**DIVISION OF NATURAL SCIENCES AND MATHEMATICS**

**2011-2012 ANNUAL REPORT**
**EXECUTIVE SUMMARY AND SWOT ANALYSIS**

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## I. EXECUTIVE SUMMARY

### A. Division Highlights

The 2011-2012 academic year was associated with continued growth and infrastructure development in the Division of Natural Sciences and Mathematics (NSM). The primary focus for the year involved the design and development of the new DeVolder Family Science Center. The design team included the division chair and two lead faculty representatives each from the Chemistry (Courtney, Flatt) and Biology Departments (LeMaster, Boomer), working in conjunction with WOU Physical Plant staff and Soderstrom Architects of Portland. The project includes the construction of ~21,000 sq. ft. of laboratory science facilities to be located in the parking lot directly north of the Health and Wellness Center. Project highlights include: (1) construction of a new stand-alone science center that will house all of the Chemistry Department and the Anatomy & Physiology component of the Biology/Pre-Professional Program, (2) facilities upgrades in lab technology, hood/ventilation systems, environmental safety equipment, and (3) expansion of the remainder of the Biology and Earth and Physical Science Departments into the space vacated in the current Natural Science Building. The new facilities will directly result in complete upgrade of the entire chemistry program, improvement to the Biology/A&P facilities, much needed expansion of BI100 and ES100 into vacated NS space, and significant increase in the number of research spaces across all disciplines.

Other events of note in the NSM Division include: (1) sustained pre-nursing/professional enrollment trends (Biology/Chemistry 100-200 levels), (2) sustained demand for lower-level mathematics service courses (MTH70-95-100 levels), (3) hiring of tenure-line replacement faculty in Biology and Mathematics, (4) completion of the NS201 Microbiology and NS114 Chemistry lab renovations, (5) development of new programming in Medicinal and Environmental Chemistry, (6) continued need, enrollment demand, and profitability in the LACC laboratory science courses (ES100, BI100) and (7) ancillary equipment upgrades including new student computer workstations (Biology, Chemistry, Earth Science). At the same time, dedicated faculty and staff advanced other program areas and continued offering high-quality educational opportunities for the greater student population.

The following is a summary of program highlights within the NSM division.

- Academic programs that focus on quality teaching, close student-faculty interaction via individualized mentoring, small upper-division class sizes, inquiry-based laboratory and field experiences, and promotion of undergraduate research.
- The highly subscribed LACC 100-level lab science courses for non-majors significantly contribute to the Liberal Arts mission at WOU and provide students with opportunities for relevant, real-world problem solving. These courses also provide the foundation for pre-nursing and pre-education students.
- NSM faculty continuously strive to improve their respective curricula, embrace a technology-enriched learning environment, and implement meaningful assessment methodologies.
- NSM faculty actively serve as leaders on campus committees and regularly participate in a variety of professional service positions, both at the state and national levels.
- NSM faculty members are actively engaged in a spectrum of peer-reviewed research, publications, grant writing and related professional development.

- NSM division students are actively engaged in independent research projects, internships, and scholarship at the local, state, and national levels
- The Biology program is notably robust with a strong number of majors and graduates, a well-developed scholarship fund, a consistent record of post-baccalaureate student placement, and continued enrollment demand at all levels.
- The Chemistry program provides rigorous training for professional scientists, has established a strong record of alumni placement in graduate school, has developed a strong collaboration with regional forensics laboratories, and is experiencing continued enrollment demand in health science-related service courses.
- The Earth Science program is one of the campus leaders with respect to service contributions to the Liberal Arts Core Curriculum and pre-education programs. The ES100 sequence serves approximately 1400 students per year, is a common first destination for entering freshman, and has a notably high retention rate between fall, winter, and spring terms.
- The Mathematics Department is nationally recognized for its math education program and is making significant contributions in the area of teacher preparation. This recognition combined with strong enrollment numbers at all levels attest to the success and assessment-driven curriculum work by the faculty.
- The Physics program is actively engaged in K-12 community outreach and improving science teacher training in the State of Oregon. Linkages with NASA-based grants programs provides WOU student scholarships and supports teacher training opportunities with a focus on global climate change in the Earth system.

