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

In answering this question, please identify:

- the specific student learning outcomes that were assessed
- reasons for assessing the outcomes, with the outcomes written in clear, measurable terms
- which CWU Strategic Plan Outcome do the student learning outcomes relate to? See: [http://www.cwu.edu/strategic-planning/strategic-plan](http://www.cwu.edu/strategic-planning/strategic-plan). For example:

I will evaluate all six SLOs this year. We systematically review each SLO for each graduating senior or exiting dual degree student in PHYS 489, Senior Assessment. The specific student requirement for each SLO is listed below. These are shared with the students and can be found at [http://www.cwu.edu/physics/sites/cts.cwu.edu.physics/files/BS%20Physics%20portfolio%20cover%20sheet%202012.pdf](http://www.cwu.edu/physics/sites/cts.cwu.edu.physics/files/BS%20Physics%20portfolio%20cover%20sheet%202012.pdf).

**SLO 1: Content Knowledge** – demonstrate a comprehensive knowledge base of the major areas of physics and related disciplines. (CWU Outcome 1.1.1)

A. Apply the following concepts to analyze and interpret the physical behavior of systems of intermediate complexity: classical mechanics, modern physics, thermodynamics, optics, classical field theory, and quantum mechanics. Include evidence for applying one of the concepts from an upper-level class such as PHYS 317, 318, 331, 333, 342, 351, 352, 361, 363, 381, 382, 383, 474, 475 or equivalent.

B. Apply the following mathematical tools to analyze and interpret the physical behavior of systems of intermediate complexity: integral and differential calculus, vector mathematics, vector calculus, differential equations, approximation techniques, linear algebra and eigenvalues. Include evidence for applying one of the tools from an upper-level class such as MATH 272, 273, 265, 376 or equivalent math-intensive physics course.

**SLO 2: Technical Skills** – perform experimental and/or analytical techniques in solving physics and physics-related problems. (CWU Outcomes 1.1.1, 1.1.3, 3.1.1, 3.1.2)

A. Apply experimental or computational techniques in a guided inquiry project assigned in a class such as PHYS 331, 333, 361.

B. Recognize, understand, and apply the process of science in a faculty-mentored undergraduate research project such as PHYS 495 or similar.

**SLO 3: Intellectual Skills** – demonstrate critical thinking skills. (CWU Outcome 1.1.1)

Relate one or more of the physics concepts listed in Goal 1A to one of the following: a) current research in physics as published in a peer-reviewed journal, b) a math concept in Goal 1B, c) or to a field outside physics or math.
SLO 4: Communication Skills – demonstrate an ability to communicate effectively. (CWU Outcomes 1.1.1, 1.1.3, 3.1.1)

Communicate scientific ideas via a presentation to a broad audience such as at SOURCE or a similar venue

SLO 5: Civic Engagement – demonstrate responsible stewardship to the community. (CWU Outcomes 1.1.1, 1.1.3, 1.1.4)

Participate in a physics or astronomy outreach project with a department sponsored student club.

SLO 6: Life-long Learning – demonstrate an ability to learn new material independently from a variety of resources, to be used throughout their life. (CWU Outcome 1.1.1)

Effectively incorporate library and electronic information resources into either of the projects used for Goal 2.

2. How were the student learning outcomes assessed?
   A) What methods were used?

Concisely describe each specific method used in assessing student learning outcomes. For each assessment method specify:

• If that assessment method was direct (e.g. exams) or indirect (e.g. focus groups)
• If the assessment method assessed performance, knowledge, and/or attitudes
• The specific standard of mastery (criterion) against which you will compare your results.
  For example, “at least 85% of students pass the senior exit exam”

Each of these outcomes was assessed with an end-of-major portfolio that students submit in their capstone course, PHYS 489: Senior Assessment. Students submit artifacts and reflections for each SLO. Here is the portfolio assignment description from the PHYS 489 syllabus.

This is a brief review/compilation of what you have learned and done as a physics major at CWU. It will be up to you, in consultation with the instructor, to find an artifact that provides evidence that you have met each standard. Each artifact must be accompanied by a brief (approximately one or two paragraphs) reflection. This reflection should describe how the artifact addresses the major outcome, what you learned from the work that led to the artifact, and any corrections to the artifact. Common artifacts include tests, homework assignments, research reports, and evidence of presentations to children or the general public. If you are missing evidence of any of the major goals, the instructor will help you find artifacts or find activities that will lead to artifacts. The instructor will give you feedback on the first drafts of the artifacts and reflections you’ll submit throughout the quarter. Your final portfolio is due at the end of the quarter.

