PRAC Report: Assessment of Student Learning
IUPUI School of Science
2018-2019 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 150 full-time faculty members. The School is the academic home of ~2,600 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. In Spring 2019, each program mapped its program level learning outcomes to the new IUPUI Profiles of Undergraduate Learning.

Undergraduate SLOs (B.A. and B.S.)	**Graduate SLOs (M.S. and Ph.D.)**
• Biology • Chemistry • Computer and Information Science • Environmental Sciences • Forensic and Investigative Sciences • Geology • Interdisciplinary Studies • Mathematics • Physics • Psychology • Neuroscience	• Addictions Neuroscience* • Biology • Chemistry • Clinical Psychology • Computer and Information Science • Geology • Industrial Organizational Psychology • Mathematics • Physics • Applied Social and Organizational Psychology • Computational Data Science ***Previously named Psychobiology of Addictions**

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

The main focus of this 2018-2019 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, particularly in the general education courses. The following data and information provides evidence that we are assessing our programs, that we are addressing the IUPUI Profiles 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: Evidence of Continuous Assessment related to Student Learning Outcomes: Course and Curriculum Development or Redesign

To prepare for the PRAC report, an email was distributed to all faculty in the SOS. The email explained the rationale for the PRAC report and requested faculty to share examples of curriculum redesign (no matter how big or small). They were asked to describe the activity going on in their departments. Below are the responses received. While many of these examples do not all represent highly formalized assessment, they do note ongoing adjustments and the reflective practices of our faculty.

Chemistry and Chemical Biology

The department of Chemistry and Chemical Biology is accredited by the American Chemical Society (ACS). As a part of this accreditation, the department annually provides evidence of the quality of the education provided students. This includes physical elements of the departments infrastructure and personnel, but most importantly focuses on the curriculum. They review the specific chemistry courses offered, the frequency of offerings, the laboratory experiences, capstone experiences and types of pedagogy used throughout the curriculum. The Department submits an annual report to ACS for review and continued accreditation.

Computer Science

In CSCI355 class, students do "quick presentations." The instructor takes a topic that is easily researched, divide it into about 10 subtopics, and then divide the class into groups. Each group has 20-30 minutes to prepare a few slides on this topic. Then, each group spends just a few minutes presenting their slides to the class, and the slides are combined into one big presentation, which serves as the notes for the class period. This change appears to increase student focus, engagement and retention on the topic.

In CSCI N200 a goal is to better equate the online vs. the in person section. In person this course is very hands-on and interactive, and that is hard to replicate online. One technique being used is to have students complete very short, low point-value assignments on Thursdays, which we then grade and return within 2 days. These assignments are designed to head off any problems students have with bigger assignments due the following Tuesday. This gives both the instructor, and the students, the information we need to course-correct before these larger assignments are due.

Earth Sciences

Faculty in Earth Sciences formed a learning community and are reviewing current undergraduate course content in earth science ethics. The Earth Science Ethics FLC recognized significant gaps, and the need for a more integrated approach to teaching earth science ethics across the curriculum. Revisions of content in 4-5 courses are underway to address the need for a coherent approach to ethics.

Forensic and Investigative Sciences (FIS)

The FIS program goes through an accreditation process every 3 years. They are accredited by the Forensic Science Education Programs Accreditation Commissions (FEPAC) of the American Academy of Forensic Sciences. Related to the current report, the program must compile a self-assessment that in part ensures the curriculum covers specific topics, includes specific science and math courses, and includes a capstone experience. The Undergraduate FIS program has maintained continuous accreditation since 2010 and the Master's program received FEPAC accreditation in 2018.

Mathematical Sciences

One of our initiatives in the Dept. of Mathematical Sciences is to find ways to increase student learning and engagement in our beginning algebra classes. Starting in Fall 2018, we have offered one section of Math 15300, College Algebra, using ALEKS, an on-line learning platform published by McGraw-Hill, each semester. This semester (Fall 2019) we have extended the use of this platform to four sections of Math 11100, Intermediate Algebra, in addition to the one section of Math 15300. Our goal in Math 11100 is to help all students improve their foundational math skills, but in addition, to help prospective STEM students who have only placed into the beginning algebra course, Math 11000, to learn the material from Math 11000 concurrently with the Math 11100 material and therefore save a semester in their sequence of required math classes.