**B. Biology Department**

- Biology enrollment continued to grow (over 3000 students took Biology-related coursework in 2011-2012, including lectures and labs). Non-majors enrollment continued to show growth (over 2300 students, including lectures and labs), particularly in BI 102, which showed a nearly 17% enrollment increase. Enrollment in the major remained constant (~750 students, including lectures and labs).
- Biology students have been successful in their professional pursuits. At least 8 current or former majors were accepted into professional schools and advanced degree programs (e.g. Education, Medicine, Veterinary, Nutrition). Another 8 successfully found employment in positions spanning several major disciplines of Biology. In addition, at least 13 advisees were accepted into professional undergraduate programs (e.g. Nursing, Dental Hygiene).
- The Biology department continued to enhance laboratory space and technology. The Microbiology Teaching Laboratory (NS201) remodel was completed in September 2011, allowing for 25% growth in BI 318 and BI 331. Additional microbiology equipment and BI100 level computers were procured from various funding sources. Additional equipment upgrades were likewise made for Cell-Molecular, A&P, and Botany coursework. Significant faculty/staff effort was expended over the course of the year to design the DeVolder Family Science Center. Finally, faculty worked with the WOU Textbook Rental Program to acquire ~600 Clickers for a new BI 100 Series-focused rental program to promote active learning and attendance.
- Biology Faculty published 8 papers in peer-reviewed journals, with another 4 in revision or press at this time. We were involved in 13 refereed presentations at state or national meetings and workshops. Eleven of these combined activities were co-authored by current and/or former WOU students.

- Biology Faculty continued to receive grant monies for their research, as well as make strong efforts to apply for grants. Ongoing grant support was provided to Dr. Dutton and colleagues via the Department of Justice and to Drs. Haberman and Baumgartner via the Oregon Sea Grant. Several new grant-writing efforts resulted in the following: 3 faculty received 5 Faculty Development grants totaling ~$9K. Dr. Baltzley received $600 from the Arctic Research Consortium of the United States. Dr. Latham contributed to a 5-year NSF ADVANCE Project awarded to Gonzaga University, and was selected to receive support for networking efforts aimed at advancing the careers of women in STEM at PUI's. Dr. Howard was awarded a NSF-ROA supplement to an OSU LTER Grant. In terms of submitted new grants pending decisions, Dr. Baumgartner submitted 2 proposals (one pre-proposal W.M. Keck Foundation, and a second NSF Research Network Grant Proposal, co-authored with other members of the Northwest Biosciences Consortium), and Dr. Dutton and colleagues submitted 2 U.S. Department of Justice grants.

- Biology Faculty contributed to WOU governance, scholarship and leadership. Activities included, notable representation on Faculty Senate, Institutional Review Board, Program for Undergraduate Research Experiences (PURE), Faculty Evaluation Committee, Scholarship Committee, and the University Personnel Review Committee. Faculty advised of ~350 students per term. Eight Biology Faculty served as mentors for 30 undergraduates engaged in research projects, including 3 in-progress Honors Theses.

- The Biology Department awarded more than $31,500 of scholarships to undergraduate Biology majors.

**C. Chemistry Department**

- As anticipated, the CH100 sequence continued its upward growth driven by the demand of students attending Western in the pre-nursing program. The department offered four large CH 104 lecture sections during fall term with a total of 240 seats and 10 laboratory sections. This was an increase by one 24-seat laboratory sequence and twenty-four lecture seats. To accommodate the sustained enrollment, CH100 trailer sections in the sequence are being offered in both the academic year and summer session. Pre-enrollment data for Fall 2012 shows continued demand for this sequence with all sections, both lecture and lab, highly subscribed.

- Enrollments in other areas remained strong including upper division courses. Although few programs in other departments have continued to require organic chemistry (Ch 334-336), enrollments remained relatively constant due to the number of second year chemistry majors and students pursuing chemistry minors and forensic science minors. Other upper division courses showed strong enrollments during 2011-2012 as well. Pre-enrollment data for Fall 2012 show a sharp increase in the demand for the science majors' general chemistry (Ch 221). To accomodate demand an additional laboratory section and additional seats had to be incorporated into the schedule to accomodate 96 students rather than the traditional number of 72. This combined with the pre-enrollment in the trailing Ch 223 section shows a total of 127 students which is a significant increase.

- In terms of program development, the Department gained approval for a new Environmental Chemistry option. This option provides training in an area of intense regional interest. The department also offered a new Medicinal Chemistry/Pharmacology option and two new minors, Medicinal Chemistry and Pharmacology: Natural Science Track and Medicinal Chemistry and Pharmacology: Health and Community Track for the first time in 2011-2012. Early data show strong interest in both the major and minor curricula which we expect to increase in upcoming years. As part of this program, a group of WOU students are traveling to China during Summer 2012, to study traditional Chinese medicine.

