

**PRAC Report: Assessment of Student Learning
IUPUI School of Science
2015-2016 Report**

Overview: The School of Science at IUPUI provides outstanding science education for all IUPUI students, education in depth for students in our School, and engages in fundamental and applied research in the physical, biological, mathematical, and psychological sciences to increase knowledge and advance the development of the life sciences at IUPUI and in the State of Indiana. Within the seven academic departments (Biology, Chemistry & Chemical Biology, Computer & Information Science, Earth Sciences, Mathematical Sciences, Physics, and Psychology) and the Forensic and Investigative Sciences and Neuroscience Programs, there are over 160 full-time faculty members. The School is the academic home of ~2,300 undergraduate majors and ~450 graduate students.

Part I: Student Learning Outcomes for Each Academic Program

The School of Science has been utilizing Student Learning Outcomes developed during the 2010-2011 academic year. A comprehensive list of SLOs for both undergraduate and graduate education and degree programs can be found in the IUPUI Bulletin.

Undergraduate SLOs (B.A. and B.S.)	Graduate SLOs (M.S. and Ph.D.)
<ul style="list-style-type: none"> • Biology • Chemistry • Computer and Information Science • Environmental Sciences • Forensic and Investigative Sciences • Geology • Interdisciplinary Studies • Mathematics • Physics • Psychology • Neuroscience 	<ul style="list-style-type: none"> • Addictions Neuroscience* • Biology • Chemistry • Clinical Psychology • Computer and Information Science • Geology • Industrial Organizational Psychology • Mathematics • Physics <p style="text-align: right; margin-top: 10px;">*Previously named Psychobiology of Addictions</p>

How is the School of Science assessing Student Learning Outcomes and Student Learning?

The main focus of this 2014-2015 School of Science’s annual report is on the efforts undertaken in the last year to refine, measure, and improve the attainment of the student learning outcomes for our programs. The following data and information provides evidence that we are assessing our programs, that we are addressing the IUPUI Principles of Undergraduate Learning and Principles of Graduate Learning, that we have deliberate and ongoing processes in place for performing these assessments of student learning, and that we are using the results to guide improvements in our programs.

Part II: Outline of Recent Assessment Activities and Accomplishments in Recruitment

This year's report will next highlight a number of ongoing and new initiatives in the School of Science that assess student learning outcomes and student success. While this is not a comprehensive list, it details many of our major initiatives in the School of Science.

The current report (2015-2016) will discuss new initiatives as well as provide updates based on evidence to support continuous improvement in student recruitment, instruction, curriculum, assessing student learning outcomes, and increased efforts in student support and Science Career Development Services.

Student Recruitment Activities

Student Recruitment is a critical process to ensure that we continue to increase the number of students enrolled in our school and increase the quality and diversity of our undergraduate students. The marketing and recruitment team within the school of science has had a positive impact on our enrollment over the last several years.

Activities

- Held 30 on campus events and 4 webinars for high school students
- Facilitated 47 individual student visits
- Made 322 targeted call campaigns
- Responded to 55 admitted student emails

Outcomes

- Increase in dual admits by 77 students (21% increase)
- Increased Hispanic/Latino enrollment by 15 (167% increase)
- Increased black/African American enrollment by 12 (80% increase)
- Increase number of students with SAT scores by 39 (45 % increase)
- Increased number students who are top 10% in their HS class by 19 (19% increase)
- Increased number of students with GPA ≥ 3.5 by 56 (22% increase)

Part III: Evidence of Continuous Assessment related to Student Learning Outcomes: Research on Course and Curriculum Development or Redesign

1. Chemistry

In the fall 2014, the Chemistry Department at IUPUI stopped using a paper and pencil Chemistry placement exam for determining placement into Chemistry C101 or C105 and used only the self-proctored math placement test (ALEKS). A full year of a high school chemistry course was still kept as a prerequisite for Chemistry C105. This led to a shift in enrollment away from the prep

course, C101, and caused a significant increase in enrollment in C105. It also resulted in a continued lowering of the exam averages over this two-year time span. A few weeks into the spring 2016 term faculty in C105 questioned students as to their feelings of preparedness for C105 course and discovered that about 50% of the students reported that they felt either their high school chemistry course had not prepared them for C105 or that they had not had a high school chemistry course at all. At the end of the Spring 2016 semester, DFW percentages in C105 were higher than they had been in more than 10 years.

