and transition elements.	CHEM 121; SCED 294: Problem sets, discussion, laboratory activities, projects, exams
2.17 Demonstrate understanding of the nature of acids and bases, oxidation-reduction chemistry, solutions and solvents.	CHEM 121; SCED 294: Problem sets, discussion, laboratory activities, projects, exams
2.18 Demonstrate understanding of the application of chemistry and physics in personal and community health and in environmental quality.	PHYS 102; SCED 294: SCED 370: Problem sets, discussion, laboratory activities, projects, exams
2.19 Demonstrate understanding of fundamental biochemistry including photosynthesis and respiration.	SCED 203; BIOL 204, BIOL 205: Problem sets, discussion, laboratory activities, projects, exams
2.20 Demonstrate understanding of and apply accepted models of the fundamental structures of atoms and molecules.	CHEM 121; SCED 294: Problem sets, discussion, laboratory activities, projects, exams
2.21 Demonstrate understanding of the basic principles of ionic, covalent, and metallic bonding.	CHEM 121, CHEM 122, CHEM 123; SCED 294: Problem sets, discussion, laboratory activities, projects, exams
2.22 Demonstrate understanding of mole concept, stoichiometry, and laws of composition.	CHEM 121; SCED 294: Problem sets, discussion, laboratory activities, projects, exams
2.23 Demonstrate understanding of radioactivity, nuclear reactors, fission, and fusion.	CHEM 123; ASTR 103: Problem sets, discussion, laboratory activities, projects, exams
3.0 Common Core- Earth and Space Science Content: *Middle level teacher demonstrate an understanding of the characteristics of and interactions between and among earth and space systems. As a result, candidates:*	WEST – E and the course-based assessments listed below
3.1 Identify natural objects in the sky and explain why they change in position and appearance.	ASTR 103: Problem sets, laboratory activities, projects, exams
3.2 Explain the cause of the seasons and impact on living and physical systems.	GEOL 252: Problem sets, laboratory activities, projects, exams
3.3 Identify the role of oceans, lakes, rivers, and atmosphere in	GEOL 211, 252: Problem sets, laboratory activities, projects,

the water cycle.	exams
3.4 Identify characteristics of the atmosphere and explain how changes in the atmosphere result in weather and climate.	GEOL 252: Problem sets, laboratory activities, projects, exams
3.5 Identify basic properties of rocks, minerals, water, air, and energy.	GEOL 211: Problem sets, laboratory activities, projects, exams
3.6 Identify structures of objects and systems in the universe.	ASTR 103; SCED 202: Problem sets, laboratory activities, projects, exams
3.7 Describe Earth's structure, evolution, history, and place in the solar system.	ASTR 103; GEOL 212; SCED 202: Problem sets, laboratory activities, projects, exams
3.8 Explain how the changes in and on the Earth are caused by chemical, physical, and biological factors.	GEOL 211, 212; SCED 202: Problem sets, laboratory activities, projects, exams
3.9 Describe the energy flow and transformation in Earth systems.	GEOL 211, 212; SCED 202: Problem sets, laboratory activities, projects, exams
3.10 Apply Earth and space sciences to environmental quality and to personal and community health and welfare.	GEOL 211, SCED 202: Problem sets, laboratory activities, projects, exams
3.11 Explain geochemical cycles including biotic and abiotic systems including the cycles of matter such as oxygen, carbon, and nitrogen.	GEOL 211, 252: Problem sets, laboratory activities, projects, exams
3.12 Describe renewable and nonrenewable natural resources and implications for their use.	GEOL 211, SCED 202: Problem sets, laboratory activities, projects, exams
4.0 Common Core – Inquiry, Issues, and Nature of Science: *Middle level teacher candidates are prepared to teach inquiry, issues, and nature of science. As a result, candidates:*	WEST – E and the course-based assessments listed below
4.1 Demonstrate understanding of the impact of science and technology on themselves and their community, and on personal and community health.	SCED 370: Essays, presentations, discussion; SCED 480, 490: Research and investigation, papers, lessons and units
4.2 Engage in inquiry, including scientific discourse, to develop concepts and identify relationships from their observations, data, and inferences in a scientific manner.	SCED 201, 202, 203, 294, 370: Problem sets, laboratory activities, essays, presentations, discussion; SCED 480, 490: Research and investigation, papers, lessons and units
4.3 Use international (metric) measurement and mathematics for estimating and calculating, collecting and transforming data, modeling, and presenting results.	SCED 201, 202, 203, 294: Problem sets, laboratory activities; SCED 480, 490: Research and investigation, papers, lessons and units
4.3.1 Demonstrate understanding of accuracy and precision in measurement.	Same as 4.3
4.4 Use measurement as a way of knowing and organizing observations of constancy and change.	Same as 4.3
4.5 Apply the principles of science to design solutions to local and regional problems and the relationship of science to one's personal health, well-being, and safety.	SCED 370: Essays, presentations, discussion
4.6 Demonstrate understanding of the historical development and perspectives on science including contributions of underrepresented groups and the evolution of major ideas and theories.	SCED 370: Essays, presentations, discussion
4.7 Use technological tools in science, including calculators, probes and computers.	Same as 4.3
4.8 Apply descriptive and inferential statistics to the analysis of data.	Same as 4.3
4.9 Demonstrate understanding of the multiple ways to organize our perceptions of the world and how systems organize the studies and knowledge of science.	SCED 201, 202, 203, 294, 370: Problem sets, exams, essays, presentations, discussion; SCED 480, 490: Research and investigation, papers, lessons and units
4.10 Use and refine observation, investigation, data collection, and inference to test ideas and construct scientific concepts and models consistent with evidence.	Same as 4.3
4.11 Demonstrate understanding of the evolution of natural systems and factors that result in evolution or equilibrium.	SCED 201, 202, 203, 294: Problem sets, discussion, essays, exams; SCED 480, 490: Research and investigation, papers, lessons and units
4.12 Demonstrate understanding of the interrelationships of form, function, and behaviors in living and nonliving systems.	Same as 4.11