- The Chemistry Department graduated three majors in 2011-2012 with two students earning the traditional chemistry degree and one student completing the requirements of the forensic

chemistry option. Western's chemistry graduates are consistently competitive in the employment market and in admissions to graduate and professional schools. There are currently six graduates at various stages in PhD programs throughout the United States and one in medical school. Of our 2011-2012 graduates, one will be entering the graduate school in chemistry at Oregon State University, one will be pursuing a law degree in the area of environmental law and the third will be entering officer's training in the U.S. Navy. Our Forensic Option graduates have been very successful in obtaining positions in the Oregon State Police (OSP) forensic labs as well as labs in other states. Open positions are few. In an average hiring situation, students have a less than 1% chance of successfully gaining a position. We currently have seven graduates working in forensic labs.

- Smart room technology and computers at individual workstations were available for the first time in NS114. This allowed the integration of computer and video technology into the laboratory portions of upper division courses such as quantitative analysis, instrumental analysis and physical chemistry. A variety of electronic data sensors purchased at the end of the 2010-2011 academic year allowed introduction of improved experiments in the laboratories of the Ch 100 sequence and Ch 337-338 . The acquisition of more of these type of sensors and small computer controlled instruments in 2011-2012 will allow further innovation in the laboratory curriculum during 2012-2013.

- July 2012 groundbreaking on the new DeVolder Family Science Center represents the start of an exciting new chapter for the Chemistry program at WOU. We look forward to engaging new research/teaching space and instrument upgrades upon grand opening in Fall 2013. The investment in new Chemistry facilities at WOU is much needed and appreciated.

**D. Earth and Physical Sciences Department**

- Earth and Physical Science faculty members actively served as leaders on a number of campus-wide initiatives including NSM Division Chair in the College of LAS (Taylor), the Academic Excellence Showcase planning committee and the Program for Undergraduate Research Experiences (Templeton), and NSM division representatives to the Collective Bargaining team (Wade and Myers). Of particular note, Dr. Steve Taylor received the Outstanding Faculty Advising Merit Award from the National Academic Advising Association.

- Earth and Physical Science faculty members actively served as professional leaders in their fields. Professional service activities include: member of Oregon Dept. of Education Science Content Assessment panel (Wade), member of review panel for NSF-supported Science Education Resource Center teaching activity collection (Templeton), leadership in state-level geoscience advisory boards (Taylor), participation in NASA Oregon Space Grant Program (Schoenfeld), co-chair Geology section of Oregon Academy of Science (Myers), and collective faculty membership and participation in professional societies (American Institute of Physics, American Educational Research Association, American Geophysical Union, Association of American Geographers, Council on Undergraduate Research, Friends of the Pleistocene, Geological Society of America, International Organization of Palaeobotanists, National Association of Geoscience Teachers, National Association for Interpretation, National Science Teachers Association, Oregon Academy of Science, and Paleontological Society of America).

- Earth and Physical Science faculty members continue to be actively engaged in a wide spectrum of peer-reviewed research, publication, and related professional development. Dr. Myers prepared two draft manuscripts studying paleofloras in California. Dr. Templeton continued research on tephra geochemistry at Newberry Volcano, Oregon and was PI on an NSF grant proposal to upgrade the ES100 laboratory curriculum at WOU (with Taylor and Wade as Co-PIs). Dr. Taylor continued watershed research in western Oregon and continued work on a NIJ-funded finger print analysis project with Biology colleagues (Dutton, Dutton, and Aldrich). Dr. Schoenfeld continued work as the PI on a Global Climate Change Education project funded by

NASA. Current (2011-2012) active research grants and pending proposals related to EPS Department faculty total approximately $1.4 M.

- Earth and Physical Science faculty members continue to actively engage high-quality undergraduate teaching, learning, and curriculum development. With 4 tenured faculty and 5 adjunct instructors, the EPS department generated over 8100 student credits hours (SCH) during the 2011-2012 academic year, accounting for at least 25% of the total production in the Division of Natural Sciences and Mathematics.

- The Earth and Physical Science programs continue to grow in a sustainable manner, in parallel with overall university trends. ES100 LACC enrollments and retention are robust, and upper-division Earth Science course enrollments are solid and growing.

