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Gateway Scholarships in Biological Sciences: Year 2 Annual Report

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NATIONAL SCIENCE FOUNDATION S-STEM GATEWAY SCHOLARSHIPS IN BIOLOGICAL SCIENCES

2/15/2017-
2/14/2022

Year 2 Annual Report (Summer 2019)

This report summarizes grant activities, progress toward goals, and broader impacts of the Gateway Scholars Program in the Boise State Department of Biological Sciences during the 2018-19 academic year.

The Gateway Scholarships for Biological Sciences is funded by National Science Foundation (February 15, 2017-January 31, 2022).

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SUMMARY

The Gateway Scholars Program has provided meaningful support for students in the biological sciences through 32 scholarships, mentorship for scholars, a focus on evidence-based teaching practices, encouraging undergraduate research opportunities, risk-based advising, and co-curricular activities designed to support greater understanding of opportunities for biology graduates. These efforts have been described as beneficial by the students surveyed and interviewed for this project.

The grant activities have helped the department identify areas for improvement and to leverage the grant with the university leadership and partners. The major accomplishments and broader impacts of the grant thus far are:

- Increased advising support for biology students through the College of Arts and Sciences through which biology majors and transfer students with fewer than 14 credit hours will be served by professional advisor, Maribel Saucedo-Gonzalez
- Centralized support for STEM departments to provide outreach to students through early alert (as described in Objective 2)
- Created a "student group" to track undergraduate research participation in the student information system
- Established the benefit of an introductory course for biology majors leading to opening access to the course for any biology student
- Collaboration between the GSP leadership team and the biology club has strengthened the co-curricular offerings the department can offer
- The DFW rates in core biology courses are inversely related to the increased use of EBIPS by biology faculty members. This finding is consistent with the scholarship on the use of EBIPs as effective pedagogy for all students.

A primary objective of our grant activities was to shift the culture of the department of biological sciences to increase learning-centeredness and a focus on engaging students. The activities included in this project, in addition efforts in the department resulting from other funded work are positively impacting GSP students and other majors.

OBJECTIVE 1: FACULTY-MENTORED COHORT PROGRAM

Objective 1 focuses on establishing and managing a faculty-mentored cohort program that provides scholarships and a coherent ecosystem of support for low-income, academically talented DBS students.

We created the following goals to support objective 1:

1.a. Annually recruit students so that we can maintain 20-25 scholars in our cohort

1.b. Each student will meet with a mentor twice per year

1.c. Provide structures and supports for student-mentor program including:

1.c.i. Shared focus on SMART[1] goals

1.c.ii. Mentor readings (e.g. helping students get the most out of college)

1.c.iii. Hold professionally facilitated mentor training annually

1.d. We will measure performance on this objective through student self-report forms documenting mentor meetings.

Objective 1 Activities in 2018-19

Student recruitment to maintain 20-25 scholars in the cohort [1.a]

We have recruited and retained a cohort of low-income, academically talented students in each year of the grant to maintain 20-25 students active in the program. Our retention of the first cohort of Gateway Scholars students was 90% with two students taking a leave of absence. The Average GPA of the 2017 students recruited was 3.7 and the average GPA of the 2018 students recruited is 3.6. Two (2) students graduated with DBS degrees, and we recruited 12 more students for the 2018 academic year for a total of 32 awards. We continued to focus on awarding scholarships to a range of students across the academic years and to balance need against the resources that we have available. We have awarded $135,000 to date.

Table 1

Current Status of Recruited Students

	2017 FA	2018 SP	2018 FA	2019 SP
Active	20	20	27	24
Changed major to other STEM	0	0	0	1
Changed major to non-STEM	0	0	0	0
Leave of absence	0	0	2	2
Graduated	0	3	5	7
Senior	5	4	5	6
Junior	6	7	10	8
Sophomore	7	4	6	7
Freshman	2	2	4	1
total awards	20	20	32	32

[1] SMART is an acronym to describe goals that are specific, measured, achievable, realistic, and timebound.

While our grant does not specify a focus on underrepresented groups in STEM, we are attending carefully to student diversity in our cohort.