The ALEKS platform is designed so students engage more directly with the math concepts, by giving them a unique sequence of algebra questions geared to each student's current level of understanding and accomplishment, with plenty of on-line support; including explanations for each problem as soon as work on the problem is completed, videos explaining how specific problems can be solved, and an easily accessible e-text. In addition, students take periodic knowledge assessments at frequent intervals to assess their mastery and retention of concepts. The philosophy behind ALEKS is a departure from the way math classes have been traditionally taught, in that the computer work helps each student find their own path through the material, with appropriate assistance from the instructor when they have questions, instead of having the instructor only lecture to the class as a whole, without knowing the particular needs of individual students. So far, the results suggest that this approach helps many students learn the math at a deeper level and retain it for longer.

We are especially interested in seeing how well students who have taken an ALEKS based class succeed in later math classes. We are continuing to monitor the effectiveness of this approach, but are planning to introduce ALEKS into our Math 11000 classes in Fall of 2020.

Physics

In Physics 29900 (Introduction to Computational Physics) we have modified the course content in the second year of offering the course to spend more time on certain topics (differential equations, linear algebra) in response to student feedback, as well as discussions among faculty on how well the first student cohort was able to apply these computational topics in advanced physic courses.

A similar change was made in Physics 30000 (Introduction to Mathematical Methods in Physics), which students take immediately after 29900. These two courses are taught by the same instructor and by integrating the material in these courses more tightly, students are likely to feel better prepared to tackle computational assignments in advanced courses.

Psychology

Over the last several years, the psychology department has systematically identified a set of classes to review. The first stage of this process was to restate/reaffirm the learning outcomes for each class and map them to the departmental level student learning outcomes. That stage was concluded in 2018. Beginning in 2019, the department began to generate course level assessment reports that provide direct and indirect evidence to support the course objectives are being met. Data in these reports includes enrollment, DFW rates, grade distributions, and descriptions of assignments and evidence of student learning. The plan is to use these reports to periodically assess student learning outcomes and inform course improvements.

Assessment reports have been generated in 2019 for:
B110 – Introductory Psychology
B310 – Life-Span Development
B340 – Cognitive Psychology
B433 – Capstone Lab in Psychology
B454 – Capstone Seminar

Assessments reports to be generated in AY 2019-2020

B203 – Ethics and Diversity
B320 – Behavioral Neuroscience
B370 - Social Psychology
B305 – Introduction to Statistics
B311 – Research Methods

Part III: Assessment and Continuous Improvement Plans in General Education Courses.

The following science courses were evaluated by the General Education Course Evaluation sub-committee of the IUPUI Undergraduate Academic Committee in AY 18-19. To date, 47 sciences courses have been successfully re-approved as general education courses at IUPUI. As a part of that review, instructors must submit an overview of the continuing improvement efforts and assessment of the course. Below is a portion of this section for each course reviewed in the AY18-19.

Astronomy – A105 Stars and Galaxies

In the recent years, we have adjusted the topics covered, generally choosing to focus on a smaller number of more essential objectives, and reducing topics that are less central. Exams are assembled from a large database of test items (on the order of a thousand) of various types. Each semester, both of the exams (Exam I and Exam II) are designed to test the students on the same material. In comparing the average scores of Exam I and Exam II, we have noticed that students have struggled more on Exam II.

The likely reason is that this material is more difficult and requires some sophistication in relating the fundamentals of physics to the astronomical elements. Therefore, in more recent years, we have spent significant lecture time explaining the fundamentals of physics required for a better understanding of the astronomy elements. (They inserted a graph (which is not able to be copied here) of average test scores across the last 10 year to show that grades on exam 2 have significantly increase with the changes).