- The 2011-2012 academic year was associated with a notably robust growth in the undergraduate research program in Earth Sciences. A total of 5 students were actively engaged in research with projects funded by NASA Oregon Space Grant, Oregon Watershed Enhancement Board, and the National Institutes of Justice. Research projects focused on geographic information systems, fingerprint analysis, watershed research, river restoration, Newberry geochemistry, igneous petrology, cinder cone analysis and landscape modeling with high resolution Lidar. Students actively engaged the profession and presented their work at the WOU Academic Excellence Showcase and the Association of Engineering Geologists spring section meeting in Portland. Three WOU Earth Science graduates (Dana, Snook, Stanley) were accepted into graduate programs (Arizona State University, Portland State University, West Virginia University) with full-ride research assistantships

**E. Mathematics Department**

- The Mathematics Department has experienced enrollment growth with a 15% increase in student contact hours from just two years ago. The growth has come primarily from service level courses as the size of the university increases and from an increase in students in the math major. Next year's graduating class of mathematics majors is projected to be the largest yet.

- Our students are doing notable work. Seven seniors presented their work at the Pacific Northwest section meeting of the Mathematical Association of America. Two students gave talks at national conferences. Several students are attending prestigious summer REUs (Research Experience for Undergraduates).

- The Mathematics Department remains committed to serving the needs of remedial and lower level mathematics students. Laurie Burton has been instrumental in establishing a regular drop in tutoring lab in the library. The lab is open daily and the number of students who use this resource grows every term. We also continue to work with SEP to offer Supplemental Instruction Tutors, math majors who meet twice a week for one hour with the SEP students to help them understand the material in the courses, create better study habits, and adjust to college life more easily.

- Mathematics Department faculty initiated a partnership with a local elementary school. The Math Buddies Program pairs students in MTH 396 (Problem Solving for elementary teachers) with 4th and 5th grade students at Ash Creek elementary school. Elementary students engage in problem solving activities that are mentored by their WOU Math Buddy. Elementary students' problem solving skills develop while WOU students learn about assessment and effective mentoring techniques from authentic student work. At the end of winter and spring terms the Ash Creek students (100 students) came to campus to meet their buddy and engage in some fun mathematics activities.

- The Mathematics Department has been investigating ways to bring some of the service level classes online. An initial step in this direction is the development this summer by Matthew Nabity of a dual credit (HS/WOU) online DEP College Algebra course to serve high school students in

rural Alaska. Matthew's work will serve as a model as we consider other courses that we can bring online to serve, for example, student populations who may take these courses elsewhere over the summer.

- Mathematics Department faculty continue to engage in scholarly research with four papers accepted in peer-reviewed journals and the publication of a new version of Laurie Burton's popular Mathematics for Elementary Teachers book. All tenure track faculty participated in some kind of presentation or poster at local or national conferences. Faculty also participate in national roles such as refereeing papers for journals and serving on national committees. Hamid Behmard is president-elect of the National Honor Society of Phi Kappa Phi.

- The Mathematics Faculty is also involved in the governance of the university. We had representatives on the Faculty Senate, Faculty Development, Curriculum, Maurice Undergraduate Initiative Review, and University Accreditation committees. Scott Beaver served as Chief Bargaining Officer for faculty on the WOUFT and on the executive committee for PURE.

- The Mathematics Department welcomed two new tenure line faculty members Breeann Flesch and Matthew Ciancetta as well as Visiting Assistant Professor Matthew Nabity. All three have made significant contributions this year in their teaching and to the department.

## II. SWOT ANALYSIS

### A. Strengths (Key words: capabilities, resources, assets, marketing, innovative aspects, value, quality)

#### *1. Biology*

- Biology Faculty are strongly committed to undergraduate education. All are active in all aspects of the university, including teaching, university governance, and research.

- As a department, we have continued to update and enhance our laboratories and budget decision-making process to improve equipment, and to emphasize more cutting-edge laboratory exercises. Construction of the new DeVolder Family Science Building will also solve a serious, long-term space challenge – both in terms of growing class enrollment and supporting faculty/office needs.

- Biology Faculty have embraced assessment as a means to provide empirical evidence for making programmatic and/or course changes with a specific emphasis on improving student preparation, managing enrollment, and better tracking/advising students.

