DEPARTMENT OF EARTH AND PHYSICAL SCIENCE ANNUAL REPORT 2007-2008

A. With regard to process outcomes, provide a summation of unit highlights for the past year 2007-2008.

The Department of Earth and Physical Science consists of two program areas – Earth Science and Physics. The following is a summary of 2007-2008 departmental highlights:

- Earth and Physical Science faculty members actively served as leaders on a number of campus-wide committees including the Academic Excellence Showcase planning committee and the Program for Undergraduate Research Experiences (Templeton), Academic Infrastructure Committee (Taylor), NSM division representative to the Collective Bargaining team (Schoenfeld), and Curriculum Committee (Myers).

- Earth and Physical Science faculty members actively served as professional leaders in their fields. Professional service activities include: president of the Oregon Academy of Science (Myers), participation in NASA Oregon Space Grant Program (Schoenfeld), participation in state-level geoscience advisory boards (Taylor), and collective faculty membership and participation in professional societies (e.g., Geological Society of America, American Geophysical Union, National Association of Geoscience Teachers, Oregon Academy of Science, Great Basin Institute, Paleontological Society, Association of American Geographers, Friends of the Pleistocene).

- Earth and Physical Science faculty members continue to be actively engaged in a wide spectrum of peer-reviewed research, publication, and related professional development. (Described in detail in the sections below.)

- 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 8400 student credits hours (SCH) during the 2007-2008 academic year, accounting for 30% of the total production in the Division of Natural Sciences and Mathematics.

B. With regard to intended student learning objectives, outcomes, please provide a narrative summary of significant student accomplishments (e.g. career placement, graduate school, scholarships, service learning, internships, study abroad) achieved by students in your unit (or students with whom your unit had significant interactions).

Scholarly Presentations

Katie Noll (B.S. Earth Science, 2008): Presented a paper at the Fall 2007 National Meeting of the Geological Society of America entitled: "Spatial Distribution of Invasive Plant Species in the Luckiamute Watershed, Central Oregon Coast Range: Vegetative Response to Geomorphic Processes and Disturbance Regime in the Riparian Corridor".

Students of ES 473/573 Environmental Geology: In spring term 2008, 16 students from the Environmental Geology class prepared abstracts and presentations for the 2008 WOU Academic Showcase. The session was entitled "Earth Science in Context: Land Use and Watershed Function in the Willamette Basin".

Students in ES 454/554 Volcanolgy: In Spring term 2008, 18 students from the Volcanology class prepared abstracts and poster presentations for the Academic Excellence Showcase at WOU. The session was entitled "Volcanoes of the World".

JA Myers, A.R. Pratt, L.M. Fitzgerald: 2008 - Oregon Academy of Science Annual Meeting, Portland Community College, Sylvania. What's Shaking at WOU? Students Develop Earthquake Awareness on Campus.

Scholarships, Awards, and Honors

Ian Macnab (senior, Earth Science major) was awarded an Urban and Regional Information Systems Association research scholarship for a project entitled: "Geomorphic and anthropogenic influences on invasive plant distribution in the Luckiamute watershed: Using GIS as a tool for spatial analysis", under the guidance of Dr. Taylor. Ian was also honored as the Outstanding Graduating Student in Earth Science.

Matt Buche (senior, Earth Science major) and Ryan Stanley (junior, Earth Science major) were honored as the Outstanding Undergraduate Students in Earth Science. Matt also took a summer position with Kane Geotechnical, Sacramento, during summer, 2008, described below.

Shawn Decker and Laura Waight (Physics Minors) each received $3000 Oregon Space Grant undergraduate scholarships this year.

Avery Cotton received a NASA/Oregon Space Grant Consortium Graduate Fellowship to study in the WOU MAT program, and work on the Global Climate Change Institute for Teachers grant.

Internships and Service Learning

Matt Buche (senior, Earth Science major) – gained summer paid employment with Kane Geotechnical, Stockton, CA. Matt is working as a field technician in the areas of landslide analysis and mitigation.

Heather Hintz (senior, Earth Science major) – gained summer employment as an interpretive ranger at Honeyman State Park, Oregon Dunes National Recreation Area, Florence, OR.

Katie Noll (B.S. Earth Science, 2008) – worked the past academic year as a research technician in Dr. Sara Boomer's microbiology lab at Western Oregon University. The focus of the research is on understanding the hydrogeologic setting of thermophyllic bacteria at Yellowstone National Park.

Career Placement

Jeff Budnick (B.S. Earth Science, 2005) – obtained employment as a hydrologist for River Measurement, Inc., Vancouver, WA.

Chandra Drury (B.S. Earth Science, 2005) – obtained employment as a hydrologist and environmental specialist for the Flood Control District of Maricopa County, AZ.

Jeff Kent (B.S. Earth Science, 2005) – continued working as a mining geologist for Resolution Copper Mining in Superior, AZ.

Katie Noll (B.S. Earth Science, 2008) – gained employment as a science instructor for Quality Schools International, Chengdu, China. Katie will be teaching physical science to middle-high students in an international setting.

Amy Poff (B.A. Earth Science, 2002) – completed volunteer work for the Peace Corps in western Africa, returned to the U.S. and obtained employment as a Intepretive Ranger at Lava Beds National Monument in northern California.

Mark Speiring (B.S. Earth Science, 2006) – completed Officers Training School with the U.S. Army in Fort Benning, GA.

Dane Wagner (B.S. Earth Science, 2007) – obtained employment as a geotechnician and field geologist with Kane Geotech, Inc., Stockton, CA.

Graduate School

Rachel Pirot (B.S. Earth Science, 2007) – continued working on an M.S. degree in engineering geology at Portland State University. Her thesis topic involves the study of debris flow mechanisms on Mt. Hood. She received several prestigious student research awards in 2007-2008 to support of her thesis research and is working under the supervision of Dr. Scott Burns.

Recent graduate Holly Grimes (Nat Sci – Chem/Phys option) is currently a graduate student at PSU and is working this summer at the Jet Propulsion Lab (JPL) in Pasadena with funding from the Oregon Space Grant program.

C. Please identify faculty who accomplished any of the following in 2007-2008:

1. **Significant recognition for exceptional and outstanding teaching.**

2. **Extensive innovations in curriculum and pedagogy (including course/program refinement, curriculum (re)design/revision, course modifications, new instructional materials, new methods of instruction, technological updating or other significant developments in pedagogy and methodology).**

- During winter term, **Dr. Templeton** completely redesigned his lecture materials for Earth System Science II (ES 105). This entailed the following: (1) full-scale reorganization of the course content, which was aligned to a newly adopted textbook, (2) development of new active-learning strategies that are designed to engage students in larger enrollment lecture classes, and (3) refinement of classroom presentations in which text and graphics are woven together using PowerPoint to create dynamic slide shows. He also played a lead role in redesigning the laboratory materials for Earth System Science II (ES 105) this past year. The laboratory manual was completely reorganized and updated with several new computer-based laboratory activities that utilize electronic measurement sensors and apparatus.

- For his Volcanology course (ES 454/554) taught in spring term, **Dr. Templeton** organized a poster session in which the students from the class presented the results of their research on "Volcanoes of the World" as part of the campus-wide Academic Excellence Showcase event.

- **Dr. Myers** introduced a recitation section to ES 453/553 Geology of the Pacific Northwest, and produced active-learning in-class activities and detailed PowerPoint presentations for ES 331 – Introduction to Oceanography and ES 491/591 – Depositional Systems

- This year in both the algebra & calculus based introductory physics sequence **Dr. Schoenfeld** instituted weekly online graded homework. The student access package comes with every new textbook. The online system gives immediate feedback, and also makes suggestions based upon common student mistakes and misconceptions. After the first week or two when everyone had finally learned the syntax associated with the system, the overall perception of the online assignments was overwhelmingly positive. Employing this system allowed him to cover more material (especially in the algebra course) than he had in previous years. Further since the textbooks for both the algebra and calculus based course were written by the same author, there were numerous occasions in which both classes had the same problems (usually conceptual) on their assignments. For the first time this sometimes allowed students from the algebra and calculus classes to collaborate on assignments.

- **Dr. Taylor** continued development of multi-media and online resources for a spectrum of Earth Science courses including ES104, ES106, ES202, ES301, ES473, ES476, and ES492.

- **Myers, Taylor,** and **Templeton** collaborated on designing changes to the Earth Science program curriculum. Proposed changes included additions of new courses targeted at the 300-level, realignment of the math requirement, and updating of catalog course descriptions.

3. Extensive participation in the development of well-articulated student learning outcomes and assessment of outcomes.

- During spring term, **Dr. Templeton** developed and implemented two embedded assessment strategies for his Volcanology course (ES 454) that are specifically aligned with the three learning outcomes for the Earth Science Major.

- During spring term, **Dr. Taylor** developed and implemented three embedded assessment strategies for his Environmental Geology course (ES 473) that are specifically aligned with the three learning outcomes for the Earth Science Major.

- **Dr. Taylor** continued development of online exit-exam assessment tools for the Earth Science program and use in ES407 Senior Seminar. The online system will use the WebCT environment to provide testing to graduating seniors in Earth Science.

- **Dr. Taylor** and **Dr. Templeton** continued follow-up analysis and program assessment related to the NWACU accreditation process.