Based on this outcome, the Chemistry Department decided to implement an online Chemistry placement exam required for the Fall 2016 semester. This has resulted in a significant change in course enrollments and a significant increase in student success on the first exam. The enrollments in C101 and C105 have normalized to previous levels and students are seeing much more success as evidenced by a 10-point increase in the average on the first exam. This student success has to be due to an appropriate placement in the chemistry course that suits their preparation as there has been no other change to the course.

2. Psychology – Student Learning Outcomes Project:

In 2015, the psychology department began the process of curricular assessment by revising the student learning outcomes (SLOs) for the B.A. and B.S. degrees in Psychology. See Table below. Now that this first phase has been completed, Dr. Lisa Contino is meeting with groups of faculty who teach courses required for the major, in order to develop SLOs for each course. Over the last 6 months, SLO's have been developed for the following courses: B110-Introduction to Psychology; B305-Statistics; B311-Research Methods; B310-Lifespan Development; B320-Behavioral Neuroscience; B370-Social Psychology; B454-Service Learning Capstone. This semester, Dr. Contino is working with faculty of the following courses to develop SLOs: B203-Ethics and Diversity; B303-Career Development; B340-Cognitive Psychology; all capstones. By the end of this semester, all required courses will have relevant, assessable, agreed-upon learning outcomes.

The next and ongoing part of this process is for faculty to develop assessment indicators (e.g., signature assignments), particularly in multi-section courses. Currently, B110 is part of university-wide assessment efforts for general education courses. Beginning in the spring of 2016, one or more courses in Psychology will be assessed in terms of how well students are attaining stated learning outcomes. This will be accomplished via a variety of sources using both internal and external review of student performance on course assignments and the course as a whole.

IUPUI Department of Psychology Students Learning Outcomes for the Undergraduate Major in Psychology

Goal 1: Knowledge Base in Psychology

Student Learning Outcomes

- 1.1 Describe key concepts, principles, and overarching themes in psychology

- 1.2 Demonstrate working knowledge of psychology's content domains (biological, developmental, cognitive, social)
- 1.3 Describe how concepts, principles, and themes in psychology are applied to individual, social, and organizational issues

Goal 2: Scientific Inquiry

Student Learning Outcomes

- 2.1 Use scientific reasoning to interpret psychological phenomena
- 2.2 Demonstrate psychology information literacy
- 2.3 Interpret, design, and conduct basic psychological research

Goal 3: Critical Thinking

Student Learning Outcomes

- 3.1 Generate essential questions to solve problems
- 3.2 Gather and assess relevant information to come to well-reasoned conclusions
- 3.3 Recognize and assess assumptions and biases of self and others

Goal 4: Ethical and Social Responsibility in a Diverse World

Student Learning Outcomes

- 4.1 Apply ethical standards to evaluate psychological science and practice
- 4.2 Build and enhance interpersonal relationships
- 4.3 Exhibit respect for members of diverse groups

Goal 5: Communication

Student Learning Outcomes

- 5.1 Demonstrate effective writing for different purposes
- 5.2 Exhibit effective presentation skills for different purposes
- 5.3 Demonstrate professionalism in formal and informal communication with others

Goal 6: Career Development

Student Learning Outcomes

- 6.1 Apply psychological content and skills to career goals
- 6.2 Exhibit self-efficacy and self-regulation
- 6.3 Develop meaningful professional direction for life after graduation

3. Assessment of Introductory Psychology B110. Historically, Introductory to Psychology was taught in a two course sequence focused on the social aspects of behavior and the biological aspects of behavior (B104 and B105 respectively). Around 2007, the DFW rates for this course were close to 50% (47% for B104; 32% for B105). At this point the department made considerable efforts through course modifications to better engage students and the rates improved (dropped) to 27% by AY 12 for B104 and 23% for B105.

In 2012, Drs. Contino and Neal-Beliveau received a course enhancement grant through CTL and developed B110 (which combines the material in B104 and B105). This new course was offered

for the first time in Fall 2012. Changes to the course included our new departmentally written interactive eBook, an improved course format that allowed for more face-to-face time with the instructor than B104 offered, more hands-on collaborative in-class activities, and a new critical thinking personal reflection assignment that required students to apply course themes and concepts to their own lives. The course also relies on undergraduate peer mentors who offer support in the classroom and help for students in the Psychology Resource Center. We have a steady group of faculty, consisting mainly of lecturers and long-time adjunct instructors, who teach the course.

