**Assessment Committee Feedback for the Physics Department Assessment Report**

**Fall 2011**

**Department Liaison and Primary Reader:** Kevin M. Metz

**Secondary Readers:** Scott Hendrix, Bob Moss

**Summary of Physics’ Assessment Plan**

The Physics Department has a student outcome-driven mission that seeks to provide intellectually rich and challenging learning experiences for *all* of their students. This is a seemingly challenging mission given that Physics offers programs of study for traditional physics majors, secondary education students, and pre-engineering students; as well as cognate coursework for students in other science discipline, pre-health students and non-majors.

The 2009 assessment plan submitted by Physics was heavily criticized for being unclear in transitions between identifying learning goals and correlating these goals to specific courses and assessment instruments. It was also deemed overly ambitious and borderline non-manageable.

In 2010 the Physics Department restructured their assessment plan, creating a short list of learning goals that transcends all of their sub-programs. We thank you for your hard work on creating this updated assessment plan! You clearly acted on the recommendations of the committee and created a streamlined assessment plan that provides you with rich and meaningful data. Furthermore, your updated plan has clear correlations between learning objectives, specific coursework, and assessment instruments. We commend your efforts!

Overall, it appears that Physics has a sound assessment plan (April 2010) in place and that they have created an assessment feedback loop in which the faculty collectively make departmental level decisions based on the available assessment data. This has been most recently highlighted by their departmental retreat (May 2011) where the department discussed all aspect of their curriculum, including recruiting, content, and pedagogy, with respect to the available assessment and survey data.

Currently, Physics seeks the following learning goals for *all* areas of study within their department:

1. Students in our program will develop proficiency in the theory and practice of physics as appropriate to their major, minor or program of study.

2. This proficiency will prepare students well for further education or careers as physicists, educators, or any other relevant life’s work.

With the desired outcomes:

**I.** Physics graduates will have knowledge required to participate in advanced studies in Physics or related areas.

**II.** Physics graduates will have the skills necessary to participate in advanced experimental research in Physics or related areas.

**III.** Physics graduates will be able to clearly articulate theoretical and experimental concepts in oral and written presentations.

The Department uses the following instruments to assess their learning objectives:

**I.** The department’s approach to curricular assessment thus far has been to use the nationally recognized Force Concepts Inventory (FCI) and the Conceptual Survey of Electricity and Magnetism (CSEM) to measure student learning in the introductory Physics courses, and a locally-developed conceptual assessment test for introductory astronomy. Physics graduates will receive scores on the Major Field Test which are consistent with national norms. Admission to graduate and professional schools will be used as an indirect indicator of student preparation for advanced work, as will alumni surveys.

**II.** Physics graduates will have satisfactory performance on a skills test that is administered in Phys 350, *Advanced Laboratory,* and those who participate in advanced independent research experiences will have, or will develop, the skills necessary to participate in those experiences. Also, external evaluation of student preparation for off-campus research experiences will be considered when available. Admission to graduate and professional schools will be used as an indirect indicator of student preparation for advanced work, as will alumni surveys.

**III.** Physics graduates will demonstrate proficiency in writing technical reports, in critically interpreting scientific literature and in delivering a technical oral presentation on primary or secondary scientific investigations.

**Outcomes of Assessment**

*Major Field Test (MFT)*

The MFT provides meaningful data indicating students’ content knowledge in several sub-disciplines in physics. Results from the MFT have been collected and analyzed since 2005. These results show that Albion students perform at or above national norms in several areas of physics. The areas that the MFT indicates as weaknesses for AC students are being addressed by the Physics Department.

*FCI and CSEM Tests*

These instruments have been used as pre- and post-tests in introductory courses. Their results provide direct feedback on changes in student content knowledge gained during the course. While classes are showing gains through their performance on the pre- and post-tests, these gains are not as significant as other colleges report. However, given the differences between Albion and other reporting schools, it is not clear to me that direct comparisons are warranted. The only concern expressed by the Physics Department is how serious the students consider the exams given that there is no course credit offered.