#### *2. Chemistry*

- The Chemistry Department is composed of three tenured, one tenure-track, three full-time adjuncts, one part-time adjunct and two specialty adjuncts from the Oregon State Police crime laboratory. This faculty is capable and versatile with each member able to teach in more than one area within the program and is the department's most valuable resource.

- One strength of the department is the commitment of the faculty to integrate innovative activities and projects into the curriculum.
    - Students work on research projects as part of laboratory coursework
    - Innovative use of technology
        - Project-based content learning through video production, web authoring, computer application design, etc
        - Use of clicker methodology to assess student learning during lecture
        - Hands on use of laboratory instrumentation including the opportunity to set up and learn how to operate instruments from manuals, etc.

- WOU possesses the only program within the OUS system that is uniquely designed to train students in the area of Forensic Chemistry while using OSP professionals to teach the techniques currently used in the working forensic lab.
- The Department is the only chemistry program within the OUS system offering unique concentrations in pharmacology, medicinal chemistry, and environmental chemistry at the undergraduate level.
- The Department will have a program geared toward providing chemists trained in the area of environmental analysis
- The quality of WOU chemistry graduates is demonstrated by competing favorably for employment within the region.
- The quality of WOU chemistry graduates is demonstrated by success in graduate programs. We currently have graduates pursuing advanced degrees at Oregon State University, the University of Utah, Oklahoma State University, Colorado State University, the University of Oregon and the John Jay College of Criminal Justice (the foremost graduate program in forensics in the U.S.)

***3. Earth and Physical Sciences***

The strengths of the Earth Science program are summarized as follows:

- The Earth Science program has a faculty:student ratio that is conducive to one-on-one contact, personalized instruction, and promotion of undergraduate research.
- The Earth Science program is one of the campus leaders with respect to service contributions to the Liberal Arts Core Curriculum and pre-education programs. The ES100 sequence (ES 104-105-106) that serves approximately 1300 students per year, is a common first destination for entering freshman, and has a notably high retention rate between fall, winter, and spring terms. ES100 encourages real-world problem solving and is appealing to non-science majors.
- Earth Science faculty members embrace a technology-based curriculum and are working to implement standardized program assessment tools.
- Earth Science faculty members actively serve as leaders on a number of campus-wide committees and serve in a variety of professional capacities.
- Earth Science faculty members are enthusiastically engaged in a wide spectrum of peer-reviewed research, publications, and related professional development.

The strengths of the Physics program are summarized as follows:

- The physics program offers small class size with opportunities for close student-faculty interaction. Upper level students engage in personalized independent studies.
- The physics laboratory represents a state-of-the- art active learning environment.
- Students have opportunities to participate in a wide range of activities through our affiliation with the NASA Oregon Space Grant Consortium.

***4. Mathematics***

- The high quality of Mathematics faculty is evidenced by their teaching evaluations, publication records and leadership roles in local and national organizations.
- The Mathematics Department has a strong commitment to undergraduate education. Smaller class size, one-on-one advising of senior projects, and easy accessibility of faculty to students are some examples of contributing factors to the high quality education we provide.

- The success of the program is demonstrated in part by the success of our students.
    - Mathematics students have been successful in gaining admittance to competitive summer research programs (REUs).
    - Students regularly attend both local and national conferences and present work (some win awards).
    - Students regularly score high as a group on the Major Field Test.
    - Students regularly earn positions teaching, in industry, or in graduate school upon graduation.
- The mathematics preparation of pre-service K – 8 teachers at Western has been recognized by the National Council on Teacher Quality.
- The department employs innovative teaching strategies both in the education and major courses. Examples include discovery-based learning, hands-on group work and use of technology.
- The department is committed to self assessment and is always looking for ways to inform our teaching and improve the quality of our education.
- Mathematics faculty play a role in the service to the larger campus community serving on a variety of committees and in leadership roles.
- The Mathematics department is committed to improving student achievement in all level of courses. Faculty were instrumental in establishing a drop in tutoring center in the library to help facilitate student success.

**B. Opportunities** (Key words: market developments, industry trends, nice markets, innovation, partnerships)

***1. Biology***

- Enrollment growth provides an opportunity, so long as it is appropriately managed and supported.
- The diverse capabilities of Biology Faculty allow for a good balance of new research programs and experienced leadership and mentoring, so long as other workload demands remain in check.
- The 2011-12 academic year saw remarkable increases in scholarship productivity: undergraduate mentoring efforts doubled, publication outputs tripled, and grantsmanship soared, with 14 new funding attempts this year, and Biology Faculty-affiliated grant requests totaling $3 million.
- Construction of the new DeVolder Family Science Center will provide opportunities for Biology program expansion into new spaces, both in the new facility and existing Natural Science Building.