4.13 Demonstrate understanding of the processes, tenets, and assumptions of multiple methods of inquiry leading to scientific knowledge.	Same as 4.11
5.0 Common Core – Integrating Technology with Science: *Middle level teacher candidates embrace technology as an essential tool for teaching and learning science. As a result, candidates:*	
5.1 Demonstrate understanding of the appropriate use of technology to experiment, visualize, and make/explore conjectures.	SCED 201, 202, 203, 294: Problem sets, discussion, laboratory activities, research project, presentation
5.2 Demonstrate an ability to use instructional support strategies to promote academic achievement for those students with significant gaps in their scientific knowledge.	SCED 480, 490: Science curriculum topic study assignment that examines research on student learning, lesson study cycle projects, lesson presentation
5.3 Use technological tools, including but not limited to computer technology, to access resources, collect and process data, and facilitate learning.	SCED 480, 490: Research and investigation, lesson presentation; IT 442: Multimedia project, WebQuest, electronic portfolio
5.4 Use appropriate technology to help students acquire concepts and skills.	SCED 480, 490: Research and investigation, lesson presentation
6.0 Common Core – Science Instructional Methodology: *Middle level teacher candidates of science create a community of diverse learners who engage in scientific discourse to construct meaning from their science experiences and possess a disposition for further exploration and learning. They use, and can justify, a variety of classroom arrangements, groupings, actions, strategies, and methodologies. They encourage students, individually and collaboratively, to observe, ask questions, design inquiries, and collect and interpret data in order to develop concepts and relationships from empirical experiences. As a result, candidates:*	
6.1. Use content knowledge to make interdisciplinary connections.	SCED 480, 490: Science curriculum review and evaluation, science curriculum topic study, unit / lesson plan development and presentation
6.2 Integrate literacy skills into the teaching of science.	Same as 6.1
6.3 Organize and engage students in collaborative learning using different student group learning strategies.	SCED 480, 490: Unit / lesson plan development and presentation, lesson study cycle projects
6.4 Demonstrate understanding of and build effectively upon the prior beliefs, knowledge, experiences, and interests of students.	SCED 480, 490: Science curriculum topic study assignment on coherency and articulation, unit / lesson plan development and presentation, lesson study cycle projects, science teaching essay and reflection paper
6.5 Engage students in studies of the nature of science including, when possible, the critical analysis of false or doubtful assertions made in the name of science.	SCED 480, 490: Unit / lesson plan development and presentation, lesson study cycle projects, science teaching essay
6.6 Engage students in developmentally appropriate inquiries that require them to develop concepts and relationships from their observations, data, and inferences in a scientific manner.	Same as 6.5
6.7 Engage students in the analysis of problems, including considerations of risks, costs, and benefits of alternative solutions; relating these to the knowledge, goals and values of the students.	Same as 6.5
6.8 Engage students in inquiries, including scientific discourse, to develop concepts and relationships from their observations, data, and inferences in a scientific manner.	Same as 6.5
6.9 Ensure that students understand the processes, tenets, and assumptions of multiple methods of inquiry including field investigations leading to scientific knowledge.	Same as 6.5
6.10 Engage students to conduct inquiries into the factual basis of such issues and to assess possible actions and outcomes based upon their goals and values.	Same as 6.5

6.11 Facilitate student understanding of the influence of science and technology on society.	Same as 6.5
7.0 Common Core – Safety and Welfare: *Middle level teacher candidates of science organize safe and effective learning environments that promote the success of students and the welfare of all living things. They require and promote knowledge and respect for safety, and oversee the welfare of all living things used in the classroom or found in the field. As a result, candidates:*	
7.1 Demonstrate understanding of the legal and ethical responsibilities of science teachers for the welfare of their students, the proper treatment of animals, and the maintenance and disposal of materials.	SCED 480, 490: Unit / lesson plan development and presentation, lesson study cycle projects, science teaching essay and reflection paper
7.2 Know and practice safe and proper techniques for the preparation, storage, dispensing, supervision, and disposal of all materials used in science instruction.	Same as 7.1
7.3 Know and follow emergency procedures, maintain safety equipment, and ensure safety procedures appropriate for the activities and the abilities of students.	Same as 7.1
7.4 Treat all living organisms used in the classroom or found in the field in a safe, humane, and ethical manner and respect legal restrictions on their collection, keeping, and use.	Same as 7.1
8.0 Common Core – Middle Level Development: *Middle level teacher candidates understand the major concepts, principles, theories, and research related to middle level development, and they provide opportunities that support student development and learning. As a result, candidates:*	
8.1 Understand that teaching all young adolescents includes students of diverse ethnicity, race, language, religion, socioeconomic status, gender, sexual orientation, regional or geographic origin, and those with exceptional learning needs.	EDUC 301, 302: Case study analysis, reflective paper, exams; SCED 490: science practicum performance; SEC 450: Integrative reflection essays, news and Internet readings and discussions, onsite school visits and/or field placements
8.2 Understand the major concepts, principles, and theories of young adolescent development – intellectual, physical, social, emotional, and moral- in the context of classrooms, families, peer groups, communities and society.	Same as 8.1
8.3 Understand the range of individual differences of all young adolescents and the implications of these differences for teaching and learning.	Same as 8.1
8.4 Understand the importance of mutually respectful relationships with and among all young adolescents that support their intellectual, ethical, and social growth.	Same as 8.1
9.0 Common Core - Middle Level Philosophy and School Organization: *Middle level teacher candidates understand the major concepts, principles, theories, and research underlying the philosophical foundations of developmentally responsive middle level programs and schools, and they work successfully within these organizational components. As a result, candidates:*	
9.1 Understand the philosophical foundations of developmentally responsive middle level programs and schools.	SEC 450: Integrative reflection essays, news and Internet readings and discussions, onsite school visits and/or field placements; SCED 490: science practicum performance
9.2 Understand the rationale and characteristic components of developmentally responsive middle level schools.	Same as 9.1
10.0 Common Core - Family and Community Involvement: *Middle level teacher candidates understand the major concepts, principles, theories, and research related to working*	

