External Review of the Biology Department, CWU

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## Table of Contents

Body of the Review

I. Summary of Assessment of the CWU Biology Department and the Review Process  P. 3

II. Biology Faculty Teaching needs to be Optimized  P. 4

III. The Biology Core Curriculum at CWU should Change  P. 5

IV. Analysis of the Biology Curriculum and Student Learning Outcomes is Recommended  P.6

V. Biology Department’s Resources are Inadequate  P. 7

VI. Impacts of Biology Graduate Program  P. 9

VII. An Example Outline of Curricular Action for the Biology Department at CWU  P. 10

VIII. COTS should help in the pursuit of the Biology Department’s Mission and Objectives  P. 12

### Appendices

Appendix I. Evaluation of Departmental Mission, Plans, Procedures, and Goals  P. 13

Appendix II. Suggestions for Components of a Self-Study  P. 16

Appendix III. An Alternative Format for Curricular Goals and Objectives  P. 21

Appendix IV. Skills & Abilities via an Education in the Sciences  P. 24

Appendix V. Peer Review of Course Materials  P. 26

Appendix VI. Peer Observation of Faculty Instruction  P. 43

Appendix VII. Proposal for Mentor Team Evaluation of Probationary Faculty  P. 58

Appendix VIII. Curriculum Vitae of R. A. Anderson  P. 59
I. A Brief Summary of the Assessment of the CWU Biology Department and the Review Process

The Biology Department at CWU has a strong potential to become broadly recognized for its high quality undergraduate and master’s level programs. Over the past ten years, the Biology Department has increased in the number of faculty involving undergraduates in collaborative research; externally funded grants and high-quality publications with students also are on the rise. In my view, however, several important changes may be needed to markedly improve the departmental programs:

♦ Although the building in which the Biology Department resides is relatively new and has excellent facilities for laboratory instruction, the department needs to develop plans for building renovations to achieve the amount of research space necessary for an exemplary academic environment.
♦ The Biology Department must continue pursuing curricular changes in the Biology core.
♦ The college and university must support the Biology Department with new personnel and more resources, including credible levels of faculty start-up funds, lab course fees, and increases in operating budgets.
♦ Even if the Biology Department does not grow significantly in faculty, more focused and formalized approaches to identifying and solving problems (explicated, flexible policies and procedures) in the Biology Department will need to be taken, well beyond the current focus the department has on developing criteria for chair duties. Methods for formative and summative peer evaluation of teaching effectiveness and for departmental-level curricular assessment, for example, are poorly developed.
♦ The philosophy, missions and goals of Central Washington University would be better exemplified by the Biology Department’s programs if more faculty had the wherewithal to pursue peer-reviewed, externally-funded, basic research, and if faculty had fewer formal course assignments.
♦ The Biology program must include significantly more undergraduate and graduate student research; the graduate program can have a strong beneficial influence on undergraduate education.
♦ A combination of pedagogical changes are needed to enable effective curricular reform and to permit faculty the time and energy to provide students with adequate bona fide research experiences in advanced undergraduate courses as well as in faculty research labs.

Biology faculty at CWU enjoy course instruction, but not enough of the faculty mentor undergraduate research. Conversations with the faculty and students involved in such collaborative intellectual discovery, however, were enthusiastic about their experiences, despite the high cost in faculty time. At virtually all largely undergraduate institutions with strong reputations, faculty research not only is vigorous, it also integrates collaboration with and mentorship of undergraduate researchers. Faculty that pursue basic research programs that are integrated with teaching and mentoring undergraduates are more effective at maximizing student potential. Basic scientific research is an exemplary means for students to develop the skills and abilities that industry and academia require. A reasonable conjecture is that the value of liberal education may be better appreciated by students involved in basic research.

Fundamental to developing scholarly tendencies and effective critical thinking in students is inculcating their basic curiosity. Basic scientific research has at its core the philosophy that there is intrinsic merit in pursuit of basic knowledge and understanding. Basic research lacks direct application to technical or social problem-solving. Similarly, in my view, the Biology Department at CWU would better serve students and society if it changed curricular focus somewhat more toward a more liberal education, and away from quasi-vocational education. Specific pre-professional training generally is not necessary; any specific courses needed for some pre-professional programs could be taught by adjunct faculty, perhaps during summer session. It appears that the Biology Department is attempting to teach an impossibly diverse array of courses as preparation for too many specific biology-related professions. Offering a high number of formal, classic courses relative to the number of faculty available to teach them competes directly for faculty time and attention spent in research with smaller student groups and individual students.

I think also that the academic strength in organismal biology at Central Washington University should be maintained. Thus, for positions currently held by organismal biologists, the department generally should be wary of pursuing replacement hires with individuals in sub-disciplines of biology that focus on levels of biological organization below and above the organism. The department instead should seek to grow by new faculty lines in cellular-molecular biology and ecology.
The recommendations in this review are based on:

- knowledge of what works well at similar universities elsewhere,
- first-hand reviewer experience with the outcomes of the situations elsewhere that are similar to those recommended for the Biology Department at CWU,
- the reviewer learning about the CWU Biology Department, other Science Departments, the College of the Sciences, and CWU from documents, catalogs, and web sites,
- a one-day site visit to CWU by the reviewer that included conversations with students, faculty, and administrators, and
- answers by CWU Biology Faculty on a questionnaire written by the reviewer (Appendix I)

Although some written information needed to perform a comprehensive and confident review were lacking, the reviewer received some of the critical knowledge (but only that which was readily available) via oral answers to direct questions in person, by e-mail, and by phone. An alternative format to the Departmental Self Study used by CWU is provided in Appendix II. One added comment is that the time scheduled for the on-site review is one-half of the time needed. Future CWU expenditures (on honoraria) and schedules for external reviews should be greater, if the CWU administration expects to the review process to be effective.

II. Biology Faculty Teaching needs to be Optimized

An increase in the number of faculty in the Biology Department is needed

The Department needs more faculty to help spread the responsibility for the formal lecture and lab course offerings. Biology faculty are teaching too many formal courses. In my view, they do not have enough time to devote to research, research mentorship, course development, and service to the college, university, and profession. The standard expectation of 2 lecture-and-lab courses each quarter is one lecture or lab too much, particularly if the faculty instructor has no TA help. As the student population at CWU has increased, teaching workload has increased commensurately. If the number of Biology faculty increases, it would be wise for individuals to teach a course no more than once per academic year (definitely not twice in one day), and each core course should have at least three faculty that routinely teach it. That is, given 1) the number of students in Biology currently (75 graduating per year), 2) seven core courses in Biology, and 3) responsibilities to GERs and upper-level service courses (e.g., Human Anatomy and Physiology, and Microbiology) then there should be a minimum of 20 tenure-track faculty and two non-tenured instructor-lecturer positions in Biology.

In my discussion with about one dozen Biology majors and graduate students, it was clear that the undergraduate research experience is not typical, and that the graduate students often find the faculty too busy at critical times in the graduate students’ thesis research. Improving the research experience for students will require several changes. For example, a beneficial combination would be fewer formal courses in the curriculum to teach and hiring more faculty in the Department to teach the remaining courses. Thus, Biology faculty would have more time to fulfill responsibilities at the upper level undergraduate level and graduate level. Faculty could provide more graduate courses (which undergraduates also could take) and they could accept more graduate students. A greater number of graduate teaching assistantships would permit a larger, more vigorous graduate program that this region of Washington deserves. Furthermore, more faculty would provide a better chance for an integrated biology curriculum at the upper undergraduate level (shared effort and perspectives among more faculty), more opportunities for undergraduates to experience research, and more faculty expertise to contribute to graduate thesis committees. The Biology Department should develop a plan with cogent rationales for new faculty positions. These new faculty should be inherently integrative in their research, and should have the expertise that complements the expertise of current faculty and maximally benefits students.

If highly capable faculty are to remain vigorous academicians, they need the time and resources to devote to research and curricular improvement. Faculty at CWU are not “just teachers” passing on knowledge to students. They have imperatives to be innovative scholars both in course development and in performing cutting-edge research that can inform colleagues in the profession. Thus, in my view, tenure-track faculty in Biology should teach fewer formal courses. Faculty could teach some of the core courses with larger sections, and should receive help from Teaching Assistants in the lab. Faculty should teach some of the upper-level core courses no less than twice per year and perhaps with the help of teaching-research postdocs, a third time in an academic year. Unless an upper-level course is a required course in an emphasis, it should be offered only once per two years. Scheduling all of the courses carefully would optimize resources and faculty time. All faculty that have funded research involving undergraduates participating in that research should be
required to reduce the number of formal courses they teach over the duration of the granted research. Also, their grants
should either include some salary for Teaching Assistantships or temporary replacement faculty for core courses, or some
of the “overhead” funds generated from grants could be used for these salaries.

In my view, the current college (university-wide?) practice of carefully quota-counting of points for SCH and two
lectures plus labs each quarter should be changed. The practice strikes me as factory-production mentality; the process is
demeaning to faculty, and it is counter-productive to effective student outcomes. Faculty work responsibilities are more
complex and integrated than the current methods used to “measure” faculty work.

The Biology Department may want to consider reducing slightly the breadth and frequency of courses offered. Other science departments also may be over-reaching in the diversity of courses offered relative to the number of faculty
available to teach them. Although the Biology Department is fulfilling its obligations to the general education program at
CWU, a more effective approach to a liberal education in the sciences may be an integrated, 3-quarter-long, general
science series.

III. The Biology Core Curriculum at CWU should Change

Because the number of faculty in the CWU Biology Department is not large, the undergraduate curriculum in
Biology must be optimized into a set of strong core courses.

First, these recommendations:

- Incoming students to the major should have 1 quarter of major’s inorganic chemistry (not gen ed
  chemistry) as background prior to enrolling in the introductory majors biology series (which should be
  offered at the 200-level) and have the second quarter of chemistry as a concurrent or prerequisite to the
  first major’s biology course.
- The core topics of ecology, evolution, genetics, molecular biology, cells, and organisms all should be
  included in three 200-level introductory biology courses that are required for all biology majors.
- The Ecology course should be a required core course at the 300-level for all Biology majors.
- The Cell and Genetics courses should be biology core courses taught at the 300-level, with neither as a
  prerequisite for the other, but with both requiring the first quarter of organic chemistry as a prerequisite.
- The Evolution course should be the integrative capstone course in the Biology core of required courses,
  and all courses in the core should be taken as prerequisites to the evolution course.

Second, is the rationale for the above recommendations:

These suggested curricular changes are not radical—the suggested curricular conditions are relatively common
among fine Biology curricula throughout the nation. The changes should move the Biology Department toward the kind
of integrated and optimized curricula that the students deserve. My understanding is that plans are being made for such
three primary emphases in the Biology B.S. and a core curriculum of seven courses similar to my recommendations. The
foregoing curricular changes should enhance the probability that students receive recursive, integrated learning from the
200-level through the 400-level. The schedule optimizes strengths of breadth and depth, that is, the schedule promotes
comprehensive learning of biology. Furthermore, the students will move through the core courses efficiently (and Ecology
will not be “remedial”) and will be prepared to integrate their knowledge and understanding of biology among an array of
advanced courses through their last six academic quarters. Moreover, along with students taking an elementary course (to
support the major, as do chemistry courses) in probability, statistics, and research design, the schedule outlined above
would enable students to pursue scientific research earlier in their undergraduate careers. Students also would be more
prepared for standardized post-graduate exams should they take them early in their senior year.

The schedule of classes and prerequisites to courses will have to make some accommodation for CWU students
(matriculated as freshmen) deciding to enter the Biology B.A. or B.S. track late and for students transferring from
community colleges with A.A. degrees but with insufficient preparation in biology or chemistry to enter upper-level
biology courses. For example, allowing the first quarter of the 3-quarter chemistry series as a prerequisite prior to the first
200-level majors biology series permits more quarter-by-quarter scheduling overlap among biology and chemistry
courses. Moreover, students arriving later to the Biology major should be encouraged to catch up by taking summer
classes in introductory chemistry and biology. Clear communication of standards and requirements for preparation in
chemistry and biology is needed to make it obvious to community college personnel that CWU will no longer expend
tenured biology faculty on remedial education (e.g., Biol 110), and that their students will need to be better prepared either on their own or with community college instructor support.

Because there are so few majors in Chemistry, the COTS and CWU administration would do well to ensure that new hires in Chemistry are focused on interdisciplinary programs, thereby integrating the research and teaching focus of Chemistry Faculty with other Departments such as Biology and Geology. Current Chemistry faculty cannot be entirely happy largely as an undergraduate service-course program for Biology.

IV. Analysis of the Biology Curriculum and Student Learning Outcomes is Recommended

This Biology Department may permit too much individual faculty autonomy and have too little oversight on course structure and content in the core and elective courses. There seems to be no mechanism to perform these analyses. From my perspective, there is insufficient integration not only of content among the courses, but in the types of laboratory experiences students acquire through their major.

The Biology Department has defined what faculty expect of students graduating with a biology major (their Biological Sciences Core Outcomes). These outcomes are stated within six different categories:

- value the process of scientific inquiry as a means to understanding the physical world,
- ability to reason analytically,
- communicate effectively through writing and speech,
- exhibit basic mastery of content (fundamental terms and biological principles),
- develop basic scientific skills,
- exhibit the characteristics of the scholar.

These six categories are all appropriate and commendable. These categories can be considered basic, strategic goals within the context of assessment of student learning. As typical of assessment plans, within each of these six basic goals are imbedded explicit sets of objectives, suitable for individual courses. What is missing, however, are statements of how these basic goals and explicit objectives are to be achieved. That is, the specific pedagogical tactics to be used at each level (e.g., 200-500) that will effect these objectives are not presented. Thus, the external reviewer is uninformed about the level to which any of the core outcomes is reached.

