Central Washington University  
Assessment of Student Learning  
Department and Program Report

Please enter the appropriate information concerning your student learning assessment activities for this year.

Academic Year of Report: 2009-10  
College: COTS  
Department: Biological Sciences  
Programs: B.S. Biology Teaching

1. What student learning outcomes were assessed this year, and why?

In answering this question, please identify the specific student learning outcomes you assessed this year, reasons for assessing these outcomes, with the outcomes written in clear, measurable terms, and note how the outcomes are linked to department, college and university mission and goals.

Our program annually assesses all Student Learning Outcomes (SLO) to provide a suitably detailed evaluation of student knowledge, skills, and disposition. Please refer to Appendix A for a detailed report of Biology Teaching SLO, criterion of mastery, and assessment results. Note that SLO #8 was added this year and assessment will begin in the 2009-10 academic year.

Two Biology Teaching majors or post-baccalaureate students completed their program in 2009-10. This year’s report reflects their performance. Please note that the 2008-2009 B.S. Biology Teaching Program Report Appendix A depicts a compilation of 2006-2009 data.

Student Learning Outcomes:

1. Demonstrate an ability to individually and collaboratively engage in inquiry and integrate the nature of science. (SCED goal 1, 3, 4; COTS Goal 1, 4, 6; CWU Goal 1, 6)
2. Explain and apply fundamental science content concepts, principles, and methods.
3. Demonstrate an ability to effectively facilitate learning for all students. (SCED Goal 1, 3, 5; COTS Goal 1, 4, 6; CWU Goal 1, 6)
4. Create safe, effective learning environments that support inquiry, collaboration, intellectual risk-taking, ethical decision-making, and student construction of knowledge. (SCED Goal 2, 3, 4; COTS Goal 1, 6; CWU Goal 1, 6)
5. Demonstrate an ability to assess teaching and learning outcomes using multiple methods, effectively evaluate teaching and learning effectiveness, and improve practice based on reflection and data. (SCED Goal 1, 2, 3, 4; COTS Goal 1, 6, 7; CWU Goal 1, 6)
6. Demonstrate an ability to make science personally and socially relevant to individual and community by incorporating current events within collaborative and social networks. (SCED Goal 2, 3, 4, 7, 8; COTS Goal 1, 6; CWU Goal 1, 6)
7. Participate in a variety of activities that enhance professional development and improve teaching effectiveness. (SCED Goal 1, 2, 4; COTS Goal 1, 5, 6; CWU Goal 4, 6)

8. Demonstrate open-mindedness and curiosity that leads to continuous improvement as a scientist and a teacher (SCED Goal 3, 4; COTS Goal 1, 2, 6; CWU Goal 1, 2, 6)

These SLO were chosen because they reflect the criteria necessary to become an effective biology teacher. The SLO were originally conceived through a consensus process of all Science Education faculty by examining commonalities in three sets of professional standards; National Science Education Standards for Teaching, National Science Teacher Association Standards, and the Washington Competencies for Biology. By using this approach, performance within the program also provides some measure of how well students are able to meet professional standards.

2. How were they assessed?

In answering these questions, please concisely describe the specific methods used in assessing student learning. Please also specify the population assessed, when the assessment took place, and the standard of mastery (criterion) against which you will compare your assessment results. If appropriate, please list survey or questionnaire response rate from total population.

A) What methods were used?

The Biology Teaching Program used a formative and summative assessment system comprised of several elements:

1) Performance-based, standards-aligned electronic portfolio
2) WEST-E and Major Field Test content examinations
3) Entry and exit surveys
4) Teacher candidate performance spreadsheet

Biology Teaching Portfolio

The Biology Teaching portfolio was used to assess student knowledge, skills, and dispositions relative to professional standards. The Biology Teaching Portfolio was built from a common template collaboratively designed and constructed by members of the Department of Science Education, with additional insight provided by content colleagues and K-12 teachers. The portfolio framework was based on the latest scientific research on how people learn (National Research Council, 2005), with assessment focused on: 1) determining student preconceptions, 2) engaging students in authentic scientific inquiry and helping them develop a scientific mental framework, 3) developing and applying robust content knowledge, and 4) promoting meta-cognitive awareness of teaching and learning process and critical thinking.