D. Please identify faculty who accomplished any of the following in 2007-2008, including the titles of the works/projects etc.:

1. **Wrote a book and/or scholarly monograph that was successfully submitted for editorial and/or peer review and eventually published.**

2. **Completed one or more articles, book reviews and essays that were published in peer-reviewed journals or presses.**

Schorn, H.E., **Myers, J.A.**, Erwin, D.M. 2007. Navigating the Neogene: Updating the paleobotanical record of the later Cenozoic in the Far West. Jarzen, D. and Retallack, G.J. editors, Festschrift Volume in honor of the 70th birthdays of Jack A. Wolfe and David R. Dilcher, Senckenberg Museum Publication, Frankfurt, Germany. V. 258: pp. 139-146.

Dr. Taylor (Taylor, 2007) published a peer-reviewed journal article entitled "Watershed Assessment, River Restoration, and the Geoscience Profession in Oregon": Oregon Geology, v. 68, p. 26-30.

3. **Completed a textbook and/or a teaching manual for a textbook or original work that was peer review/juried and published.**

4. **Prepared peer-reviewed work or practice in the fine arts, including creative work in music, drama, artistic exhibits, productions and performances of artistic works or literature and subsequently performed.**

5. Delivered a refereed paper at scholarly meetings or major professional symposia attended by specialists and leaders in the field.

- **Dr. Myers**: 2008 - 20th Anniversary Celebration of the Stonerose Interpretive Center, Republic WA. April 19, 2008. The Okanogan Floras: A story of Temperate Plant Speciation and Intergradation.

- **Dr. Myers**, A.R. Pratt, L. M. Fitzgerald: 2008 - Oregon Academy of Science Annual Meeting, Portland Community College, Sylvania. What's Shaking at WOU? Students Develop Earthquake Awareness on Campus.

- **Dr. Taylor** presented a refereed paper at the Fall 2007 National Meeting of the Geological Society of America: "Riparian Plant Distribution in the Luckiamute River Basin, Central Oregon Coast Range: Preliminary Analysis of Geomorphic and Anthropogenic Controls on Adventive Species Propagation in an Unregulated Watershed". Paper comprised part of a topical theme session entitled "Geomorphology and Ecology: Interactions and Feedback", presented in collaboration with Dr. Dutton and two undergraduate students.

- **Dr. Taylor** served as third author on abstract and paper presented at the Fall 2007 National Meeting of the Geological Society of America in Denver: "Spatial Distribution of Invasive Plant Species in the Luckiamute Watershed, Central Oregon Coast Range: Vegetative Response to Geomorphic Processes and Disturbance Regime in the Riparian Corridor", in collaboration with Dr. Dutton and two undergraduate students. Paper comprised part of a topical theme session entitled "Sigma Gamma Epsilon Undergraduate Research".

- **Dr. Taylor** participated as Panel Member in session entitled: "River Restoration – The Three "R's": Rules, Regulations, and Registration". Panel comprised a portion of the Feb. 2008 River Restoration Northwest conference held in Skamania, Washington. Taylor presented paper entitled: "Watershed Assessment, River Restoration, and the Geoscience Profession in Oregon".

6. Secured an externally funded and peer-reviewed research grant.

7. Participated as a named investigator in sponsored, peer-reviewed research.

- The GIFT team (**W. Schoenfeld** (NSM), A. Schepige (COE), **P. Wade** (NSM), V. Anderson (COE), S. Dauer (COE), and A. Cotton) put in hundreds of hours working on many aspects of a NASA Grant to provide quality educational

materials and activities on climate change for use by elementary school teachers. Schoenfeld made nearly weekly trips to a fifth grade classroom to test various hands-on activities. As a group, they are presently working on a thorough review of children's literate on the subject. The first of their workshops for teachers was held July 11th. Two WOU undergraduates, S. Decker (Chemistry), and L. Waight (Mathematics) assisted in the workshop, and each made brief presentations to the participants. The second workshop will be held in late August, and further workshops will be held both next academic year, and the following summer. They are also making multiple presentations at the NSTA meeting this fall in Portland. Initial discussions have begun with Earth & Space Research to fund the development of activity kits and book collections for use by WOU in outreach activities.

- **Dr. Taylor** continued collaborative research with Dr. Fred Swanson at the HJ Andrews Experimental Forest, Pacific Northwest Research Station (U.S. Forest Service). Working title of this research project is "The Influence of Geomorphic and Anthropogenic Processes on Decadal-Scale Sediment Yield in the Western Cascades, Oregon: An Updated Compilation of Experimental Watershed Data at H.J. Andrews Experimental Forest". This work forms part of a sabbatical-related Research Opportunity Award (ROA) funded by the National Science Foundation.

- **Dr. Taylor** continued collaboration with Dr. Dutton on research entitled (work in progress): "Geomorphic and Anthropogenic Influences on the Distribution of Invasive Plant Species in the Luckiamute Watershed, Polk and Benton Counties, Oregon".

8. Securing competitive peer-reviewed external awards, grants/fellowships or other notable extramural support for scholarly endeavors.

- **Dr. Myers** was employed as a professional paleobotanical consultant from July, 2007 – March, 2008 by Paleoresource Consultants of Auburn, CA, and produced two professional consulting reports:

  Myers, J.A. 2007. Fossil leaf remains from the type locality of the late Miocene Anaverde Flora, Anaverde Valley, Palmdale, California. Professional Consulting Report Prepared For Paleoresource Consultants, Sacramento, California.

  Myers, J.A. 2007. Fossil Leaf Remains from the late Miocene Neroly Formation of the San Pablo Group , HWY 580-Midway Road Intersection, Tracy, California. Professional Consulting Report Prepared For Paleoresource Consultants, Sacramento, California.

E. Please identify faculty (and/or approximate percentage of unit faculty) who made significant or extraordinary accomplishments in the following areas in 2007-2008. * Given the relative lack of data in these areas, please provide best estimates and or representative samples.

1. **Special contributions to the faculty governance of the institution, particularly including service activities as a very valuable departmental colleague and/or faculty mentor.**

- **Dr. Myers** served as chair of the Faculty Senate Curriculum Committee, and was a member of the ad hoc Learning Communities committee and Freshman Experience committee.
- **Dr. Schoenfeld** served as NSM Division representative to the Union bargaining team.
- As of June 15, 2008, **Dr. Taylor** was appointed chair of the Division of Natural Sciences and Mathematics at Western Oregon University. He is currently beginning a three-year rotation as division leader and facilitator in the College of Liberal Arts and Sciences.
- **Dr. Taylor** continued lead role in guiding the WOU Academic Infrastructure Committee for the 2007-2008 year. The primary products of the year's activity included continued smart-room planning, development of a preliminary academic infrastructure plan, initiation of a pilot program to provide freely accessible wireless internet service to faculty and students on campus, and successful lobbying for inclusion of faculty advisors on the Student Technology Fee Committee.
- **Dr. Templeton** continued serving as Chair of the Earth and Physical Science Department.
- **Dr. Templeton** served as the Chair of the Academic Excellence Showcase Planning Committee. He had full responsibility for planning and organizing the campus-wide Academic Excellence Showcase held on May 29, 2008. Over 350 students presented their scholarly work at this highly successful event.
- **Dr. Templeton** served as the Coordinator of the Program for Undergraduate Research Experiences (PURE) at WOU.
- **Dr. Templeton** actively participated as a member of the Faculty Senate Ad Hoc Committee on LACC/General Education Review.

2. **Extensive service to students outside of the formal classroom, beyond regular advising.**

- **Myers**: Photodocumentation of the earthquake retrofit of the Humanities and Social Sciences Building and development of an earthquake awareness and preparedness program at WOU. This work is sponsored by the Oregon Department of Geology and Mineral Industries (DOGAMI) in conjunction with the WOU Physical Plant and Federal Emergency Management Agency (FEMA). This project benefited from a major Faculty Development Research Grant in 06-07, which was used to pay student salaries. For 07-08, they received stipend funding from DOGAMI to help continue the project. Students: Matt Buche (WOU ES Major, senior), Laura Fitzgerald (WOU junior), Alyssa Pratt (WOU ES Major, sophomore), Ryan Stanley (WOU ES Major, Sophomore).
- **Dr. Schoenfeld** secured Oregon Space Grant Consortium (OSGC) Graduate Fellowship for Avery Cotton ($2000 per term, for up to 3 years); Worked with WOU Graduate Holly Grimes in assisting her to get a summer OSGC internship at the Jet Propulsion Laboratory (JPL) in Pasadena, CA; Advertised and evaluated candidates for OSGC undergraduate scholarships at WOU, two students each received $3000 scholarships.

3. **Extensive participation in University fund raising, public relations or alumni development.**

- **Dr. Schoenfeld** coordinated (with M. Pettinger and K. Brown) the Focus the Nation events concerning global warming that took place on campus last January. He participated in faculty panel discussion (along with K. Brown, E. Plec, and D. Ellingson), which was written about in an article in the Dallas Itemizer-Observer.
- **Dr. Schoenfeld** assisted with the CWOSE Science Fair, including coordination of the distribution of WOU scholarships associated with the science fair.
- **Dr. Schoenfeld** worked on a project to integrate middle school math and science instruction. This included out-reach activities at Linus Pauling Middle School in Corvallis and meetings on future activities at a Woodburn Middle School.
- **Dr. Templeton** served as a Professional Mentor at two K-12 schools in the local area. On Nov. 1, 2007, he assisted groups of students at Leslie Middle School in Salem on their Science Fair projects, and on April 3 and 4, 2008, he worked with a group of students at Jefferson Elementary School in Corvallis on a field-based research project.