Biology N 100 – Contemporary Biology

- The lead instructor (Dr. Vaughan) stays current on the latest biological research and follows the biology education research literature (he is a HHMI National Academies Summer Institute Teaching Fellow) in an effort to improve the course and improve the student outcomes.
- The Chair of the Department is working with Dr. Vaughan to achieve better coordination between sections in the future. The full-time faculty member tasked with N100 lead instructor duties (currently Dr. Vaughan) will be more involved in the vetting and hiring of adjuncts from this point forward.
- Peer Review. Full time faculty will be peer reviewed at least one time every year. The reviewer will be the choice of the faculty member after consultation with the department chairperson. Adjunct faculty will be peer reviewed by the course coordinator or department chairperson once every semester.
- We are instituting a mid-semester formal feedback mechanism that will be used in all sections.
- There is a continual search for better textbooks and other course materials.
- Dr. Vaughan is committed to student success and works to update the course with this in mind. Feedback is gathered from students throughout the semester and, especially after exams, notes are made of possible points to change for the course. Dr. Vaughan not only reflects on how to make the course better after the semester is finished, but does this during the semester. With a dynamic area such as Contemporary Biology, it is important to not only adjust for the next semester, but to adjust on the fly during the semester, often in response to student interest or current events.
- Dr. Vaughan passes on his improvements to the other sections.
- The course will be reviewed annually by the course coordinator with the department chairperson. This will include a review of student feedback and alignment with SLO's. Course content and assessment tools will be reviewed to insure that basic biological principles and contemporary issues are included in all sections of the course and adhere to the SLO's.

Chemistry – C125 Experimental Chemistry 1

Strengths:

- CHEM-C125 (lab) compliments CHEM-C105 (lecture) well and helps students better grasp the theories and skills covered in lecture.
- A strong, dedicated group of teaching assistants
- Most students collaborate in the laboratory and reported that they have learned to better work with other people.
- Students find online resources provided to them helpful.

Areas of Improvement:

o Many resources are provided to the students taking CHEM-C125, including prelab slides, guides and tutorial on writing lab reports, and Chemistry Resource Center. Students who utilize the resources find them helpful. But most students do not take advantage of the resources.

o Plans to improve in this area:

- Promote the resources more frequently, both face-to-face in the lab and online (via Canvas).
- Promote the right kind of resources "just in time" (when most students need that type of resources).
- Make available to students the exact hours the CHEM-C125 TAs are working in the Chemistry Resource Center (instead of giving them the general hours of the Center, as we do now).
- Ask those who use the resources to share with the whole class how the resources have benefited them.

• Some experiments do not stimulate students' interest in the subject matter and encourage them to chemical principles and real-world applications.
o Based on the results of student survey and my conversations with selected students, students gain more from experiments that make real-world connections (e.g., Vinegar Analysis) and encourages them to think deeper about a scientific theory (e.g., Atomic Spectra). Other experiments are less effective.

- Make real world applications clearer in some experiments. For example, thermochemistry has many real world applications, and the experiment can be easily re-designed to show its relevance to students.

- Focus on important learning goals and avoid distractions. For example, Iron in Cereal experiment has clear real world applications, but it is a little too complex for students at this level. As a result, students are trying to learn too much in a short period of time, and do not gain as much from the experiment as they could have.

• Some students perceive certain required assignments as busy work, and do not see the value of the work as a way to help them improve their critical thinking skills and scientific method. Make

assignments and requirements more transparent and explicit. Help students understand the value of each assignment and requirement (e.g., keeping a good laboratory notebook).

Chemistry C 106 Principles of Chemistry II.

In the last 5 years, we have added

- Critical Thinking Journals, where the questions are open-ended and we teach some methods that can help students learn more about critical thinking processes.
- "Clickers" or Student response pads, first through Turning Technologies and most recently through TopHat. This gives both the instructor and the students immediate feedback on whether they understand the material that was just covered in lecture that day and a "quiz" at the end of each chapter that covers the last 2 to 3 lectures.
- Online homework, using Mastering Chemistry. This tool often gives feedback within the questions via "hints" that can help the student succeed with the problem.
- Discussion Forum via Canvas that allows for questions on a range of topics such as relating the concepts learned in class to real world applications, to hitting harder on concepts that are known to be confusing, and to allowing the students to ask and answer questions of each other with the instructor as a moderator. This activity is used the least by the students, but those students who do use it self-report that they enjoyed the interaction.

In the same time frame, suggested pre-readings and end of chapter questions from the textbook was prepared and we began to aggressively tell the students that in order to get the most out of lecture they needed to follow the pre-reading schedule and complete the end of chapter questions. There are no points assigned to this, it is not graded nor collected.