Table 2

Gateway Scholars Students by First-Generation, Gender, and Underrepresented Status

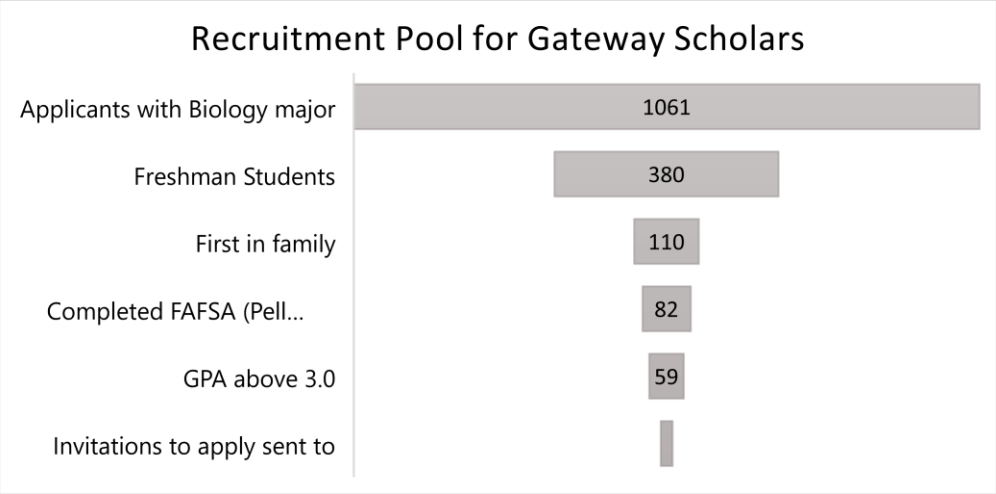
	2017 Y1	**2018 Y2**
First in family	13 (65%)	15 (47%)
Female	15 (75%)	23 (72%)
URM	9 (45%)	11 (34%)
% Need met	25%	23%

Note. These data are cumulative regardless of active SSTEM status. % of need met is based on data reported on FAFSA (%Need met by NSF S-STEM Scholarship = NSF Scholarship award$/(COA*-EFC*); [Cost of Attendance (COA); Expected Family Contribution (EFC)]

We are targeting to recruit eight (8) new scholars for Fall 2019 and will focus on recruiting freshman students. Our plan for recruiting calls for us to draw from the students who apply for a scholarship through Boise State's general pool. The students must have Biological Sciences as their declared major, meet financial need requirements (PELL eligible) based on data reported in their FAFSA form, have a GPA of 3.0 or greater. Given these criteria, our recruiting pool is reduced from 1061 to 59 as follows:

Figure 1

Targeted Filtering of the Applicant Pool by Grant Eligibility and Diversity Recruiting Strategy



Invitations to apply were sent to 20 students acutely focusing on geographical areas that are more likely to include underrepresented groups (Idaho residents who live outside the Boise metropolitan area, approximately 300 students) and female applicants (724 or 68% of the total applicant pool). 21 students applied in 2019 for the 3rd year, however only 14 qualitied. 9 Freshman students applied and we sent invitation letters to 8 freshman students.

We were interested in understanding how the Gateway Scholars financial support is impacting the students and asked for their response in a brief open-ended survey. Their responses highlighted the way this funding

is helping them focus on their studies, decrease stress on their families, and reduce the amount of their tuition they need to cover through employment during college (see text box below).

Text box 1

Excerpts from Student Feedback Survey

> *I would never have been able to complete my degree in five years if it hadn't been for the National Science Foundation.*
>
> *The scholarship is such a blessing in being able to finish my degree at BSU with as little debt as possible.*
>
> *The financial impact of the award has been huge. Because of the award, I have been able to focus more on my studies and research as opposed to working.*
>
> *Every little bit helps with paying for college and I really appreciate the extra money this scholarship offers. It helps my single mom out with paying, decreasing her stress financially a bit.*

Student-Mentor Pairings and Support Materials [1.b. and 1.c.]