Each portfolio element, or dimension, required a reflection and was closely aligned to Biology Teaching SLO and professional standards. In an effort to promote critical thinking, students were required to supply evidence they deemed suitable rather than those prescribed by faculty. Students had to justify their choice of evidence and progress toward meeting professional standards in each reflection. Evidence and reflection portfolio scores are tracked separately to
identify problems with artifact quality or metacognitive awareness. The dimensions of the Biology Teaching portfolio (including content strands) are indicated below:

1) Inquiry and Nature of Science
2) Content
   a. Basic Biology
   b. General and Organic Chemistry
   c. Cell and Molecular Biology
   d. Microbiology
   e. Physiology
   f. Ecology
   g. Evolution
3) Teaching
4) Learning Environments
5) Assessment and Evaluation
6) Relevance
7) Professional Growth. The Content dimension is further subdivided into the major disciplinary themes in biological science, and included:

WEST-E and MFT Exams
Student content knowledge was assessed in Science Education (WEST-E) and Biology (MFT) disciplines. Minimum scores were required for both exams. Each student had to post total and component scores (e.g. Ecology; Molecular Biology) in the Content dimension of the Biology Teaching Portfolio. These scores were also tracked in a separate spreadsheet to identify areas of performance strength and necessary development.

Entry and Exit Surveys
An entry to program survey was used to assess student demographics, disposition toward science teaching, and program learning expectations. An exit survey was used to evaluate program effectiveness, changes in disposition, and met/unmet learning expectations. A reflection comparing entry and exit survey results was also required in the Biology Teaching portfolio.

Prior to being allowed to student teach, portfolios were evaluated by biology teaching faculty using a standards-aligned rubric. Students had to demonstrate minimum proficiency for each portfolio dimension. An advising hold that could be removed only by a biology teaching or another Science Education faculty member was used to ensure compliance.

Teacher Candidate Performance Spreadsheet
A comprehensive spreadsheet was developed to track individual candidate performance and identify performance trends across all candidates. A weighted calculation provides a composite candidate score and includes performance on all portfolio dimensions, entry/exit surveys, and content exams.

B) Who was assessed?
All eligible biology teaching majors, biology teaching certification and endorsement students. Students are assessed by the biology teaching advisors and the SCED 487 course instructor. Other SCED faculty may also be consulted to resolve score discrepancies. Sixteen students have been assessed to date, with results summarized in the 2008-2009 report. Two students were assessed for the 2009-2010 year.

C) When was it assessed?

Upper division coursework during the academic year, with final portfolio due prior to student teaching. Portfolio was periodically evaluated during advising, additional feedback was given during SCED487, and the final portfolio was reviewed by a teacher candidate’s academic advisor in the quarter prior to student teaching.

3. What was learned?

In answering this question, please report results in specific qualitative or quantitative terms, with the results linked to the outcomes you assessed, and compared to the standard of mastery (criterion) you noted above. Please also include a concise interpretation or analysis of the results.

Please refer to Appendix A for detailed assessment results. Several points of strength and areas for improvement emerged from assessment results, as follows:

- Generally, the assessment methods employed provided meaningful insight into Biology Teaching student knowledge, skills, and to a lesser extent dispositions.
- SLO were closely aligned to department, college, and university goals, and covered a range of basic and advanced knowledge and skills. Disposition SLO that were previously lacking have been added and assessment will begin in 2009-2010.
- Overall, Biology Teaching portfolio and performance spreadsheet results indicated 100% of candidates met competency requirements.
- The overall WEST-E pass rate for Biology Teaching students was 67%. One candidate had to take the test twice.
- Major Field Test results further showed that Biology Teaching students performed lowest in Molecular Biology and Genetics (48th rank). Otherwise performance in other MFT areas was satisfactory: Cell Biology (60th rank), Organismal Biology (54th rank), and Population Biology, Evolution, and Ecology (61st rank). Molecular Biology and Genetics continues to have the lowest percentile average.
- Portfolio reflection scores closely match evidence scores.
- Survey results and advising discussion indicated that students achieved the majority of their learning goals. Insufficient experience with assessment, evaluation, and classroom management were common criticisms. The relative absence of these and field teaching experiences, particularly in College of Education courses, was a consistent concern. Professional Education Program curriculum revisions are underway.