collaboratively with family and community members, and they use that knowledge to maximize the learning of all middle level learners. As a result, candidates:	
10.1 Understand how prior learning, differing experiences, and family/language/cultural backgrounds influence middle level learning.	SEC 450: Integrative reflection essays, news and Internet readings and discussions
10.2 Understand the challenges that families may encounter in contemporary society, and are knowledgeable about support services and other resources that are available to assist them.	SEC 450: Integrative reflection essays, news and Internet readings and discussions, onsite school visits and/or field placements; ELED 470: community assets inquiry project; SCED 490: science practicum performance
10.3 Understand reciprocal relationships between schools and community organizations.	Same as 10.2
10.4 Understand the roles of families and community members and strategies to involve them in improving the education of all middle level learners.	Same as 10.2
11.0 Common Core - Middle Level Professional Roles: *Middle level teacher candidates understand the complexity of teaching middle level learners, and they engage in practices and behaviors that develop their competence as professionals. As a result, candidates:*	
11.1 Understand the interrelationships and interdependencies among various professionals who serve middle level learners (e.g., school counselors, social service workers, home-school coordinators).	SEC 450: Integrative reflection essays, news and Internet readings and discussions, on-site school visits and/or field projects; SCED 490: science practicum performance
11.2 Understand the need for continual reflection on middle level development, the instructional process, and professional and collaborative relationships.	SEC 450: Integrative reflection essays
12.0 Common Core - Middle Level Instructional Methodology: *Middle level teacher candidates create environments that enable students to develop and apply essential concepts and skills. As a result, candidates:*	
12.1 Plan lessons, units and courses that target Washington Essential Academic Learning Requirements (EALRs), Grade-Level Expectations (GLEs), Washington Assessment of Student Learning (WASL) Test and Item Specifications, and additional WASL resources.	SCED 480, 490: Unit / lesson plan development and presentation, WASL readings and discussion; ELED 471: Teacher Work Sample learning goals and design for instruction rubrics; ELED 494: Internship performance – Lesson and Activity Planning
12.2 Design, facilitate, and assess differentiated learning experiences that reflect an understanding of the development of all middle level learners.	SCED 480, 490: Unit / lesson plan development and presentation; ELED 471: Teacher Work Sample design for instruction and assessment plan rubrics; ELED 494: Internship performance – Student Development
12.3 Use understanding of students' cognitive and social development to present concepts in multiple and meaningful ways.	SCED 480, 490: Unit / lesson plan development and presentation; ELED 471: Teacher Work Sample design for instruction rubric; ELED 494: Internship performance – Student Development, Multiple Instructional Strategies
12.4 Select, adapt and implement middle level instructional materials that are relevant, rigorous, challenging, integrative, and exploratory.	SCED 480, 490: Science curriculum topic study, unit / lesson plan development and presentation SEC 450: Thinking skills article review; ELED 471: Teacher Work Sample design for instruction ELED 494: Internship performance – Content Pedagogy, Lesson and Activity Planning
12.5 Design and facilitate a positive, productive learning environment where developmental differences are respected and supported, and individual potential is encouraged.	SCED 490: Unit / lesson plan development and presentation; ELED 470: Classroom learning culture inquiry and practicum; ELED 494: Internship performance – Motivation and Management
12.6 Create and maintain a psychologically and socially safe and supportive learning environment.	Same as 12.5
12.7 Use continuous observation, assessment, and reflection on student learning and development to guide instruction.	SCED 490: Unit / lesson plan development and presentation, evidence of student learning project

	ELED 471: Teacher Work Sample instructional decision-making and reflection and self-evaluation rubrics; ELED 494: Internship performance – Assessment and Evaluation
12.8 Engage middle level learners in activities related to their interpersonal, community, and societal responsibilities.	SCED 490: Unit / lesson plan development and presentation; ELED 471: Teacher Work Sample design for instruction rubric; ELED 494: Internship performance – School and Community Involvement
12.9 Design and implement learning experiences requiring students to locate, acquire, and evaluate information from a variety of sources.	SCED 490: Unit / lesson plan development and presentation; ELED 471: Teacher Work Sample design for instruction rubric; ELED 494: Internship performance – Content Pedagogy
12.10 Use skillful questioning strategies to support student learning and develop critical thinking.	SCED 490: Unit / lesson plan development and presentation; SEC 450: Thinking skills article review; ELED 494: Internship performance – Content Pedagogy, Communication and Technology
12.11 Know effective, developmentally responsive classroom management techniques.	ELED 470: Classroom learning culture inquiry and practicum; ELED 494: Internship performance – Motivation and Management
12.12 Understand a variety of strategies to motivate middle level learners	SEC 450: Integrative reflection essays, news and Internet readings and discussions, onsite school visits and/or field placements; ELED 494: Internship performance – Motivation and Management
13.0 Common Core – Middle Level Curriculum: *Middle level teacher candidates understand the major concepts, principles, theories, standards, and research related to middle level curriculum and they use this knowledge in their practice. As a result, candidates:*	
13.1 Understand the interdisciplinary nature of knowledge and how to make connections among subject areas when planning curriculum.	SCED 480, 490: Science curriculum topic study, unit / lesson plan development and presentation SEC 450: Integrative reflection essays, news and Internet readings and discussions; ELED 494: Internship performance – Content Pedagogy
13.2 Facilitate student learning through the use of developmentally responsive materials and resources (e.g., technological resources, manipulative materials).	SCED 480, 490: Science curriculum topic study, unit / lesson plan development and presentation ELED 494: Internship performance – Content Pedagogy