In our year 1 activities, we established a starting point for our faculty mentoring program [1.b., 1.c.] by pairing each student in the program with a faculty mentor based on career interests and student suggestions. The pairs met each other at an orientation event in February and were intended to meet on more time during the semester. Half of our students met their mentors at that event and had positive interactions. We relied upon faculty to report on the faculty-student meetings and had a poor response rate to our query about total meetings. Student responses during the focus group provided triangulation -- none indicated that an interaction with their faculty member stood out or was impactful. Student data also pointed to a need for more mentoring related to course planning and preparation for post-graduation positions. We used the 2017-18 findings to inform our second-year goals and activities for this objective.

To increase the quality, frequency, and documentation of student/mentor meetings [1.c], in Fall 2018 we implemented several changes. Our annual faculty mentor training [1.b.] was facilitated by Catherine Bates, STEM Diversity Coordinator in the BSU Institute for STEM and Diversity Initiatives. Ms. Bates provided basic information on why mentoring matters, basic approaches to help mentors get to know students, and engaged them in role playing practice. During this session they were trained about SMART[1] goals (see Appendix B for materials).

Students were prepared for their faculty meeting either in Biol 198 (8 students new to the program took this course) or via email with training in creating SMART goals (see Appendix B) for the year with the intent of reviewing them with their mentors. We also gave them examples of how to email their faculty mentor and told them the mentors were expecting to be contacted (emails to faculty and students are also in Appendix B). Both methods decreased barriers to talking with mentors and providing a topic for the meeting.

Measuring Student-Faculty Mentorship [1.d.]

Rather than rely upon faculty to report back to us about mentoring meetings, we shifted this responsibility to the students. They used an online form to log when they met with their mentors (see Table 3). The SMART

goals assignment provided a focus for the initial meeting, easing the awkwardness that students and faculty can feel. For example, one student reported:

> *[name] and I went over my smart goals and changed them up. We discussed a little bit about ourselves and our interests. We both decided that right now it is important to focus on me transitioning into college and learning the right habits. He described how he has had a few people he has mentored and he thinks it is super important to focus on classes right now and trying not to overwhelm myself. He told me a little bit about his son and how we were in the same boat.*

Another student commented:

> *The meeting with my mentor…went great! When filling out the SMART Goals Worksheet, I found it fairly difficult to fill out. [Name] helped me to establish attainable goals and helped me to identify timelines that are applicable to my career path. She not only helped me with setting goals and establishing timelines, but she also set me up with personal contacts that will allow me to ask more in-depth questions regarding my career desires.*

Table 3

Gateway Scholar Student-Faculty Mentor Meetings (2018-2019)

Student self-report of mentor meetings 2018-19

Student-Mentor Meetings	22
Unique Students	16
>1 meeting with mentor	5

While we note that not all students reported meeting with their mentor two times per year, we have reason to believe that many are meeting more often than they report. For example, in one student's comments, she wrote that she meets with her mentor weekly, but only recorded 3 meetings using our form. We are working to create a report that will identify the Gateway Scholars working in faculty labs, which may explain under reporting.

Objective 1 Insights

The pool of URM students coming to our department is very low to start with, as it is nationally. We understand that STEM students, nationally, do not reflect the demography of the U.S. and our efforts need to include recruiting more URM students into the field.

These data make it very clear that mentors are important to help students navigate college. Creating a dialog about mentoring among faculty in the department enriches the culture of the department. Mentoring the mentors' and modeling what good mentoring looks like is an effective way to establish the practice of mentoring in the departmental culture.

Broader Impact

The focus on faculty mentorship for Gateway Scholars students appears to be positively affecting the department culture. We will continue to gather data to demonstrate shifts in the department.

OBJECTIVE 2: RISK-BASED ADVISING SYSTEM WITH PROACTIVE ADVISING FOR GATEWAY SCHOLARS

Objective 2 focuses on advising the Gateway Scholars cohort students while working to apply best practices in proactive way to all Department of Biological Sciences (DBS) undergraduate majors, as feasible. Following our 2017 report, our external evaluator feedback to the leadership team was that we needed to add metrics to the advising system and that we needed to "overhaul of the tasks, their definitions, and their assessment measures." Our work on objective 2 was aligned to these recommendations and we conclude this second year with far greater clarity about the impacts that the advising is making on our students and the gaps that remain.