Some of the aforementioned core outcomes coincide with general goals in academia, such as imbuing the tenets of critical thinking, developing cognitive abilities, and instilling an interest in lifelong learning, all of which are important for developing students into scholars. The department’s categories for core outcomes overlap and duplicate specific objectives, and omit what I would consider to be important goals and objectives for a department in the sciences. See Appendix III for alternative perspectives and approaches for student outcomes.

Beyond providing students with basic, comprehensive knowledge and understanding of biology (and more focused understanding in sub-fields of biology learned in advanced courses), The curriculum then should be modified to provide students with opportunities to develop those skills and abilities (see Appendix IV).

Students should receive an effective combination of: (a) learning about and developing proficiency with instrumentation and techniques, (b) learning about the major scientific methods and research designs, and (c) applying these pragmatic areas of knowledge in *bona fide* scientific research as laboratory and field experiences in scheduled laboratory courses. The foregoing combination of learning objectives may be obtained by most students in Biology, but no evidence has been presented to demonstrate that this is happening. That is to say, not enough is known by faculty either about each course and combinations of courses, or about the consequences for students that take different course combinations. Faculty apparently seem to assume favorable outcomes rather than verify that they are happening (this criticism can be leveled at most science programs nationwide). The Biology Department could more effectively document student outcomes by:

1. thorough reporting of the kinds of experiences received in each laboratory course,
2. comparison of samples of individual student products as they move through the biology program,
3. a more reflective student review and analysis of student and faculty input and outcomes of courses,
4. having qualified faculty at leading academic institutions review sample syllabi, papers, and exams from each core course,

Appendix II lists alternative approaches to student outcomes.
(5) obtaining answers to effectively written questionnaires given to graduating seniors and to Biology alumni, and
(6) documenting current and former student performance on GRE, MCAT, and DAT exams,
(7) eliminating the LFAT exam, given the convincing arguments in the biology department’s self review.

It must be understood that departmental mission, goals, and objectives are hindered commensurate with the level that faculty are hindered in their efforts to mentor sufficient numbers of students in scientific research. The number of faculty in the Biology Department is low by about four individuals relative to the size of the major and the size of the University. Certainly, some of the faculty are frustrated with the considerable difficulty in trying to maintain active and inclusive research programs. The faculty neither have the time nor the wherewithal to perform at the level that they know they can achieve. More faculty in the department would provide a greater range of research mentorship expertise as well as greater ease of access to faculty mentorship by students. Further, more faculty could reduce the formal course teaching assignments per faculty member, thereby allowing faculty to place more effort into collaborative research with students. Of course, more financial, staff, and infrastructural support to facilitate advanced undergraduate research classes and faculty research would be beneficial. Regardless, however, of whether new faculty are added to the Biology Department, the current faculty could improve the student learning outcome by mentoring entire groups of student researchers in upper-level laboratory courses that focus heavily on quarter-long team research projects.

V. Biology Department’s Resources are Inadequate

New financial sources for curricular support are needed

The CWU Biology Department’s operating budget is neither designed to support a modern curriculum in evolutionary ecology and molecular biology, nor is it enough to enable physiology lab courses to develop to their potential. Budgetary issues are even more obvious when there is need for fabrication of instruments and equipment for advanced undergraduate research and for graduate research. The Biology Department should assess a minimum of $20 Lab Course Fee per student enrolled in a biology lab class, with the intent of the funds to pay for timely replacing and repairing of instruments and equipment (including computers and printers) to enable research (including new techniques) by students to be pursued.

An improvement in facilities for faculty and student research is needed

Research space and adequate instrumentation that can fulfill teaching and research functions are sorely needed by students, staff, and faculty. The current practice of faculty and undergraduate researchers using temporarily available space must be improved upon substantially. Graduate students and undergraduate students, as well as postdocs, technicians, and faculty require research space and instrumentation for extended times, not parts of days and parts of weeks, within the confines of lab course preparation. The Biology Department and the CWU administration should vigorously pursue renovation of current facilities. Timely planning and rapid action are necessary to permit the inexorable growth of the biology programs to be satisfying rather than trying.

The library resources, including books, journals, and literature search-and-retrieval must be improved

The library resources do not meet the needs of Biology. My analyses of the cost just for a base set of journals needed to support teaching and research at a minimally acceptable level in the Biology Department is about $80,000 per year, given the current diversity of faculty expertise. It seems that a respectable effort at purchasing books currently exists. The current set of biological journals in the library is insufficient to support student literature search for either review papers or empirical research papers. A careful biennial analysis of journals in the fields of biology that are particularly relevant to Biology faculty research and teaching, and an annual review of newly published books available for purchase should be a standard cooperative procedure between the Biology Department and the CWU librarians. Ensuring adequate book purchases is a reasonable and accessible strategy, but biology is such a large and diverse field of science, the commitment of CWU to biological journal purchases must improve dramatically.

Insofar as I could determine, software search engines of the biological literature are inadequate for effective student literature search, and although interlibrary loans for faculty generally seem adequate, the effectiveness or extent of commitment to interlibrary loans for students is unclear. Students apparently are restricted in the number of interlibrary loan requests. Of course, time delays between the inevitable successive set of loan requests are problematic, particularly for students in the limited time of a single academic term. Specific word searches, however, cannot approach the efficacy and serendipity of review of the journals and books in person. Hence, I reiterate the importance of having adequate availability of journals for undergraduate courses and student research. A strong commitment to comprehensive, full-
abstract search engines and abundant, rapid interlibrary loans would be helpful, nonetheless, because journal costs continue to increase by 8-10% per year, thus making the prodigious increases in the number of biology journals in the CWU library highly problematic.

**A Scientific Technical Services Team is needed for the Sciences**

Support for research and teaching should include a team of three or four individuals comprising a unit known as Scientific Technical Services that works for the sciences to fabricate and repair instrumentation and equipment. Space for an STS team is available in the Sciences Building that houses Chemistry and Biology. The STS team should be able to work with electronics, metal, glass, plastic, and wood. As salaried employees they should not charge their time for their work, and faculty and departments would have to pay only for materials. Faculty and students involved in research and innovative teaching would be enormously benefited by these skilled technicians. CWU administrators surely understand the value of computer support personnel, so by analogy, the need for an STS team should be understood as well.

**Another Scientific Instructional Technician is needed in the Biology Department**

The importance of hiring another Scientific Instructional Technician in Biology is paramount. The teaching and research support needs for another departmental technician are already evident. Faculty seem challenged to get the time to set up the labs, much less to modify labs; maintaining study specimens for the organismal biology courses and for student and faculty research is also problematic for the department. Any departmental plans for added faculty, graduate students, and undergraduate researchers requires hiring a another departmental technician to support teaching and research.

**Office personnel for the Biology Department are needed**

The number of Biology majors and non-majors interacting with the Biology Department warrants the Biology Department having an undergraduate program coordinator (some of the duties would include providing basic advising and information to students) plus a half-time assistant for the coordinator. Moreover, the Biology Department needs a senior-level secretary with help of another half-time staff person to handle much of the procedural paperwork, and budget, travel, and personnel issues, particularly if more graduate students, research technicians, and postdocs become fixtures in the Biology Department.

**Start-up Funds for research and teaching are needed**

Incoming new faculty have insufficient start-up funds either for research or for course development. The college and university should be embarrassed by this practice. Insufficient investment in new faculty cannot be countenanced.

**Faculty require more institutional support for research**

The importance of faculty having vigorous research programs is recognized above, but that any of the Biology faculty perform externally funded research is remarkable. CWU must support the endeavors of currently vigorous faculty in the sciences before these faculty weary under the burden of trying to do what must be done for too long with too little support. The benefit and demands of technology on biological research have made the cost of developing and maintaining teaching labs and research labs dramatically more expensive over the past twenty years. The average citizen can understand these expensive changes by referring to the many high-tech solutions and commensurate financial costs in human medicine over the past two decades.

**Faculty are well aware of their needs**

The answers given by Biology faculty to the questionnaire (Appendix I) revealed that faculty recognize the categories of foregoing needs. They cannot rise to the levels of excellence they expect of themselves if they do not have the level of support from the College and University that they and their students deserve. Moreover, if not low morale, then complacency can predominate in an academic setting wherein the institutional support is inadequate. CWU must invest more than it has in academic programs so that students develop the skills and abilities, knowledge and understanding that are at the basis of a highly capable citizenry.

Faculty are also aware that they need more formalized bases upon which to judge the quality of their teaching. Faculty responses on the questionnaire (Appendix I) indicate their desire for a team effort at career planning and evaluation of teaching effectiveness. Thus, I provide two examples of forms I developed at WWU for evaluating teaching effectiveness. These are placed as Appendix V and VI. In a related vein, because the two forms are designed to be used more in formative than in summative evaluations, it would be useful for the Biology Department to modify their developing plans for a faculty mentor (which, in my view, currently is written with the implicit assumption that the new
VI. Impacts of Biology Graduate Program

Impacts on Undergraduate Education in Biology

The Biology Graduate Program should be expanded, particularly with the aid of more Teaching Assistantships supplemented by Research Assistantships. Although hiring graduate students as Teaching Assistants is expensive, the benefits of paying for graduate students far outweigh the costs. The amount of money provided for graduate courses and graduate research is typically a very small fraction of the academic operating budget. The time faculty invest in graduate education is much less than time spent for undergraduate education. Any time faculty will spend with the graduate students translates to benefits to undergraduates. The vigor and quality of any Biology Department relates directly to the number of graduate students with Teaching Assistantships and Research Assistantships.

The most obvious impact of graduate students on undergraduate education is the essential Teaching Assistant support that graduate students provide for non-majors and majors introductory biology labs. The labs are usually complex logistically so that both the faculty member and the Graduate Student Teaching Assistant must work closely together to make sure lab procedures work and the students receive the aid they require. Graduate students establish a unique rapport with the undergraduates that benefits communication between faculty and undergraduates.

Without Graduate Student Teaching Assistants in the lower level lab courses, faculty will not have adequate time and energy to teach more 400-level courses and to be research mentors. These 400-level courses are essential for a high quality experience at the advanced undergraduate levels; and when graduate students enroll in some of these 400-level courses, and the graduate students contribute uniquely to the dialogue in these courses in ways that directly benefit undergraduate learning. Group projects are common in upper-level lab courses, and it is in these group interactions that one would expect to see some of the greatest benefit to the undergraduates. The research projects that include graduate students should be more robust and sophisticated efforts. The undergraduates will receive some guidance and mentorship from their graduate colleagues in the 400-level courses. Undergraduates working with graduate students should be more excited about their research projects, and co-written research publications may result from some of these collaborations. Moreover, advanced undergraduates that enroll in 500-level courses may gain perspectives on the scientific literature that they would not have otherwise. The presence of graduate students at a university reveals the graduate environment to undergraduates, and provides a tangible link for undergraduates when they consider pursuing postgraduate education. Graduate students are role models for undergraduates.

Faculty research laboratories are more alive with activity because graduates and undergraduates work side-by-side. The graduate students often have undergraduates helping in their research, and graduate students will frequently help undergraduates enrolled in directed research. Graduate students learn how to use new instrumentation and new techniques that benefit the research of the undergraduates. Furthermore, graduate students commonly bring to the research environment very useful perspectives and knowledge gained from other institutions. The presence of graduate students markedly improves the quality of undergraduate education at CWU.

Impacts on Faculty Development

Without graduate students faculty will not have the collegial synergism in the research lab that graduate students provide. Faculty roles with undergraduates doing research in their labs will be much more the mentor and guide, whereas faculty roles with graduate students can be as much colleague as mentor. Indeed, graduate students will help faculty work with undergraduates in their research labs. Graduate students bring in fresh perspectives, new ideas, new techniques, and often cause faculty to acquire new equipment, all of which improves the research and teaching environment. Graduate students invigorate the faculty. Graduate students help faculty maintain active research programs as well as enabling faculty to provide more effective and innovative undergraduate instruction.
VII. An Example Outline of Curricular Action for the Biology Department at CWU

Delete from Biology course list and do not replace these courses:
Biol 200, 201, 300, 302, 304, 322, 344, 355, 356, 422, 426, 456

Delete these courses Replace with these courses
Biol 110 Biol 204, Introduction to Ecology and Evolution
Biol 220 Biol 205, Introductory Cellular and Molecular Biology
Biol 343, 442 Vascular Plant Anatomy and Morphology
Biol 352, 421, 426, 440 Coevolution; Pathobiology
Biol 443, 445 Fungal Diversity
Biol 444, 463 Freshwater Ecology
Biol 454, 353 400-level Vertebrate Anatomy and Morphology (6 hr labs)
Biol 354 400-level Animal Development and Morphogenesis (6 hr labs)
Biol 462 Population Ecology
Biol 461, 464 Terrestrial Community Ecology
Biol 450 Vertebrate Zoology; Field Ichthyology (summer?)
Biol 451 Vertebrate Zoology; Amphibian Diversity; Reptile Diversity
Biol 452 Vertebrate Zoology; Field Ornithology (summer?)
Biol 453 Vertebrate Zoology; Field Mammalogy (summer?)

Some of the above courses in the suggested delete category may be “service” courses, and perhaps could be taught by faculty in other departments or by non-tenure track instructors. Generally, if tenured faculty are assigned to teach service courses above the 100-level, it reduces availability of tenured faculty to teach necessary biology courses (or mentor students in research) and forces faculty onto long-term status of teaching “over load.”

Increase the statistical and scientific research acumen of the Biology major earlier in the curriculum:
Require a 5-credit or two 3-credit 200-level “Basic Statistics for the Sciences” courses that include basic understanding of how to collect, handle, interpret, and present data. Require the courses as supporting courses to be taken preferably when they are taking the new Biol 200-series.