13. Budget

The state-funded proposed middle level science program does not impact the SMATE program budget. All courses are currently offered and the existing infrastructure, faculty and staff can easily accommodate full student enrollment projected at 10 FTE. Budget detail may be found in Form 7: Program Cost and Revenue, available by request.

14. External Evaluation of Proposal

Please refer to Appendix A for external evaluations performed by Dr. Sacha E. Kopp, Associate Dean for Curriculum and Programs, College of Natural Sciences, University of Texas at Austin; and Dr. Tamara Nelson (no relation), Associate Professor, Science Education, Washington State University Vancouver.

Responses to External Reviews

Overall, the external reviews by Dr. Tamara Nelson at Washington State University Vancouver and Dr. Sacha Kopp at the University of Texas Austin were positive and supportive. Three points were raised by the external reviewers that will be addressed below.

1. *How is the sequence of courses in the program being planned, in particular the inclusion of hands-on and early field experiences?*

   The sequence was intentionally planned to first engage students in science content through the unique Science Education 201, 202, 203, 294 series. This series will provide both a deep content base and explicit experience with research-based science pedagogy. Students enter the formal teacher preparation program in their third year with sufficient content knowledge and experience with hands-on, student-centered pedagogy to prepare them to allow them to focus on learning to teach. The program does not have an early field experience at this time. Providing such experiences is under consideration and will be addressed in future revisions of the program.

2. *How will students enter the program and how will the program deal with the transfer of prior credits, especially science content credits?*

   Students will declare the major anytime during their freshman or sophomore year. Early advising will be critical to get students started taking the required courses in their freshman year. Students will apply to the Woodring College of Education Elementary preservice program during their sophomore year after completing roughly half of the required science content courses. Students that transfer from other institutions will be given credit for science content courses completed at their initial institutions. The unique Science Education 201, 202, and 203 courses are also offered at Everett Community College, Skagit Valley College, and Whatcom Community College, the largest source of transfer students for WWU.

3. *Is there a clear description of desired student goals that can be accurately assessed for evaluation of the program?*

   Each course in the program has a clear set of desired student learning goals. Students will be evaluated in each individual course. Student performance on the Teacher Preparation Assessment (TPA) during student teaching will be used to provide overall evaluation of the program.

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ATTACHMENTS

Part I Forms
Form 4: Required Course Work
Form 5: Enrollment and Graduation Targets

Part II Forms
Form 6: Key Program Personnel
Form 7: Program Costs and Revenue

Appendix A
Course Descriptions

Appendix B
External Evaluation of Proposal

FORM 4: REQUIRED MAJOR COURSE WORK – Part I

The following 81-82 credits are required course work for the major. Teacher candidates will complete the Elementary Professional Preparation Program in addition to the major courses.

Course	Title	Qtr. Credits
SCED 201	Matter and Energy in Physical Systems	4
SCED 202	Matter and Energy in Earth Systems	4
SCED 203	Matter and Energy in Life Systems	4
SCED 294	Investigative Science	4
SCED 370	Science and Society	3
ASTR 103 or	Astronomy for the Liberal Arts	4 or
ASTR 113	Sun, Moon, and Planets	3
BIOL 204	Intro to Evolution, Ecology and Biodiversity	4
BIOL 205	Intro to Cellular and Molecular Biology	5
BIOL 206	Into to Organismal Biology	5
CHEM 121	General Chemistry I	5
CHEM 122	General Chemistry II	5
CHEM 123	General Chemistry III	4
GEOL 211a	Physical Geology Review	2
GEOL 212	Historical Geology	4
GEOL 252	The Earth and it's Weather	4
MATH 115	Precalculus II	5
PHYS 101	Physics Analysis	4
PHYS 104	Physics Applications	4
300 Level	Elective	4
SEC 450	Introduction to Middle School	4

FORM 5: ENROLLMENT AND GRADUATION TARGETS – Part I

Year	1	2	3	4	5
Headcount	10	12	20	20	20
FTE	5	7	10	10	10
Program Graduates			10	12	20

FORM 6: KEY PROGRAM PERSONNEL – Part II

Faculty				
Name	**Degree**	**Rank**	**Status**	**% Effort in Program**
GEORGE D. NELSON	PhD	Professor, Physics and Astronomy and Program Director, SMATE	Fulltime	1.7%
ALEJANDRO ACEVEDO-GUTIÉRREZ	PhD	Associate Professor, Biology	Fulltime	1.7%
EMILY BORDA	PhD	Associate Professor, Chemistry	Fulltime	1.7%
ANDREW BOUDREAUX	PhD	Assistant Professor, Physics and Astronomy	Fulltime	1.7%
DONALD BURGESS	PhD	Associate Professor, Secondary Education	Fulltime	1.7%
SUSAN M. DEBARI	PhD	Professor, Geology	Fulltime	1.7%
DEBORAH A. DONOVAN	PhD	Professor, Biology	Fulltime	1.7%
STEVEN GAMMON	PhD	Professor, Chemistry	Fulltime	1.7%
SCOTT R. LINNEMAN	PhD	Professor, Geology	Fulltime	1.7%
CHRIS OHANA	PhD	Associate Professor, Elementary Education	Fulltime	1.7%
Total Faculty FTE				**0.17 FTE**