In Fall 2015 we moved B110 from Oncourse into Canvas. This involved a redesign of several major aspects of the course. Students now take a pre-class quiz before beginning a new chapter and a more challenging chapter quiz at the end of each unit. These assessments were incorporated based on research on the testing effect, demonstrating the benefit of frequent quizzing on retention of material. They also naturally encourage spaced practice and preparation before class. Analyses reveal that pre-class quiz scores are significantly correlated with scores on chapter quizzes, class participation, exams, reflection papers, and final grades. Chapter quizzes are also strongly correlated with class participation, exams, reflection papers, and final grades.

Given the large enrollment in this class, it was important to develop a mechanism by which to ensure that students were achieving the important critical thinking skills we hope they gain. The final personal reflection assignment is a way to assess this aim. The course coordinator, Dr. Debbie Herold has developed this assignment, plus a highly descriptive grading rubric to ensure continuity of grading across course sections.

During 2015, Dr. Herold worked with a group of five other faculty members at other IU campuses to create an online Introductory Psychology courses that included the same learning outcomes for all campuses. While faculty were free to use their own individual books, activities, and assessments, they developed a common set of learning outcomes to ensure that students at all campuses were meeting the same goals.

As a part of this project, Dr. Herold began incorporating a pre- and post-test assessment for B110 students. Analysis revealed that for students in the online section, scores on the post-test were significantly higher than those on the pre-test. In addition, there were no correlations between pre-test scores and final grades in the class, however there was a significant correlation between scores on the post-test and final grade in the class.

4. Neuroscience Program and e-Portfolio Grant

This program is an interdisciplinary program including faculty from biology, psychology, physics, chemistry, computer science, and mathematical sciences, with the nervous system as a common focus. Students may pursue concentrations in behavioral, cellular/molecular, or computational neuroscience, culminating in a capstone research experience. This program has grown very quickly to a total of 182 majors after just over 3 years. We had anticipated 50 majors after the first two years and this growth, while exciting, has presented the faculty with challenges

that we are addressing.

This program is extremely rigorous and the students in the program are also very strong. Currently, 51 (30%) of the majors are participating in the IUPUI honors program and another 22 (13%) are participating in the School of Science honors program (73; 43%, total in honors). Additionally, 45 (27%) of the neuroscience students have a cumulative GPA of 3.50 or higher, and 90 (54%) have cumulative GPA's above 3.00 (80% of students above a 3.00). These students have the highest major GPA in the school of science.

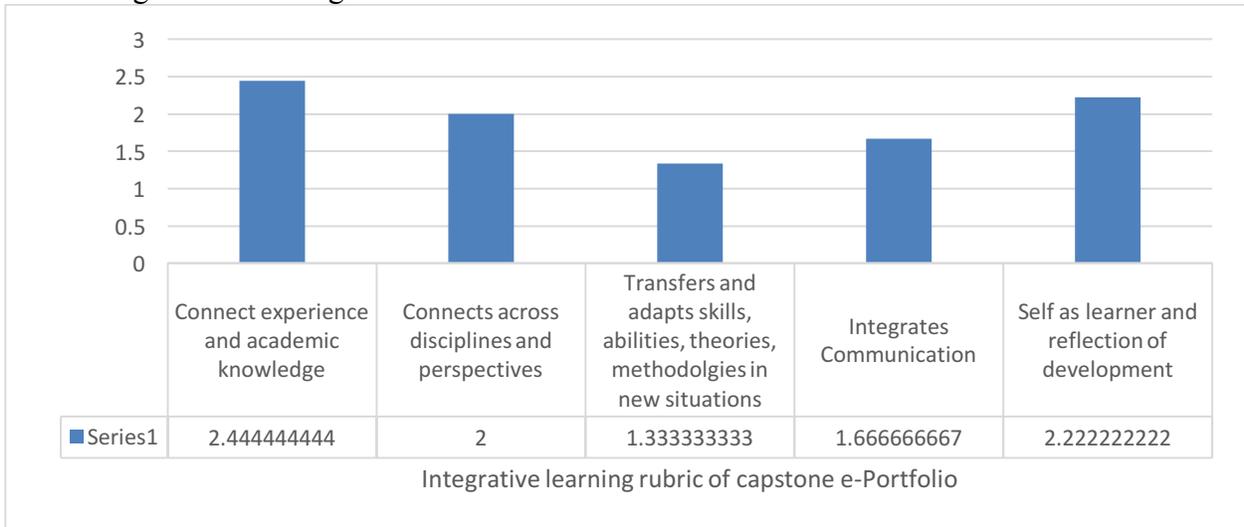
To complete a Bachelor of Science degree in Neuroscience, a 3 credit hour capstone experience must be completed in the senior year. Up until now, this capstone requirement has been fulfilled by an honors research project or other faculty-mentored research (some outside the School of Science), or through existing capstone courses in one of the departments in the School of Science. However, the number of majors needing to complete a capstone is about to exceed the capacity of the Neuroscience Program to accommodate them. Thus, the faculty needed to identify capstone opportunities outside of the School of Science. In addition, they needed to ensure that the outcomes achieved in these capstone experiences met the standards of the Neuroscience curriculum. In 2015-2016 the program introduced a new capstone to meet the increasing number of majors.