Create entirely new courses:
Biostatistics (300-level; required for Organismal and Ecology oriented students)
Research Design (stacked, 400/500 level, includes use of computer-based statistical package: Systat or SPSS)
Molecular Biology
Molecular Phylogeny
Conservation Genetics (must also include some basic population genetics)
Functional Genomics

Net change: 13 fewer courses

A suggested list of the numbers, titles, and prerequisites of courses:
New Intro Biol 204: Introductory Ecology and Evolution (and biodiversity), (4 credits; prereq 1st Qtr inorganic chem)
New Intro Biol 205: Introductory Cellular and Molecular Biology (5 credits; prereq Biol 204; second quarter inorganic chem)
New Intro Biol 206: Organismal Biology (5 credits; prereq Biol 205; third quarter inorganic chem)

New Courses: Biol 325 + 326, Ecology and Ecology Lab
(prereq Biol 203, co-req 200-level stats course, and pre- or co-req Chem 241)

Biol 470, Evolution: Course Revision: (pre-req is Genetics, Biol 321)
Required for all Biology majors:

(1) A minimum of five upper level Biology Lab Courses: a minimum of two at the 300-level and a minimum of two at the 400-level:
(2) Select at least one Organismal Biology course above the 200 level.

It may be a mistake for the Biology Department not to have a significant population ecology component in its curriculum; currently I see one applied course: Biol 462. Sufficient depth and breadth of student understanding of organismal form and function in an ecological and evolutionary context require an understanding of population biology. Moreover, if a population biologist on the faculty had an interest in biostatistics and research design, then upper-level students of organismal, population, and community biology could be well served with some sort of biology-intensive statistics and research design course at the 300-level.

New courses that may help develop a more comprehensive curriculum:

- Population and Community Ecology
- Forest Ecology or Ecosystem Ecology or Terrestrial Ecology
- Vertebrate Zoology or Vertebrate Diversity as a required course in the animal track of the organismal emphasis (the course includes ecological and evolutionarily relevant form and function)

The following courses could be made useful for students in both Ecology and Organismal Emphases:

- Consider transforming Ornithology into a Field Ornithology class, perhaps taught in summer
- Consider transforming Mammalogy into a Field Mammalogy class, perhaps taught in summer
- Consider transforming Ichthyology into a Field Ichthyology class, perhaps taught in summer
- Consider transforming Herpetology into two classes: Amphibian Diversity & Reptile Diversity
- Molecular Methods; this course is transformed from Molecular Biotechnology. This new course should be designed to attract a broader set of students, including those interested in conservation biology and evolutionary biology as well as cellular and molecular biology.
- Molecular Phylogeny
- Plant Diversity (includes Evolution, Systematics, and Taxonomy)
- Coevolution (focus on coevolutionary patterns: Parasites-Hosts, Predator-Prey, Mutualisms and Symbioses).
- Developmental Biology (includes Developmental Genetics and Embryology)
- Include elements of the Histology lab in a Vertebrate Anatomy and Morphology(?)
- Other possible supplemental courses: Introductory Geology courses.

Suggested minimum pace for a Student Schedule in Biology and Supplemental courses:

First Quarter:
- Take no Biology core, perhaps a Biol freshman seminar class, take intro inorganic chem and a math class

Second Quarter:
- Take Biol 204, and the second quarter inorganic chem, and another math class.

Third Quarter:
- Take Biol 205, perhaps 200-level stats from Math, take third quarter inorganic chemistry

Fourth Quarter:
- Take Biol 206, take first quarter organic chemistry; perhaps take a core 300-level biology course.

Fifth Quarter:
- Take one or two core 300-level biology courses; take second quarter organic chemistry. Assist in research labs.

Sixth Quarter:
- Take any remaining core courses at the 300-level in Biology. Assist in research labs.

Seventh Quarter:
- Take two Biology courses, perhaps Evolution, and physics or biochemistry.
  Begin research under faculty mentorship; that is, the research should be more collaborative than prescriptive.

Eighth Quarter and later:
- Biology courses, as needed.
- Develop papers, posters, and talks on collaborative and quasi-independent research.
VIII. COTS should help in the pursuit of the Biology Department’s Mission and Objectives.

The COTS Dean and the Biology Department should have shared visions for student outcomes and faculty success in research, teaching, and service. As a scientist, a Dean of “Sciences” should actively interact with science and technology deans elsewhere, and should stay abreast of educational and research trends by attending scientific and technical conferences and workshops. The COTS Dean should be sure to develop the expertise and focus to perform effectively such duties as:

- Help the Biology Department to define near-term and long-range academic goals, including verification that exemplary student outcomes are achieved
- Help the Biology Department to define buildings renovations, particularly to promote a strong research environment
- Provide incentives for Biology Faculty to pursue external funding for basic research, especially funding that involves collaborative research with undergraduate and graduate students
- Help Biology Faculty balance the amount of formal course teaching to enable effective research mentorship, research, and service as well as effective formal course development
- Help the Biology Department modify faculty evaluation procedures to reflect the uniqueness of the tasks of faculty in the sciences, such as teaching labs and mentoring student research
- Determine what added faculty positions would be most beneficial within Biology and among science departments
- Optimally apply resources among science programs, to the benefit of many and the harm of none
- Have complete enough knowledge and understanding of Biology Department personnel and programs to argue persuasively for strong budgets, more staff and more faculty
- Develop outside funding sources for the college, thereby also benefiting the Biology Department
- Advocate library needs for Biology
- Oversee science pedagogy changes and coordinate the science curriculum (e.g., the imprints of math, chemistry, and physics on biology majors are strong, and the course content in math, physics, and chemistry should be carefully considered) so that schedules of students in the sciences are optimized and so that the Gen Ed Requirements of non-majors are well-served
- Assist the Biology Department in developing its graduate program and a teaching-research postdoctoral program

One of the core missions of COTS presumably would be to contribute to the liberal education of students via effective general education courses. In my view, an exemplary pair of general education courses, serially integrated, that includes faculty in Physics-Astronomy, Geology, Chemistry, Biology, and Geography-Environmental Studies could be taught about the History and State of the Earth, the Biosphere, and Biota. Faculty in the sciences could also contribute to a team-taught intensive-writing, general education course at the 300-level on Science, Technology, and Society. The course could involve faculty across campus. Obviously, Biology Department faculty could be strong contributors to such a set of courses.
Appendix I. Evaluation of Departmental Mission, Plans, Procedures, and Goals

For each situation or set of situations described below, please assess the value and importance, and the extent to which the situation(s) exists for your department. Please provide enumerated written comments at the end of this survey if you want to further define, characterize, and discuss the situation. Although several of these questions could be divided into several parts, the idea is for this survey to provide a springboard for discussion more than to be definitive and comprehensive.

\[ V = \text{value and importance. The comparative assessment scale for } V: \]
\[ - \text{ means its costs would exceed the benefits, and should not exist, 0 means it has no value,} \]
\[ + \text{ means it has moderate value, and ++ means it has high value and importance.} \]

\[ E = \text{extent it exists. The comparative assessment scale for } E: \]
\[ n = \text{not at all, l = low level, m = moderate level, h = high level} \]

1) The Department has an explicit mission statement comprising attainable goals that complement the liberal education and diversity missions of the college and university.

\[ V: - 0 + ++ E: n l m h \]

2) The Department has effective and flexible structures, policies, plans, and procedures for identifying and prioritizing goals and problem-solving in undergraduate curriculum design and curriculum outcome, both within and among departmental programs (e.g., students can easily schedule science courses and complete minors in chemistry and a major in biology).

\[ V: - 0 + ++ E: n l m h \]

3) The Department has effective and flexible plans and procedures for identifying, obtaining, developing, and maintaining facilities and instrumentation.

\[ V: - 0 + ++ E: n l m h \]

4) The Department has effective and flexible structures, policies, and procedures for identifying goals and problem-solving in faculty development, including shared and individual needs.

\[ V: - 0 + ++ E: n l m h \]

5) The Department has comprehensive, definitive, and flexible plans for assessment of student learning—based on defensible rationale—for the next three years, with provisions for within-period assessment review and revision, and more general plans and goals for the longer term.

\[ V: - 0 + ++ E: n l m h \]

6) Each faculty member has a comprehensive, individualized three-year plan (or one that temporally corresponds to mandated periodic evaluations)—developed with Dept Chair and College Dean assistance—for relative weighting of research, teaching, and service (in context of a reasonable expectation for total amount of effort and accomplishments) with specific objectives for course development and progress in research, all of which coordinates with other faculty plans, Departmental plans, and student needs.

\[ V: - 0 + ++ E: n l m h \]

7) The Department has effective plans and procedures to encourage and enable faculty to take the risks of pursuing innovative teaching and research (e.g., with the time and pursuit of funding), even including time required for change in research program and retooling to meet technological changes in the discipline.

\[ V: - 0 + ++ E: n l m h \]
8) The Department has effective, clearly understood policies, procedures, and criteria (i.e., an effective plan for evaluating faculty) in faculty hiring and evaluation for promotion.

V: - 0 + ++ E: n l m h

9) The departmental plan for evaluation of faculty is more specific to departmental needs than the more general evaluation plan used by the college.

V: - 0 + ++ E: n l m h

10) The Department uses a set of forms to facilitate comprehensive and objective evaluation and assessment of faculty, staff, and departmental programs:

- A) Peer observation of faculty instruction
  V: - 0 + ++ E: n l m h

- B) Peer review of course materials
  V: - 0 + ++ E: n l m h

- C) Student review of course outcome: a reflective analysis of the combination of effort and accomplishment by student and instructor (rather than the prevalent consumer-satisfaction questionnaire that ultimately induces conformity on faculty teaching: an entertaining sage-on-the stage that spoon-feeds information to passive students)
  V: - 0 + ++ E: n l m h

- D) Peer review of advising and service
  V: - 0 + ++ E: n l m h

- E) Final-term student evaluation of outcomes of Biology education (includes academic and career advising by faculty and staff, course instruction, and research mentorship)
  V: - 0 + ++ E: n l m h

- F) Alumni survey and evaluation of outcomes of Biology education
  V: - 0 + ++ E: n l m h

- G) Annual faculty review of Biology Chair performance
  V: - 0 + ++ E: n l m h

11) The Department has staff support, the time, and resources for the Department Chair and Departmental Committees to effect Departmental plans for goals and objectives.

V: - 0 + ++ E: n l m h

12) The Department has planned opportunities for interactions with other Departments and faculty from across campus that enhances communication, understanding, and support among academic units.

V: - 0 + ++ E: n l m h

13) Support for Departmental goals (e.g., mentoring student research, verifying high-quality student learning outcomes) by the College and University includes adequate start-up research funds for incoming faculty, officially-allocated time and financial support for faculty to write grants, develop laboratory courses, pursue major changes in research program, and sabbatical leave. Moreover, along with the financial resources, the administration supports hiring personnel with suitable expertise to support the Department’s facilities, equipment, and instrumentation, and programmatic changes, and sets out a realistic schedule for obtaining new faculty tenure-track and lectureship positions.

V: - 0 + ++ E: n l m h

14) Support for Department by the College and University not only includes adequate financial resources, but the administration supports hiring personnel with suitable expertise to support the Department’s facilities, equipment, and instrumentation, and programmatic changes, and sets out a realistic schedule for obtaining new faculty tenure-track and lectureship positions.

V: - 0 + ++ E: n l m h
15) Library and instructional support resources—including journals, advanced textbooks, literature searching and interlibrary loans—are adequate for most faculty research, student research and coursework.

\[ V: - 0 + ++ \quad E: n \quad l \quad m \quad h \]

16) The Department has adequate facilities for lecturing, class seminars and discussions, course laboratories, other instructional and research support facilities such as computer labs with up-to-date hardware and advanced software, aquaria rooms, walk-in environmental chambers, animal care rooms, greenhouses, and facilities for autoclaves, water purification, image analysis and microscopy labs, DNA sequencers and genomics labs, and other important technological and facilities support for teaching and research.

\[ V: - 0 + ++ \quad E: n \quad l \quad m \quad h \]

17) The breadth and depth of faculty expertise in Biology enables high-quality undergraduate degrees, wherein instruction at the 100-400 levels comprises (a) an integrated and comprehensive set of core courses, (b) an optimized set of advanced courses in the degree specialties or tracks, and (c) with most students having adequate biological knowledge and exposure to scientific methods to be given (d) the opportunity to perform collaborative scientific research with faculty by the 6th or 7th semester.

\[ V: - 0 + ++ \quad E: n \quad l \quad m \quad h \]

18) The Department has enough faculty, facilities, and instrumentation to support a graduate program, and the university has adequate financial resources to support a credible graduate program, including enough graduate courses, modest funding for graduate research costs, funding for an adequate number of full-year graduate teaching assistantships, and several quarter or semester-long research assistantships annually.

\[ V: - 0 + ++ \quad E: n \quad l \quad m \quad h \]

19) The Department has adequate funding sources beyond the University-supplied operating budgets, (all of which collectively permit financial flexibility in problem-solving) including:

   a) overhead from research grants, \[ V: - 0 + ++ \quad E: n \quad l \quad m \quad h \]
   b) alumni giving, \[ V: - 0 + ++ \quad E: n \quad l \quad m \quad h \]
   c) student lab-course fees, \[ V: - 0 + ++ \quad E: n \quad l \quad m \quad h \]
   d) campus-wide student technology fees \[ V: - 0 + ++ \quad E: n \quad l \quad m \quad h \]

20) The Department faculty demonstrate genuine commitment to service at the College and University levels, seek interdependent collegiality with faculty across campus, and are politically astute.

\[ V: - 0 + ++ \quad E: n \quad l \quad m \quad h \]

Please attach your comments and explications, but be sure to enumerate the response to correctly correspond with one of the 20 situations listed above. It is expected that for some questions (e.g., number 13, 15, 18) some features are adequate and some are not. Perhaps you would like to underline the specific features that are very important and circle those that you consider both very important and insufficiently available. Feel free to offer comments on how to improve this questionnaire.
Appendix II: Suggestions for Components of a Self-Study

Objectives of Self-Study

1) Evaluate the Department’s Contributions to the General Education Programs insofar as they meet the mission of the institution and fulfill the goals of a liberal education.