Administration and Staff			
Name	**Title**	**Responsibilities**	**% Effort in Program**
GEORGE NELSON	Program Director, SMATE	Plan, Coordinate, and Analyze Student Performance Data for Program Improvement	1%
JAMIE HARRINGTON	Assistant Program Director, SMATE	Learning Resource Center Operations, Student and Faculty Support	1%
LORI TORRES	Administrative Assistant	Advertising and Recruitment, Student and Faculty Support	5%
Total Administration and Staff FTE			**0.07 FTE**

FORM 7: SUMMARY OF PROGRAM COSTS AND REVENUE – Part II

Program Costs	*YR 1*	*YR 2*	*YR 3*	*YR 4*	*YR n Full Enrollment*
Administrative*	2,025	2,086	2,149	2,213	2,279
Faculty*	16,485	16,980	17,490	18,014	18,554
TA/RA*	0	0	0	0	0
Clerical*	2,580	2,657	2,737	2,819	2,904
Other*	0	0	0	0	0
Financial Aid	0	0	0	0	0
Contract Services	0	0	0	0	0
Goods and Services	0	0	0	0	0
Travel	0	0	0	0	0
Equipment	0	0	0	0	0
Lease or Acquisition	0	0	0	0	0
Other (outside reviewers)	0	0	0	0	0
Indirect	0	0	0	0	0
Total Program Costs	21,090	21,723	22,376	23,046	23,737
**includes benefits @ 29% and a 3% salary increase each year*					
FTE	5	7	10	10	10
Headcount	10	12	20	20	20
Program Revenue					
General Fund: State support	19,275	26,985	38,550	38,550	38,550
Tuition & Fees	41,495	66,226	101,232	108,316	108,316
Total Program Revenue	60,770	93,211	139,782	146,866	146,866

Formulas:

General Fund = FTE X 3,855/ FTE

Tuition and Fees–(FTE X 1.07) X 7,756 with a 14% increase Yr 2, 7% increase in Yr 3 and Yr 4

Numbers used:

Admin Salaries: GDN $105,000, JAH $52,000

Average Faculty: $75,173

Clerical Salary: LJT $40,000

APPENDIX A

COURSE DESCRIPTIONS

SCIENCE EDUCATION

201 MATTER AND ENERGY IN PHYSICAL SYSTEMS (4)
Prereq: MATH 112 or higher. The first course in a three quarter sequence designed for prospective elementary teachers but open to all Students. The course uses a student-oriented pedagogy with an integrated content focus to help students develop important ideas in physical science.

202 MATTER AND ENERGY IN EARTH SYSTEMS (4)
Prereq: SCED 201 and MATH 112 or higher or permission of instructor. The second course in a three quarter sequence designed for prospective elementary teachers but open to all students. The course uses a student-oriented pedagogy with an integrated content focus to help students develop important ideas in earth science.

203 MATTER AND ENERGY IN LIFE SYSTEMS (4)
Prereq: SCED 202 and MATH 112 or higher or permission of instructor. The third course in a three quarter sequence designed for prospective elementary teachers but open to all students. The course uses a student-oriented pedagogy with an integrated content focus to help students develop important ideas in life science.

294 INVESTIGATIVE SCIENCE (4)
Prereq: three courses in the natural sciences. Experimental science for preservice elementary education students. Through "directed discovery," students collaborate in developing and executing a plan to investigate a topic as a common thread in biology, chemistry, geology and physics. Includes experimental work and discussion/lecture, allowing students to develop a theoretical base and practice experimental design.

370 SCIENCE AND SOCIETY (3)
Prereq: Completion of science GURs and completion 90 credits or permission of instructor. An in-depth exploration of selected contemporary issues such as global climate change, energy crisis, genetically modified foods, and large-scale extinction of species. The course also explores what constitutes science and pseudo science, looking specifically at "creation science."

480 SCIENCE METHODS AND CURRICULUM FOR THE
ELEMENTARY SCHOOL (5)
Prereq: at least 12 credits in the natural sciences; general university requirements in mathematics; ELED 370 or SPED 420. Classroom/laboratory study of theory, curriculum, science content and processes and effective teaching methods in the context of national and Washington state standards in science and with activities appropriate for the elementary classroom.

490 LABORATORY/FIELD EXPERIENCE IN ELEMENTARY SCIENCE (3)
Prereq: SCED 480. A field-based experience in which WWU students teach science within their internship year. Includes biweekly seminar.

ASTRONOMY

103 INTRODUCTION TO ASTRONOMY (4)
Prereq: MATH 107 or higher. A survey of astronomy including stars, galactic structure and cosmology. Not recommended for science, math or computer science majors.

ASTR 113 - SUN, MOON, AND PLANETS
Introduction to the Solar System, with emphasis on the motion of objects in the sky, including seasons, phases of the Moon, and eclipses. Properties of the Sun, planets, and moons with discussion of recent results from space missions. Some class sessions will be held in the planetarium. Intended for future science educators but open to all students.

BIOLOGY

204 INTRODUCTION TO EVOLUTION, ECOLOGY AND BIODIVERSITY (4)
Prereq: Chem 121 or 125 or concurrent. Introduction to evolutionary and ecological processes involved in the generation of our planet's biodiversity, including review of patterns and processes that influence the origin, evolution, distribution, and abundance of living things. Includes lab.