In addition, an electronic portfolio project was piloted in 2015-2016 to assess the course as well as the feasibility of an e-portfolio assessment with these students. Cindy Williams (Neuroscience Advisor) received a grant to run a pilot test of the e-portfolio with the Neuroscience majors enrolled in Psy B499 (Honor's Capstone Research) in spring 2016. Three of the student learning outcomes (SLO) for the capstone are scientific inquiry, critical thinking and content knowledge base. The integrative and applied learning value rubric (see table below) generated by AAC&U was used to assess the SLO's.

Based on the data presented in the chart below and her experience through the process, she made the following suggestions. Always fully integrate an e-portfolio project with the course syllabus, assignment, and learning outcomes, so it doesn't feel like an add-on. Students need mentoring either as individuals or as a group to build the portfolio. The e-portfolio project is being integrated into 2 capstone courses in fall 2016.

Capstone 4	
Connections to experience Connects relevant experience and academic knowledge	Meaningfully synthesizes connections among experiences outside of the formal classroom (including life experiences and academic experiences such as internships and travel abroad) to deepen understanding of fields of study and to broaden own points of view.
Connections to discipline Sees (makes) connections across disciplines, perspectives	Independently creates wholes out of multiple parts (synthesizes) or draws conclusions by combining examples, facts, or theories from more than one field of study or perspective.
Transfer Adapts and applies skills, abilities, theories, or methodologies gained in one situation to new situations	When prompted, presents examples, facts, or theories from more than one field of study or perspective.
Integrated Communication	Fulfills the assignment(s) by choosing a format, language or graph (or other visual representation) in ways that enhance meaning, making clear the interdependence of language and meaning, thought and expression.
Reflection and Self Assessment Demonstrates a developing sense of self as a learner, building on prior experiences to respond to new and challenging contexts (may be evident in self assessment, reflective, or creative work)	Envisions a future self (and possibly makes plans that build on past experiences) that have occurred across multiple and diverse contexts.

Note: Integrative Learning Rubric



Part IV: Evidence of assessment and changes made towards continuous improvement in student success initiatives and student support services.

A. Continuation and Expansion of Summer residential STEM Bridge program

designed for students who will be residents on campus. There were several positives to the residential STEM bridge program. Students living in the same buildings had an opportunity to get to know one another before the semester began and there was more interaction as the semester continued. The number of students participating in the STEM, Science and Psychology Bridge programs continues to increase each year. Recent data indicates that STEM and other bridge participants have higher GPAs compared to non-participants; students participating in Summer Residential STEM Bridge have lower DFW rates compared to non-participants; and minority students (especially African Americans) participating in Summer STEM Bridge obtained higher GPAs, lower DFW rates and higher Fall-to-Fall retention rates compared to non-participating AA students. Based on an end of the semester assessment for Science Bridge participants, students are meeting the stated IUPUI Bridge Learning Outcomes:



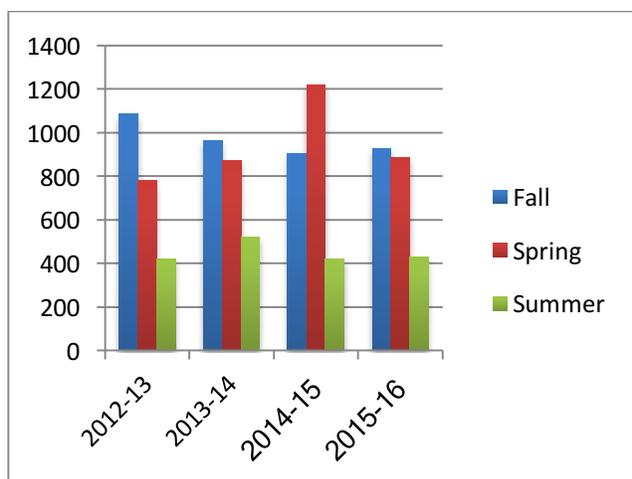
- Develop a perspective on higher education
- Develop a community of learners
- Develop communication skills
- Develop critical thinking skills
- Develop study skills
- Develop college adjustment skills
- Understand the demands and expectations of college
- Understand information technology
- Understand and use university resources

B. Continuation of the Physics Learning Space (PhyLS)

In order to reduce the DFW rates in Physics, PhyLS has adopted the “assistance center” model that has proven successful in Math, Chemistry and Biology. Since its opening, the PhyLS or “Phyllis” as it is known, has proven to be a popular destination for many students. Students are able to interact with mentors and faculty in small groups or one-on-one, focus on the areas that cause them the most trouble, receive individual support, guided access to computer simulations, video analysis software, and other online tools that support learning in physics.

Department of Physics expanded the hours (the PhyLS is now open 42 hours/week) after its initial success, and has made an attempt to increase physical space by adding an “overflow whiteboard” to the corridor outside (unfortunately, no larger rooms are available) and by adding a second mentor during peak hours. Students, faculty and tutors have all had positive reactions to the PhyLS. Typical student comments focused on the “peer” aspect, finding that the help they get from other students is often more accessible than that from faculty.

Student use of the learning space has remained rather constant across the first 4 years. Visits to the PhyLS typically number 800-1000/semester and just over 400 in the summer, with the mean stay being over one hour. Initial assessment showed that students are highly positive about almost all aspects of PhyLS, based on a Likert scale survey was conducted in May 2013 by a campus evaluator.



C. Walk in Tutoring Service for Computer and Information Science

In Fall 2015, the department of Computer and Information Science began a tutoring service for students in CSCI N200 – Principles of Computer Science, N201 – Programming Concepts, N207 – Data Analysis Using Spreadsheets, and N211 – Introduction to Databases, to supplement faculty and TA support for these courses. These services are free and time is made available Monday – Friday.

During the academic year 2015-16, this tutoring service was sought out 467 times by students. Approximately 900 students take these classes in person and another 200 take the class on-line. The attendance numbers suggest that the tutoring service is highly valuable to students taking these courses.

D. School of Science PREPs (Pre-Professional and Career Preparation for Science Students):

The Science Career Development Services moved to the new University Tower space (HO 200) in July 2013, launching their name as “PREPs” Pre-Professional & Career Preparation for Science Students” (SciencePREPs.iupui.edu), which has positioned the center as a key resource for Science students. One of the initial goals of the new Director was to increase the awareness of the center, its location, and services provided. The center was promoted through various programs and methods. Although only two employees initially staffed the center, outreach to hundreds of undergraduate and pre-professional students, has been successful. As of fall 2016, the office continues to have 4 full-time staff and several part-time student workers.

There were several goals in the SOS Strategic Plan that are directly related to the PREPS office

- 1) Increase PREPs usage by 10% each year. Usage increased by 19% with 909 individual appointments in 2014-2015 and increased another 16% with 1090 appointments in 2015-16.
- 2) 97% of students who visited our office said their appointment was helpful and information and that they would recommend PREPs to a classmate.
- 3) More than 30 club and classroom presentations. Initiated the “Done Cancel Class”

initiative.

- 4) Preps brought in over 140 employers and graduate/professional school representatives for career fairs, information sessions and programming.
- 5) Partnered on Career Connection STEM Fair and coordinated the School of Science Next Step fair reaching more than 9090 students through both events.
- 6) In 2015-16 students participated in 54 credit-bearing internships and approximately 30 other students participated in non-credit internships.
- 7) First destination graduation data from Class 2015 which includes August 2014, December 2014, and May 2015. The survey data reveal an 82.8% knowledge rate (national requirement is 65-85%).