***2. Chemistry***

- The opportunity to attract students in pre-nursing by packaging current forensic course offerings as well as a new course offerings in toxicology/pharmacology into a 12-hour upper division block that could be used in the nursing program to prepare students for the rapidly developing area of Forensic Nursing.
- Fresh opportunities exist with respect to upgrading our offerings in the areas of biochemistry, toxicology, environmental chemistry, medicinal chemistry and pharmacology to prepare students for graduate work in these areas.
- Continue our interaction with the OSP crime lab by integrating lab experts into our curriculum and maintaining student intern positions within the laboratory. After working with OSP professionals, our students fare well in acquiring forensic employment within the system in an area that has a limited employment market.

- Construction of the new DeVolder Family Science Center will provide the chemistry department with totally updated facilities and opportunities for continued program growth.

### *3. Earth and Physical Sciences*

Key opportunities for the Earth Science program include the following:

- Lower-division Earth Science enrollments have been increasing over the past 5 academic years (2006-2012). Total student credit hour production increased by 15% and ES100 enrollments by 10%. The upper-division population remains steady with a consistent number of degrees awarded. The program is economical and efficient, with a high annual credit-hour production per faculty-staff member (~400 SCH per faculty-staff) and a low salary:SCH ratio. The Earth Science program is profitable.

- A key aspect of the program is the close alliance with faculty in physics, chemistry, biology, and education. Faculty members from different disciplines work directly together on a daily basis and cultivate a multi-disciplinary, collegial atmosphere that is unique compared to other institutions. The cross-disciplinary alliance in NSM provides a superb opportunity for faculty and students with diverse interests to interact in a rich and stimulating academic environment. Earth Science plays an important role by providing a nexus for studies in the biological and physical sciences. In this regard, Earth Science faculty are instrumental in supporting a growing alliance of NSM faculty and programs that provide integrated, interdisciplinary field-based courses and research opportunities in Natural Science disciplines. In addition, there is a common linkage between majors and minors in Earth Science, Geography, and Environmental Studies. As such, a significant number of students share common classes in each of these programs.

- Construction of the new DeVolder Family Science Center will provide opportunities for Earth Science program expansion into new spaces vacated by Chemistry when they move from the existing Natural Science building in Fall 2013.

Key opportunities for the Physics program include the following:

- The Physics program is actively engaged in K-12 community outreach and improving science teacher training in the State of Oregon. Linkages with NASA-based grants programs provides WOU student scholarships and supports teacher training opportunities with a focus on global climate change in the Earth system. The application of Physics to real-world problems in Earth Science represents an innovative opportunity for cross-collaboration between faculty and students.

### *4. Mathematics*

- Faculty members have been increasingly engaged in collaborative projects that will create new opportunities. Matthew Ciancetta is beginning work on a grant with other WOU faculty involving Talmadge Middle School and Cheryl Beaver will be on an advisory board for a STEM Center being developed by the Oregon Aquarium through an MSP grant.

- Matthew Nabity is developing an online course offering for a dual credit (HS/WOU) College Algebra class for students in Alaska. The market for such offerings is strong and we look forward to working with DEP to develop more such classes. We also plan to use Matthew's work as a model to develop online offerings for other classes. There is a demand for such offerings over the summer for the population of students who leave campus and tend to take classes elsewhere.

- Cheryl Beaver has been working with a state Mathematics Specialist Task for to help establish a Mathematics Specialization for a teaching license. This proposal is being reviewed by the Teachers Standards and Practices Commission and will likely be approved. This gives us the opportunity to develop a program and degree path in conjunction with the College of Education to provide a means of achieving this specialization.

- As we consider alternate delivery methods for courses, we see an opportunity to increase enrollment in the mathematics courses in the MS in Ed program by offering math education content courses in a hybrid fashion. We believe this will better cater to the schedule demands of in-service teachers who are the market for such courses and as a result increase enrollment. It will take resources to develop and revise our courses to accommodate the hybrid delivery model.
- Retention and remediation of low level mathematics students is both a challenge and an opportunity. We continually look for ways to help this struggling population.

