

2016-17 Department Student Success Plan Assessment Report

Department of Chemistry and Physics

Please answer the following questions in two pages and submit to your Dean by October 2. Your Dean will offer you feedback by Oct. 16 and advance final version¹ to Academic Affairs by October 20. This report will inform your 2017-18 Student Success Plan update that will be due to your Dean by Nov. 3. Previous report and plans can be found at this website: <http://irt2.indstate.edu/cms7/sp16/index.cfm/department-plans/>.

Person Primarily Responsible for Preparing this Report: Eric Glendening

1. Specific accomplishments/achievements this past year (*briefly explain using bullet points, noting any changed/adapted*):

- The Department developed and now offers B.A. degrees in Chemistry and Physics. The B.A. in Physics requires 43 hours (whereas the B.S. requires 65 hours), and the B.A. in Chemistry requires 52 hours (compared to 69 hours for the B.S.). The B.A. degrees can be completed rather straightforwardly in six semesters. The B.A. degrees are generally sufficient for students who want to teach in middle or high schools, who seek careers in the medical or health sciences, or want to combine an interest chemistry or physics with another interest (like business, communication, criminology, law, etc.). The B.A. also allows students to pursue dual majors in the STEM disciplines, such as chemistry and biology, chemistry and geology, physics and math, or physics and technology.
- The Department continues to offer a preparatory course in chemistry (CHEM 101) for students who need to complete the science majors-level general chemistry (CHEM 105/106) sequence but lack the appropriate background to succeed. CHEM 101 has been available to students every semester since Fall 2014. A preliminary analysis of student outcomes shows that of the 45 students who enrolled in CHEM 101 during the 2014-15 and 2015-16 academic years, only 17 (38%) continued on to CHEM 105, and 6 (13%) successfully completed CHEM 106. Four (9%) of the CHEM 101 students eventually completed the sophomore-level organic chemistry sequence (CHEM 351/352). Student success in CHEM 101 is not as strong as the chemistry faculty might have anticipated, and has required a significant commitment of staffing resources. Whether the Department will continue to offer CHEM 101 remains an open question. The faculty will review student success in CHEM 101 again at the conclusion of this academic year, when data from an additional academic year are available.
- The Department now offers workshops for all sections of PHYS 105 (General Physics I). Students are required to attend these extra 75-minute group-learning sessions. Workshops are designed to strengthen problem-solving skills and build peer relationships that enhance the likelihood of success in physics courses. The Department has supported workshops for the past decade in CHEM 105/106, and we are interested in adding workshops to PHYS 106 but don't have the teaching capacity to do so at this time.
- The Department organizes and funds the Science Help Center that provides free, drop-in tutoring services for students in biology, chemistry, and physics. Tutoring in the Center typically serves 100-120 chemistry and physics students each week.
- The Department offers 50-60 positions every semester for undergraduate student employment, including opportunities as teaching assistants in chemistry labs, laboratory assistants in chemistry and physics labs, stockroom attendants, and Science Help Center tutors. The Department spent over \$60K in student wages during AY 2016-17 compensating students for their work in these positions. Training and assessment programs have been implemented for all teaching assistants, laboratory assistants, and tutors.

¹ Dean will request a refinement to the report if it is not suitably addressing the questions. Report will be shared with Trustees.

- The Chemistry and Physics faculty provided opportunities for 19 students to participate in this past summer's Summer Undergraduate Research Experiences (SURE) program. The students worked with the faculty in our research laboratories for 20-40 hours per week for ten weeks. All students presented their research at the SURE Research Symposium in late July and at the Fall Exposium in September. Roughly half will present their research at professional meetings during AY 2017-18.
- Sections of CHEM 100/L and PHYS 105/L were offered online for the first time in Spring 2017. Despite being offered for the first time, the online PHYS 105 and 105L courses were exemplary. CHEM 100 and 100L still need additional attention.
- Free, open-source textbooks are now used in sophomore-level organic chemistry (CHEM 351/352) and in nonmajors-level general physics (PHYS 105/106).

2. Objective/Actions Not Achieved (*briefly explain using bullet points*):

- Although the CHEM 105/106 instructors considered adopting an open-source textbook for 2017-18, they eventually decided not to. An open-source text with the Sapling Learning electronic homework system would cost students about \$80 for the academic year. When it became evident to publishers that we were considering moving to open-source, Cengage offered to bundle the Zumdahl loose-leaf textbook (the text that we had been using) with the OWL electronic homework system to be offered direct from Cengage for \$95 for the year. Zumdahl is a better text than the open-source text (OpenStax), and the instructors elected to stay with Zumdahl/OWL. Unfortunately, the bookstore still sells Zumdahl/OWL to students for about \$180 for the year.
- The Department has yet to consider fast-fail or gatekeeping mechanisms that redirect students before it becomes essentially impossible for the student to successfully complete the major.
- The physics program has yet to consider whether the prerequisites for PHYS 106 and 116 (the second semester courses of the General Physics, PHYS 105/106, and University Physics, PHYS 115/116 sequences) are appropriate. Students who perform poorly in PHYS 105 or 115 may pass the course but not have sufficient knowledge of physics principles or adequate problem-solving skills to succeed in PHYS 106 or 116. It is likely the case that a grade of C or higher will be required in the first-semester course to continue on to the second semester, as is done in some chemistry and mathematics courses. The physics faculty have yet to examine historical grade data to determine whether such a prerequisite is appropriate.

3. Attention areas going forward as informed by 2016-17 retention, completion, course completion ratio, credit hour productivity, and D/F/drop rate data provided as well as other Blue Report or departmental data (*briefly explain using bullet points*).

- It is evident in introductory physics courses (particularly in PHYS 105) that math placement scores (from the Maple TA exam) are not particularly reliable indicators of adequate math preparation for physics. It appears that some students receive assistance (e.g. from a friend, sibling, parent, etc.) when completing this un-proctored exam so that their MTA score is artificially elevated and does not accurately reflect math competency. Students probably realize that a higher MTA score may help them avoid taking remedial math courses that take time and money; so, the students seek assistance while completing the exam. What they do not realize is that an inflated MTA score may well place the students into a course for which they are not adequately prepared and are bound to fail. Apparently the math faculty are working on a new placement exam, and the physics faculty need to learn more about this.