4. What will the department or program do as a result of that information?
In answering this question, please note specific changes to your program as they affect student learning, and as they are related to results from the assessment process. If no changes are planned, please describe why no changes are needed. In addition, how will the department report the results and changes to internal and external constituents (e.g., advisory groups, newsletters, forums, etc.).

Based on collected data, the following revisions to the Biology Teaching program are proposed:

**Improvements for Student Learning**

- Provide more opportunities for students to experience authentic inquiry in introductory science courses. If inquiry is important in K-12 schools (and it is), then more content courses should model investigative science and focus on inquiry, not less. This could be partly addressed if all secondary science teaching students took SCED 401 (Interdisciplinary Secondary Science Inquiry).
- Help students better learn how to assess and evaluate student learning for K-12 students. Students must have the ability to design, align, and employ effective methods of assessment as an integral part of K-12 accountability. Evidence indicates this is a deficit for many science education students, and they feel it should be emphasized more in College of Education courses. Regardless, greater emphasis on assessment can occur in science education methods courses.
- Embed use of current events and community involvement to a greater extent in content and science education courses. We would also like to add SCED 354 (Science, Society, and the Teaching Community) but it unclear whether than will be possible in light of program credit limits.
- Encourage submission of additional, high-quality evidence in some content areas. In some cases, students must draw from transferred courses, which sometimes provide less-than-ideal evidence.
- Embed diversity and safety to a greater extent in content and science education courses. Diversity is a biological and social principle, and cultivating it should help to broaden perspective and increase teaching effectiveness and employability. Safety is a legal requirement, and must be properly maintained in K-12 classrooms.
- Help students better connect evidence to developmental progress. Greater emphasis on developing metacognitive awareness will help students become better learners, which in turn should improve job performance as professional teachers. Improvement in this area will be important considering the increased emphasis on accountability in K-12 schools.

**Improvements in Assessment Process**

- Entry and exit survey data is more reliably collected now that both surveys have been rebuilt in Qualtrics; however this change makes it difficult for students to retrieve the data.
- Since the Biology, Chemistry, Earth Science, and Physics Teaching portfolios are based on a common template, it would be useful to compare across these programs to identify overall trends in science teacher preparation. A retooling whereby all secondary science teaching majors use a common teaching portfolio and develop a second for content area
performance may be a more useful and efficient strategy. Plans are underway to develop a pilot for next year.

- The LiveText software used to collect student data is disconnected from Blackboard, making it unnecessarily confusing for students and faculty. LiveText is limited in features, and exploration of new options is recommended.

5. **What did the department or program do in response to last year’s assessment information?**

*In answering this question, please describe any changes that have been made to improve student learning based on previous assessment results. Please also discuss any changes you have made to your assessment plan or assessment methods.*

Systematic implementation of assessment has been occurring in Biology Teaching (and Science Education generally) for several years, partly in response to NCATE accreditation requirements, which has prompted the following:

- Added a dispositional outcome for Biology Teaching candidates. Addition based on previous years feedback, recognition of the importance of a dispositional outcome during assessment retreat for Science Education departmental self study, and collaborative work with COTS chairs. The addition of this outcome also supports dispositional assessment through the CTL.
- Developed a dispositional survey with the COTS natural science department chairs. This survey will be used at entry and exit from all natural science programs, beginning Fall 2010.
- Developed an electronic rubric to track elementary, middle level, and secondary candidate performance during science teaching practica.
- Changes in the program portfolio rubric prompted a change in the assessment timeframe. Current results reflect SLO performance since 9-2008 when changes to portfolio rubrics were made.
- Based on ongoing data collection and feedback, we plan to revise the Biology Teaching Portfolio to include measures of candidate impacts on K-12 student learning.