205 INTRODUCTION TO CELLULAR AND MOLECULAR BIOLOGY (5)
Prereq: Biol 204; Chem 121 or 125; Chem 122 or 126 or concurrent. Structure and function of biomolecules and cells, membrane structure and function, photosynthesis and respiration, molecular origin of life, phylogenetic and metabolic diversity of prokaryotes, molecular genetics and genomics. Includes lab.

206 INTRODUCTION TO ORGANISMAL BIOLOGY (5)
Prereq: BIOL 205; CHEM 122 or 126; CHEM 123 or 225 or concurrent. Study of the many ways that eukaryotic organisms perform basic functions and cope with varying environmental conditions. Phylogenetic organismal diversity and organ system structural and functional diversity will be studied in lecture and laboratory.

CHEMISTRY

121, 122, 123 GENERAL CHEMISTRY I, II, III (5,5,4)
Prereq: Math 114 or the equivalent score on the intermediate algebra mathematics placement test. Each course prerequisite to the next. Stoichiometryatomic and molecular structure, states of matter, solutions, thermodynamics, chemical equilibrium, kinetics, electrochemistry. Includes lab.

211a PHYSICAL GEOLOGY REVIEW (2)
Prereq: GEOL 101 or SCED 202 with a grade of B- or better; MATH 114; high school or college chemistry. This is a laboratory-only course for students who wish to enter the geology major or minor or take upperdivision geology courses and who have had a general introduction to geology. Emphasis on rock and mineral identification, geologic structures, map interpretation. Successful completion of both GEOL 101 and 211a or SCED 202 and GEOL 211a may substitute for GEOL 211 in all geology department requirements. GEOL 211a may not be used to fulfill general education requirements.

212 HISTORICAL GEOLOGY (4)
Prereq: Geol 211. Evolution of the major features of the earth surface and of life; history of the ocean basins, continents and mountain belts related to the theory of plate tectonics; geologic history of North America and the Pacific Northwest. Includes lab.

252 THE EARTH AND ITS WEATHER (4)
Prereq: Geol 101, CHEM 101 or Phys 101. An introduction to meteorology from a global viewpoint. A study of the earth's atmosphere, including weather observation and forecasting. Measurement and description of atmospheric properties. Includes lab.

MATHEMATICS

115 PRECALCULUS II (5)
Prereq: At least C- in Math 114. Data analysis, modeling, trigonometry, inverse functions. Graphing calculator required. Cannot be counted toward majors or minors in mathematics or computer science.

PHYSICS

101 PHYSICS ANALYSIS (4)
Prereq: Math 107 or higher. In-depth analysis of physical phenomena such as the motion of objects and conditions for equilibrium; development and application of conceptual models that account for observations and have predictive power. Instruction seeks to actively engage students in scientific reasoning. Lab.

102 PHYSICS AND SOCIETY (3)
Prereq: MATH 107 or higher. Exploration of the relationships between basic physics concepts and broader social issues such as the generation of energy or global climate change; using scientific evidence to judge claims and construct arguments.

104 PHYSICS APPLICATIONS (4)
Prereq: MATH 107 or higher. A study of physics as a human endeavor to understand everyday phenomena and the development of technology; exploration of basic concepts from physics relevant to phenomena such as weather, music or sports; investigation of the effects of technology and the causes of disasters; new advances in applied physics. Lab.

SECONDARY EDUCATION

450 INTRODUCTION TO MIDDLE SCHOOLS (4)
Prereq: admission to Woodring College of Education. Designed to give students an overview of middle school curriculum and instruction. Examines various forms of curricula currently used in middle schools, developmental issues concerning middle school students and appropriate instructional strategies. Provides an opportunity to closely examine issues through onsite visits to middle schools in the area.

APPENDIX B

External Evaluation of Proposal

COLLEGE OF NATURAL SCIENCES

THE UNIVERSITY OF TEXAS AT AUSTIN

Office of the Dean • 1 University Station G2500 • Austin, Texas 78712-0549
(512) 471-3285 • FAX (512) 471-4998

To: George Nelson, Director
Science, Math, and Technology Education,
Western Washington University
Date: January 13, 2011
Re: New Middle School Degree Offering

Dear Pinky,

Thank you for the opportunity to review your new BAEd degree in General Science Middle Level degree program offering graduates a dual endorsement in elementary and middle school science.

i) Whether or not the program demonstrates a coherent design, with appropriate depth and breadth, curriculum, sequencing of courses and synthesis of learning.

The curriculum has the appropriate span of courses in science content and pedagogy. The Science, Math And Technology Education Center has a well-deserved reputation for innovative, integrated curricula, especially in connection with its elementary education courses. The proposed degree plan leverages off the strength of these courses as well as other courses currently offered at WWU to create a content level appropriate to middle school teachers.

Sequencing of courses was not made clear from the proposal. While the span of courses is impressive, I was not sure in what order they were to be taken. Would SEC450: Introduction to Middle School be taken, for example, concurrently with SCED201: Matter and Energy in Physical Systems? Our program at UT Austin has previously suffered because content and methods courses have been distinctly separated, to the detriment of pre-service teachers understanding the relevancy of the content or having facility with content when trying to work through lesson planning and implementation. While I'm sure that such sequencing has been considered, its description escaped me in the documentation.