**C. Challenges** (Key words: market demand, sustainability, obstacles, weaknesses)

***1. Biology***

- The greatest challenge facing Biology at this time is retention – particularly in the major. Although Biology has made strong efforts to promote active learning and basic study skills in our BI 211-2-3 series (including developing and offering a winter BI 211 trailer – so less well-prepared students can take more remedial coursework in the fall), assessment efforts have demonstrated that far more basic challenges exist: the most damning of which is that ~25% students skip class. Consequently, the number of majors continuing in our second year core dropped again this year.
- Once again, challenges regarding research were frequently stated in faculty annual reports – with concerns regarding equipment, space, time, equity, and a support (e.g. FTE recognition for mentoring undergraduates). Indeed, mentoring efforts doubled in the last year, coupled with a tripling of publication output, and a staggering increase in granstmanship.
- Enrollment continues to grow without a concomitant hiring of more tenure-track faculty. As reflected by some negative student feedback (e.g. Exit Survey), this is decreasing our ability to offer advanced electives in a timely manner. In particular, required organismal and A&P (both Human and Animal) coursework for the Pre-Professional, Zoology, and General Biology emphases is suffering from a lack of seats and faculty expertise. It is also effectively increasing our advising workload, which has also resulted in some negative student feedback.

***2. Chemistry***

- Finite resources for maintenance of the Department's instrument holdings, upgrading of instruments to state-of-the-art models and acquisition of expensive forensic instrumentation and basic chemical instrumentation such as a nuclear magnetic resonance spectrometer. Such instrumentation frequently costs in excess of $100,000 for the initial purchase and brings with it ongoing operational costs. Construction of the new DeVolder Family Science Center will help catalyze funding for equipment upgrades and provide new space for housing instrumentation.
- There is a limited market demand for forensic specialists. This challenge is met within the curriculum by providing our Forensic Option majors with the skills needed to be marketable as bench chemists.
- To accommodate any further growth of the Ch 104-106 sequence to meet the demand of the pre-nursing program without making sacrifices in other programmatic areas.
- Weakness in the area of Quality Assurance/Quality Control training within our curriculum. This is an area that would increase the desirability of our students to potential employers.
- Construction of the new DeVolder Family Science Center will require much additional work outside of already booked staff/faculty schedules to set up shop in the new facility. It is anticipated that there will be growing pains associated with the development of and move to the new space.

### *3. Earth and Physical Sciences*

- The most immediate challenge facing the Department of Earth and Physical Science at present is the pressing need for a full-time lab preparator. We currently share a half-time position with the Biology Dept. Growth in both the ES100 and BI100 introductory LACC laboratory science courses has made it challenging for the current staff member to accomplish all of the tasks that could and should be completed. A full-time, dedicated EPS lab preparator would remedy this situation.

- Another key challenge facing the Department of Earth and Physical Science is the over-dependence on adjunct faculty and lack of tenure-line positions compared to other departments in the division. The adjunct faculty ratio in Earth Science ranges up to 65%, almost double that of other NSM Division programs. The Earth Science program is currently in need of at least one tenure-track faculty position. Adjunct pay levels, teaching loads, and contract procedures at WOU are such that there is relatively high turnover in these positions, which ultimately destabilizes curricular programs and inhibits long-term development. Institutional stability, continuity, and future growth are dependent upon the stock of tenure-line faculty. Adjuncts represent short term investments with high turnover rate and curricular instability. Not only do tenure-track faculty members add to the vitality of individual courses and program curricula, they also represent an institutional investment in advanced levels of service, scholarship, and grant writing that is not typically possible for adjunct instructors. The Earth Science program is challenged by this instability.

- An ongoing challenge is also associated with the teaching load required of faculty. The standard teaching assignment requires 12 contact hours per week (36 FTE contact hours per academic year), with lecture hours counting for 1 FTE contact and lab hours counting for 0.66. The teaching load combined with maximum-capacity class sizes results in little time available for other faculty duties such as scholarly research, program planning / assessment, and professional service. As such, the bulk of the latter activities must be conducted after hours, on weekends, and during the summer. An additional challenge presented by the relatively high teaching load is that associated with depletion of creative energy and "teacher burnout".

Physics program challenges include the following:

- The most urgent challenge faced by the physics program is the lack of a second tenure line which limits the ability to offer upper division courses and to plan for programmatic upgrades.

- A high number of weekly student contact hours (typically 15-16) prevents the sole physics faculty member from fully engaging in scholarly and professional activities.