2) Identify potential combined majors and interdisciplinary degrees with other academic units.

3) Determine whether the curriculum is relevant to current and emerging biological sciences and discipline-specific careers; consider eliminating courses, and reforming (optimizing) curriculum and the majors to keep the program up-to-date.

4) Examine technological advances and opportunities relative to current facilities.

5) Determine lacunae in departmental faculty expertise, seek new faculty lines and changes in faculty areas of expertise with retirements.

Self Study Outline

A. Executive Summary

B. Narrative

I. History and Mission

✓ Brief history of Department and its programs.
✓ Dept mission statement; and how, when and by whom was the current mission statement developed?
✓ How does Department mission statement support and how does it differ from the College and University mission statements? Is it virtually the same as the mission statements of other science departments?

II. Goals and Objectives

✓ Major goals of the departmental programs.
✓ Specific objectives planned.
✓ Identify and describe major program activities that will enable goals and objectives to be reached.
✓ Identify what data will be used to measure (assess) whether objectives are achieved.
✓ State how the major goals and objectives were developed and how they and their outcomes are communicated to faculty, administrators, alumni, and students.

III. Departmental Program Structures and Reputation

Evaluate the Programs in each of the following areas:
✓ Are the Department’s programs fulfilling state, regional, and national needs and expectations?
✓ Is the curriculum adequate to meet the needs of the diversity and abundance of students?
✓ How up-to-date is the curriculum for current and future students seeking careers inside and outside of academia?
✓ How does the quality of the curriculum (e.g. comprehensive and integrated among courses from 100-level through 400-level, within its stated goals) compare to those recognized as highly effective curricula by regional and national scientific and educational societies?
How does the curriculum compare with similar departments at 4-year liberal arts colleges, comprehensive regional universities, and major, tier 1 universities with Ph.D. programs?

Is the Department serving non-majors to the satisfaction of the students and faculty across campus?

What is your perception of the reputation of the Department among current students in the departmental programs, recent graduates of the programs, employers, and other faculty on and off campus?

IV. Evaluating the Departmental roles in the College and University

Describe how curriculum development and long-range planning is done.

How are the programmatic objectives implemented by faculty; in which ways by which kinds of courses (e.g., state which courses are methods-oriented, inquiry-based research oriented, factual knowledge content-focused, theory-content focus) with what kinds of pedagogy?

List, describe, and discuss the joint cooperative and combined interdisciplinary efforts with other academic units, departments, and programs.

Discuss the Department’s contribution to the University’s general education program and to college-wide goals and objectives.

Describe Departmental faculty involvement in college curriculum planning and governance.

Discuss the commitment among faculty to diversity issues.

V. Student Learning in the Departmental Programs

Assessment Methods

What are the academic standards of student competencies at the A, B, C levels?

What proportion of the students are at each academic achievement level in the non-majors courses and in the majors courses, and how does the average annual cohort of students compare when they first arrive at the institution with other new students at other institutions across the state and country?

What are the prevalent student products in courses that are graded, and which courses are writing intensive, what do they do in writing intensive classes, and do science courses require full scientific format papers?

Which courses are classic lectures, lecture-and-inquiry-based guided discussions, and labs as:

1. (1) guided demonstration (gaining technical expertise),
2. (2) inquiry-based, guided learning,
3. (3) inquiry-based open ended learning, and
4. (4) collaborative research between student and faculty?

Advising

What are the structures, policies and procedures for academic advising and pre-career advising and what are the student perceptions of advising and of course scheduling?

VI. Assessing Faculty

What levels of effort, commitment, and accomplishment do faculty show for teaching, research mentorship, scholarly activities, and professional service activities?

What are the student perceptions of their learning and how well do their evaluations assess teaching effectiveness?

How many and what proportion of the faculty are tenure-track v. non-tenure-track full-time instructors, v. part-time lecturers?
Are there effective methods of evaluating and helping faculty improve their academic endeavors, thereby enabling them to succeed in tenure, promotion, and merit reviews?

VII. Academic Support for Faculty

- What staff support exists relative to that needed to fulfill departmental goals and objectives?
- What are the library resources available—list all relevant current journals, state number of books purchased per annum (state the materials budget for library and for biology-relevant materials) and state number of books in stacks. How thorough are literature searches able to be, and how thorough are they permitted to be, and how easy is it for faculty and students performing a literature search for publishable papers in peer-reviewed journals to obtain the resources chosen from the searches?
- What is the departmental operating budget, and how does it compare with similar academic departments?
- What level (how frequent and in what amounts?) of departmental funding for instrumentation comes from alumni giving, research overhead, and other sources?
- What monetary support for student research (e.g., supplies to perform research and travel to meetings to report on research), student research technicians, faculty “teaching-release” time, professional leaves, and other research and teaching development exists?
- Describe the extent of teaching and research support from campus personnel as equipment fabrication and maintenance, and instrumentation maintenance. That is, does the campus have two or three individuals that do not charge back services to the departments, and only require faculty to seek funds for the materials, then fabricate and modify everything from (wood, Plexiglas, metal) tables, bookshelves, terraria, and a variety of field and lab research and teaching apparatuses, including electronic meters?
- How adequate are the facilities:
  - Number, space, and usability of lecture halls, discussion and seminar rooms, teaching laboratories, other instructional facilities?
  - Faculty office space, research space, and other research facilities, such as animal care rooms, greenhouses, aquaria rooms, walk-in environmental chambers, image analysis and microscopy labs, map library and GIS facilities, molecular biology facilities?
  - Administrative and staff offices and related storage and preparatory areas?
  - Campus computing hardware and software?

VIII. Strategic Planning

- What are the Departmental Goals and Major Priorities, and what is the rationale for each specific goal and priority?
- What are the recommendations to achieve these goals, and when and how will these achievements be assessed?
- What plans are to be implemented for:
  - Faculty replacements, new faculty lines, changes in the form of faculty responsibilities and effort.
  - Increases in curriculum efficiency, such as (a) reducing duplication of material in courses within and among departments, (b) reducing content and integrating content among courses, (c) increasing lecture class size, (d) not teaching a course every semester of every year.
  - Priority use of any newly available funds for (a) supplies and standard equipment to be shared among new and established courses for course development, and (b) major instrumentation for research and teaching.
IX. Other Necessary Information for the Review

- The Design of the Curriculum
- Lists of the Requirements for each specialty track of each Degree
- Alumni Surveys
- Five-year summary of majors and minors:
  - Number entering as lower-division students, proportion of those entering into the upper division, number of annual transfers, number at each level—freshman through seniors; average number of semesters to complete each degree track for students entering as freshman v. those entering as transfers; average number of semester for students with minors in other fields.

- Number and proportion of all non-majors on campus that are served in each of the 100-level, 200-level, 300-level, and 400-level courses taught by Department faculty in each of the last five years?
- Which courses, how many sections, and how many courses are taught by non-tenure track lecturers and instructors annually, and what are the beneficial aspects and disadvantageous aspects of having non-tenure track full-time and part-time teaching in the department?
- What was the salaries budget over each of the last five years, and what have been the salary levels for assistant professors, associate professors and full professors in the Department and how do these salaries compare with similar faculty in similar departments elsewhere, and other faculty across campus?
- What were the non-salaries budgets over each of the last five years, and what were the sources of the funds?
- What funds and release time are available for research start-up?
- What funds and release time are available for new lab course development?
- How much of what funding sources (e.g., alumni and foundation gifts, government granting agencies, student lab course fees, student technology fees), to whom and for what purposes has the external and internal support been provided in each of the last five years?
- Provide specific curriculum vitas and research and teaching statements of each tenure track and non-tenure track faculty member along with a departmental executive summary of faculty achievements in teaching, service, and research over each of the past five years.
- Describe the facilities; include square footage and numbers of offices, research labs, teaching labs, and teachings and research support-prep rooms, and lecture and discussion rooms, storage facilities, all major instrumentation and equipment.
- Provide each unique course syllabus for each course
- Summary of assessment data collected by alumni office, college, or by the department.
- Provide all department and college strategic plans, evaluation plans, handbooks, annual reports, and accreditation reports for the past five years.
- Provide other pertinent information.
XI. The Role of the External Review Team Members
(there are slightly separate and added roles for the chair of the ERT, assuming there are several ERT members)

A. Write External Report, about 10-12 pages long, that generally follows the format of the Internal Self-Study.
B. Develop Program Recommendations, based on:
   1. Internal Self-Study written by one or more members of the Department under review.
   2. Documentation from university sources, interviews with faculty, staff, students, administrators, and alumni; that is, all who have an important influence on the departmental programs.
C. Review Internal Self-Study; make substantive comments and recommendations for improving the structure and content of Internal Self-Study.
D. Function as consultants, given that each ERT member has a unique expertise.
E. Try to view the graduating student outcomes in context of careers in academia and outside of academia.
F. Provide recommendations on how future external reviews could be performed.
Appendix III. An Alternative Format for Curricular Goals and Objectives

An Example Assessment Strategy: Common Goals for Student Learning Outcomes.

The educational goals of the Biology Department are best exemplified by the expected outcomes for students graduating with the Biology BS degree, the biology degree of highest priority at CWU. Biology majors should be provided the opportunity to develop:

- comprehensive knowledge in basic, contemporary biology as represented by biology core courses, which include the knowledge and understanding of an array of biological systems (subcellular through biosphere), set in an evolutionary context,
- the knowledge, understanding, and knowledge-acquisition mastery of the subdisciplines promoted in their biology degree, wherein students can employ a large body of scientific and technical concepts that can be used to investigate, answer, and solve complex questions and problems about biological phenomena,
- the abilities to think innovatively and critically, and to apply problem-solving ability via quantitative and scientific methods,
- the ability to design and implement statistically reliable, comparative and experimental scientific research in field and laboratory conditions,
- an array of technical skills with a variety of equipment, instrumentation, and computer technologies,
- ability to understand, interpret, and evaluate the biological research reported on in advanced peer-reviewed journals,
- the ability and desire to communicate proficiently—in writing, and via visual and oral presentation—the results of one’s own empirical scientific research and the scientific research published by others,
- the necessary level of preparedness to enter into professional and graduate academic programs as well as degree-relevant jobs in business, industry, government, and non-government organizations.
- understanding of scientific principles and an abiding appreciation of science as a way of knowing,
- the desire to continue learning beyond graduation, and the understanding that scientific knowledge must be continually revised and renewed.
- the characteristics of a scholar.

Fundamental Faculty Tactics Needed for Exemplary Student Learning Outcomes.

Faculty should enhance student learning outcomes by:

- developing and maintaining a modern curriculum that builds an understanding of biology in a progressive and integrative fashion from introductory through graduate levels,
- maintaining a modest student/faculty ratio in lecture courses and a low student/faculty ratio in discussion and lab courses,
- giving students opportunities to apply their conceptual knowledge in rigorous scientific research (including observational-descriptive, comparative, and experimental research) in introductory labs through advanced lab and field experiences,
- obtaining and using instrumentation and computer technologies to facilitate the contemporary techniques that must be used in these research experiences,
- attending scientific meetings, reading current peer-reviewed journals, and serving on NSF review panels to stay apprised of new developments in their fields of research,
- maintaining active, contemporary scientific research programs of high quality that include the mentorship of advanced undergraduates and graduates,
- the outcomes of faculty research, including collaborations with students, as presentations at major scientific meetings and publishing in highly respected peer-reviewed, scientific journals.
Specific Pedagogical Tactics Needed by Faculty To Enhance Student Learning Effectiveness

Most of the courses in biology should be aimed at achieving some of the elements of the aforementioned expected outcomes of the Biology BS. As experts in ever-advancing fields, faculty must challenge students academically via:

- asking students fundamental, conceptual and integrative questions that require students to think analytically and synthetically,
- maintaining a high standard for the amount of course content, including up-to-date knowledge, and requiring some supporting, contextual knowledge to be learned by students outside of class,
- requiring students to write, rewrite, and edit papers; students must be encouraged to search a variety of up-to-date sources for ideas, concepts, and facts to extract and integrate into coherent frameworks,
- requiring students to write essays in exams; students should learn to cope with the current, open-ended problems, not closed-ended problems with a single right answer that can be rote memorized,
- requiring students in introductory lab courses to work collaboratively and to carry out projects that include analysis, presentation, and interpretation of data,
- requiring students in upper-level courses to propose, design, implement, and cogently report on their research, and to critically evaluate hypotheses, data, and conclusions in original research published in advanced peer-reviewed scientific journals.

What should be an Important Departmental Goal: Effective Critical Thinking

Effective critical thinking is one of the hallmarks of a scholar. Thus, students should learn to apply the basic tenets of critical thinking. Critical thinking is systematic, self-regulatory judgment, wherein inquiry is based on clear conceptualizations, and includes knowing and understanding the context, methods, and standards for obtaining reliable evidence, and also uses sound reasoning that includes analysis, inference, interpretation, evaluation, and explanation.

Critically thinking about an issue requires one to:

1. Understand and define all terms and models (verbal, physical, mathematical); clarify interpretations.
2. Look for hidden assumptions and biases in the arguments, models, or explanations; examine assumptions for oversimplification, omissions and for complexity and contradiction in the logic; seek historical perspective.
3. Question the methods by which facts are derived; the information gathering process is fallible.
4. Question the source of facts; compare conflicting sources, evaluate their credibility.
5. Gather complete information, but maintain a rigorous standard for what constitutes evidence (facts, data).
6. Examine for multiple causes for any effect and for multiple effects from any causal phenomenon.
7. Don't expect all of the answers; suspend judgement if outcomes are not definitive.
8. Question the conclusions (think independently); compare alternative conclusions; seek new conclusions.
9. Examine how your emotions (e.g., enthusiasm, anger, insecurity, pride) may affect your thinking.
10. Understand how your own biases and values may affect your thinking; develop perspective on yourself.
11. Do not rush the process.
12. Be contemplative, honest, courageous, and persevering in your search for truth.