Starting in the Fall of 2016, Chem C106 began using the Peer-Led Team Learning (PLTL) model for recitations. A workbook was developed (and published starting in the Spring 2018 semester). This was a major course change and requires much more student "man-power" as we need one PLTL leader for every 10 students in the class instead of the previous 1 teaching assistant for every 40 – 45 students.

Thoughts for future improvements have come about from doing this General Education review. We feel that the information from the ACS final exam could better be used to inform us of where students still struggle. There was definitely a repetition of questions from semester to semester off the final that were likely to be missed and it is felt that a more thorough analysis of this data could guide us to perhaps better methods of presenting that particular information.

Computer Science - CCI 23000 Computing 1

We will continue to look for ways to use new technologies as they become available, but the most important areas of improvement really are not technical. The key to the success of this class and its future growth is clearly in learning more about how to apply the peer-led team learning model in the beginning computer science environment. While the PLTL model is well-studied in natural and physical sciences, the CS classroom is different in some fundamental ways, and further research is needed on how to best modify and utilize this approach to high-enrollment foundational CS courses.

Computer Science teaching laboratories have not changed much in the last 30 years. The PLTL model has shown us that our very traditional learning spaces are not as conducive to collaborative learning as we would like. We have made some adjustments (moving tables, adding white boards) but the need to re-think learning spaces in a computing environment is clear. The course coordinator is currently a fellow in the IU MOSAIC institute, actively looking into ways to integrate collaborative learning space pedagogy into computing classrooms. This is an exciting area of growth for us, especially as it has the potential to make our discipline more inviting to all.

Forensic and Investigative Sciences – 10100 Investigating Forensic Science

My plan for the continuous improvement of FIS10100 as a General Education Science elective consists of the following:
1.Continue to evaluate assignments. Alterations have been made to assignments for clarity, and in some cases simplicity based on student responses. Exams have been added to the course over the past two years as a means of assessment. Improvements and alterations to lectures have been made based on student assessment on the exam(s).
2.Continue to evaluate learning objectives for the course. Adjustments have been made to better align the lectures with the course level and learning objectives. While some forensic science analysis can be very simply explained, many of the details of more complex forensic science analysis are not necessarily appropriate for this course level.
3.Yearly faculty reviews of the course and instructor to improve the quality of the course have been scheduled on a rotational basis so every instructor will evaluate and be evaluated regularly.
4.Continue to analyze student feedback about the course provided in response to open ended questions on the course evaluations.
5.Add a mid-term course evaluation for students to complete on the course.

Geology G-110 Physical Geology
Student comments have highlighted some differences in student experience between online and face-to-face sections. All faculty teaching this course will meet before the start of classes to continue efforts to standardize the student experience and grade allocations by assessment type. Faculty will also meet at the end of the semester to review student feedback and share course innovations. Priorities set for coming semesters will ensure that all instructors use both formative and summative assessments in grade determination, that all instructors use the new Student Engagement Roster (SER) system for early intervention, and that all sections administer the pre- and post-tests and the course specific goal and objective survey. The implementation of these goals will be supervised by the Gateway Coordinator.

Additionally, faculty members teaching the course have been accepted into the TILT Pilot Program at IUPUI through the Center for Teaching and Learning, the Gateway to Graduation Program, the Learning Communities Program, and First-Year Programs. The assignments revised to fit TILT parameters within this pilot participation will likely include the term project and critical thinking writing assignments for this course to further strengthen assessment of core student learning outcomes and increase student understanding of why they are being asked to complete these assignments. The updated assignments will be shared across course sections to further improve alignment between sections.

Geology G-115 Introduction to Oceanography

GEOL-G115 sections will continuously be improved upon in response to direct and indirect feedback from students. Spring 2018 was the first semester that we implemented mid-term evaluations for GEOL-G115. The valuable feedback and opportunities to address concerns during the semester is helpful to the success of the course. We will continue to offer these mid-term evaluations in the future as they are a valuable source of feedback from students at a time when we can make adjustments that benefit the students taking the evaluation (not in a subsequent semester).

Another improvement we would like to continue to make is to offer Skype/Zoom sessions between our classes and scientists currently working on oceanic problems. In the Spring of 2018, we offered a real-time Skype session with researchers aboard the JOIDES Resolution research vessel during class. Students responded favorably to the session, and we believe more of these will be helpful to student learning. We plan to work to increase these opportunities in our in-person classes, and allow for students in the web sections to participate as well.