6. **Questions or suggestions concerning Assessment of Student Learning at Central Washington University:**

The Departments of Biological Sciences and Science Education recommend the following changes to student learning assessment at CWU:

- Coordinate assessment and other academic and administrative reports to reduce time overhead. It should be possible to streamline assessment, reporting, and analysis of unit and faculty performance.
- Provide more opportunities for training and professional development for how to conduct assessment. Graduate training typically does not include assessment; therefore it is important to not assume faculty know why or how to conduct assessment. Many faculty may experience a steep learning curve.
• The due dates for the annual Assessment Plans should correspond more closely with annual departmental planning so that necessary changes have the greatest chance of being implemented.

• Provide necessary infrastructure for program assessment. This may include financial and intellectual resources including focused release time, collaboration, and dissemination of best practices across colleges and departments. Since it is unlikely that all faculty will adequately participate in assessment, focus on developing and supporting areas of excellence.

• Effective sharing of materials should minimize the reinvention of the wheel, as it were. Examples of rubrics (which will figure prominently in performance evaluations) should be shared as most faculty do not know what rubrics are, why they are useful, or how to make them.

• Each department should have an assessment coordinator with reasonable workload release. This person should coordinate efforts, not remove assessment responsibility from other faculty.

Appendix A – Biology Teaching Results Matrix

<table>
<thead>
<tr>
<th>Student Learning Outcome</th>
<th>Criterion of Mastery</th>
<th>Assessment Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Demonstrate an ability to individually and collaboratively engage in inquiry and integrate the nature of science.</td>
<td>100% average score of Proficient or better for portfolio dimension 1 and associated reflection.</td>
<td>Students assessed: 2</td>
</tr>
<tr>
<td></td>
<td>100% average score of Proficient or better for relevant aspects of SCED 324 portfolio.</td>
<td>Portfolio dimension 1 proficiency:</td>
</tr>
<tr>
<td></td>
<td>Passing of WEST-E Biology exam.</td>
<td>• Inquiry Artifact: 100%</td>
</tr>
<tr>
<td></td>
<td>MFT Biology exam scores consistent with national averages.</td>
<td>• Nature of Science Artifact: 100%</td>
</tr>
<tr>
<td></td>
<td>All standards met for WA Pedagogy Assessment.</td>
<td>• Independent Research Artifact: 100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Dimension 1 Reflection: 100%</td>
</tr>
<tr>
<td>2. Explain and apply fundamental science content concepts, principles, and methods.</td>
<td>100% average score of Proficient or better for portfolio dimension 1 and associated reflection.</td>
<td>Students assessed: 2</td>
</tr>
<tr>
<td></td>
<td>100% average score of Proficient or better for relevant aspects of SCED 324 portfolio.</td>
<td>Portfolio dimension 2 proficiency:</td>
</tr>
<tr>
<td></td>
<td>Passing of WEST-E Biology exam.</td>
<td>• Basic Biology Artifact: 100%</td>
</tr>
</tbody>
</table>
### Relevant Aspects of SCED 324 Portfolio
- General and Organic Chemistry Artifact: 100%
- Cell and Molecular Biology Artifact: 100%
- Microbiology Artifact: 100%
- Physiology Artifact: 100%
- Ecology Artifact: 100%
- Evolution Artifact: 100%
- Dimension 2 Reflection: 100%

### Passing of WEST-E Biology Exam
- MFT Biology exam scores consistent with national averages.

### All Standards Met for WA Pedagogy Assessment

<table>
<thead>
<tr>
<th>Artifact</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>General and Organic Chemistry</td>
<td>100%</td>
</tr>
<tr>
<td>Cell and Molecular Biology</td>
<td>100%</td>
</tr>
<tr>
<td>Microbiology</td>
<td>100%</td>
</tr>
<tr>
<td>Physiology</td>
<td>100%</td>
</tr>
<tr>
<td>Ecology</td>
<td>100%</td>
</tr>
<tr>
<td>Evolution</td>
<td>100%</td>
</tr>
<tr>
<td>Dimension 2 Reflection</td>
<td>100%</td>
</tr>
</tbody>
</table>