Scientific research, as displayed throughout the biology curriculum, is an excellent means to apply the tenets of critical thinking. Scientific research is an array of objective, logical systematic methods of analysis, designed to accumulate reliable knowledge. As stated in the foregoing Common Goals and Specific tactics, students should learn how to accumulate reliable knowledge, and in the process, learn how to communicate the ideas, methods, results of those methods, and the interpretation of those results, in the context of ideas and data of others. That is, students learn scientific research as an exemplary process of applying the methods of critical thinking.
An important goal of the Biology Department for students as they move through the biology program should be for the students to develop their cognitive abilities. In Bloom’s widely known taxonomy of cognitive objectives, as students develop their intellectual skills through the curriculum, their capabilities should increase, from:

1) knowledge acquisition and
2) knowledge comprehension (understand enough to discuss and interpret),
through
3) knowledge application (use knowledge in problem-solving) and
4) knowledge analysis (see interrelationships of component parts),
finally to
5) knowledge synthesis (create original ideas and perspectives from previously unlinked knowledge), and
6) knowledge evaluation (judge the process of knowledge construction and the quality of the knowledge).

It is expected that students can achieve the desired intellectual progress by learning more deeply about topics as they recursively return to and focus on topics through the curriculum (particularly in certain Emphases), and by performing ever-more advanced scientific research as they progress from freshman through senior levels.

Students must learn that science includes both Creativity and Critical Analysis. These two kinds of scientific advances tend to be cyclic. The joys of intellectual discovery in science include Creativity, wherein the focus is on asking questions and finding problems, and the reasoning approach tends to be inductive and abductive. The emphasis in the Creativity portion of the scientific cycle is on integration and synthesis of knowledge into new perspectives, new explanations and new ways to test those explanations. The cycle of scientific advance also includes Critical Analysis, wherein the focus is on answering questions and solving problems, and the reasoning tends to be more deductive, within the classic hypothetico-deductive framework for which science is well known. Critical Analysis involves defining the question, developing that question into a testable hypothesis (a model), then assessing the data (either observational, descriptive, or experimental tests), comparing data produced with the data predicted, then drawing logical conclusions from the results. It is understood by most scientists that the aforementioned goals of critical thinking and the skills and abilities described in the next section are imbedded within the process of scientific research.
Appendix IV: Skills & Abilities via an Education in the Sciences.

These skills can be applied to any profession after graduation. Note that these benefits must be actively pursued. The second, bulleted list is more specific to your Biology programs. The student research experience in upper level biology laboratory courses are especially valuable because to be effective at critical thinking and the pursuit of wisdom requires developing and refining the skills listed below.

- **Creative Problem Solving**
  Ability to: address open-ended questions and problems; generate new ideas, frame new problems, and develop multiple potential solutions; challenge traditional approaches and solutions.

- **Analytical Skills**
  Ability to: recognize assumptions and predictions; logically analyze and solve problems from different points of view; apply scientific and mathematical theory using appropriate scientific techniques and technology in problem solving.

- **System Thinking Skills**
  Ability to: understand how events interrelate; synthesize new information with a variety of prior sources of knowledge.

- **Project Management & Leadership Skills**
  Ability to: set goals; create action plans and timetables; prioritize tasks; meet project milestones; complete assigned work; seek clarification of task requirements and take corrective action based upon feedback from others.

- **Teamwork Skills**
  Ability to: work together to set and meet team goals; encourage participation among all team members; listen and cooperate; share information and help reconcile differences of opinion when they occur.

- **Self-learning & Information Retrieval Skills**
  Ability to: learn independently, which includes the propensity to seek and acquire relevant reliable knowledge (e.g., in library and on the web) when investigating questions and attempting to solve problems.

- **Technology Skills**
  Ability to: properly use computer and instrumentation technology appropriate to field; adapt to new technology; integrate existing technology to create new possibilities.

- **Data Management & Statistical Skills**
  Ability to: organize and evaluate data; understand and implement multivariate parametric and nonparametric statistical techniques in experimental design and data analysis.

- **Oral Communication Skills**
  Ability to: verbally present ideas in a clear, concise manner; plan and deliver presentations; speak and listen effectively in discussions.

- **Visual Communication Skills**
  Ability to: utilize appropriate technology to create graphs, tables, illustrations, and models to clearly convey information; interpret and utilize similar information created by others.

- **Written Communication Skills**
  Ability to: present ideas in clear, concise, well-structured prose; choose appropriate style, form, and content to suit audience; utilize data and other information to support one’s reasoning and conclusions.

- **Ethics and Professionalism Skills**
  Ability to: understand social and ethical implications and complexities of your work; understand and demonstrate professional and ethical behavior and respond to challenges in a responsible and professional manner.

**General Outline for Developing Skills and Abilities**

1) Analytical Skills. In the first core course and in each successive core course we reinforce analytical skills learned previously, and introducing new skill requirements.

2) Technology Skills. In the first core laboratory course, and in each successive core laboratory course, and in most upper lab courses, students are required to develop evermore proficiency with instrumentation and equipment, some of which interfaces with computers. Much of the instrumentation is similar in principle and design or is actually the same equipment as that used in basic and applied research labs in industry, government, and academic research labs.

3) Creative Problem Solving Skills. As students proceed from the 200-level through 300-level, and into the 400-level, they are increasingly expected to devise an integrated set of plans and procedures that may provide effective avenues for answering open-ended questions and solve complex problems.

4) System-thinking Skills. As students build their experiences through the core courses, they increasingly are required to analyze multiple causes and interactions of multiple causes that may cause similar and multiple effects. Some of these analyses are written treatises entirely, and others are laboratory challenges that involve trouble shooting and problem solving.
5) **Self-learning Skills.** In each core course, the individual student must independently investigate a question or problem. The student must seek the most useful and verifiable knowledge available and must, in writing, develop a logical, integrated analysis of the topic. As students move through the core, faculty expectations for analysis and synthesis increase.

6) **Data Management Skills.** In the first core laboratory course and in each successive laboratory course, students are expected to demonstrate ever increasing abilities to collect reliable data, and to efficiently and logically organize the data and enter and edit the data in spreadsheets and databases, and to analyze data with appropriate statistical techniques in statistical software, and present the data with elegant computer graphics programs.

7) **Written communication Skills.** In the first core course and each successive core course we reinforce the scientific paper format, and include extensive advice and standardized evaluative feedback on the format, technical content, and the organization, clarity, and logic of the writing, as well as the mechanics of writing. Some upper-level courses are writing-intensive, thus several written, edited drafts are required and much of the course grade is dependent on the written product.

8) **Visual Communication Skills.** In the first core course, and in each successive core course, where feasible, we reinforce the ability to create visual representations of structures and processes, including organismal form and structure, and cellular, organismal, and ecological processes, as represented by drawings, photographs, charts, concept maps, and graphs. All student products are provided evaluative feedback, and students are given the opportunity to improve on their designs.

9) **Oral communication skills.** In the upper level laboratory courses and in the capstone core course Biol 432, Evolution, we require oral presentations, and instructors provide standardized evaluative feedback.

10) **Project Management Skills.** In the first core laboratory course, and in each successive laboratory course, successful research project outcomes increasingly depend on coordination within and among student research teams and on individual initiative. Students are given increasing responsibility to develop plans and procedures, to monitor their own progress, and meet course deadlines. Use of rooms and instrumentation and staff support must be scheduled, and supplies must be ordered, within a modest budget.

11) **Teamwork Skills.** Team research is an important component in each core laboratory course and in most upper laboratory courses. Usually some portion of the course grade for an individual is based on how well that individual works in a team environment, particularly as it relates to the research outcome of the team. Evaluative feedback is provided on the data generated, data analyses, and research conclusions by the team, as well as on team-project management.
Appendix V: Peer Review of Course Materials

Introductory Policy Statement

The Biology Department Faculty expressly want to avoid the “tyranny of the form.” We are neither subtly nor openly enforcing conformity. We do not want instructors to adhere to a recipe of common teaching practices. We must, however, balance the value of academic freedom, as it applies to our teaching styles and content, with the value of academic responsibility—as it applies to departmental curricular needs. Hence, the instructional features rated in this form Peer Review of Course Materials and in the companion form, Peer Observation of Faculty Instruction should help us achieve a perpetual goal in common with both academic freedom and responsibility: better learning outcomes for students.

Instructions for Reviewer

This Peer Review of Course Materials form comprises nine categorical areas for evaluation and assessment of course materials:

- Course Syllabus
- Textbooks
- Handouts & Web Documents
- Assignments
- Exams

Course Content Materials to be included

- Assignments (graded copies)
- Graded Exam Copies
- Study Questions, Preparation & Review Materials
- Active Learning Experiences

Use the following subjective scale of 1-6 to assess how the faculty member performed in each of the nine categories:

1 = very poor  2 = poor  3 = fair
4 = good  5 = very good  6 = excellent.

Because foregoing scale is comparative, you will have to use as a reference your understanding of the standards and expectations of course instructors in Biology, in the College of Arts and Sciences, and at Western.

Below each major heading is a set of specific features that should be helpful in evaluating whether the course materials are effectively facilitating student learning. Please note that many of the specific features listed can be evaluated only if they are relevant to the type of course and to the department-sanctioned purpose of the course. Thus, you and the course instructor are likely to consider a substantial number of the specific evaluation features as “not relevant” or “not reviewed,” hence those evaluation features will receive a preliminary “nr” designation (see suggested worksheet scale below). You must consult with the course instructor prior to review of course materials and you must note which features that the course instructor thinks are not relevant.

Please do not be excessive with your “nr” designations. That is, even though some features are relatively less important than others, you should not ignore the less important ones because even though you judge them
as less important, they are not altogether unimportant. Moreover, whereas the course instructor will designate some features as “nr” for the course, you, as a reviewer may consider those features as both relevant and suitable to evaluate.

Although some features are surely more important than others, the order in which they are listed in this form intends no value judgement for order of importance. Moreover, space is provided below each list for adding hitherto unstated features that are part of the course materials, or those you think should be included for consideration. Space is also provided for annotations about the features, your opinions about which are the more important features, and the basis for your opinions.

The worksheet pages of this Peer Review of Course Materials are for your own use and are not to be turned in to the Biology Chair. In the interest of enabling you to perform an assiduously comprehensive evaluation, a space is provided beside each feature in the worksheet pages. In the space you can apply symbols that represent assessments of the quality of achievement or relevance of the feature. An example, advisory scale that could be used for those assessments is provided here:

nr = not relevant or not reviewed
Plus (+) = performed well = exceeds expectations or standards for instructors at WWU,
check (✓) = performed adequately = meets expectations or standards for instructors at WWU,
minus (-) = performed inadequately = below expectations or standards for instructors at WWU.

Please place any further elaborations and explanations of your opinions about any specific evaluation category and any explanation of your rationales for summative ratings at the end of the form. Your summative ratings are important, but your summative comments and elaborations are even more important because they should provide the rationale for your assessment of how well the students learned in the course, within the context of the department-sanctioned purpose of the course. You should make more extensive comments for the more important features than for less important features.

You must turn in to the Biology Department Chair: the Summative Ratings page and the Summative Comments and Elaborations page(s) from the Submission Version of the Peer Review of Course Materials form. If you think your comments below each section would help the Biology Chair and others interpret your conclusions, then feel free to turn in the Optional Submission pages of the Peer Review of Course Materials form.
If you are a member of the Course Materials Review Team, then within a week of completing your evaluations and assessments, you should meet with the other team members that reviewed course materials for the same faculty member. Discuss your evaluations and assessments, and write a *Team Summary Statement*.

**Brief Review of Procedures:**

1. Consult with the instructor whose course you are assigned to review and determine which features should be designated as “nr” and what unique features should be added for consideration.

2. Prior to your review, fill in all information on the *Summative Ratings* page down to line in the middle of the page, and have the course instructor sign the statement that says you consulted with the instructor about which features should receive “nr” designations.

3. Use the form as an aid for evaluation and assessment of the course materials.

4. Choose your summative scores, place them on the *Summative Ratings* page, and compose your rationales for those scores, placing them on the *Summative Comments and Elaborations* page (and also on the *Optional Submission* pages if you wish).

5. Meet with the other Course Materials Team Members to compose a *Team Summary Statement*.

6. Submit your *Summative Ratings* and *Summative Comments and Elaborations* and the *Team Summary Statement* pages to the Biology Chair.
Summative Evaluation Scale:

1 = very poor    2 = poor    3 = fair    4 = good    5 = very good    6 = excellent

On these worksheet pages (not to be turned in) of the form you may want to use some simple format for an informal assessment scale when you evaluate each specific performance feature. A sample, advisory scale is listed here:

+ = performed well    ✔ = performed adequately
- = performed inadequately    nr = not relevant or not reviewed

You may also want to designate the more important features with an “M” and the less important features with an “L”, thus permitting you to focus on the “M” features as you peruse the course materials.