In Fall of 2018, both the in-person and web sections of GEOL-G115 are using a web-based textbook provided by the publisher, which has the interactive elements of the book built into the content. For example, Smart Figures (narrated figures) are presented on the same page as text so that students can easily watch the SmartFigure as a part of their reading. The platform also allows for increased analytics from the instructor side – we can see where students are spending the most and least amount of time reading and correlate these to performance in the course.

Math 22100 Calculus for Technology I

We assess student learning outcomes by collecting and analyzing data from the comprehensive final exam. We use these results to discuss with the instructors in the beginning of the next semester the problems where many students made mistakes, to prepare, if needed, additional lists of practice problems for the least successful topics and, if needed, to make changes in teaching appointments in future semesters.

The other efforts to improve learning include completing the Student Performance Roster through- out the semester to flag students with irregular attendance and/or performance issues as well as the Math Department peer evaluation program with annual visits to instructors' classes. In the case of serious deficiencies in teaching or learning, the coordinator makes recommendation for changes in teaching appointments immediately during the semester.

Physics 25100 Heat Electricity and Optics

It is absolutely important to read or listen to student feedback on surveys and year-end evaluations. The midterm survey will continue to be used to gauge adjustments that may be made early on in the course. The standard, year-end evaluations can provide an overall assessment of the effectiveness of PHYS 25100 based on its curriculum and its team of instructors.

Based on student responses from previous semesters, there are four general areas about which many students have raised concerns:

1) The pace of the course: *Students feels that they do not have enough time to assimilate the material as it is presented in the course*. In other words, there is too much material presented too quickly. Unfortunately, we have no control of the course content given that this class is aligned with equivalent classes across the state. We can, however, create activities that reinforce the material within the pace of the course, e.g. the use of online "warm-up" activities and puzzles has been successfully implemented in PHYS 15200.

2) The level of difficulty: *Students have complained that the course is too challenging, that it should be taught at a slower pace with easier exams*. It is expected that the course is challenging given that chemistry, engineering, mathematics, and physics majors are being taught. This course is intended to prepare them for the rigor of 300-level courses in their majors which are at a faster pace with more difficult exams. The physics department can and should continue to evolve a pedagogy that maintains the rigor of the course while raising the performance of more students.

3) The educational technology: *Some students believe that educational technology is a "gimmick" and would rather revert to reading a hard-copy textbook and submitting pencil-and-paper "old school" assignments*. One of our educational researchers (Prof Gavrin) has found that most students favor the use of educational technology and tend to raise their grades as a result. Given Prof Gavrin's research, the department will continue to use such technology for years to come. Currently, we are using MasteringPhysics for its online homework technology and other educational resources. Over the past ten years, we have used the SmartPhysics system with "clickers", and the Quest homework server. We have changed technology through the years primarily to improve the quality and, secondarily, to reduce the cost per student.

4) The structure of recitations: *Many students fail to see the purpose behind recitations*. We believe that recitations are key to the PHYS 25100 curriculum (as well as our other introductory courses). At the core of recitations, students are required to work in groups to solve problems, which is a necessary skill in the "real world". In the past, students displayed their solutions on whiteboards located throughout the lecture hall. More recently, students have transmitted their answers using "clicker" technology. Lately, students are given the final answers to problem and are tasked with supplying the steps necessary to obtain these answers. Group work promotes discussion about the material, the concepts as well as the mathematical problem-solving.

<u>Physics 20000 Physical Environment</u>

We feel that the content and pedagogy of the course are working well for the students who take it, but the course is not meeting our expectations for enrollment. We do not need it to become a large enrollment course, but we have targeted 30 students/semester, and recent years have seen declines to less than half that number. Our plans for the next five years are to reconnect with our colleagues in the School of Education, to be sure that the course meets their student's needs and that their students are aware of it. Specifically, we will

1. Arrange a meeting with School of Education faculty to discuss the content of the course.
2. Make any adjustments necessary to ensure that the course content matches the needs of the target group.
3. Work with School of Education advisors to be sure their students have the tools to make informed decisions about enrolling in PHYS 20000.