The goals and measures for objective 2 are as follows:

2.a. Monitor on/off track students using the advising dashboard, reach out to students, and document via advising notes.

2.b. Advisor meetings with all Gateway Scholars students each semester

2.c. The advisor or his designee will update advising notes documenting advisee meetings including annotations about at-risk outreach.

2.d. Include discussions about advising related issues with faculty at department faculty/committee meetings

2.e. Collect and document midterm grades in all courses for Gateway Scholar students

2.f. Collect and document midterm grades in all core courses for all DBS students

Objective 2 Activities in 2018-19

Monitoring on/off track students [2.a.]

DBS advisor, Clay Cox monitors on/off track student enrollment patterns using the advising dashboard and documenting outreach efforts by reviewing an at-risk report generated by the Boise State College of Arts and Sciences. The advisor sends an outreach message to students who are at-risk based on the variables built into the report (based on enrollment, course taking patterns, and grades).

One tool that Boise State offers to help students participate actively in their own curriculum planning is the "degree tracker" platform. However, in our GSP focus group interview, the degree tracker emerged as an obstacle. One student describes this tool, which should help her plan her curriculum:

> *…the online degree tracker isn't the best thing in the world, it really [expletive]. So, um, it wasn't clear like what kind of classes I still needed and so I met with Clay and [he] fixed that. But since the classes are*

> *always like, this is like odd years or even years, it's only this year…so it was a lot of sitting down and…some of the courses I wanted to take weren't going to be taught this year. […] Sometimes, like I have no idea what I'm supposed to do" (lines 485-494, Spring 2019 Focus Group).*

Another student agreed with the comment above and added, "just don't even look at it…it makes you feel bad about yourself."

The degree tracker is a "home grown" system at Boise State that relies on updated curriculum maps and multi-year plans. It is possible that, given the recent curricular changes, updates have not been maintained in the degree tracker platform. It is recommended that DBS leadership reviews the degree tracker programming for DBS majors and makes updates if they are needed.

Advising meetings with Gateway Scholars [2.b. and 2.c.]

The DBS advisor attempts to meet with all Gateway Scholars students at least one time per semester [2.b.]. In Fall 2018 there were 806 actively enrolled undergraduate Biological Sciences majors and in Spring 2019 there were 679 students. There is one professional advisor assigned to all undergraduate DBS majors; thus the advisor load in this department ranges from 1:679-806 if you do not count students who are stepping out and plan to re-enroll or students who are entering the university as incoming freshman or transfer students. NACADA notes that many variables will impact optimal advising loads, however, the 2011 National Survey of Academic Advising reports the median advisee load for a public doctoral degree granting institution is 285 (Robbins, 2013). Still, a count of advising notes entered into the student information system indicates Mr. Cox logged 488 advising notes (for 417 distinct students) in the fall and 471 (for 404 distinct students) in the spring (includes in-person or phone advising as well as email exchanges with students).

Although we were aware that Mr. Cox's advising load was above recommended ratios, we followed our plan for intrusive advising with the Gateway Scholars. Table 4 illustrates the number of advising meetings between Mr. Cox and the Gateway Scholars students. Of the six students who did not meet at all with Mr. Cox, three either had or were about to graduate and two students were on a leave of absence, hence were not enrolled during the term. That leaves six students remaining who did not meet with the advisor two times during the academic year, falling short of our goal.

Table 4

Advising Meetings with Gateway Scholars Students

Advising meetings Fall 2018 and Spring 2019	# students	% of total meetings
0 meetings	6	18.8
1	5	15.6
2	6	18.8
3	7	21.9
4+	8	25.0
Total	32	100%

Below, we have included a snapshot of the advising meeting subjects for the fall term in Table 5 generated by an analysis of notes added to students' advising notes [2.c.]. Note the percentage of "outreach" appointments for Gateway Scholars is far higher than that for the general student population. This figure demonstrates the commitment to proactive advising for the Gateway Scholar students