Course Syllabus

1. _____Contains information about the faculty member: name, office address, office hours, office phone number, e-mail, class website (enabling updates of syllabus)
2. _____Includes office hours are scheduled at varied times of the day and week to enable student visits
3. _____Includes a concise statement or description of course objectives
4. _____Outlines the sequence and timing of topics to be covered
5. _____States specific objective for each unit or section in the course
6. _____Lists exam dates and due dates of major assignments
7. _____Describes expectations for student exams and assignments
8. _____Describes evaluation procedures
9. _____Identifies instructional resources: websites, texts, journals, and guest lectures
10. _____Is structured so that the information is clear and easily understood
11. _____Is neatly typed without spelling or grammatical errors
12. _____Makes clear that reasonable precautions will be taken to prevent cheating
13. _____Indicates that the course is moderate-to-high challenge, but is of low threat, and includes learning incentives

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Textbooks  

1. ___Clearly related to course objectives  
2. ___Are appropriate to course level  
3. ___Meets current disciplinary standards  
4. ___Meets departmental standards  
5. ___Written at level of depth and breadth for effective student learning  
6. ___Illustrated and organized to enable student to use for substantive study  
7. ___Contains study questions that integrate knowledge and enhance student understanding  
8. ___Contains study questions that focus on analytical and quantitative problem-solving skills  
9. ___Includes ancillaries such as study guides, figure notebooks, transparencies, and Power Point® presentations on compact disc  

Handouts & Web Documents  

1. ___Handouts are easy to obtain and website is easy to use (assuming campus technology is adequate)  
2. ___Are effective additions to classroom and text content  
3. ___Are organized and structured so that the content is clearly communicated  
4. ___Are attractive documents (illustrations, graphs, and grammar are accurate and correctly presented) that display enough, but not an excessive amount of information on each page
Study Questions, Preparation & Review Materials

1. ____ Are assigned with a clear rationale
2. ____ Prepare students for the substantive challenges of exams and quizzes
3. ____ Provide sample exam and quiz questions
4. ____ Are not too time consuming relative to their contribution to overall course knowledge and understanding
5. ____ Review concepts and supporting knowledge that students are expected to recall and understand
6. ____ Are assigned so that completion facilitates retention and understanding of knowledge provided (e.g., in lecture, text, website, handouts)
7. ____ Include materials for added perspective and understanding such as concept maps, annotated bibliographies, and case studies.
8. ____ Contains questions that induce students to integrate knowledge and enhance their understanding via creative problem solving and systems-level thinking
9. ____ Contains interesting questions that inculcate curiosity and creativity
10. ____ Contains questions that focus on analytical and quantitative problem-solving skills
11. ____ Writing that students are required to do principally functions to promote mastery of course material, to the extent that students can develop the ability to communicate clearly about the subject in breadth and detail
12. ____ Assignments evaluated so that clear, effectively communicated feedback is provided to students for their timely preparation for exams, and helps the students understand how well they are mastering the subject material
Assignments Summative Rating: 1 2 3 4 5 6

1. ___Are appropriate to course objectives and content level
2. ___Are spaced at appropriate intervals in the course
3. ___Prepare students for other biology courses that are more in-depth or complex
4. ___Produce meaningful, interesting, and appropriately challenging learning experiences
5. ___Include a variety of activities that are responsive to varying student interests, abilities, and learning styles; that is, the array of learning challenges is diverse, with incentives for learning imbedded in the assignments

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Assignments (graded copies) Summative Rating: 1 2 3 4 5 6

1. ___Written comments or a clear answer key was provided
2. ___Written comments are clear and legible
3. ___Written comments offer specific non-discouraging suggestions for eliminating writing weaknesses
4. ___Written comments provide positive reinforcement for well-performed features, and function as incentives for further thought by students
5. ___Score calculation is clear
6. ___Assessment standards are similar among graded assignments
7. ___Assessment and scoring proportional for A-graded paper v. B-graded paper
8. ___Encourages and enables poor-performing students to improve their learning

_____________________________________________________________________
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Worksheet Page, for Reviewer Convenience

Exams

Summative Rating: 1  2  3  4  5  6

1. ____ Contain content consistent with course objectives
2. ____ Intent of questions are clear and explicit
3. ____ Cover manageable amounts of course material
4. ____ Are of appropriate length and can be completed thoroughly by students in allotted time
5. ____ Clearly indicates question weight in relation to the total score
6. ____ Require knowledge, analysis, integration, and application of course content
7. ____ Are of instructional value and are likely to help students find the limits to their knowledge
8. ____ Encourages and enables poor-performing students to improve their learning

Graded Exam Copies

Summative Rating: 1  2  3  4  5  6

1. ____ Include written comments or provides a clear answer key
2. ____ Written comments are clear and legible
3. ____ Written comments offer specific non-discouraging suggestions for improving knowledge and understanding of examination material
4. ____ Written comments provide positive reinforcement for well-performed features, and function as incentives for further thought by students
5. ____ Encourages and enables poor-performing students to improve their learning
6. ____ Score calculation is clear
7. ____ Assessment and scoring standards are consistent among graded exams, and scoring is appropriately proportional for A-graded paper v. B-graded paper
8. ____ A-graded exams required strong conceptual understanding of course material
9. ____ Grade distributions for exams (and papers, and the entire course) reveals the challenge of the course relative to the level of preparation the students had before and during the course.
### Active Learning Experiences (student-centered)

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1. ___Written directions or procedures are clearly explained for all activities
2. ___Clearly written explanation of the goal of each activity, and with explanation of how each goal fits within course objectives
3. ___Lists of available materials and equipment are provided
4. ___Effectively illustrated and written explanations for equipment use
5. ___Strongly promote adherence to safety procedures
6. ___Activities are set up so that equipment use increases student competence in laboratory and field procedures
7. ___Written explanations and illustrations are placed in a sequence that enables students to avoid needless confusion and proceed at an acceptable pace
8. ___Activities require skills of students that are within reasonable expectations for the course and skills students have in hand at outset of the course
9. ___Activities can be performed in time allotted for completion of lab or field project, and allows time for reflective thought and discussion among students
10. ___Activities provide opportunities for students to learn biological and scientific theory and use appropriate scientific techniques and technology in problem-solving.
11. ___Activities provide opportunities for students to develop curiosity about the biological phenomena under study
12. ___Activities provide opportunities for students to develop creative, integrative problem-finding abilities
13. ___Activities provide students opportunities to learn information retrieval and instrumentation technology skills
14. ___Activities provide students opportunities to develop analytic abilities
15. ___Activities provide students opportunities to develop problem-solving abilities
16. ___Activities provide students opportunities to develop independent thinking and decision-making abilities
17. ___Activities provide students opportunities to develop both self-directed learning and teamwork skills
18. ___Activities provide students opportunities to develop data management and statistical skills
19. ___Activities, follow-up assignments, and assignment guidelines provide students opportunities to develop data presentation skills and research communication (written and oral) skills
Optional Submission Page

Summative Evaluation Scale:

1 = very poor  2 = poor   3 = fair   4 = good   5 = very good   6 = excellent

Course Syllabus

1. Contains information about the faculty member: name, office address, office hours, office phone number, e-mail, class website (enabling updates of syllabus)
2. Includes office hours are scheduled at varied times of the day and week to enable student visits
3. Includes a concise statement or description of course objectives
4. Outlines the sequence and timing of topics to be covered
5. States specific objective for each unit or section in the course
6. Lists exam dates and due dates of major assignments
7. Describes expectations for student exams and assignments
8. Describes evaluation procedures
9. Identifies instructional resources: websites, texts, journals, and guest lectures
10. Is structured so that the information is clear and easily understood
11. Is neatly typed without spelling or grammatical errors
12. Makes clear that reasonable precautions will be taken to prevent cheating
13. Indicates that the course is moderate-to-high challenge, but is of low threat, and includes learning incentives
### Textbooks

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<td>8. Contains study questions that focus on analytical and quantitative problem-solving skills</td>
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<td>9. Includes ancillaries such as study guides, figure notebooks, transparencies, and Power Point® presentations on compact disc</td>
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### Handouts & Web Documents

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<td>1. Handouts are easy to obtain and website is easy to use (assuming campus technology is adequate)</td>
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<td>4. Are attractive documents (illustrations, graphs, and grammar are accurate and correctly presented) that display enough, but not an excessive amount of information on each page</td>
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Study Questions, Preparation, & Review Materials

Summative Rating: 1  2  3  4  5  6

1. Are assigned with a clear rationale
2. Prepare students for the substantive challenges of exams and quizzes
3. Provide sample exam and quiz questions
4. Are not too time consuming relative to their contribution to overall course knowledge and understanding
5. Review concepts and supporting knowledge that students are expected to recall and understand
6. Are assigned so that completion facilitates retention and understanding of knowledge provided (e.g., in lecture, text, website, handouts)
7. Include materials for added perspective and understanding such as concept maps, annotated bibliographies, and case studies.
8. Contains questions that induce students to integrate knowledge and enhance their understanding via creative problem solving and systems-level thinking
9. Contains interesting questions that inculcate curiosity and creativity
10. Contains questions that focus on analytical and quantitative problem-solving skills
11. Writing that students are required to do principally functions to promote mastery of course material, to the extent that students can develop the ability to communicate clearly about the subject in breadth and detail
12. Assignments evaluated so that clear, effectively communicated feedback is provided to students for their timely preparation for exams, and helps the students understand how well they are mastering the subject material
Optional Submission Page

Assignments

1. Are appropriate to course objectives and content level
2. Are spaced at appropriate intervals in the course
3. Prepare students for other biology courses that are more in-depth or complex
4. Produce meaningful, interesting, and appropriately challenging learning experiences
5. Include a variety of activities that are responsive to varying student interests, abilities, and learning styles; that is, the array of learning challenges is diverse, with incentives for learning imbedded in the assignments

Assignments (graded copies)

1. Written comments or a clear answer key was provided
2. Written comments are clear and legible
3. Written comments offer specific non-discouraging suggestions for eliminating writing weaknesses
4. Written comments provide positive reinforcement for well-performed features, and function as incentives for further thought by students
5. Score calculation is clear
6. Assessment standards are similar among graded assignments
7. Assessment and scoring proportional for A-graded paper v. B-graded paper
8. Encourages and enables poor-performing students to improve their learning
Optional Submission Page

Exams Summative Rating: 1 2 3 4 5 6

1. Contain content consistent with course objectives
2. Intent of questions are clear and explicit
3. Cover manageable amounts of course material
4. Are of appropriate length and can be completed thoroughly by students in allotted time
5. Clearly indicates question weight in relation to the total score
6. Require knowledge, analysis, integration, and application of course content
7. Are of instructional value and are likely to help students find the limits to their knowledge
8. Encourages and enables poor-performing students to improve their learning

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Graded Exam Copies Summative Rating: 1 2 3 4 5 6

1. Include written comments or provides a clear answer key
2. Written comments are clear and legible
3. Written comments offer specific non-discouraging suggestions for improving knowledge and understanding of examination material
4. Written comments provide positive reinforcement for well-performed features, and function as incentives for further thought by students
5. Encourages and enables poor-performing students to improve their learning
6. Score calculation is clear
7. Assessment and scoring standards are consistent among graded exams, and scoring is appropriately proportional for A-graded paper v. B-graded paper
8. A-graded exams required strong conceptual understanding of course material
9. Grade distributions for exams (and papers, and the entire course) reveals the challenge of the course relative to the level of preparation the students had before and during the course.
Active Learning Experiences  (student-centered)  

Events occur in  ____Lecture  ____Discussion  ___Seminar  ____Lab

1. Written directions or procedures are clearly explained for all activities
2. Clearly written explanation of the goal of each activity, and with explanation of how each goal fits within course objectives
3. Lists of available materials and equipment are provided
4. Effectively illustrated and written explanations for equipment use
5. Strongly promote adherence to safety procedures
6. Activities are set up so that equipment use increases student competence in laboratory and field procedures
7. Written explanations and illustrations are placed in a sequence that enables students to avoid needless confusion and proceed at an acceptable pace
8. Activities require skills of students that are within reasonable expectations for the course and skills students have in hand at outset of the course
9. Activities can be performed in time allotted for completion of lab or field project, and allows time for reflective thought and discussion among students
10. Activities provide opportunities for students to learn biological and scientific theory and use appropriate scientific techniques and technology in problem-solving.
11. Activities provide opportunities for students to develop curiosity about the biological phenomena under study
12. Activities provide opportunities for students to develop creative, integrative problem-finding abilities
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18. Activities provide students opportunities to develop data management and statistical skills
19. Activities, follow-up assignments, and assignment guidelines provide students opportunities to develop data presentation skills and research communication (written and oral) skills
Required Submission Page

Review Team Member’s Summative Ratings of Course Materials

Reviewer Name______________________  Signature  __________________________

Date ___________   Faculty Member Reviewed  _______________________________

Course Number _______    Course Name ______________________________________

Term and Year of Course  _____________     ______________

Course Format (circle all that apply):

Lecture/Expository  Lecture/Discussion  Seminar  Laboratory  Other: __________

Team-taught  Solo-taught  Lab with GTA  Lab without GTA

Class Sizes (state for each meeting type)  Lecture ____,  Discussion ____  Lab ____

Course Instructor signature, verifying that “nr” designations were provided to Reviewer:

Instructor’s Signature _____________________________

Course Syllabus

Summative Rating: 1  2  3  4  5  6

Textbooks

Summative Rating: 1  2  3  4  5  6

Handouts & Web Documents

Summative Rating: 1  2  3  4  5  6

Assignments & Exams

Summative Rating: 1  2  3  4  5  6
Required Submission Page

Course Materials Review Team Member’s Summative Comments and Elaborations

Reviewer Name _______________________  Signature ___________________________
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Appendix VI: Peer Observation of Faculty Instruction

Introductory Policy Statement

The Biology Department Faculty expressly want to avoid the “tyranny of the form.” We are neither subtly nor openly enforcing conformity. We do not want instructors to adhere to a recipe of common teaching practices. We must, however, balance the value of academic freedom, as it applies to our teaching styles and content, with the value of academic responsibility—as it applies to departmental curricular needs. Hence, the instructional features rated in this form Peer Observation of Faculty Instruction and in the companion form Peer Review of Course Materials, should help us achieve a perpetual goal in common with both academic freedom and responsibility: better learning outcomes for students.

Instructions for Reviewer

This Peer Observation form comprises five categorical areas for evaluation and assessment of performance of course instructors in the classroom:

- Classroom Organization,  Presentation and Comportment,
- Interaction and Classroom Management,
- Presentation Content,  Active Learning Experiences.

Use the following subjective scale of 1-6 to assess how the faculty member performed in each of these major categories: 1 = very poor 2 = poor 3 = fair 4 = good 5 = very good 6 = excellent.

Because foregoing scale is comparative, you will have to use as a reference your understanding of the standards and expectations of course instructors in Biology, in the College of Sciences and Technology, and at Western.