4. Repeat 3 with University College advisors who work with pre-education students.

Of course, as PHYS 20000 evolves, we will continue our efforts to ensure that the content and pedagogy remain up-to-date through the means we have described before: discussions with students, a mid-term survey, and end-of-semester evaluations.

Psychology B203 Ethics and Diversity In Psychology
There are several improvement goals for this course:

- *Revision of student learning outcomes and profiles:*
  Course coordinator and PSY B203 instructors plan to meet to discuss further development of the student learning outcomes. With the recent development of student learner profiles by the University, the goal is to create a better match between student learning outcomes and recently developed student learner profiles.
- *Signature assignment revision:*
  There is a plan to revise a signature assignment for the course. First goal will be to review all student learning outcomes and reach an agreement among instructors with regards to which specific outcomes should be reflected in the signature assignment. This goal can manifest in different ways. Either the instructors will agree to adopt the exact same signature assignment, or they will obtain further evidence that each instructor's signature assignment reflects newly identified required student learning outcomes.
- *Reidentification of the most important Ethics Code Standards:*
  There is a plan to further ensure consistency between different PSY B 203 sections by revisiting specific Ethical Standards covered in each course section. Currently, all instructors cover the same chapters from the Ethic Code which ensure considerable consistency of covered materials across sections. Further understanding of which specific ethical standards are emphasized within those chapters will help to strengthen the inter-section consistency.
- *Development of common discussion moderation strategies:*
  Finally, there is a plan to devise common strategies that help current and new instructors to better moderate in-class discussion on difficult diversity topics.

Statistics 30100 Elementary Statistical Methods I
STAT 30100 is dedicated to continual course improvement and assessment. The course coordinator regularly meets with instructors and students to refine the learning activities, support documentation, and assignments to ensure that quality student learning.
We continually assess student learning outcomes using the assignments as mentioned in Sections 2C and 4A. The final examination can be used and mapped to each Student Learning Outcome.

The course coordinator is continually discussing new methods of engaging students in their learning. For example, in Spring 2018, the coordinator, teaching the online section of STAT 30100, created an Instagram page for @IUPUIstat30100 to engage students in their learning in a social media context. Students are asked to follow the page and then post statistics as they see them with the #statsinthewild. This activity is for low stakes extra credit as an attempt to gauge whether it will increase student engagement and statistical literacy.

The coordinator is also teaching in a Mosaic classroom in Spring 2018 to allow students to engage in groups with technology and better support their understanding of the SPSS software.

The coordinator has also implemented regular meetings with the graduate TA instructors to better support their education in teaching, giving suggestions and examples for better class time use and efficiency and increase engagement. This is an area that is in need of continuous improvement and reinforcement as the TA's change regularly. Most of the time, if it is their first semester teaching STAT 30100, it is also their first semester teaching at all.

As we collect feedback each semester, we identify tools, assessments, and activities which are working and those which need improvement. Then, in planning for future semesters, the coordinator and instructors implement new technologies and techniques to ensure student success.

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

1. Continuation and Expansion of Summer Bridge program in science

The school of science is working towards being able to provide a bridge and first year seminar experience to all science majors. We added 3 science bridge/FYS courses in summer 2019 and expect to increase that number significantly to meet the campus goals. A taskforce of department chairs and others has been formed to identify how the school will provide personnel to cover this, and how we will financially support these efforts. Both the anecdotal evidence and data suggest that these are important experiences for student success. The math department recently reviewed those math sections that are connected to a bridge section (e.g., part of a learning community) and the DFW rates for those sections are dramatically lower than other sections of the same course.

2. 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 2019, 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

- **Pre-Professional and Career Preparation (Preps) Office in AY 2018-19**
  - 994 students completed 1461 advising sessions with PREPs staff
    - Includes 91 walk-ins, 1370 scheduled appointments
    - Totals more than 1079 hours of career advising
    - Appointments by Reason: Professional School Planning (48%); Graduate School Planning (11%); Resumes/Cover Letters (10%); Job/Internship Search and LHSI Application Prep (10%); Mock Interviews (9%)
    - **This is a 61% increase in advising sessions over 2017-2018.**
  - The School of Science Pre-Professional Advising site in Canvas housed 906 students
    - Students viewed the Canvas site pages **29,430** times, an average of **81 views per day**