*Astronomy Assessment*

An in-house assessment instrument has been develop and given as a pre- and post-test in PHYS 105 to assess student learning in the course. Data has been collected since 2006 and has shown consistent increases in students’ content knowledge.

*Alumni Survey*

The Physics Department received significant feedback from several alumni, who provide very positive responses with respect to their experiences at Albion. The most common recommendation from alumni is to offer more research experiences for students.

*Tracking of Alumni*

Your efforts to track alumni who entered graduate school and those who sought employment is noted and appreciated. Such data provides indirect validation of the department’s ability to prepare students for their life’s work. While this might not provide meaningful data that can be used to identify and correct weaknesses, these data do indicate that students are deemed sufficiently prepared for advanced studies at some of the top universities in the world.

**Recommendations**

Again, it is clear that you have put considerable effort into your assessment efforts and we thank you for this!

You have self-identified areas that need consideration, e.g., student effort on FCI and CSEM tests given that no course credit is given for their test performance. These are difficulties that many departments and programs are considering and at the moment, there is no clear best practice.

Missing from your assessment update is any direct data collected using assessment instruments II and III. Your program review survey (April 2010) indicated that data would be collected through PHYS 350, offered for the first time in spring 2010. Following a discussing with Dave Seely (9.21.2011) it became clear that the data were collected, but not reported due to the small sample size (n=3). It is my understanding that Physics will collect this data again during spring 2012 and compile the results from the two semesters. We look forward to seeing these data.

Also missing from your assessment plan is assessment of any kind of assessment in the middle of your program of study. The most effective assessment plans make strategic use of both direct and indirect measures, and collect data at the beginning, during the program of study, and at the end. This gives a richer sense of where and when your work contributes strongly to learning goals and where improvements might be made. You have excellent assessment plans at the beginning (FCI, CSEM, Astronomy, etc.) and a solid benchmark for the end (MFT), but have several semesters that are critical to student preparation that are not assessed.

Following the meeting with Dave Seely (9.21.2011), I understand that Physics is in the peculiar situation of not having national standardized exams that cover content knowledge and/or skills of physics students at intermediate levels. This leads to the inability to collect data that can be compared to national norms. Nonetheless, it is still recommended that Physics finds some way to assess the abilities of their students in the 200 level courses.

*This being said, I wish to reiterate that strong assessment plans are also manageable and sustainable!* Thus the decision to add assessment instruments must be carefully considered.

The following recommendations are meant as conversation starters for departmental discussions on improving you assessment plan, many of which were discussed directly during the 9.21.2011 meeting.

1. Given the lack of national standardized exams, consider developing an in house exam that can be administered to your majors in the middle of their course of studies. This exam can, and should, draw upon earlier content knowledge. Following conversations with Dave Seely and Aaron Miller, it seems that PHYS 250 might be an appropriate course to place such an exam. If this exam was used annually, and the questions were linked to key learning objective from your curriculum, you would have the ability to track data specific to your earlier course work that would allow for changes in your curriculum to be discussed by your department.

2. At the moment you have no identified plans to differentiate the different fields of studies (majors, minors, pre-engineering). While I am not convinced that this is necessary, and you have received push-back in earlier feedback for have overly ambition assessment plans, an assessment instrument in the middle of your curriculum would also allow for comparison between majors, minors, and pre-engineers. Again, following the conversations on 9.21.2011, you may need to institute two exams as discussed above, one in PHYS 250, which would distinguish majors and minors; and, one in PHYS 244, which would differentiate pre-engineers and major (and minors?).

3. One final area to consider for improvement is to develop a method that will allow you to compare your majors at the end of your second year with your graduating majors. This can be easily corrected if you adopt a test as described above. You could simply give the same test to your graduating majors in addition to the MFT. This would allow you to compare your students, and program, to national norms using the MFT, while also allowing for direct comparison for student improvement between years 2 and 4.