Note that you will need to witness several lectures or discussions or labs in a short span of time for any particular course before you have seen the faculty member often enough in the variety of situations that these questions address. For example, it would be unwise to arrive at a conclusion about a faculty member if the person appeared to have faltered in one situation once. Conversely, just because the individual nicely demonstrated an attribute in one situation, does not mean the person’s performance is uniformly exemplary. Hence, you may want to take frequent notes on the person’s in-class performance, and try to enumerate or quantify frequency of occurrences. Try to recognize your own bias in your reactions to features of the person’s presentation.

Below each major heading is a set of specific features that should be helpful in evaluating the course instructor’s teaching effectiveness (effective facilitation of student learning). Please note that many features will not be evaluated because either they will not be appropriate to the lecture style, course type or scheduled day of observation, or they are likely to be uncommon events. Thus, you and the course instructor are likely to consider a substantial number of the items as “not relevant” or “not reviewed.” You must consult with the
Please do not be excessive with your “nr” designations. That is, even though some features are relatively less important than others, you should not ignore the less important ones because even though you judge them as less important, they are not altogether unimportant. Moreover, whereas some features that the instructor will designate as “nr” for that class period, you, as a reviewer may consider those features as both relevant and available to review.

Although some features are surely more important than others, the order in which they are listed in this form intends no value judgement for order of importance. Moreover, space is provided below each list for placing hitherto unstated features that you encounter when observing the instructor or those you (or the instructor) think should be included for consideration. Space is also provided for other annotations such as comments about the features as they relate to the instructor’s performance, or your opinions about which are the more important features, and the basis for your opinions.

The worksheet pages of this Peer Observation of Faculty Instruction form are for your own use and are not to be turned in to the Biology Chair. In the interest of enabling you to perform an assiduously comprehensive evaluation, a space is provided beside each feature in the worksheet pages. In the space you can apply symbols that represent assessments of the quality of achievement or relevance of the feature. An example, advisory scale that could be used for those assessments is provided here:

nr = not relevant or not reviewed
Plus (+) = performed well = exceeds expectations or standards for instructors at WWU,
check (✔) = performed adequately = meets expectations or standards for instructors at WWU,
minus (-) = performed inadequately = below expectations or standards for instructors at WWU.

To enable a more effective and comprehensive evaluation, please carefully review each evaluation feature prior to each class period, and frequently scan amongst the evaluation features during each of the class periods (preferably consecutive) that you are likely to attend. Please describe notable occurrences, or provide specific examples, or note frequency of occurrences, thus enabling you to elaborate on your assessment in writing at the end of each section and at the end of the form.

Please expend effort commenting about the performance features you witnessed relative to their importance for providing an effective learning environment for students. That is, you should be making more extensive comments for the more important features than for less important features. Your summative ratings are important, but your summative comments and elaborations are even more important because they should provide the rationale for your assessment of the course instructor’s “teaching performance.”
You must turn in to the Biology Department Chair: the *Record of Peer Observation* page, *Summative Ratings* page and the *Summative Comments and Elaborations* page(s) from the *Submission Version* of the *Peer Observation of Faculty Instruction* form. If you think your comments below each section would help the Biology Chair and others interpret your conclusions, then feel free to turn in the *Optional Submission* pages of the *Peer Observation of Faculty Instruction* form.

If you are a member of the Peer Observation Team, then within a few days of completing your observations, you should meet with the other team members that observed the same instructor for that course and discuss your experiences observing that instructor.

**Brief Review of procedures:**

7. Talk to the course instructor to be observed and to the other Peer Observation Team members and coordinate your schedule of visits.

8. Consult with the course instructor about the features that should be designated as “nr” and what unique features relative to the instructor’s class should be added for consideration.

9. Be sure you fill in the *Record of Peer Observation* page; have the course instructor review the page for accuracy, and have the course instructor sign to attest to the accuracy.

10. Use the form as an aid for evaluation and assessment of the course instructor’s classroom performance.

11. Choose your summative scores, place them on the *Summative Ratings* page, and compose your rationales for those scores, placing them on the *Summative Comments and Elaborations* page (also on the *Optional Submission* pages if you wish)

12. Meet with the other Team Members to compose a Team Summary Statement.

13. Submit your *Record of Peer Observation, Summative Ratings* and *Summative Comments and Elaborations*, and *Team Summary* pages to the Biology Chair.
Record of Peer Observation

After each class period observed, complete this cover page and have reviewee sign approval of what was filled in on this page.

Faculty Member Observed _____________________________

Peer Reviewer _____________________________

Reviewer Signature _____________________________

Date of Observation_________________ (please notify the reviewee before attendance)

Day and Time of Day of Observations _________________ __________________

Course Observed: Course Name ______________________________ Course Number ______

General Course Format (circle all that apply):

- Lecture/Expository
- Lecture/Discussion
- Seminar
- Lab
- Other:____________________

General Format for the Class Period Observed:

- Expository Lecture: monologue with efficient information delivery and strong content focus
- Interactive Lecture: dialogue with students participating in the focus on asking questions and developing answers and ideas
- Discussion: mediation of student-centered interactions, developing ideas and deriving knowledge
- Other:

Topic(s) for the Class Period:

Presentation format (media used):

Signature of Faculty Instructor Being Reviewed: _____________________________
Worksheet Page, for Reviewer Convenience

**Summative Evaluation Scale:**

1 = very poor     2 = poor      3 = fair     4 = good     5 = very good     6 = excellent

On these worksheet pages (not to be turned in) of the form you may want to use some simple format for an informal assessment scale when you evaluate each specific performance feature. A sample, advisory scale is listed here:

+       = performed well       ✔    = performed adequately
-       = performed inadequately  nr  = not relevant or not reviewed

You may also want to designate the more important features with an “M” and the less important features with an “L”, thus permitting you to focus on the “M” features as you observe the instructor in the classroom.

**Classroom Organization**

**Summative Rating: 1   2   3   4   5   6**

1. ____Begins class on time and in an organized fashion
2. ____Clearly states and posts the goals or objectives for the class period
3. ____Previews and outlines content of lecture/discussion for the class period and relates it to prior class meeting
4. ____Proceeds systematically and provides internal summaries and transitions during lecture/discussion
5. ____Digressions and asides do not detract from overall goals and objectives of the class period
6. ____Provides summary conclusions of lecture/discussion and previews next period

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_____________________________________________________________________
_____________________________________________________________________
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Presentation and Comportment

1. _____ Speaks audibly and clearly, and variation in rate, tone, and loudness used effectively
2. _____ Oral delivery and demeanor are neither too formal nor too casual, and distracting speech fillers are avoided
3. _____ Facial and body movements do not contradict or distract from oral communication
4. _____ Communicates a sense of thoughtful enthusiasm, interest, and confidence
5. _____ Frequently establishes and maintains eye contact, focuses attention more on students than on the board or screen, displays a demeanor of true desire to communicate
6. _____ Appears to listen attentively and respectfully to student questions and contributions, appears receptive to new ideas
7. _____ Effectively presents instructional supports: not only are boardwork, overheads, and slides legible, organized, and not too detailed, but transitions of attention and thoughts to and from these materials smooth and effective
8. _____ Use of humor is appropriate; helps solidify ideas and does not detract from purpose of the presentation
Interaction & Classroom Management  

1. ____In class early enough to greet incoming students to instructor’s domain
2. ____Is aware of rate and form of information delivery and their effects on ease and thoroughness of student note-taking and student comprehension
3. ____Is attentive to students’ facial and oral expressions of comprehension
4. ____Solicits student feedback to gauge student comprehension and engage students more actively in their learning
5. ____At appropriate junctures allows ample time for questions, and is willing to deviate somewhat from class period plans to meet student requests for knowledge and understanding
6. ____Responds constructively and considerately to student opinions and questions
7. ____Answers questions effectively enough to satisfy students
8. ____Is able to admit error or insufficient knowledge, and suggests appropriate follow-up (how and when it will occur) if that knowledge is not too difficult to obtain
9. ____Gives students time to respond to questions
10. ____Is not confused or flustered by unexpected questions; rather instructor grasps quickly what student is saying
11. ____Considerately and effectively encourages students to clarify their questions
12. ____Effective at requesting that questions for which answers are complex and time-consuming, and are likely to be interesting to a comparative few in class, be discussed and researched in office hours (or just after class or before next class).
13. ____Asks challenging close-ended and open-ended questions to maintain student attention or stimulate discussion
14. ____Enables students to answer an originally posed difficult question by providing related and smaller questions in a logical sequence and in a patient and encouraging manner
15. ____Draws nonparticipating students into the discussion and reduces the dominance of other students in the discussion
16. ____Encourages students to respond to each other’s questions
17. ____Encourages mutual respect among students and mediates their differences of opinion
18. ____Treats class members equitably
19. ____Students appear to understand instructor’s ground rules for student participation
20. ____Knows and uses student names (if tractable)
Presentation Content

Summative Rating: 1 2 3 4 5 6

1. ___Focuses on important content, and makes clear why that content is worthwhile and important
2. ___Presents up-to-date developments in the field, and the questions and problems of current research focus

3. ___Presents historical background and intellectual rationales for ideas and concepts
4. ___Explains abstruse concepts, terms, or problems in more than one way, and neither oversimplifies nor over-complicates; repeats to ensure clarity
5. ___Stresses important points and places those ideas into context clearly
6. ___Reiterates recently introduced concepts and terms to further familiarize students with these new ideas
7. ___Provides appropriate examples and enough examples to develop understanding of the concept
8. ___Selects examples relevant to student experiences and course content (relates new ideas to prior ideas), and uses relevant personal experiences to help elucidate understanding in students
9. ___Includes illustrations and instructional aids that are effective at emphasizing or explicating important concepts, patterns, and processes.
10. ___Integrates text material into class presentations, but broadens knowledge and understanding beyond text material
11. ___Presents pertinent facts and concepts from related fields, and demonstrates how to apply ideas from this course to other courses and other situations
12. ___Explicitly states relationships among various topics and facts/theory
13. ___Seeks to apply theory to problem solving
14. ___Describes (without digressing) and explains the importance of effective formulae, methods, or techniques used to derive knowledge and understanding
15. ___Presents alternative views when relevant, useful, or appropriate
16. ___Relates assignment to course content
17. ___Clearly organizes and carefully explains assignment
18. ___Takes opportunities to help students develop curiosity and creative abilities
19. ___Takes opportunities to help students develop analytic abilities
20. ___Takes opportunities to help students develop problem-solving abilities
21. ___Takes opportunities to help students develop independent thinking and decision-making abilities

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**Active Learning Experiences (student-centered)**

<table>
<thead>
<tr>
<th>Event occurred in</th>
<th>Lecture</th>
<th>Discussion</th>
<th>Seminar</th>
<th>Lab</th>
</tr>
</thead>
</table>

1. ____ Clearly explains directions or procedures
2. ____ Clearly explains the goal of the activity, and explains how it fits within course objectives
3. ____ Has readily available materials and equipment
4. ____ Promotes following of all safety procedures
5. ____ Provides demonstrations that are clearly visible to all students
6. ____ Properly explains equipment use; equipment use increases student competence in laboratory and field procedures
7. ____ Is adept at providing timely and helpful comments on lab or field procedures, thereby obviating student problems
8. ____ Gives prompt attention to individual student problems
9. ____ Provides constructive verbal feedback to students
10. ____ Requires skills of students that are within reasonable expectations for the course and skills students have in hand at the outset of the course
11. ____ Provides opportunities for dialogue about the activity with peers and course instructor
12. ____ Allows sufficient time for completion of lab or field project
13. ____ Allocates sufficient clean-up time within the class session
14. ____ Provides opportunities for students to learn biological and scientific theory and use appropriate scientific techniques and technology in problem-solving.
15. ____ Provides opportunities for students to develop curiosity about the biological phenomena under study
16. ____ Provides opportunities for students to develop creative, integrative problem-finding abilities
17. ____ Provides opportunities for students to learn information retrieval and instrumentation technology skills
18. ____ Provides opportunities for students to develop analytic abilities
19. ____ Provides opportunities for students to develop problem-solving abilities
20. ____ Provides opportunities for students to develop independent thinking and decision-making abilities
21. ____ Provides opportunities for students to develop both self-directed learning and teamwork skills
22. ____ Provides opportunities for students to develop data management and statistical skills
23. ____ Provides opportunities for students to develop data presentation skills and research communication (written and oral) skills

_____________________________________________________________________
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_____________________________________________________________________
_____________________________________________________________________
Classroom Organization  Summative Rating: 1  2  3  4  5  6

1. Begins class on time and in an organized fashion
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4. Proceeds systematically and provides internal summaries and transitions during lecture/discussion
5. Digressions and asides do not detract from overall goals and objectives of the class period
6. Provides summary conclusions of lecture/discussion and previews next period

Presentation and Comportment  Summative Rating: 1  2  3  4  5  6

1. Speaks audibly and clearly, and variation in rate, tone, and loudness used effectively
2. Oral delivery and demeanor are neither too formal nor too casual, and distracting speech fillers are avoided
3. Facial and body movements do not contradict or distract from oral communication
4. Communicates a sense of thoughtful enthusiasm, interest, and confidence
5. Frequently establishes and maintains eye contact, focuses attention more on students than on the board or screen, displays a demeanor of true desire to communicate
6. Appears to listen attentively and respectfully to student questions and contributions, appears receptive to new ideas
7. Effectively presents instructional supports: not only are boardwork, overheads, and slides legible, organized, and not too detailed, but transitions of attention and thoughts to and from these materials smooth and effective
8. Use of humor is appropriate; helps solidify ideas and does not detract from purpose of the presentation
**Interaction & Classroom Management**