4. **Extensive participation in student recruitment/admissions and student retention activities and other special assignments related to the business of the University.**

- **Myers, Taylor,** and **Templeton** represented the Earth Science program and department at six Academic Fair/Preview Days during the 2007-08 academic year.
- **Schoenfeld, Taylor,** and **Templeton** participated in SOAR during summer 2007 and 2008.

5. **Developed new or innovative programs and active participation in the curriculum development, program review and assessment process.**

- This year the Geology faculty members (**Myers, Taylor, and Templeton**) collaborated on changes to the Earth Science program curriculum. These curriculum modifications included the following: 1) addition of four new courses and updates to course numbers, titles and/or descriptions for eight existing Earth Science courses; 2) changes to the Earth Science Major, including incorporation of the new courses into the degree plan, addition of three new Mathematics options, revision of the Computer Science requirement, and concomitant credit hour change; and 3) modifications to the Earth Resources, Earth System Science, and Geology Minors to reflect to the course changes. These modifications represent a fine-tuning of Earth Science curriculum, the goal of which is to strengthen and modernize the major to best serve student needs.
- **Dr. Taylor** continued development of online exit-exam assessment tools for the Earth Science program and use in ES407 Senior Seminar.
- **Dr. Taylor** and **Dr. Templeton** continued follow-up analysis and program assessment related to the NWACU accreditation process.

6. **Demonstrated leadership in local, state, federal or international agencies, professional and public interest organizations and other entities that substantially enhance institutional goals.**

- **Dr. Schoenfeld** served as Associate Director NASA/Oregon Space Grant Consortium (OSGC) and as Affiliate Representative for Western Oregon University to OSGC. Significant duties included the following:
  - Represented WOU as affiliate rep at state wide meeting of OSGC, Eugene Sept 2007.
  - Represented OSGC at National meeting of NASA/Space Grant, Las Cruces, NM Oct 2007.
  - Represented OSGC at National meeting of NASA/Space Grant, Washington D.C., Feb 2008; presented plans for upcoming National meeting in Portland in Fall 2009.

- **Dr. Myers** was selected to serve as a President of the Oregon Academy of Science for 2008-2009.
- **Dr. Myers** was keynote presenter at the 2007 Portland Gem and Mineral Society Annual Meeting.
- **Dr. Myers** was formally appointed a Research Associate of the UW Burke Museum of Natural and Cultural History.
- **Dr. Taylor** is serving as Earth Science Advisor for K-12 Science Standards Review Panel, Oregon Department of Education, Salem, Oregon.
- **Dr. Taylor** continued serving as faculty advisor and university liaison to the Oregon Geographic Information Council, Salem Oregon.
- **Dr. Taylor** continued duties as chair and board member of the Oregon State Board of Geologist Examiners (OSBGE), Salem Oregon. He also maintained active registration as a Professional Geologist in the State of Oregon (Registration Number G1968).
- **Dr. Taylor** continued serving as member of the council of examiners, Association of State Boards of Geology, Columbia, South Carolina.
- **Dr. Taylor** continued serving as faculty advisor and university liaison to the State Geologic Map Advisory Committee, Oregon Dept. of Geology and Mineral Industries, Portland, Oregon.
- **Dr. Taylor** continued serving as university liaison for the Luckiamute Watershed Council, Monmouth, Oregon.
- **Dr. Taylor** served as Team Co-Leader and Geologic Field Guide for the Summer 2007 and 2008 White Water Institute, Maupin, Oregon. The White Water Institute is a non-profit organization dedicated to the development of outcomes-based education and assessment initiatives at Community Colleges across the U.S.
- **Dr. Taylor** served as a participating scientist and faculty facilitator in the Summer 2007 and 2008 Ecosystem Informatics Institute at Oregon State University and HJ Andrews Experimental Forest. The six-week program involves 15 graduate and undergraduate students from institutions around the country.
- **Dr. Templeton** continued serving as the WOU Campus Representative for the Geological Society of America.

F. Personnel - please provide a summary of professional development activities provided for or undertaken by staff in your unit, including unit managers.

- **Dr. Schoenfeld** participated in a three-day workshop on grant writing offered by the Grant Writers Institute; held at Portland State University in Jan. 2008.

G. Personnel Status

Identify Special Staffing Situation:	Explain Proposed Plan of Action:
Adjuncts for ES 104, 105, 106 Lecture and Laboratory Sections	This is an ongoing issue that will only be fully addressed when the administration provides 1- to 2-year contracts for adjuncts and hires at least one more tenure-track faculty member in Earth and Physical Science.
One full time physicist is not sufficient to cover needs of program.	Strategy has not been determined.

Earth and Physical Science Tenure-Track Faculty and Staff Needs

Earth and Physical Sciences is currently in need of at least two tenure-track faculty positions. The departmental course load is supported with an anomalously high number of adjunct instructors. The department respectfully requests that the administration evaluate current faculty needs and rectify the notable tenure-line deficiency in the Earth and Physical Sciences. We need at least two tenure-track positions and one staff position, described below.

Assistant Professor of Earth and Physical Science Education

The Earth and Physical Science Department requests that WOU hire a broadly trained **Science Education Specialist** for a full-time tenure-track Assistant Professor position beginning Fall 2009. The successful candidate will teach courses enrolled primarily by K-12 Education majors, including Earth and Physical Science Methods and introductory Earth System Science. Additional instructional duties depending on specialty will include Meteorology, Oceanography, Astronomy, and one or more upper-division Science Education courses in area of expertise. This position will provide a critical link between the Colleges of LAS and Education, and the successful candidate will be encouraged to pursue external funding opportunities to improve Science Education curriculum at the undergraduate level and for pre-service K-12 Educators.

Assistant Professor of Physics

Faculty member will instruct introductory courses in Physics (General and Calculus based physics with labs), Meteorology, Astronomy, and possibly some science education or introductory Earth Science courses.

Justification: About eight years ago a Physics position was being held for a candidate to finish her Ph.D., but the individual decided not to return to WOU. The position was

one of twenty-four cancelled by the Administration that year. We currently have one physicist who teaches both the general and calculus-based Introductory Physics courses with labs plus upper-division courses for the minor. This is a challenging task and puts a significant strain on the one physicist. Physics is an important area which supports the Biology and Chemistry programs, as all majors in chemistry and most majors in Biology are required to complete physics. The addition of a second physicist would allow more upper-division courses to be offered and promote growth in the number of physics minors, especially among math majors.

Earth and Physical Science Lab Preparator and Technology Support Specialist
Staff member will have primary responsibility for preparation of Earth System Science labs, Geology labs, and related Science Education Methods courses. A key aspect of this position will be to assist in the development and integration of technology across the Earth Science curricula. The Department requests that an individual be hired for this half-time staff position to begin as soon as possible. *(Search is underway as of July 2008.)*

H. Strengths, Weaknesses, Opportunities, and Threats: Looking ahead & prioritizing for 2008-2009.
(Includes description of problems that need to be addressed and discussion of opportunities.)

Earth Science Program

Primary Strengths

1. The Earth Science program has a faculty:student ratio that is conducive to one-on-one contact, personalized instruction, and promotion of undergraduate research.
2. The Earth Science program offers an introductory LACC laboratory science sequence (ES 104-105-106) that is highly relevant to real-world problem solving and appealing to non-science majors.
3. Earth Science faculty members embrace a technology-based curriculum and are working to implement standardized program assessment tools.
4. Earth Science faculty members actively serve as leaders on a number of campus-wide committees and actively serve in a variety of professional capacities.
5. Earth Science faculty members are actively engaged in a wide spectrum of peer-reviewed research, publications, and related professional development.
6. Earth Science faculty members generated over 8400 student credits hours (SCH) during the 2007-2008 academic year, accounting for 30% of the total production in the Division of Natural Sciences and Mathematics.

Primary Challenges

The four primary challenges to advancing the Earth Science program at WOU include: (1) over-dependence on adjunct faculty and lack of tenure-line positions, (2) limited faculty time available for scholarly activities, program assessment, and faculty development, (3) paucity of internal funding for large-scale equipment and facility infrastructure, and (4) student enrollment and retention.

1. The Earth Science program is currently in need of at least one tenure-track faculty position. There is an ongoing issue with regards to staffing the Earth System Science sequence (ES 104, 105, 106) lecture and laboratory courses primarily with adjunct instructors.
2. An ongoing challenge is associated with the teaching load required of faculty. 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.
3. 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. The most pressing infrastructure need is to completely renovate, remodel, and update NS 017, which is the primary laboratory teaching space for the high-enrollment LACC lab science sequence Earth System Science (ES 104-105-106). Additional equipment and infrastructure needs include student-grade reflected-light binocular microscopes, field-grade laptops, and high resolution GPS station for field mapping and data collection.
4. Student enrollment and retention is an ongoing challenge in the 200-level and upper-division Earth Science courses. In most upper-division courses, enrollments have been relatively steady, but growth has been slower than expected. The 200-level Earth Science sequence saw a significant decline in enrollment associated with the change in course prefixes several years ago; ES 201 and 202 are beginning to rebound. The most significant challenge to growth of the Earth Science Program results from the general lack exposure to Earth Science or Geology in the high school curriculum at the state level. In Oregon, K-12 students are only required to take Earth Science in 8th grade. Geology-related course offerings at the high school level occur sporadically on a district-by-district (teacher to teacher) basis, and are not prominently required in the same way as chemistry, biology, or physics. The result is that students receive minimal exposure to geology in high school, with little understanding of career options or the importance of Earth Science to natural resources issues in Oregon.