Table 5

Comparison of Advising Appointment Subject

	All Students		**Gateway Scholars**	
Advising Subject	Count	%		
Adjustment	1	0.2%	0	0.0%
Appeal	1	0.2%	0	0.0%
Degree Req	36	7.7%	1	8.3%
Dismissal	1	0.2%	1	8.3%
Financial	1	0.2%	0	0.0%
Finish in 4	1	0.2%	0	0.0%
General Advising	280	60.0%	1	8.3%
Graduation Check	43	9.2%	0	0.0%
Major Change	5	1.1%	0	0.0%
Major Exploration	2	0.4%	0	0.0%
No Show	2	0.4%	0	0.0%
Outreach	8	1.7%	7	58.3%
Register for SP19	84	18.0%	2	16.7%
Transfer Credit	2	0.4%	0	0.0%
Grand Total	**467**	**100.0%**	**12**	**100.0%**

This year, in response to the need for more granularity regarding advising contacts with the Gateway scholars, we developed an advising notes annotation system that includes providing advising meeting detail and using the built-in subject headings to identify advising meeting types. In doing so we were able to better track the number of advising meetings and the nature of those meetings.

Discussing advising related issues with faculty [2.d.]

Department Chair Kevin Feris integrated several discussions about first-generation students and underrepresented groups into faculty meetings. Importantly, these topics were integrated into conversations about a faculty search as well as in the annual mentor training, which comprised an entire meeting on its own. (See Objective 1.c.ii.).

Members of the GSP leadership team serve on the departmental curriculum committee. They provide input and share findings related to this grant with the faculty on that committee so that action can be taken to lower potential barriers to student success. For example, this year, in addition to the typical work of addressing course requirements that change periodically, the committee deliberated about **clearer expectations for student and faculty in the Undergraduate Research Experience course** (BIOL 479). Clear expectations are one of the pillars for students to be successful in their research projects and to reap the greatest benefits from them.

An additional topic pertinent to this project concerns clear and consistent policies for missed labs including when they are excused, and the total number of excused absences permitted. While empirical studies have demonstrated a positive correlation between higher grades and class attendance (Crede, Roch, & Kieszczynka, 2010), recent work highlights the choices that lower income students are forced to make based on financial needs rather than educational ones (Soria, Weiner, & Lu, 2014). Increased awareness of lower

income students in the department and their differential needs should be shared with the faculty to help inform decisions about policies including rigid attendance policies for students who are struggling to balance school, work, and family.

Collect midterm grades and conduct proactive outreach [2.e.& 2.f.]

The Gateway Scholars Program includes "at-risk" advising efforts that are intended to intercede to support students prior to a failing grade for the term. Advisor Cox requests midterm grades from the faculty teaching all courses for the GSP students. Mr. Cox reaches out to the students who have grades lower than a C and attempts to meet with them to determine what supports might be needed to improve the grade (see Appendix C, email example). The response rate from faculty providing grade data is fairly high for the courses that should be graded (78% in fall 2018). Table 6 highlights grades that prompted at-risk outreach. Table 7 compares the final grades to the midterm grades reported – 51% of the grades are either the same or higher while only 10% of the reported grades fell from midterm to the final.

Table 6

GSP Midterm Grades Fall '18-Spring '19

Term	# GSP Students with grades <C-	# midterm grades below C-	Courses
fall 2018	4	5	CHEM 307, BIOL 442, BOT 401, ART 100, BIOL 191
spring 2019	6	11	Chinese 102, CHEM 307 SPANISH 102, ENGL 101, ANTH 103, MATH 187, MATH 211, STEM-ED 310, MATH 175, BIOL 426, BIOL 191

Table 7

Comparison of Final Grades to Midterm Grades for GSP Students (Spring 2018)

Final Grade Compared to Midterm Grade	#	%
Higher	38	22%
Lower	17	10%
Same	50	29%
Non-Graded Component	28	16%
N/A	38	22%
Grand Total	**171**	**100%**

While four GSP students had grades lower than a C- in the fall 2018 semester and four students ended the fall 2018 term with a grade of a D or F in a course, there were changes from midterm to the final grades. The GSP students had earned D or F grades in the following courses:

CHEM 307

SPANISH 304
BIOL 192
CHEM 112
MATH 170

While we believe this outreach effort is important and supports student success, we lack ample evidence to measure its impact on the students. Yet, midterm grades or progress reports are one of the recommended early warning systems that are empirically demonstrated to be effective when they are used to connect students with other support systems (Kuh, Kinzie, Bridges, & Hayek, 2006).