SCHOOL OF SCIENCE FIRST DESTINATION 2014-2015		
Primary Plan	N	Percentage
Employed (includes fellowships and internships)	235	38.6%
Job Seeking	51	8.4%
Continuing Education (graduate and professional school)	141	23.2%
Planning to Enroll in grad school (Gap year)	69	11.3%
Other (Army, Volunteering, etc.)	8	1.3%
<i>No Information Available</i>	105	17.2%

Part V: Graduate Program Assessment

1. Program Overview: Graduate programs at the Ph.D. and M.S. level are advanced fields of study that provide new knowledge in areas unique to the specialization of particular faculty members within research disciplines. At the graduate level overall, however, there are generally similar educational outcomes that are usually independent of the specific field of scientific study. IUPUI has a series of Principles of Graduate Learning (PGLs) that form a conceptual framework that describes expectations of all graduate/professional students at IUPUI. Virtually all graduate students in almost all disciplines are assessed on:

- (a) Ability to undertake appropriate research, scholarly or creative endeavors, and contribute to their discipline;
- (b) Demonstrating mastery of the knowledge and skills in an advanced area expected for the degree and for professionalism and success in the field
- (c) Thinking critically, applying good judgment in professional and personal situations
- (d) Behaving in an ethical way both professionally and personally”
- (e) Ability to teach, often at the undergraduate level; and

- (f) Communicating effectively to others in the field and to the general public
- (g) Success in finding employment in a field related to their graduate work.

Together, these PGLs are expectations that identify knowledge, skills, and abilities graduates will have demonstrated upon completing their specific degrees.

2. Program Outcomes: In general, graduate programs in the School of Science assess M.S. and Ph.D. students through comprehensive written and/or oral examinations by a committee related to their field of study, and regular committee meetings to discuss research progress and mastery of skills and knowledge. Graduate students often teach in the department, and they are assessed on their ability to teach by the campus Student Satisfaction of Teaching survey that all faculty receive. Depending on the department, the Teaching Assistants may receive peer evaluation, if teaching. Their record of presentations at meetings, invited talks, publication and submission for grants or fellowships is also a means of assessment, and contributions to the scholarly literature both during and several years immediately after graduation similarly have are used as a form of program assessment.

The School of Science has been working for several years to have the doctoral program site approved on this campus. Previously, doctoral work completed on this campus was partially overseen (this varied by department) by faculty from Purdue and the graduates were counted as Purdue graduates. Given the development and increasing quality of our graduate programs in our school, we were encouraged to seek sight approval from the Indiana Higher Education Commission. After a two-year process, all Purdue doctoral programs (e.g., Biology, Chemistry, Computer Science, Mathematical Sciences, Physics and Psychology) in the School of Science are independent and site approved for our campus. In addition, a new IU doctoral program in the department of psychology, Applied Social and Organizational Psychology, was approved as a new program by the IHEC in June. This program joins IU doctoral programs from earth science and bio-statistics that are offered within the school of science.

Evaluation of these undertakings by committees of graduate faculty remains the ultimate assessment standard of student success at the graduate level. These metrics are generally found to be an academically acceptable method of capturing most of the information necessary for graduate student assessment. In terms of final numbers, approximately 225 students earned the M.S or Ph.D. in the School of Science in 2014-2015.

Part VI: Assessment Plans for 2016-2017

Assessment Committee Plans For 2016-2017: The creation of cohorts and tracking their performance through the pipeline to graduation has proved to be a challenge, but with the progress the School has made as a result of the STEP grant, we have been better able to track cohorts and chart their progress towards graduation, as well as gather data necessary to determine whether our students are not only meeting the standards set by the PULs but also developing the skills needed for graduate or professional school or a career after college.

Currently, we are collecting the following data on each cohort for both first-time freshman and transfer students (by gender, race, FT/PT, etc.):

- 1) Average GPA each year for cohort
- 2) Track those who attended a STEM or other Science Bridge, First year Experience or Themed Learning Community, and assess the impact of student persistence and retention
- 3) Track number who changed major, but dropped STEM major each year
- 4) Track students in each cohort involved with each student resource center (BRC, CRC, MAC, PhyLS), and compare their DFW and retention rates as well as graduation rates to others in cohort
- 5) Track number who use Career Development Services
- 6) Track the number of students who complete 2 or more RISE experiences

We will also continue to assess the effects of course development and course transformation efforts in the School of Science such as Chemistry PLTL workshops, Math, Biology, and Physics Recitations, CUREs in Biology and Chemistry, and Psychology.