Jobs & Internships

- 318 employers posted 1,014 positions to ScienceLink

Career Fairs & Programming

- 103 employers and more than 1,300 students attended the 2018 Career Connection STEM Career Fair, presented by the School of Science and the School of Engineering & Technology
  - **This is an increase of 25% (employers) and 19% (students) over 2017 attendance.**
- Hosted 48 programs (site visits, info sessions, workshops, etc.)
- 72 organizations and more than 300 students attended the first Health Professions Fair, presented by the School of Science and the Health & Life Sciences Advising Center

Academic Engagement

- 45 students completed an experiential learning course (science-based internship or healthcare shadowing) through the PREPs office
- 81 students completed new pre-professional elective courses (SCI-I 120, 197, or 397)
- 46 students completed the new Medical School Preparation course, delivered in partnership with Kaplan
- 28 students completed a career-development focused course (SCI-I 120, 296)
- PREPs staff completed 53 classroom presentations on career development topics
  - **This is a 47% increase in classroom presentations over 2017-2018.**

3. Development of Learning Outcomes for School of Science RBLC's.

The SOS currently has 4 unique living and learning locations for students;

STEM Floor – North Hall
WISE (Women in Science and Engineering) Wing – North Hall
WISH (Women in Science House)
Purdue House

We have developed both common and unique learning outcomes for each location.

As a result of living in a STEM RBLC, residents will be able to:

- Choose at least one School of Science and/or School of Engineering and Technology involvement opportunity of interest (school student organization, school social event, school lecture, etc.)
- Examine STEM career opportunities
- Identify STEM research opportunities
- Describe STEM campus and community resources
- Name a new STEM faculty, staff member, and/or industry leader they met as a result of an RBLC program

Community Specific Outcomes:

- *STEM Floor*
    - Discuss college level academic expectations of a STEM major (study skills, time management, etc.)
    - Identify a social issue that STEM research and work can influence
- *STEM Floor WISE Wing*
    - Connect with a new female STEM faculty, staff member, and/or industry leader
    - Identify issues facing women in STEM on college campuses and/or in the workplace
- *WISH:*
    - Connect with a new female science faculty, staff member, and/or industry leader
    - Identify issues facing women in science on college campuses and/or in the workplace
    - Describe a contribution of a women scientist in their field of study
- *Purdue House*
    - Describe the influence of STEM research and work on a community issue
    - Develop an academic plan for their remaining semesters of coursework

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.

In 2019, following a change requested by the Purdue Graduate School, faculty members and graduate students must meet twice a semester to set goals for that term and subsequently review them at the end of the term. Both must sign off on this document and the documents are held centrally within the department.

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 2016. In addition, a new IU doctoral program in the department of psychology, Applied Social and Organizational Psychology, was approved in 2016. 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 140 students earned the M.S or Ph.D. in the School of Science in 2018-2019.

Part VI: Assessment Plans for 2019-2020

Assessment Plans

There are two large assessment efforts going on in the school currently. First, we will continue to complete the dossiers to reapprove the general education courses located within science. As noted above, 47 courses have been reapproved, another 17 will be reviewed in 2020, and the final 16 will be reviewed the subsequent year. These reviews require a great deal of work for the departments. After this initial review is completed, the process of reapproval will begin again.

The second assessment effort going on in the school is departmental or program review. For each of the next 3 years, 2 of our departments/programs (we have 7 departments and 2 programs total) will go through the program review process coordinated by Stephen Hundley's office. Psychology and Math will be reviewed in Fall 2020, Biology and Chemistry in Spring 2021, Earth Science and Physics in Fall 2021, Computer Science and Neuroscience in Spring 2022, and Forensic and Investigative Sciences in Fall 2022.

In addition to these larger efforts, Jay Gladden has requested that each department/program must map the Capstone Learning Outcomes to the IUPUI Profiles. This work will be completed by May 15th, 2020. The following year, each department/program will select a mid-level (e.g., early junior year) course that is required for each major and map it's learning outcomes to the IUPUI Profiles. Our expectation is that subsequent assessment will be required by the campus to ensure the courses are in fact meeting the IUPUI Profiles of Undergraduate Learning.