Addressing these Challenges: Opportunities for Initiating Change

Challenge 1 - Adjunct Faculty and Tenure-Track Positions: To address the first challenge, we have requested that the administration hire at least one tenure-track faculty in the area of Earth and Physical Science Education.

Challenge 2 – Teaching Load: To address the second challenge, we are working with the local faculty union representative (American Federation of Teachers at WOU) and WOU administration to reduce the annual FTE credit hours to 33 and to initiate a 1:1 accounting system for contact hours in laboratory classes.

Challenge 3 – Funding for Facility Infrastructure: To address the third challenge, we have been actively involved in securing external grants and student lab fees to support laboratory infrastructure improvements. While great progress has been achieved during the past 5 years, the bulk of funds to build laboratory infrastructure came from one-time contributions via in-house grants and administrative support (e.g., Dean's Office, Student Technology Fee, PT3, OCEPT). This has been a slow and tedious process that requires constant faculty attention and time. Although the laboratory infrastructure is sporadically advancing, a systematic, sustainable investment strategy is needed to support upgrades. This is a significant challenge that requires institutional commitment, long-term administrative investment, a secured budget line-item, WOU Foundation support, and teaching release time for faculty to develop externally-funded grants.

Challenge 4 – Student Recruitment and Retention: To address the fourth challenge, Earth Science faculty members have been engaged in a wide variety of on-campus recruiting activities, including participation in academic fair/preview day displays, advertising and signage, science fair participation, and career counseling. While these efforts have been persistent, the relatively flat enrollment trends in Earth Science require a more targeted approach to recruiting and advertising. The primary road block to recruiting is the general lack of exposure to Geology / Earth Science curricula and career opportunities at the high school level. A significant percentage of students who are attracted to the Earth Science major are recruited from the ranks of lower division undergraduates who enroll in 100- and 200-level LACC courses. As such, we need to develop an on-campus recruitment strategy that focuses on information exchange and awareness of academic and career opportunities in Earth Sciences.

Physics Program

Primary Strengths

Modern introductory physics lab, with dedicated funding allows for continued improvement. Dr. Schoenfeld's position within Oregon Space Grant helps to provide financial support to qualified and motivated students.

Primary Challenges

Most WOU students are fundamentally weak in Mathematics >> they put off physics to the end of their college careers >> low enrollment in physics classes >> limited advanced coursework for those students who have both the interest and aptitude.

Future Plans

Continue support for:

i. Joint teacher of math & physics major
ii. Science specialization/authorization for elementary ed students

Both of these potential programs hold out the hope for a second physicist, which would vastly improve the long-term quality of the Dept of Earth & Physical Sciences.

I. Summary of Program Curriculum Changes for 2007-2008

Please provide a summary of program curriculum changes that were initiated this past year. In your summary, provide a brief short title/description of the change, the status of the change (options: proposed, final approval pending, approved, in new catalog), and a list of program outcomes to which the change is linked.

STATUS: The curriculum changes described below are pending final approval; these changes were considered as new business at the July 15, 2008 Faculty Senate meeting.

A) Describe the proposed degree program change(s) in terms of how the changes differ from the program as currently approved and published in the latest University catalog (2007-08).

Permanent Course Changes and Approvals:

- Add new course: ES 199 – Special Topics in Earth System Science (4 cr)
- Change description to ES 203/203L – Principles of Geology
- Add new course: ES 304 – Survey of the Fossil Record (3 cr)
- Change course title, number, description, and number of credit hours for ES 303 – Geo-Techniques: Petrographic Microscopy (1 cr) to ES 301 – Petrographic Microscopy (2 cr)
- Change course title, number, description, and number of credit hours for ES 301 – GeoTechniques: Quantitative Applications (1 cr) to ES 302 – Quantitative Methods (2 cr)
- Change course number and title for ES 302 – GeoTechniques: Geology in the Field to ES 303 – Geologic Field Techniques
- Add new course: ES 341 – Fundamentals to Geographic Information Systems (4 cr)
- Change description to ES 351 – Geology for Educators
- Add new course: ES 354 – Volcanoes and Earthquakes (3 cr)
- Modify prerequisites and description for ES 392 – Sedimentary Geology
- Change number of credits for ES 454/554 – Volcanology from 3 cr to 4 cr
- Modify prerequisites for ES 492/592 – GIS Applications in Earth Science

Modifications to the Earth Science Major:

- Change required number of credits from 74-75 to 73-78.
- Remove the CS 161 and CS 162 (Computer Science I and II) option from the Earth Science Major.
- Add three Math options for students to choose from in Major.
- Changes in "GeoTechniques" courses (ES 301-303). Remove ES 301, 302, 303 GeoTechniques (3 cr) from Earth Science Major and replace with ES 301 Petrographic Microscopy (2 cr) and ES 302 Quantitative Methods (2 cr).
- Change the Computer Science requirement for the B.S. and B.A degree requirments.
- Replace WR 321 with WR 322 in notes section.
- Changes to "Choose 1 course in Volcanology/Petrology" section of ES major:

- Add the new course ES 354 Volcanoes and Earthquakes (3 cr) to increase potential electives options for Earth Science majors.
- Change number of credits from (3) to (3-4) to accommodate increase in credits from 3 to 4 for ES 454.

- Changes to "Choose 1 course in Environmental Geology/Surface Processes" section of ES major:
  - Add the new course ES 341 Introduction to Geographic Information Systems to increase potential electives options for Earth Science majors.
  - Change number of credits from (3) to (3-4) to accommodate the new 4-credit course ES 341.
- Change to "Choose 1 course in Sedimentology/Paleobiology" section of ES major:
  - Add the new course ES 304 Survey of the Fossil Record (3 cr) to be offered in 3 year rotation with ES 431 and ES 491/591.

Modifications to the Earth Resources Minor:

- Remove ES 454 Volcanology and ES 460 Energy and Mineral Resources from list of required courses. Instead, add list of limited electives to include ES 321 Structural Geology, ES 354 Volcanoes and Earthquakes, ES 454 Volcanology, and ES 460 Energy and Mineral Resources.
- Add ES 341 Introduction to Geographic Information Systems to electives list.
- Modify number of credit hours for minor from 27 to 27-30 to accommodate the above changes.

Modifications to the Earth System Science Minor:

- Create four sets of related elective courses for students to choose from for this minor. These lists of limited electives will allow students greater flexibility to successfully complete this minor and increase the breadth of Earth system courses in the minor.
  - Choose two courses from the following list: ES 331, ES 390, GS 351
  - Choose one course from the following list: ES 341, ES 473, ES 476, ES 492
  - Choose one course from the following list: ES 354, ES 454, ES 460
  - Choose one course from the following list: ES 304, ES 431, ES 453, ES 491
- Modify number of credit hours for minor from 27 to 25-28 to accommodate the above changes.

Modifications to the Geology Minor:

- Remove ES 301, 302 303 GeoTechniques (3 cr) from Geology minor. Replace with ES 301 Petrographic Microscopy (2 cr) and ES 302 Quantitative Methods (2 cr).
- Increase number of credit hours for minor from 27 to 28 to accommodate the course change in hours. While the number of credit hours will increase by one, the total number of courses required to complete this minor will decrease by one.

B) Describe the reasons for making these changes.

Permanent Course Changes and Approvals:

- Add new course: ES 199 – Special Topics in Earth System Science (4 cr)

  This course is designed for undergraduate non-science majors. This course will address the need of many undergraduates who have difficulty understanding the relevance of science in their lives. Topics such as natural disasters, global climate change, environmental quality, Earth resources, and recent advances in astronomy are socially relevant and are an appropriate part of a liberal arts laboratory science curriculum. Many universities offer similar courses for non-science majors. As an example of how class time might be used in a given course: the lecture portion will be divided into a two-hour traditional oral lecture to introduce new ideas and concepts, and a one-hour group discussion of an assigned "case study" science article. Laboratories will be two hours in length and are designed to supplement lecture topics and provide opportunities for authentic scientific discovery by students. No new faculty or facilities are needed. The course will be integrated into the current ES 100 teaching rotation with no net effect on FTE distribution. When offered, ES 199 will replace one ES 100 lecture course and two ES 100 labs in the schedule, resulting in no impact to FTE.
- Change description to ES 203/203L – Principles of Geology

  Remove statement: (three hour lab for ES 203) from previous description. ES 203L (required with the lecture ES 203) was converted from a two hour to a three hour lab a few years ago in order to accommodate time-intensive weekly writing discussion and analysis necessary for ES 203W. However, ES 203 is no longer taught as a W course, and the extra lab hour is no longer necessary. ES 201 and ES202 are writing intensive courses, so these courses, along with the WR 322 Technical Writing, provide adequate W credits for ES majors.
- Add new course: ES 304 – Survey of the Fossil Record (3 cr)