Another question which I could not answer from the documentation provided is where and how field service opportunities enter into the curriculum. Research suggests that early field work can help with pre-service teacher mastery of content and engagement in content learning. Maybe this is more of an issue for pre-service elementary teachers than middle school level, as elementary teachers self-identify less as content experts than middle and secondary teachers. The proposal indicates that practicum or hands-on experiences are included in many of the

courses, but it would be helpful to detail where these appear in a typical student's degree experience.

ii) How does the program compare to other institutions' programs? Is it traditional? Is it innovative ("cutting edge") in some way(s)?

It is notable that WWU will focus specifically on the difficult period of middle school. At our university, middle school certification is grouped in with the high school certification path, requiring pre-service teachers to pursue BS degrees in math or science in addition to teaching pedagogy and practica. Few, as a result, pursue middle school teaching and opt instead for high school. At the elementary level, we have no similar science endorsement. Thus, the WWU program is and continues to be innovative. It is important to develop a specific solution for science and math education at the middle school level.

Past curricula developed by the WWU SMATE Center have been very innovative. Their team is at the leading edge of mapping curricula required for all grade levels K-12 in science and math. Further, they have built upon the best research for science content development and developed an innovative integrated natural science curriculum based upon a well-known text for physics developed at San Diego State. The WWU SCED curriculum has been rightly supported by the National Science Foundation and is held up as a model for replication. The coursework of 21 courses and 85 credits appears to be well thought out and does a good job scaffolding from elementary level curriculum through early high school curriculum, giving pre-service teachers the correct content span necessary for middle school.

Of particular note is the WWU emphasis on teacher support in the field post graduation. WWU has developed an impressive set of partnerships with local school districts through the North Cascades and Olympic Science Partnership. By simultaneously focusing on pre- and in-service teacher science content and pedagogy, pre-service teachers may look forward to better support when they go into the field for the first time, and this addresses one of the most challenging issues in education today: teacher retention. The NCOSP both offers support to new teachers and works with districts to take a uniform approach to science education in pre-service and in-service work and shapes strategies amongst school districts in their pursuit of higher student outcomes.

iii) Does the program respond to current trends in the field?

Yes, the proposed program responds to an urgent need in the field of science an math education. As reported by the US Department of Education National Center for Education Statistics, students demonstrate a reasonable proficiency in science and math up through 4th grade, but there is a precipitous drop through middle and high school. It is well known that qualified teachers at the middle school are lacking, and research suggests a strong correlation between student outcomes and teacher content knowledge. As noted in the report, the need for qualified middle school teachers in Washington state is growing, and with particular acuity in the region of northwest Washington served by WWU.

iv) Are student learning outcomes appropriate and clearly defined?

It is important that the WWU group has worked so closely with community colleges in the Bellingham area. A common problem in other programs is that transfer students into a program may come in with content courses which they wish to transfer. Depending upon the content

courses at the transfer institution, these may not match well to the pre-service teacher program. The WWU group has taken great steps beyond most other programs in the nation to have a well-articulated curriculum with the local community colleges, and I only could wish for this level of coordination at UT Austin.

One question I had is whether the 45 credits required before joining the program could prove a challenge for students transferring within WWU; can students transfer in science or math content courses? If students were pursuing a different major at WWU, such as a science or math major, would such courses satisfy the degree requirements for the middle school curriculum? Internal transfers are a particular challenge at UT Austin because of the variability of science content coursework.

v) Is the student assessment system adequate, stellar, innovative? Why?

The proposal provides detailed and exceptional assessment of student progress through all stages of the program in areas of content and pedagogy. Assessment will come from a variety of supervisors, teachers, and mentors working with pre-service teachers, and will be utilized in the advising process for students. The proposal provides a detailed outline of the 13 common cores for teacher certification and a map of elements of the proposed curriculum that address each of these 13 common cores.

vi) Is the program assessment system adequate, stellar, innovative? Why?

This will be a key issue as the group is starting up a new program. Active feedback on student achievement outcomes, attitudes and expectations, and success in the field will be important in shaping the new program. The proposal outlines a reasonable process for program data to be collected and identifies the faculty team who will conduct bi-monthly reviews. It is perhaps unrealistic to include in this document, but it would have been nice to see what are some of the desired student outcomes; this would aid in reviewing whether the assessment process is sufficient to ensure these goals are met.

vii) Are the resources (faculty, administrative, facility, equipment) appropriate?

The Science Math and Technology Education (SMATE) center at WWU is at the leading edge of science education nationwide. It has produced innovative curricula both for pre-service and in-service teachers that serve as a model for many other universities. The SMATE Center houses the highly-successful North Cascades and Olympic Science Partnership, a network of institutions of higher ed and local school district administrators and teachers working toward coordinated professional development for teachers in northwest Washington. The NCOSP is a model of leveraging the resources pre-service teacher preparation programs and professional development networks towards mutually beneficial positive feedback. The SMATE Center brings together faculty from science and math departments as well as the WWU College of Education, a very positive model for bringing the best content and pedagogy expertise toward the challenge of teacher preparation. The SMATE Center, furthermore, has a strong array of laboratory and research resources available for students in the program.

viii) Discussion of program strengths and weaknesses.

The target audience of pre-service middle school teachers is extremely important on a national and local level. The proposed program leverages a large array of resources at WWU that

address a critical need in the state of Washington and in the northwest region in particular. WWU has a strong history of collaboration between the SMATE Center, College of Science and College of Education. The SMATE Center houses the NCOSP which has a strong record of teacher professional development and retention. NCOSP has also achieved a significant level of coordination amongst institutions of higher education and school districts in northwest Washington which will serve pre-service teachers well and will increase the impact of this degree plan for teachers entering the workforce. The faculty have made significant and nationally-recognized contributions to curriculum development for pre-service teachers which will positively impact the proposed program. There are no weaknesses of note.

ix) Recommendations

It would be helpful to clarify several issues; even if, as is likely, they are clear to the WWU faculty, providing such detail will signal to future students and partner school districts the goals of the program. These include (1) the sequencing of courses, and in particular the inclusion of hands-on or early field experience; (2) a description of how students enter the program and whether transfer students' prior credits transfer in to the middle school program; this can be especially important for science content courses not taken in SMATE or partner community colleges; and (3) a description of desired student goals for accurate assessment of the program.