You may use the same artifact to meet more than one major outcome. For example, a report or poster about your undergraduate research project will likely address more than one major outcome. But, your reflection for each artifact should be different.

Thus, the assessment is direct and evaluates performance (quality of the artifact) and reflective ability. Students are judged to Exceed, Meet, or Fail each SLO. Here is the explanation of the criteria.

E – Exceeds standard means the artifact: 1) clearly addresses the outcome, 2) is exceptionally well presented, 3) has no errors or the errors have been corrected or reflected upon in a written reflection, and 4) provides overwhelming evidence that the student has met the outcome.
M – Meets standard means the artifact: 1) clearly addresses the outcome, 2) is well presented, 3) has no distracting errors, and 4) provides sufficient evidence that the student has met the outcome. 
F – Fails standard means the artifact: 1) does not address the outcome OR 1) is not well presented and 2) has numerous errors.

B) Who was assessed?

- The population assessed
- The number of students assessed (e.g., 53)
- Survey or questionnaire response rate (if appropriate)

All students in PHYS 489 were assessed. This includes all seniors graduating within the following three quarters and all dual degree students in their final quarter at CWU. This year, there were 14 students assessed.

C) When was it assessed?

- When did the assessment take place (was it at the end of the degree, as students entered the program or during a specific term?)

Spring 2015. This includes all seniors graduating within the following three quarters and all dual degree students in their final quarter at CWU.

3. What was learned?

- Were the standards of mastery met?
- Report results in specific qualitative or quantitative terms, with the results linked to the student learning outcomes you assessed, and compared to the standard of mastery (criterion) you noted above
- Include a concise interpretation or analysis of the results

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<th>(n=14)</th>
<th>Exceeds standard</th>
<th>Meets standard</th>
<th>Fails standard</th>
<th>Not included*</th>
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Overall interpretation of the results. A different faculty member taught PHYS 489 spring 2015. The overall portfolio grades are about 10% lower this year than the previous year. This may be due to a diminished quality in the portfolios, more rigorous grading of the portfolio, or less guidance of portfolio creation during the quarter. We will be reviewing the portfolio template and portfolio evaluation winter and spring, 2016.
SLO 1: Four of the six students who failed to meet this standard failed the applied math component. We will be reviewing the portfolio template winter and spring, 2016. This review will included discussing how much more guidance we should give students in selecting artifacts. The most common mistake is to select a math artifact that does not relate to physics.

SLO 2: Low scores here came from students not including an acceptable artifact. The department will discuss making the artifact request more specific. The four students not included will be completing their artifact at the engineering school they are transferring to.

SLO 3 requires students to synthesize ideas from two different content areas or from a research journal. Some of the assignments in their senior lab coursework address this either explicitly or implicitly in an assignment. But not all students chose to focus on the synthesis aspect of these assignments while they are in PHYS 331 or 333, for example. We will discuss adding this component to an assignment or rubric in PHYS 331 or 333.

SLO 4: We give students the most specific artifact request here: use your SOURCE presentation. And this SLO has the lowest failure/omission rate. This is evidence that giving students specific requests, at least, results in higher portfolio scores.

Students were the most successful on SLO 5, Civic Engagement. This is the most straightforward SLO to complete. We have a guided reflection form available online.

SLO 6 is not explicitly taught in our curriculum. The use of library and information resources is typically taught by research mentors on an “as needed” basis while students are working on their projects. We will discuss adding this component to an assignment or rubric in a course.

4. What will the department or program do as a result of that information?

- 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 has/will the department report the results and changes to internal and/or external constituents (e.g., advisory groups, newsletters, forums, etc.)

This is what I wrote in last year’s very late report:

We will add specific teaching about use of library or electronic information resources into at least one required course with PHYS 333 being the best candidate. It is a required course for all students, most students chose a report from that course as an artifact, and it includes assignments that require effective use of library and computer information resources. We will report the results in a future year Assessment Report.

5. What did the department or program do in response to previous years’ assessment results, and what was the effect of those changes?
• Describe any changes that have been made to improve student learning based on previous assessment results
• Were those changes effective?
• Discuss any changes to your assessment plan or assessment methods

We planned on adding specific instruction and assessment of SLO 6. But the course has not been taught since we submitted that late report. It is being offered spring 2016 so we will act on the assessment result then.

6. Questions or suggestions? Contact Tom Henderson (henderst@cwu.edu) or Bret Smith (bpsmith@cwu.edu)