  ES 304 fills a real need for the general WOU undergraduate population because it introduces, through a general and non-intimidating approach, the range of life forms preserved in the fossil record and the use of quantitative fossil data for documenting important processes including evolutionary change and the monitoring of ancient environmental conditions. Nationally almost every major university offers a history of life course at the introductory level. It is surprising that few Oregon universities offer the course, since the class is invariably popular, extremely relevant, and enrolls large numbers of students. In the past I've tried to give students a flavor of the biological history of life in ES 203 – Historical Geology – but there is insufficient time to accomplish this goal in the ES 203 course and the material requires a separate course. Because course enrollment is currently to be limited to 24 students, this course will eventually be proposed as a writing intensive course.
- Change course title, number, description, and number of credit hours for ES 303 – Geo-Techniques: Petrographic Microscopy (1 cr) to ES 301 – Petrographic Microscopy (2 cr)

  The increase in credit hours from 1 to 2 is needed to more accurately reflect student workload and time commitment. Petrographic Microscopy is a critical course for the Earth Science program to maintain competitiveness with comparable majors elsewhere. The change in numbering and the title change are needed to reduce some confusion from the original number scheme chosen for this course. The changes to this course are part of several additional modifications to this series of courses in the Earth Science major. These include removing ES 302 "Geotechniques: Geology in the Field" from the Earth Science major, aligning the content

from the field course with the updated "ES 302 Quantitative Methods" course, and changing the numbering scheme of these courses. These changes will not require any additional faculty FTE to implement.

- Change course title, number, description, and number of credit hours for ES 301 – GeoTechniques: Quantitative Applications (1 cr) to ES 302 – Quantitative Methods (2 cr)

  The increase in credit hours from 1 to 2 is needed to more accurately reflect student workload and time commitment. Quantitative Methods is a critical course for the Earth Science program to maintain competitiveness with comparable majors elsewhere. The change in numbering and the title change are needed to reduce some confusion from the original number scheme chosen for this course. The changes to this course are part of several additional modifications to this series of courses in the Earth Science major. These include removing ES 302 "Geotechniques: Geology in the Field" from the Earth Science major, aligning the content from the field course with the updated "ES 302 Quantitative Methods" course, and changing the numbering scheme of these courses. These changes will not require any additional faculty FTE to implement.

- Change course number and title for ES 302 – GeoTechniques: Geology in the Field to ES 303 – Geologic Field Techniques

  The change in numbering is necessary to reduce some confusion from the original number scheme chosen for this course. The changes to this course are part of several additional modifications to this series of courses in the Earth Science major. These include removing ES 302 "Geotechniques: Geology in the Field" from the Earth Science major, aligning the content from the field course with the updated "ES 302 Quantitative Methods" course, and changing the numbering scheme of these courses. These changes will not require any additional faculty FTE to implement.

- Add new course: ES 341 – Fundamentals to Geographic Information Systems (4 cr)

  Introductory course concepts are currently covered in part by ES 492/592 "GIS Applications in Earth Science", for 3 credits. The current 3-credit structure does not match the student workload or lab time required to complete the course. The newly proposed ES 341 GIS course will raise the credits from 3 to 4 to more accurately reflect the required lab time; plus allow ES 492/592 to move away from introductory concepts and become a truly advanced applications course (i.e., GIS "Part 2"). In addition, a partnership has developed over the past several years between Earth Science and Geography, due to overlapping curricular interests in geospatial technology. Majors from both programs have been substituting the GEOG and ES GIS courses, based on availability and scheduling. Geography has recently implemented "GEOG 341 Geographic Information Systems". The rationale was that students need to be introduced to GIS earlier in their program careers, during junior year (i.e. 300-level), rather than waiting until senior year (400-level). Through coordinated discussions, both programs have agreed to align their respective GIS courses in content and scope, and alternate the offerings every other year. The proposed ES 341 will alternate with GEOG 341 every other year, thus providing an introductory GIS course on campus annually, without the need for additional faculty FTE in either program. Juniors in the Earth Science and Geography programs will be provided an introduction to GIS via either ES 341 or GEOG 341, depending on year, and, if desired, be able to take an additional 3 credits of advanced GIS in ES 492/592 as an elective in the off year as seniors. Students from each program will be able to substitute either GEOG 341 or ES 341 as part of the major degree requirements. This arrangement will also provide students with the opportunity to take a second GIS course at the advanced level, better preparing them with marketable skills for the geospatial technology workforce. No additional faculty

and/or facilities will be needed. The course will be integrated into Taylor's teaching rotation with no net effect on FTE distribution. Existing software and computer lab facilities in NS216 and NS218a will be utilized.

- Change description to ES 351 – Geology for Educators

  To help future teachers recognize and better understand processes that shape the earth. To provide curriculum-enhancing approaches for discussing Earth science topics. To highlight and thoroughly examine Earth science topics of societal concern.

- Add new course: ES 354 – Volcanoes and Earthquakes (3 cr)

  Beyond being subject matter that is very interesting to me, this topic is highly relevant to people living in the Pacific Northwest, and I think will be of interest to a broad cross-section of WOU students. The course will be an upper-division elective in the Earth Science Major, and Earth Resources and Earth System Science Minors. As envisioned, this course would also be suitable for Environmental Studies Minors, Integrated Science Teacher Education Majors, and as a Science content course for K-8 Pre-Education Majors. For degree areas outside of Earth Science, advisors from those programs would need to consider whether this course would be suitable for students in these programs. In addition, comparable courses are commonplace at most other OUS institutions, including PSU, UO, OSU, and SOU. No new faculty or facilities are needed. The course will be integrated into Templeton's teaching rotation with no net effect on FTE distribution.

- Modify prerequisites and description for ES 392 – Sedimentary Geology

  Students regularly attempt ES 392 before possessing the field and laboratory experience to achieve success in the course. The prerequisite changes and new catalog description is an effort to eliminate this problem.

- Change number of credits for ES 454/554 – Volcanology from 3 cr to 4 cr

  The change from 3 credits to 4 credits is necessary to better represent the student work load required by class, to align upper-division Earth Science courses with similar level courses being offered by other science program areas at WOU, and to make course comparable to Volcanology courses taught at other OUS institutions.

- Modify prerequisites for ES 492/592 – GIS Applications in Earth Science

  New course description reflects change in prerequisites.

Modifications to the Earth Science Major:

- Change required number of credits from 74-75 to 73-78.

  The change in the number of credits is necessary to accommodate the various curriculum modifications proposed herein.

- Remove the CS 161 and CS 162 (Computer Science I and II) option from the Earth Science Major.

  As originally conceived in 2000, the Earth Science Major was designed with two quantitative-skills options, CS 161-162 (Computer Programming) or MTH 251-252 (Calculus). During the past eight years, the scope and focus of CS 161 and CS 162 have changed to provide more of a starting foundation for the computer science majors, rather than a general elective for non-CS majors. Few Earth Science students have elected to take the CS option since its inception, and the CS 161-162 course content is no longer applicable to our major. For these reasons, we would like to eliminate the CS 161-162 option from the Earth Science Major.

- Add three Math options for students to choose from in Major.

  In addition to eliminating the CS option in the major, we propose to create three Math options for students to choose from. The three options will be (A) MTH 112-MTH 243, (B) MTH 243-MTH 251, and (C)

MTH 251-MTH 252. We are modeling and adopting best practices from the Biology Major. Having three math options, will provide greater flexibility for students majoring in Earth Science.

- Changes in "GeoTechniques" courses (ES 301-303). Remove ES 301, 302, 303 GeoTechniques (3 cr) from Earth Science Major and replace with ES 301 Petrographic Microscopy (2 cr) and ES 302 Quantitative Methods (2 cr).

  These changes are needed to update the catalog to reflect operating procedures that have been completed via "Request for Temporary Course Approval" for the past two years. These changes will align course numbering to follow fall-winter-spring rotation, thus improving sequencing through the Earth Science degree. The change from one three-hour lab per week (1 cr.) to one hour of lecture and two hours of lab per week (2 credits) will allow for greater class productivity with two class meetings per week, and increasing the number of credits will bring these courses more in line with the workload. The "Geology in the Field" course is no longer being offered on a regular basis, so we need to remove this from the Earth Science Major, but retain it as an option for future use.
- Change the Computer Science requirement for the B.S. and B.A degree requirments.

  In the notes section, we propose to change the Computer Science requirement to "completion of 2 to 4 credit hours of Computer Science coursework depending on the chosen Math option". Students working towards the B.S. and B.A. degrees will complete MTH 112, MTH 243, MTH 251, and/or MTH 252 for a total of 8-10 hours. They will need to complete 2 to 4 credit hours of Computer Science to fulfill the Math and Computer Science graduation requirement of 12 credits.
- Replace WR 321 with WR 322 in notes section.

  "*For this major, 4 hours of Writing Intensive course work should come from WR 322 (Technical Writing).*" This change is necessary because the English Department recently split the old WR 321 (Business and Technical Writing) into two courses.
- Changes to "Choose 1 course in Volcanology/Petrology" section of ES major:
  - Add the new course ES 354 Volcanoes and Earthquakes (3 cr) to increase potential electives options for Earth Science majors.
  - Change number of credits from (3) to (3-4) to accommodate increase in credits from 3 to 4 for ES 454.
- Changes to "Choose 1 course in Environmental Geology/Surface Processes" section of ES major:
  - Add the new course ES 341 Introduction to Geographic Information Systems to increase potential electives options for Earth Science majors.
  - Change number of credits from (3) to (3-4) to accommodate the new 4-credit course ES 341.
- Change to "Choose 1 course in Sedimentology/Paleobiology" section of ES major:
  - Add the new course ES 304 Survey of the Fossil Record (3 cr) to be offered in 3 year rotation with ES 431 and ES 491/591.