**Summative Rating:** 1 2 3 4 5 6

1. In class early enough to greet incoming students to instructor’s domain
2. Is aware of rate and form of information delivery and their effects on ease and thoroughness of student note-taking and student comprehension
3. Is attentive to students’ facial and oral expressions of comprehension
4. Solicits student feedback to gauge student comprehension and engage students more actively in their learning
5. At appropriate junctures allows ample time for questions, and is willing to deviate somewhat from class period plans to meet student requests for knowledge and understanding
6. Responds constructively and considerately to student opinions and questions
7. Answers questions effectively enough to satisfy students
8. Is able to admit error or insufficient knowledge, and suggests appropriate follow-up (how and when it will occur) if that knowledge is not too difficult to obtain
9. Gives students time to respond to questions
10. Is not confused or flustered by unexpected questions; rather instructor grasps quickly what student is saying
11. Considerately and effectively encourages students to clarify their questions
12. Effective at requesting that questions for which answers are complex and time-consuming, and are likely to be interesting to a comparative few in class, be discussed and researched in office hours (or just after class or before next class).
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18. Treats class members equitably
19. Students appear to understand instructor’s ground rules for student participation
20. Knows and uses student names (if tractable)
Presentation Content

Summative Rating:  1  2  3  4  5  6

1. Focuses on important content, and makes clear why that content is worthwhile and important
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3. Presents historical background and intellectual rationales for ideas and concepts
4. Explains abstruse concepts, terms, or problems in more than one way, and neither oversimplifies nor over-complicates; repeats to ensure clarity
5. Stresses important points and places those ideas into context clearly
6. Reiterates recently introduced concepts and terms to further familiarize students with these new ideas
7. Provides appropriate examples and enough examples to develop understanding of the concept
8. Selects examples relevant to student experiences and course content (relates new ideas to prior ideas), and uses relevant personal experiences to help elucidate understanding in students
9. Includes illustrations and instructional aids that are effective at emphasizing or explicating important concepts, patterns, and processes.
10. Integrates text material into class presentations, but broadens knowledge and understanding beyond text material
11. Presents pertinent facts and concepts from related fields, and demonstrates how to apply ideas from this course to other courses and other situations
12. Explicitly states relationships among various topics and facts/theory
13. Seeks to apply theory to problem solving
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1. Clearly explains directions or procedures  
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Required Submission Page

Review Team Member’s Summative Ratings

Review Team Member ______________________________

Team Member Signature ______________________________

Date _______________

Faculty Member Reviewed _____________________________

Review Categories and Summative Ratings:

<table>
<thead>
<tr>
<th>Category</th>
<th>Summative Rating:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom Organization</td>
<td>1  2  3  4  5  6</td>
</tr>
<tr>
<td>Presentation and Comportment</td>
<td>1  2  3  4  5  6</td>
</tr>
<tr>
<td>Interaction &amp; Classroom Management</td>
<td>1  2  3  4  5  6</td>
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<tr>
<td>Presentation Content</td>
<td>1  2  3  4  5  6</td>
</tr>
<tr>
<td>Active Learning Experiences</td>
<td>1  2  3  4  5  6</td>
</tr>
</tbody>
</table>
Appendix VII. Proposal for Mentor Team Evaluation of Probationary Faculty

What is adequate documentation of what each individual faculty member is accomplishing in (a) that member’s research programs, (b) facilitating student learning, and (c) contributing to service? What form of periodic analysis is necessary for to establish what one has accomplished in producing student learning, in research, and in the many facets of service? That is, how must individual faculty performance be evaluated? Assistant Professors could be evaluated by teams of three mentors, with the Department Chair as a fourth, ex officio member of the team.

The primary purpose of the Mentor Team would be to provide annual formative evaluations for Assistant Professors. These formative evaluations would be to provide the Assistant Professor with information that the individual can use for improving: (1) effectiveness of student learning, (2) research accomplishments, (3) optimality of service.

A secondary function of the Mentor Team would be to provide a brief annual summative evaluation that can be used as an important reference by the Department Chair and other tenured faculty when they are required to provide summative evaluations. The summative evaluation is used in making personnel decisions, such as for merit pay, promotion, and tenure. The summative evaluation is much less detailed than the formative evaluation. The summative evaluation places the faculty member in a more comparative context, and reviews the individual’s performance relative to the standards of performance expected for a faculty member with similar level of experience.

Two forms that could be used are Peer Review of Course Materials and Peer Observation of Faculty Instruction (Appendix V and VI); they are primarily formative evaluations. The abstracted summative evaluations, however, are dependent on the formative evaluation experience of the Mentor Team. Another form that the Biology Department would use is an annual summative evaluation form that would be similar in format to the college tenure and promotion evaluation form.

The Mentor Team should assist the Biology Chair in providing a summative evaluation annually. The remaining tenured faculty would provide a summative evaluation in Winter Quarter of the third academic year of the Assistant Professor. All tenured faculty would also provide a summative evaluation at least once more; that is when the Assistant Professor is applying for promotion and tenure in the Fall Quarter of the 4th or 5th year (thus only once more) or in the fall of the 5th year as an annual review, then again in the fall of the 6th and final review year, should the Assistant Professor apply for tenure and promotion that year. Thus, the majority of tenured faculty would provide a summative evaluation of the Assistant Professor only two or three times for an Assistant Professor, whereas the Mentor Team provides a formative evaluation either in spring or fall quarter of each year and a summative evaluation in the fall quarter of each year. Although all tenured faculty would be required to provide two or three summative evaluations, they could, if they wished, provide annual summative evaluations.

The choice of whom the Department Chair would request as Mentor Team members would be a mutual decision by the Department Chair and the Assistant Professor. Criteria for choosing a Mentor Team member would include, but not be limited to: 1) the research expertise of the potential mentor, 2) the research philosophy of the potential mentor, 3) the overlap and similarity of teaching topics between the assistant professor and the potential mentor, 4) teaching philosophy of the potential mentor, and 5) level of congeniality between the assistant professor and the potential mentor.

The principal courses reviewed by the Mentor Team would be all core courses taught by the Assistant Professor, and no less than one specialty course. In the interest of a comprehensive and balanced review of the assistant professor’s instruction, each tenured faculty (other than the Mentor Team) performing a summative evaluation would be assigned (by the Department Chair, with consultation of both the tenured professor and the Assistant Professor) a course lecture and lab to observe for at least one lecture and part of one lab (should the course have a lab). Generally, the tenured faculty will be asked to observe a course that has been taught by the Assistant Professor at least once before.

The tenured faculty would continue to use the summative evaluation form that is used for annual review of Assistant Professors (it should be similar to the college t & p evaluation form). The Mentor Team would provide a team-written summative evaluation report annually (typically in Winter Quarter) to the Department Chair, and the report would be available to all tenured faculty for review in the annually updated Assistant Professor’s dossier.
Curriculum Vitae of R. Anderson

Address
Department of Biology
Western Washington University
Bellingham, WA 98225-9160
Roger.Anderson@wwu.edu

Education
University of California, Riverside, CA. M.A., Biology, 1980.
University of California, Los Angeles, CA. Ph.D., Biology, 1986.


Positions
Current: Associate Professor and Chair, Biology Dept, Western Washington University, appointed 1999
Previous: Assistant Professor, Biology Dept, WWU, 1994-1999.
Assistant Professor, Biology Dept, Berry College, 1990-1994.
Temporary Assistant Research Ecologist, Univ. Georgia, 1987-90.
Teacher (high school biology and chemistry, 7th grade general science), Windward School, Los Angeles, 1985-1987.

Courses taught
1990-2003:
Introductory Biology I and II
Comparative Animal Physiology
Human Anatomy and Physiology
Behavioral Ecology
Ecological Methods
Ecology, Evolution, & Biodiversity
Introductory Animal Biology
Comparative Vertebrate Physiology
Human Physiology
Animal Behavior
Research in Reptile Ecology
Biodiversity
Physiological Ecology
Vertebrate Zoology
Freshman Seminar
Ecology

Professional Societies
American Society of Ichthyologists and Herpetologists
Herpetologists League
Society for Integrative and Comparative Biology
Ecological Society of America
Animal Behavior Society
Society for Conservation Biology
Society for the Study of Evolution
International Society for Behavioral Ecology
Ecological Society for the Study of Amphibians and Reptiles

Invited Seminars
2002: Anderson, R. A. Body Temperatures of Field-Active Lizards: Patterns and Consequences, delivered to faculty and students at University of Victoria.
1998: Anderson, R. A. On Integrating Organismal Theory; delivered to the Department of Biological Sciences at Ohio University, Athens, Ohio.

Grants Received
2000-2001: USDA Grants $8500, Correlates of habitat use in the leopard lizard, Gambelia wislizenii, with J. E. Steffen, Western Washington University
1996-1998: NSF-ARI Grant, $122,000, for: Acquisition of equipment for image analysis and 3-D reconstruction; with David Leaf, Western Washington University
1995-1997: NSF-DUE-ILI Grant # DUE-9552238, $64,558, for: Enhancement of animal physiology experiences for undergraduates; with David E. Schneider, Western Washington University.

Selected Publications

Research with Undergraduate Students:

1992-1997: Investigated effects of timber management practices on lizards in the Florida Sand Pine Scrub; a total of 28 students assisted in the summers of 1992-1997 (24 co-directed with H. Ticehurst; four undergraduates and one graduate student in 1997, all from WWU, were under my auspices only; one conducted a senior thesis.

1999-2002: Mentored a total of 48 undergraduate students, grouped in 3-4 person teams in performing two complementary three-week field research projects (6-8 separate projects each year), in the Great Basin Desert in Harney County, Oregon, as part of two six-week long summer courses.

1998-2003: Mentored 10 undergraduates in laboratory research in behavioral and physiological ecology; one manuscript is completed and has been submitted, and three other manuscripts are nearing completion.

Research Advisor for Master's Students

1995-96, Laura Murphy, Effects of temperature and moisture on embryonic development in *Chrysemys picta belli*, in central Washington
1995-98, Doug Reese, Field and Laboratory Investigations of habitat use by nearshore marine fish, with emphasis on young-of-the-year rockfish (Genus *Sebastes*)
1996-2000, Darcie Johnson, Colonization by the lizard *Sceloporus woodi* in a managed landscape
2000-2003, David Waltz, Microgeographic variation in desert rodent populations in the Great Basin Desert
2002-2004, Chris Fabry, Patterns of Colonization of Lizard Communities in the Managed Ecosystem of the Ocala National Forest, Florida.
2002-2004, Ellen Ward, Habitat-related morphology and locomotor performance in *Cnemidophorus tigris*.

Service on for College and University Committees and Professional Societies

- Member of University Task Force to Revise the General University Requirements, 2001-2003
- Member of Search Committee for Founding Dean of the College of Sciences and Technology, WWU 2003.
- Sole External Review-Consultant for the Biology Program at University of Hawaii, Hilo, fall 2002.
- External reviewer of a Ph.D. dissertation defense for the University of Victoria, spring 2002
- Chair of the Faculty Affairs Council for the College of Arts and Sciences for AY 2000-2001
- Member of WWU Head Librarian Search Committee, 2001
- Served as an On-site External Reviewer of the Biology Program at Southern Oregon State University, 1995
- Annually review 5-10 scientific papers for the journals published by the scientific professional societies in which I am a member.

Recent Activities as Chair of Biology

- Wrote the Biology Department Unit Plan in 2000, an 80-page document that describes the accomplishments and goals of the Biology Department.
- Orchestrated the first Biology Alumni, Biology Student, Biology Faculty meeting in fall 2000 - Sharing the Biology Experience.
- In 2002, completed writing the Biology Alumni Questionnaire, focused on outcomes of their education in Biology at WWU, to be submitted to Alumni in fall 2002.
- In 2001, wrote a Questionnaire for Graduating Seniors: The Advising and Learning Experience, devised to improve advising and student learning in Biology, data are compiled quarterly.
- Wrote the Teaching Assistant Handbook, a 40-page document, 1st Edition in 1999, revised annually
- In 2002, conducted two specific forms for evaluating probationary faculty, that the Department is now using:
  ✓ Peer Review of Course Content
  ✓ Peer Observation of Faculty Teaching Performance in Lecture, Lab, and Discussion
- Led the Biology Department through a thorough core curriculum review, 2001-2002.
- Leading the Biology Department through implementation of an entirely revised curriculum, in 2002-03, thus enabling undergraduates to perform credible scientific research one year earlier in their college career than prior to the revision
- Initiated and led the effort to complete and pass (2000-01) two interdisciplinary curriculum proposals through the Biology Department:
  ✓ Biology-Psychology Combined Major, B.A.(will be submitted to the Higher Education Coordinating Board in 2003)
  ✓ Applied Ecology and Conservation Biology M.S., with Environmental Science Dept in Huxley College (will be submitted to the Higher Education Coordinating Board in 2003).
- Successfully negotiated a 50% increase in the number of graduate teaching assistantships over the past two years.
- Led the effort to set up an Alumni Endowment for Student Research Fellowships.
- Led the creation of three departmental awards: Undergraduate and Graduate Research Accomplishment Awards, and Graduate Teaching Assistant’s Teaching Excellence Award.
- Successfully: led the Biology Department through tenure and promotion review for four assistant professors and two associate professors; helped negotiate professional leave for five faculty members in Biology, and negotiated a salary increase for a disgruntled assistant professor.
- Have overseen the candidate review and hiring of two assistant professors and 4 staff members.
- Insisted that “discouraged” faculty submit yet one more instrumentation proposal, this one to NSF for DNA sequencer to support research; they submitted and succeeded, at last, in 2002.
- Successfully argued for a new permanent Office Assistant position for the Biology Department, despite 12 departments being higher on the list of needs for such positions.
- Initiated and developed two successful proposals for two building renovations, several rooms on two floors; work completed in summers 2001 and 2002.
- Took the lead, among faculty at WWU, in arguing for a reconfiguration of the College of Arts and Sciences into two new Colleges; in fall 2002 the WWU President proposed such a configuration, and the Board of Trustees approved the proposal.
- Wrote the Biology Department Curriculum Assessment Plan, March 2003