- Another challenge involves entering students who are ill-prepared for the quantitative problem solving demands that a university level physics class thrusts upon them.

- Issues with scheduling conflicts between upper-division Mathematics courses and upper-division Physics. Also, difficulties in convincing the Mathematics department to require that Applied Math majors take calculus based physics as part of their LACC.

### *4. Mathematics*

- As we move forward to act on our opportunities a constant obstacle is lack of manpower. In an already tight schedule, if we wish to develop and sustain new courses we need another tenure line faculty member. If our visiting assistant professor (who has taken on the development of online offerings) were to leave, the online development would come to a halt.

- In the past few years the numbers of students in MTH 70 and MTH 95 has continued to grow. We have further noticed a need for mathematics remediation below the level of MTH 70. Addressing this issue so that all students can succeed is a major challenge.

- As the university continues to grow and the number of course offerings increase it has become an increasing challenge to find office and classroom space.
- In spite of limited time for the immersion required by mathematical research, we have worked hard as a department to stay active in our specific areas, but this is always a challenge.

**D. Vulnerabilities (**Key words: gaps in capabilities, financials, cash flow, supply chain, disadvantages)

***1. Biology***

- Advising has become a serious vulnerability, not only because it is consuming our collective workload but also because of student feedback (e.g. Exit Survey) regarding requests for more career-focused services, and perceived dissatisfaction among our large Pre-Nursing cohort given an extremely low placement in target programs this year.
- We have long prided ourselves in offering a broad training in the field of Biology for undergraduates. Indeed, General Biology graduates, for the first time since the inception of tracked emphases, out-numbered Pre-Professional graduates in 2011-2; we also continued to graduate majors with Botany or Ecology emphases. Despite these positive trends, several advanced courses remain low-enrolled given ongoing student gravitation toward animal-based coursework.
- Increases in tenure-track faculty positions have not kept pace with increases in student numbers. We believe that the department has been able to build a strong reputation in recent years but, without investing in additional tenure-track faculty positions, we foresee drops in recruitment and retention as we increase class sizes, reduce class availabilities, and continue to see diminished student satisfaction.

***2. Chemistry***

- Reliance on adjunct personnel to meet the demands of pre-nursing program students in the Ch 104-106 sequence. This reliance places us in jeopardy due to the volatile nature of such teaching positions. For example, we lost one excellent adjunct instructor when a more lucrative industrial position became available during the 2009-2010 academic year. It also has become necessary to hire another part time adjunct to cover laboratory classes for Fall 2012.
- Added pressures to increase enrollments in upper division electives. Cancelling courses that are offered in an alternate-year mode is damaging to students in programs such as the Environmental Studies minor, and removes the ability of students to explore some of the non-core areas of chemistry. Students have commented that they do not want to register for some upper division electives due to the fear of those courses being cancelled due to low enrollment numbers.

***3. Earth and Physical Sciences***

Vulnerabilities for the Earth Science and Physics program are summarized as follows:

- The Earth Science program, along with others in the division, lacks a consistent source of funding for large-scale instrumentation and facility infrastructure. While we have worked diligently to upgrade and support laboratory infrastructure, the Earth Science program still lags behind other science program areas in terms of modern laboratory equipment and resources.
- While the need is clearly documented by staffing and enrollment data, there is a notable lack of institutional commitment to securing a long overdue tenure-line addition of an Earth and Physical Science education specialist, comparable to that recently added to the Biology faculty complement.

- The primary vulnerability for the Physics program is lack of office space, course-load equivalency and adequate long-term funding for a second tenure-line physicist.

***4. Mathematics***

- We currently lack a tenure-track member of the department who can teach the statistics courses needed for a student to go into actuarial sciences or graduate school in statistics. That is a major weakness. Such a person would open the doors for new degree tracks or perhaps an applied baccalaureate in actuarial sciences.
- The online and hybrid delivery course development presents a lot of opportunities; however, the lead on that is the visiting assistant professor if he leaves for a more permanent position our development stops.
- As the number of classes increase, the classroom space and office space is becoming scarce. If we are unable to support the demand, students will fall behind in their ability to complete their graduation requirements on time.
- The number of mathematics majors is currently in a steep upward trend. Upper division classes are filling up like never before and we are having trouble staffing all the courses that we need. This gap together with the work that would be required if we take on new opportunities would be filled by a new tenure-track person.