Modifications to the Earth Resources Minor:

- Remove ES 454 Volcanology and ES 460 Energy and Mineral Resources from list of required courses. Instead, add list of limited electives to include ES 321 Structural Geology, ES 354 Volcanoes and Earthquakes, ES 454 Volcanology, and ES 460 Energy and Mineral Resources.
- Add ES 341 Introduction to Geographic Information Systems to electives list.

This list of limited electives will allow students greater flexibility to successfully complete this minor and increase the breadth of Earth Resources courses in the minor.

- Modify number of credit hours for minor from 27 to 27-30 to accommodate above changes.
  The total number of courses required to complete this minor will remain the same, but the number of credit hours will possibly increase depending on whether students complete 3 or 4 credit hour courses.

Modifications to the Earth System Science Minor:

- Create four sets of related elective courses for students to choose from for this minor.
  These lists of limited electives will allow students greater flexibility to successfully complete this minor and increase the breadth of Earth system courses in the minor.
- Modify number of credit hours from 27 to 25-28 to accommodate above changes.
  The total number of courses required to complete this minor will remain the same, but the number of credit hours will possibly increase depending on whether students complete 3 or 4 credit hour courses.

Modifications to the Geology Minor:

- Remove ES 301, 302 303 GeoTechniques (3 cr) from Geology minor. Replace with ES 301 Petrographic Microscopy (2 cr) and ES 302 Quantitative Methods (2 cr).
  Refer to justification statement above in Earth Science Major for rationale for making this change.
- Increase number of credit hours for minor from 27 to 28 to accommodate course changes.
  While the number of credit hours will increase by one, the total number of courses required to complete this minor will decrease by one.

C) How and when will the effectiveness of these changes be determined?

The proposed changes will most likely go into effect during the 2008-09 and 2009-10 academic years. The Earth Science program will design and implement a comprehensive evaluation plan that entails both formative and summative assessment strategies. Numeric data will be collected on course enrollments, grade distributions, and individual faculty evaluations. Embedded assessment strategies that are specifically linked to program outcomes will employed in all Earth Science courses, with special emphasis on the courses that are being modified. In addition, focus groups of Earth Science students will be formed to gauge how well these changes are accomplishing the intended outcomes. Surveys of graduates from the Earth Science program will be conducted to continually refine the degree program.

J. Program Assessment Activities and Results

Provide a summary of program assessment activities and results from the past year, include evidence that the assessment activities are leading to the improvement of teaching and learning. Departments are to keep written records of review/assessment discussions and actions. Please submit descriptions of such engagement in the annual departmental report to the division.

1. Embedded Assessment Results. Provide results of Spring 2008 embedded assessment activities mapped to one or more of the program's learning outcomes. Each faculty member is expected to participate in embedded assessment and to file an embedded assessment action report, submitted to division chair and forwarded to dean's office. As necessary, fill out the attached form (see below, at end of report template) for each participating faculty member and course(s).

2. Other embedded approaches. Provide documentation of other assessment methodologies including capstone reports, oral presentations, senior theses, writing portfolios, service learning accounts, laboratory reports, creative arts portfolios, etc., mapped against a program learning outcome. Provide departmental evidence that these student works are being assessed, collectively, and tabulated for departmental program review and decision making. Representative samples and an assessment rubric should be collected and numerical data should be compiled on how many students performed above/at/below desired proficiency.

For the purposes of this report, provide a summary list of these activities, an overview of results, and faculty members who are responsible for archiving the documentation.

3. Exit and Proficiency Exams. Provide a summary of results from any program-related exit or proficiency exams (e.g. ETS specialty exams, state licensing exams, etc.). Describe how these results are being used to map program outcomes and guide improvements in teaching and learning. Include a list of faculty members who are responsible for archiving the documentation.

LAS Embedded Assessment Action Report For Program Review - TEMPLATE

Degree Program(s): _____

(BA, BS, BFA, MA, MS, LACC, etc.)

Course # / Title: _____

Faculty name: _____

Date: _____

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

B) Check the embedded assessment tool(s) used :

- ☐ Exam question
- ☐ Essay
- ☐ Oral presentation
- ☐ Thesis
- ☐ Portfolios
- ☐ Practicum / Service Learning
- ☐ Capstone paper / project
- ☐ Other _____

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

Attach a copy of this action report for each faculty member and/or course to the annual department report. These will be compiled by the division chair and submitted to the LAS dean's office.

LAS Embedded Assessment Action Report For Program Review

Degree Program(s): _____B.A./B.S. Earth Science + LACC Lab Science Course___
(BA, BS, BFA, MA, MS, LACC, etc.)

Course # / Title: ____ES203 Historical Geology_____

Faculty name: _____Dr. Jeff Myers_____

Date: _____Spring Term 2008_____

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

- Use a liberal arts approach to solving problems requiring an interdisciplinary scientific knowledge (from the Earth Science mission statement).
- Aquire a comprehensive understanding of the interrelated physical, chemical, and biological processes operating in the Earth system (from Earth Science learning outcomes)

B) Check the embedded assessment tool(s) used :

XX Exam question
☐ Essay
☐ Oral presentation
☐ Thesis
☐ Portfolios
☐ Practicum / Service Learning
☐ Capstone paper / project
☐ Other ____

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

I use multiple quizzes in each course I teach, and because these quizzes require the synthesis of diverse information from a range of scientific disciplines, it is possible to measure a student's developing understanding of some critical aspects of the ES program mission and learning outcomes. I have designed at least one question, and often several questions, per quiz to be comparable between courses. Examples of questions include some I use in Historical geology: (1) Briefly explain INDIRECT evidence from rocks of the Isua sequence that suggests that life was present on earth 3.8 Ga; (2) Was the Cretaceous bolide impact responsible for changing global climate and killing off the ammonites and dinosaurs? Make a TIMELINE with explanations below to argue your case and briefly explain your conclusion. Be creative!

These types of questions measure a student's ability to synthesize data from diverse disciplines, with increasing rigor through the quarter. Results can easily be evaluated using a scoring rubric.

I have found that open ended exploratory questions are the mose effective tools for measuring student understanding of interdisciplinary scientific concepts.

LAS Embedded Assessment Action Report For Program Review

Degree Program(s): _____B.A./B.S. Earth Science_____

(BA, BS, BFA, MA, MS, LACC, etc.)

Course # / Title: ____ES407 Senior Seminar_____

Faculty name: _____Dr. Steve Taylor_____

Date: _____Spring Term 2008_____

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

- Understanding of physical processes operating in the Earth system.
- Understanding of chemical processes operating in the Earth system.
- Understanding of biological process operating in the Earth system.
- Understanding of interrelated nature of the Earth system.
- Student engagement of inquiry-based science.
- Application of the scientific method; including ability to define problems, make observations, present data, and develop interpretations.

B) Check the embedded assessment tool(s) used :

☐ Exam question
☐ Essay
XX☐ Oral/Multi-Media presentation Multi-media presentations of journal articles
☐ Thesis
☐ Portfolios
☐ Practicum / Service Learning
☐ Capstone paper / project
☐ Other _____

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

To assess the above-stated program outcomes, the activity involved each student selecting 3 peer-reviewed, recently published scientific papers on a wide range of topics related to Earth surface processes and integrated watershed functions with a focus on physical, chemical, and biological parameters. Students were required to read their papers, construct extended outlines, and then prepare a 30-minute multi-media presentation on the topic in a format typically engaged at professional scientific meetings. Through this process, students were required to read and comprehend high-level scientific journal articles, assimilate data, understand quantitative methods and statistical analyses, encounter scientific vocabulary, and synthesize information by presenting it to their peers in a formal seminar setting.

LAS Embedded Assessment Action Report For Program Review

Degree Program(s): _____B.A./B.S. Earth Science_____

(BA, BS, BFA, MA, MS, LACC, etc.)

Course # / Title: ____ES407 Senior Seminar_____

Faculty name: _____Dr. Steve Taylor_____

Date: _____Spring Term 2008_____

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

- Understanding of physical processes operating in the Earth system.
- Understanding of chemical processes operating in the Earth system.
- Understanding of biological process operating in the Earth system.
- Understanding of interrelated nature of the Earth system.
- Application of the scientific method; including ability to define problems, make observations, present data, and develop interpretations.