In summary, I commend WWU for considering this proposal and to the SMATE team for its creation. It is a strong proposal, and I would welcome something similar at my university. If I may answer any further questions, please do not hesitate to contact me at kopp@hep.utexas.edu or (512) 232-0677.

Sincerely,

Sacha E. Kopp,
Associate Dean for Curriculum and Programs,

WASHINGTON STATE UNIVERSITY
VANCOUVER

Jan. 17, 2011

Western Washington University makes a strong case in their proposal for a new program leading to Bachelor of Arts in Education: General Science-Middle Level. There are only a few opportunities in Washington State for teachers to receive this middle level science endorsement. WWU is well-known for their teacher education and, more specifically, science education programs, and a middle level science program will provide opportunities for new teachers in an area of high need.

The design of the middle level science program draws upon the strengths of existing secondary and elementary education, and extends these to include a solid foundation in the sciences. Middle school teachers are called upon to teach a variety of science disciplinary courses, including earth, life, space, and physical sciences. Elementary education graduates (certificated for K-8) seldom have much coursework and experiences across these areas, yet often find themselves teaching science at a level (4^{th} grade and up) that demands significant content knowledge. As designed, the WWU program will engage preservice teachers in three quarters of study in each of the science disciplines relevant to middle school, plus courses in the nature of science and science in society. This is a very strong science grounding for middle level teachers. There is a course to address the particulars of the middle school learner, and a mathematics course that will support new teachers use of mathematics in science. This is in addition to the regular elementary education program, where students study foundations of teaching and learning. As such, the proposed degree program is quite extensive in well-preparing new teachers for elementary teaching as well as middle school science.

An innovative aspect of this program is the year-long sequence focused on matter and energy in physical, earth, and life systems. This sequence will help new teachers develop understandings aligned with Big Ideas in science, as defined by multiple standards documents (AAAS Benchmarks, National Science Education Standards, and Washington State Science Learning Standards). This is a significant difference from the middle level science education major offered at Central and Eastern Washington State Universities. Additionally, the University of Washington, Washington State University, and numerous other Washington State colleges offer teachers an opportunity to earn a middle level science endorsement. These programs all differ from the WWU proposal for a major in Education: General Science-Middle Level predominantly in this sequence on matter and energy and in WWU's emphasis on scientific inquiry, the nature of science, and society and science.

An additional strength of the proposed WWU program is the support available to preservice teachers from the multiple funded partnership projects between the Science,

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Mathematics, and Technology Education (SMATE) group at WWU, local school districts, and community college science faculty. These partnerships provide education students with opportunities to learn science in the context of teaching young learners and to network with practicing teachers and administrators. These opportunities will help preservice teachers synthesize science content knowledge, middle school contexts, and learning expectations as defined on local, state, and national levels.

The WWU proposal has been designed in response to needs in Washington State and the United States. The National Science Teachers Association put forward recommendations for a specific focus on middle level science. As is discussed in the proposal, teacher content knowledge is key to student learning. However, there is evidence that middle school science teachers often do not have sufficient understanding in the sciences to implement powerful teaching and learning. The proposed sequence of courses is well designed to address this. The proposal also documents a small demand for the program by students at WWU. It might be expected that this demand will increase when students learn of the program.

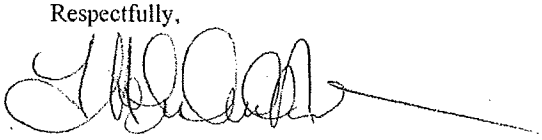
Student outcomes are clearly defined by the Middle Level Science Competencies. The means for gathering evidence has been clearly matched to each competency. While the components of the assessment system are similar to many (e.g., examinations, projects, papers, laboratory activities, unit and lesson plans, observations of teaching), the inclusion of multiple forms of evidence is appropriate and informative as to students' progress and needs. The proposal addresses not only summative evaluations, but also the use of assessments to monitor progress and advise and support students in their progress. Program assessment has an innovative element in the *Closing the Assessment Loop* annual report, based on reviews and discussions held at bi-monthly meetings of the science education faculty throughout the academic year. Using student learning data in relation to program goals allows the faculty to evaluate programmatic strengths and weaknesses and propose improvements.

The faculty in Science Education at WWU are highly qualified, with degrees and experiences in science, science education, and K-12 teaching, and leadership roles from local to international levels. The facilities at SMATE exceed any in the state, with resources for student and faculty use ranging from specialized classrooms to curricular and theoretical texts to equipment for science lessons that can be used for teacher learning and for use in local schools.

I fully recommend approval of this proposal for a Bachelor of Arts degree program at WWU in Education: General Science-Middle Level. The program is comprehensive in addressing the fundamentals of K-8 education and science content, and unique in the inclusion of courses that go beyond traditional science courses to reflect understandings of the nature of science, scientific inquiry, and society and science. While it will be a lengthy course of study for students, the partnerships with local community colleges provide students with opportunities to fulfill many of the science credits in their freshman

and sophomore years. Graduates of this program will be well-qualified and I expect them to have a significant impact on the learning of their middle school students.

Respectfully,



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