### MFT Scores: Exceeds National Percentile in All Areas
- Cell: 60
- Molecular/Genetics: 48
- Organismal: 54
- Population/Evolution: 61

### WEST-E Passing Scores: 67%

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#### 3. Demonstrate an Ability to Effectively Facilitate Learning for All Students.

100% average score of Proficient or better for portfolio dimension 1 and associated reflection.

- 100% average score of Proficient or better for relevant aspects of SCED 324 portfolio.

### Students Assessed: 2

**Portfolio Dimension 3 Proficiency:**
- SCED 324 Portfolio Artifact: 100%
- Other Teaching Experience Artifact: 100%
- Dimension 3 Reflection: 100%

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#### 4. Create Safe, Effective Learning Environments That Support Inquiry, Collaboration, Intellectual Risk-Taking, Ethical Decision-Making, and

100% average score of Proficient or better for portfolio dimension 1 and associated reflection.

- 100% average score of Proficient or better for relevant aspects of SCED 324 portfolio.

### Students Assessed: 2

**Portfolio Dimension 4 Proficiency:**
- Collaborative Learning
### 5. Demonstrate an ability to assess teaching and learning outcomes using multiple methods, effectively evaluate teaching and learning effectiveness, and improve practice based on reflection and data.

- Proficient or better for relevant aspects of SCED 324 portfolio.
- Passing of WEST-E Biology exam.
- MFT Biology exam scores consistent with national averages.
- All standards met for WA Pedagogy Assessment.
- 100% average score of Proficient or better for portfolio dimension 1 and associated reflection.
- 100% average score of Proficient or better for relevant aspects of SCED 324 portfolio.
- Passing of WEST-E Biology exam.
- MFT Biology exam scores consistent with national averages.
- All standards met for WA Pedagogy Assessment.
- 100% average score of Proficient or better for portfolio dimension 1 and associated reflection.

Students assessed: 2

- Portfolio dimension 5 proficiency:
  - Assessment of Student Learning Artifact: 100%
  - Self Assessment of Teaching Artifact: 100%
  - Dimension 5 Reflection: 100%

### 6. Demonstrate an ability to make science personally and socially relevant to individual and community by incorporating current events within collaborative and social networks.

- Proficient or better for relevant aspects of SCED 324 portfolio.
- Passing of WEST-E Biology exam.
- MFT Biology exam scores consistent with national averages.
- All standards met for WA Pedagogy Assessment.
- 100% average score of Proficient or better for portfolio dimension 1 and associated reflection.
- 100% average score of Proficient or better for relevant aspects of SCED 324 portfolio.
- Passing of WEST-E Biology exam.
- MFT Biology exam scores consistent with national averages.
- All standards met for WA Pedagogy Assessment.
- 100% average score of Proficient or better for portfolio dimension 1 and associated reflection.

Students assessed: 2

- Portfolio dimension 6 proficiency:
  - Incorporation of Current Events Artifact: 100%
  - Community Involvement Artifact: 100%
  - Dimension 6 Reflection: 100%
7. **Participate in a variety of activities that enhance professional development and improve teaching effectiveness.**

- 100% average score of Proficient or better for portfolio dimension 1 and associated reflection.
- 100% average score of Proficient or better for relevant aspects of SCED 324 portfolio.
- Passing of WEST-E Biology exam.
- MFT Biology exam scores consistent with national averages.
- All standards met for WA Pedagogy Assessment.

**Students assessed: 2**

**Portfolio dimension 7 proficiency:**

- Professional Membership Artifact: 100%
- Professional Growth Artifact: 50%
- Dimension 7 Reflection: 50%