B) Check the embedded assessment tool(s) used :

☐ Exam question
☐ Essay
☐ Oral/Multi-Media presentation
☐ Thesis
☐ Portfolios
☐ Practicum / Service Learning
☐ Capstone paper / project
XX☐ Other _____Web-based Exit Exam_____

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

To assess the above-stated program outcomes, the activity involved each student taking a web-based exit exam that is under development by Dr. Taylor in the Earth Science program. The web-based exit exam for Earth Science uses the WebCT software environment. Over 1500 keyed questions have been entered into a database, derived from published GRE Geology practice exam manuals from the 1990's and from more recent introductory Earth Science test banks. A pilot version of the exam was administered to four students in ES407 during spring term 2008. The online exam environment is approximately 60% complete, but the database is still under construction. Robust statistical methods also need to be further developed. The next iteration of the exam will be administered in spring 2009, with the goal of full implementation at that time. The objective of the exit exam will be to measure minimum competency of graduating seniors in approximately 6 specialty sub-disciplines from the undergraduate Earth Science program, as tied to program outcomes. In the final rendition, each question will be related statistically to a sub-discipline area and an explicit program outcome. In sum, this is still a work in progress, and a large time sink, however full implementation is targeted for use with the senior seminar class of spring 2009.

LAS Embedded Assessment Action Report For Program Review

Degree Program(s): _____B.A./B.S. Earth Science_____

(BA, BS, BFA, MA, MS, LACC, etc.)

Course # / Title: ____ES407 Senior Seminar_____

Faculty name: _____Dr. Steve Taylor_____

Date: _____Spring Term 2008_____

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

- Understanding of physical processes operating in the Earth system.
- Understanding of chemical processes operating in the Earth system.
- Understanding of biological process operating in the Earth system.
- Understanding of interrelated nature of the Earth system.
- Student engagement of inquiry-based science.
- Application of the scientific method; including ability to define problems, make observations, present data, and develop interpretations.

B) Check the embedded assessment tool(s) used :

☐ Exam question
☐ Essay
☐ Oral presentation
☐ Thesis
☐ Portfolios
☐ Practicum / Service Learning

XXCapstone project Willamette Basin project presentation at Academic Exc. Showcase

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

ES407 students partnered with the ES473/573 class and participated in a threaded theme session entitled: "Earth Science in Context: Land Use and Watershed Function in the Willamette Basin". The theme session was comprised of subcomponents including Physiographic Setting, Climate History, Geologic Framework, Hydrology, Landuse, Natural Hazards, Effects of Timber Harvest, and River Alteration. Each student was assigned two published journal articles or reports in their assigned subtopic. Participants were required to read their papers, construct extended outlines, write abstracts, and then prepare a poster presentation on the topic in a format typically engaged at professional scientific meetings. Through this process, students were required to read and comprehend high-level scientific journal articles, assimilate data, understand quantitative methods and statistical analyses, encounter scientific vocabulary, and synthesize information by presenting it to their peers in a formal conference setting. After the conference, students provided 10-minute oral summaries of their posters to their peers, then were provided an opportunity to share notes and concepts for use in studying for the linked final exam.

LAS Embedded Assessment Action Report for Program Review

Degree Program: BS Earth Science; Minors in Earth Resources, Earth System Science, Geology

Course # / Title: ES 454 / Volcanology

Activity: Bend Pumice-Tumalo Tuff Field and Laboratory Research Project/Writing Assignment

Faculty name: Jeffrey Templeton

Date: Spring 2008

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

1. Acquire a comprehensive understanding of the interrelated physical, chemical, and biological processes operating in the Earth system.
   Outcome not being assessed by this embedded assessment strategy.
2. Develop proficiency in using technology-enriched analytical techniques to solve geologic problems.
   a. *Rate degree to which technology-enriched analytical techniques are used to solve given geologic problem*
   b. *Use of technology-enriched analytical techniques is appropriate to solve given geologic problem*
   c. *Student demonstrates proficiency / competence in applying technology-enriched analytical techniques to solve a given geologic problem.*
3. Gain experience in conducting inquiry-based science in the context of outdoor adventure.
   a. *Rate degree to which student was engaged in inquiry-based science.*
   b. *Rate degree to which student engaged science in field setting.*
   c. *Student demonstrates skills in applying the scientific method, including ability to define problem, present relevant observations and data, and develop interpretations based on these observations and data.*

B) Check the embedded assessment tool(s) used:

X Capstone paper / project

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

ES 454/554 Volcanology

Bend Pumice/Tumalo Tuff Writing Assignment (Part 3)

Due: Wed., June 11 by NOON

Worth 20 points towards Exercises/Assignments/Field Trip Project part of grade.

Each student in the class will prepare a short paper (3-5 pages of text) focusing on the research we have been conducting on the Bend Pumice/Tumalo Tuff section studied as part of the field trip. A couple of points to consider: (1) be sure to separate observations and data from interpretations, and (2) the use of photographs, figures, maps, graphs, and tables is strongly encouraged (figures must be specifically relevant to the paper and cited in text).

The paper should:

i. briefly introduce project
ii. provide a concise description of the Bend Pumice/Tumalo Tuff section (provide well drafted copy of measured section)
iii. highlight the pertinent field observations
iv. present and discuss the granulometric analysis data (provide relevant graphs and data)
v. provide an interpretation of the origin of the different units of the Bend Pumice/Tumalo Tuff exposure based on the field observations and granulometric data
vi. summarize study and discuss hazard implications
vii. cite references

LAS Embedded Assessment Action Report for Program Review

Degree Program: BS Earth Science; Minors in Earth Resources, Earth System Science, Geology

Course: ES 454 – Volcanology

Activity: Volcano Research Project – Poster Presentation at Academic Excellence Showcase

Faculty name: Jeffrey Templeton

Date: Spring 2008

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

1. Acquire a comprehensive understanding of the interrelated physical, chemical, and biological processes operating in the Earth system.
   a. *Content displays understanding of physical processes operating in the Earth system*
   b. *Content displays understanding of chemical processes operating in the Earth system*
   c. *Content displays understanding of interrelated nature of the Earth system*
2. Develop proficiency in using technology-enriched analytical techniques to solve geologic problems.
   a. *Rate degree to which technology-enriched analytical techniques are used to solve given geologic problem*
   b. *Use of technology-enriched analytical techniques is appropriate to solve given geologic problem*
   c. *Student demonstrates proficiency / competence in applying technology-enriched analytical techniques to solve a given geologic problem.*
3. Gain experience in conducting inquiry-based science in the context of outdoor adventure.
   Outcome not being assessed by this embedded assessment strategy.

B) Check the embedded assessment tool(s) used:

X Poster presentations at Academic Excellence Showcase, Spring 2008

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

ES 454/554: Volcano Research Project

For the term project, you will conduct research on a topic associated with a specific volcano and prepare a poster based on your research. The posters are due on **Thursday, May 29** and will be displayed as part of the Academic Excellence Showcase. Abstracts for the Showecase are **due Monday, April 28.** You will be required to display your poster at the scheduled session on that day. (Exact time will be determined, but probably in the afternoon from 1:30-3:30.) No late posters will be accepted – **no exceptions**, including computer/printing problems! I will collect your posters after the poster session on that day.

I expect your poster to be informative, artfully designed, and suitable for public display. I will evaluate your work based on your ability to convey the information in a poster format (i.e., graphically AND with text), the originality and creativity of your work, how well researched the topic is, and the completeness and thoroughness in covering the material outlined below. Be sure you cover the specific topic for your volcano in sufficient detail for a 400-level science class.

INTRODUCTION

Provide a brief overview of the poster. Introduction should hook the viewer and get them excited about the topic. Also, discuss relevance of your volcano and topic to science of volcanology.

OVERVIEW OF VOLCANO

Location: Geologic and plate tectonic setting

Provide an overview of the Geologic and Plate Tectonic setting in which the volcano occurs. (Consult the Earth's Fractured Surface map)

Eruptive history, Products of volcano, and Modes of eruption

Briefly Summarize the eruptive history of the volcano (i.e., <u>when</u> has it erupted). This will most likely be based on geological studies of the volcano and possibly historical records.

Provide information on the composition of the volcano, types of rocks, and the types of deposits produced (i.e., <u>what</u> does it erupt? e.g., pyroclastic flows, lava flows). Given this information, describe how volcano erupts (i.e., modes of eruption)

DISCUSSION

This section should cover, in detail, the specific aspect of your volcano and/or volcanic eruption, as provided on the "List of Volcano Research Topics" sheet. I will expect you to conduct research on your topic and present the results of this research in this section of the poster.

CONCLUSIONS

Present your own interpretations and ideas about the volcano. Also, conclusion should convey the significance of your volcano to the growth and development of science of volcanology.

REFERENCES CITED

You should use at least <u>three</u> different sources of information (besides your textbook) to prepare your poster. I will be evaluating your research in terms of how thorough and complete it is for the given topic and will give higher scores to students who use peer-reviewed scientific literature rather than non-peer reviewed web resources. Make sure to cite the pertinent references within the body of the poster, where applicable, and provide a reference list.

Poster Information:

Your poster should include all of the materials described above and the components below. Poster size will be a maximum of 36" x 48", although the size will probably be 32" x 40". The Earth Science program has a color plotter, which is ideal for printing large-sized posters. I would strongly encourage you to do your posters in PowerPoint and plot them. I have a template available to get your started, which you can get by emailing me and requesting the template. You should plan an adequate amount of time to plot your poster. You must plot the poster PRIOR to May 29, and time will be limited on May 28. *The recommended time for plotting is sometime during the 8th week of the term.* A sign-up sheet will be provided.

Necessary Components:

Required: Title; Student Name; at least three references

Introduction

Does it spark interest and draw viewer in.

