

# 2015-16 End-of-Year Report Academic Department Success Plan



**Department:** Chemistry and Physics

**Department Chair:** Eric Glendening

**Person Primarily Responsible for Preparing this Report:**  
Eric Glendening

Please answer the following questions in two or three pages and submit to your Dean by October 3. Your Dean will review and advance to Academic Affairs by October 10<sup>1</sup> and will offer you feedback by Oct. 17. This report will help inform your 2016-2019 Student Success Plan update that will be due to your Dean by Nov. 4.

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

### *Retention Action Steps*

- The Department offers 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. As many as 30-40% of CHEM 105 students are unable to achieve a score of 50% or higher on their first CHEM 105 exam. Data reveal that only 10% of these students will successfully transition into CHEM 106. We should more aggressively encourage these at-risk students to begin their study of chemistry in CHEM 101, not 105.
- The Department offers workshops in CHEM 105/106 and, in Spring 2016, piloted workshops in PHYS 105. Students are required to attend these extra 75-minute group-learning sessions. Workshops are designed to strengthen problem-solving skills and build peer-peer relationships that enhance the likelihood of success in chemistry and physics courses.
- The Department organizes and funds the Science Help Center that provides free, drop-in tutoring services for students in biology, chemistry, and physics. Tutoring is usually available for chemistry and physics from 10:00-5:00 MTWR and 10:00-1:00 F.
- The Department provides space for our student groups, including the American Chemical Society Student Members (Science 20), the Society of Physics Students (Science 111), and the Pre-Med Association (Science 6). Rooms 20 and 111 were cleaned and painted in Summer 2016 with the help of our Summer Undergraduate Research Experiences (SURE) students.
- 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, supplemental instructors (the Department funds several of these), and Science Help Center tutors. The Department spent over \$50K in student wages during AY 2015-16 compensating students for their work. Training and assessment programs have been implemented for all teaching assistants, laboratory assistants, and tutors. Supplemental instructors are trained and assessed by the Center for Student Success.

### *Persistence to Completion Action Steps*

- The Chemistry and Physics faculty provided opportunities for 17 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

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<sup>1</sup> Note that the Dean will request a refinement to the report if it is not suitably addressing the questions.

presented their research at the SURE Research Symposium in late July and at the Fall Exposition in September. Many will present their research at professional meetings during AY 2016-17.

- All 100-level chemistry and physics courses (with the exception of PHYS 101, 115, and 116) are offered every semester, and many of these courses are offered in the summer as well.
- Sections of CHEM 100/L and PHYS 105/L will be offered online for the first time in Spring 2017.
- Free, open-source textbooks are now used for CHEM 351/352 and PHYS 105/106.

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

- All retention action steps have been completed or are on-going. Some work remains with regard to the persistence to completion action steps, including the following.
- The chemistry faculty has yet to consider the use of open-source textbooks for CHEM 105/106.
- 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.
- Formal degree audits for majors who have completed 60 and 90 hours have not been implemented. However, each advisor only works with 20-25 students, and each was selected because he/she reveals an attention to detail and an ability of effectively communicate with students that make him/her an effective advisor. All advisors focus particular attention on ensuring that majors have the opportunity to complete their degrees within four years, and all communicate with students when potential problems arise.
- The Department has encouraged faculty to begin attending chemistry and physics teaching conferences. Five faculty members have indicated an interest in doing so this year.

## **3. Looking ahead, briefly describe changes, additions, or subtractions that need to be made to your goals and/or action steps, including with respect to their linkage to student learning outcomes.**

The Department is currently undergoing a comprehensive review of its programs [see (5) below], which will include the assessment of its student success plans and student learning outcomes. Representatives of the faculty may also participate in Spring 2017 in a Council on Undergraduate Research (CUR) institute focusing on the integration of undergraduate research and curriculum. Although it is too early to detail the outcomes of these efforts there are several initiatives that the Department will likely pursue.

1. Too many students enter our general chemistry (CHEM 105) and physics (PHYS 105/115) courses with insufficient preparation to be successful. It is not that they aren't motivated to succeed – they simply have not yet developed rudimentary problem-solving skills and fundamental knowledge of science that are required to succeed at the college level. Students generally gain these skills in high school-level mathematics, chemistry, and physics courses. Many students arrive at ISU with satisfactory high school math preparation but with little or no significant experience with chemistry or physics. These students are seriously disadvantaged in our general chemistry and physics courses. Although our courses cover the fundamentals of the disciplines, the courses are sufficiently fast-paced that many students cannot keep up and fairly quickly lose traction in class. In chemistry, these at-risk students are encouraged to switch from CHEM 105 to CHEM 101 (our preparatory chemistry course), but few students pursue this option and most either drop or fail the course. We should be more aggressive at ensuring that poorly prepared students complete a preparatory course in the discipline before attempting CHEM 105 or PHYS 105/115. We may recommend that a year of high school chemistry or prior completion of an ISU chemistry course serve as the prerequisite for CHEM 105. We may recommend something similar for PHYS 105/115.

2. We have also discussed (although not fully yet) offering B.A. degrees in our disciplines. We currently offer B.S. degrees only, and these require at least 69 hours for the chemistry major and 65 hours for the physics major. The B.A. degrees would likely only require 43 hours for physics and about

55 hours for chemistry. Whereas the B.S. degrees best serve students who seek admission to graduate school or want to work in industry as chemists or physicists (about half of our students), the B.A. would probably be 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. may also allow students to pursue dual majors in the STEM disciplines, such as chemistry and biology, chemistry and geology, physics and math, or physics and technology.

**4. Do you see opportunity for this project to work more closely with another department, college, or unit such that greater impact might be possible (*briefly explain*)?**

Establishing an engineering program in the College of Technology will most likely allow us to eliminate a low enrolled course (PHYS 309 – Statics) that serves our engineering physics concentration. Physics students would instead take their statics course in the COT. In addition, the influx of engineering students into our calculus-based physics courses (PHYS 115/116) may eventually allow us to begin offering these courses every semester rather than fall (PHYS 115) and spring (116) only.

**5. Is there anything else about your initiative you feel important to detail?**

The Department underwent external review in AY 2015-16. Reviewers were very complimentary of our chemistry and physics programs but offered several suggestions for growth and improvement. The faculty is currently reviewing our programs through a series of discussions guided by a self-study model promoted by the American Association of Physics Teachers. The physics faculty started these discussions in June, and the chemistry faculty started in September. We are not in a position yet to detail what changes we will make or direction we will pursue in the future but should have recommendations by Spring 2017.