Content

Substantial and Informative

Excellent coverage of all materials described above

Well researched, references cited

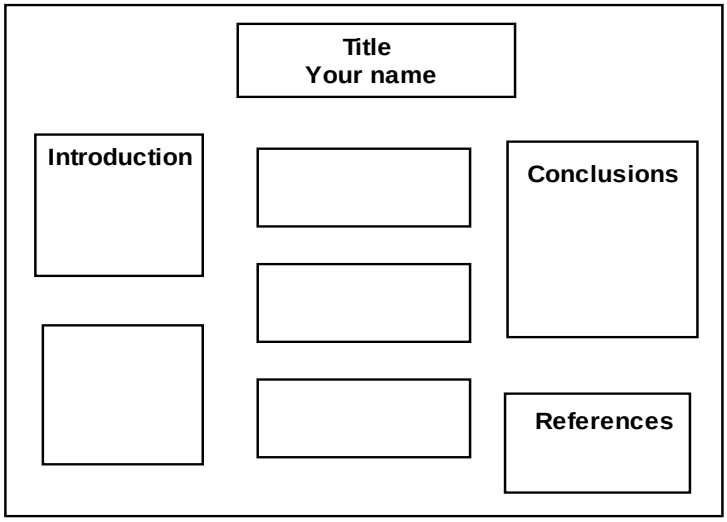
Presentation

Graphical and diagrammatic; artfully designed

Text and figure captions are provided to tell viewer what they should be observing

Good flow and organization

Sample Layout (Please use this as a guide only, be creative!)



LAS Embedded Assessment Action Report For Program Review

Degree Program(s): _____B.A./B.S. Earth Science_____

(BA, BS, BFA, MA, MS, LACC, etc.)

Course # / Title: ____ES473/573 Environmental Geology_____

Faculty name: _____Dr. Steve Taylor_____

Date: _____Spring Term 2008_____

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

- Understanding of physical processes operating in the Earth system.
- Understanding of chemical processes operating in the Earth system.
- Understanding of biological process operating in the Earth system.
- Understanding of interrelated nature of the Earth system.
- Student engagement of inquiry-based science.
- Application of the scientific method; including ability to define problems, make observations, present data, and develop interpretations.

B) Check the embedded assessment tool(s) used :

☐ Exam question
☐ Essay
☐ Oral presentation
☐ Thesis
☐ Portfolios
☐ Practicum / Service Learning
XXCapstone project Willamette Basin project presentation at Academic Exc. Showcase
☐ Other _____

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

ES473/573 students partnered with the ES407 class and participated in a threaded theme session entitled: “Earth Science in Context: Land Use and Watershed Function in the Willamette Basin”. The theme session was comprised of subcomponents including Physiographic Setting, Climate History, Geologic Framework, Hydrology, Landuse, Natural Hazards, Effects of Timber Harvest, and River Alteration. Each student was assigned two published journal articles or reports in their assigned subtopic. Participants were required to read their papers, construct extended outlines, write abstracts, and then prepare a poster presentation on the topic in a format typically engaged at professional scientific meetings. Through this process, students were required to read and comprehend high-level scientific journal articles, assimilate data, understand quantitative methods and statistical analyses, encounter scientific vocabulary, and synthesize information by presenting it to their peers in a formal conference setting. After the conference, students provided 10-minute oral summaries of their posters to their peers, then were provided an opportunity to share notes and concepts for use in studying for the linked final exam.

LAS Embedded Assessment Action Report For Program Review

Degree Program(s): _____B.A./B.S. Earth Science_____

(BA, BS, BFA, MA, MS, LACC, etc.)

Course # / Title: ____ES473/573 Environmental Geology_____

Faculty name: _____Dr. Steve Taylor_____

Date: _____Spring Term 2008_____

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

- Understanding of physical processes operating in the Earth system.
- Understanding of chemical processes operating in the Earth system.
- Understanding of interrelated nature of the Earth system.
- Develop proficiency in using technology-enriched analytical techniques to solve geologic problems
- Student engagement of inquiry-based science.
- Student engagement of science in a field setting.
- Application of the scientific method; including ability to define problems, make observations, present data, and develop interpretations.

B) Check the embedded assessment tool(s) used :

☐ Exam question
☐ Essay
☐ Oral presentation
☐ Thesis
XX☐ Portfolios Lab exercise portfolio with writing work samples
☐ Practicum / Service Learning
☐ Capstone project
☐ Other _____

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

ES473/573 students were required to work on a variety of inquiry-based, technology-enriched, laboratory exercises throughout the term. In addition to in-class assignments, students participated in several field trips related to environmental geology (e.g. water filtration plant, landfill, highway construction site, etc.). Each field trip and reading assignment was associated with a 500-800 word summary to enhance the writing skills of students. Summaries included: (1) Introduction to the Problem / Issue, (2) Summary of Main Points, (3) Final Discussion of the Relevance of the Presentation / Field Trip to Environmental Issues in the State of Oregon, (4) References Cited, and (5) pertinent figures and tables. Lab exercises and writing assignments were compiled into professional portfolios that could later serve as work samples which students are encouraged to use for employment-related interviews.

LAS Embedded Assessment Action Report For Program Review

Degree Program(s): _____B.A./B.S. Earth Science_____

(BA, BS, BFA, MA, MS, LACC, etc.)

Course # / Title: ____ES473/573 Environmental Geology_____

Faculty name: _____Dr. Steve Taylor_____

Date: _____Spring Term 2008_____

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

- Understanding of physical processes operating in the Earth system.
- Understanding of chemical processes operating in the Earth system.
- Understanding of biological process operating in the Earth system.
- Understanding of interrelated nature of the Earth system.
- Application of the scientific method; including ability to define problems, make observations, present data, and develop interpretations.

B) Check the embedded assessment tool(s) used :

XX☐ Exam question Final exam question focusing on integrated watershed functions

☐ Essay
☐ Oral presentation
☐ Thesis
☐ Portfolios
☐ Practicum / Service Learning
☐ Capstone project
☐ Other _____

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

An embedded assessment question was presented on the final exam to assess student understanding of integrated concepts of physical, chemical, and biological processes operating at the Earth's surface. The question was framed in the context of watershed function and linked to the Academic Showcase project presentations. The question was stated as follows: "Summarize your understanding of the interrelated physical, chemical, and biological processes operating in the Willamette Basin subsystem. Frame your answer in the context of the ES473/573Academic Showcase Poster project entitled: "Earth Science in Context: Land Use and Watershed Function in the Willamette Basin". In the order presented, address the following components: (A) regional tectonic setting of the Willamette Basin (include a sketch map of the plates, the type of tectonic system, and the key tectonic and physiographic components of the landscape), (B) the environmental and anthropogenic setting of the Willamette Basin (land-use activities and their distribution throughout the valley), (C) the relationship between regional climate and vegetation distributed from west to east across the basin (relate this answer to the tectonic-physiographic setting discussed in A above), and (D) the geomorphic and ecological effects of human-induced disturbance to the landscape via timber harvesting. forest-road construction, and floodplain alteration (i.e. discuss how human activities influence sedimentation and vegetation patterns in the watershed system)"

LAS Embedded Assessment Action Report for Program Review

Degree Program(s): LACC / Minors in Physics
Course # / Title: Physics 201 General Physics, Physics 211 General Physics with Calculus
Faculty name: W. Schoenfeld
Date: Fall 2004, Fall 2005, Fall 2006, Fall 2007

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

Gain experience in combining graphical and numeric information to produce mathematical models

B) Check the embedded assessment tool(s) used :

X Exam question

Summary and results of program assessment activities:

For the past 4 academic years I have been administering the **Force and Motion Conceptual Evaluation**, a national exam which tests student understanding of the fundamental concepts of motion and Newton's Laws (force), as well as interpreting information presented in a graphical format. Its 47 questions are a mix of multiple-choice conceptual questions aimed at exposing student misconceptions, and matching graphs of physical quantities with the corresponding word descriptions. In the calculus based class (PH211) the test is administered both as a pre-instruction diagnostic exam on the first day of class (and does not count whatsoever), and post-instruction as part of their final exam (which counts). In the algebra based class (PH201) I give it only post instruction as part of their final exam. The reason for this is twofold; first, the student population in this class is mostly juniors or seniors, far removed from math classes, and they have usually never seen physics before. As an example, 60% of the fall 2007 class were both seniors, and have never had even a high school physics class. The second reason is that many of these students tend to drop the class immediately upon realizing how little physics they know, and upon discovering how vital mathematics is to the course content.

The following trends are generally observed.(although small sample size in any given year has on occasion reversed the trends):

i. Male students generally have higher pre-instruction scores.
ii. Male students generally have higher fractional gains, which leads to even greater gender differences on the post-instruction scores
iii. Mathematics majors generally do well on post-instruction test, regardless of their pre-instruction scores
iv. While high scores on these conceptual questions do not necessarily lead to high scores on the problem solving portion of the exams, failure to do well on the conceptual questions almost always leads to poor performance on the problem solving aspects of the course.

Based on the data collected these past few years I have implemented a few changes in both the algebra and calculus based physics sequences. These include:

- Greater emphasis on graphical analysis during lecture portion of the course.
- More extensive use of analysis features of PASCO during laboratory sessions.
- More conceptual homework assignments, especially now that I am using the online homework grading system.
- Slower pace of material coverage during the first term of the sequence so that as many students as possible have the chance to succeed in the first term, and advance on to the second and third terms.