Advisor Cox requests the midterm grades for all Biology major courses asking faculty to provide student names for any students who have a grade or C- or lower at midterm. Mr. Cox sends an outreach email message to the students letting them know his walk-in hours and notifying them of the last date to drop a course with the grade of "W." We note that BIOL 310 has not been included in this list of courses but will be added to the midterm grades effort in year 3 (see Year 3 Plans).

Objective 2 Insights

Anecdotally, faculty on the GSP Leadership team have acknowledged that some required courses outside the Biology Department pose greater challenge to the students than the core Biology courses. This insight is supported by the focus group data from Spring 2018 and 2019, both of which highlight organic chemistry as an academic stumbling block. The midterm and final grade analysis data above also support the challenges posed by chemistry courses. The GSP leadership team should discuss approaches to better support DBS students in the required CHEM courses.

In addition to academic challenges, the pressure that low-income students face to balance supporting themselves and attending learning assistance sessions, collaborating with other students, and attending classes and laboratories has surfaced in our focus group and in national empirical studies. It is clear that the success of biology students and the GSP cohorts are not based only on the activities and supports within the department, but that there are external variables that come into play. Affording greater flexibility to meet students increasingly complex lives has been a topic of discussion by the GSP leadership team and steering committee. Working to convey these insights to the full faculty and staff and considering ways the department can meet the students where they are is very important.

It should be noted that Clay Cox is highly regarded by students and faculty and admired for the work that he does to support DBS students. He is only one person, however, and it is unreasonable to expect him to meet a demand that more than doubles the NACADA recommendations for student to advisor ratios. While mentors and advisors from other programs such as the College Assistance for Migrant Program (CAMP), TRIO Programs, and the pre-medical program provide some assistance, these auxiliary advisors are not familiar with the Biology major. The comments about the degree tracker, noted challenges meeting with students, and comments from the spring 2018 focus group discussing students' challenges accessing advising for DBS majors, underscore our recommendations that the department needs funding for another full-time professional advisor (see Plans for Year 3).

BROADER IMPACT

GSP has illuminated the need for additional professional advising support for biology majors and has helped the department advocate for these resources from the university's administration.

GSP has highlighted external threats to students' academic success (courses outside the department and access to learning assistants and faculty office hours for low-incoming and working students). Alternatives and flexibility to accommodate students' divided time need to be considered by the faculty.

OBJECTIVE 3: INTEGRATE EVIDENCE-BASED INSTRUCTIONAL PRACTICES (EBIPS) IN THE DBS CORE

Objective 3 focuses on the program elements designed to support faculty integration of evidence-based practices in core biology courses.

The goals and measures designed for objective 3 are:

- 3.a. Encourage EBIP usage in core courses and labs and measure these efforts using the COPUS instrument and faculty self-report.
- 3.b. Measure impact of EBIPS in core courses
  - 3.b.i. Student sense of biology identity
  - 3.b.ii. Brief Professor-Student Rapport Scale (in core course lectures and labs)
- 3.c. Close the loop through data sharing meetings with faculty
- 3.d. Enhance Learning Assistance program to foster greater success in BIOL courses and measure these efforts through analysis of grades

Objective 3 Activities in 2018-19

Encourage EBIP usage in core courses and labs [3.a.]

As a broader impact of the Boise State's NSF WIDER PERSIST Grant (*DUE-1347830, 9/15/13–8/31/17*), DBS faculty gained familiarity with EBIPS and the work in the GSP Project is helping to deepen the impact of WIDER PERSIST. The DBS was selected to participate with the goal of transforming the instructional practices in the department and began work integrating EBIPs and redesigning courses. Discussions about EBIPs and active learning became a regular topic in department meetings.

Demonstrated Progress Adopting EBIPS [3.b.]

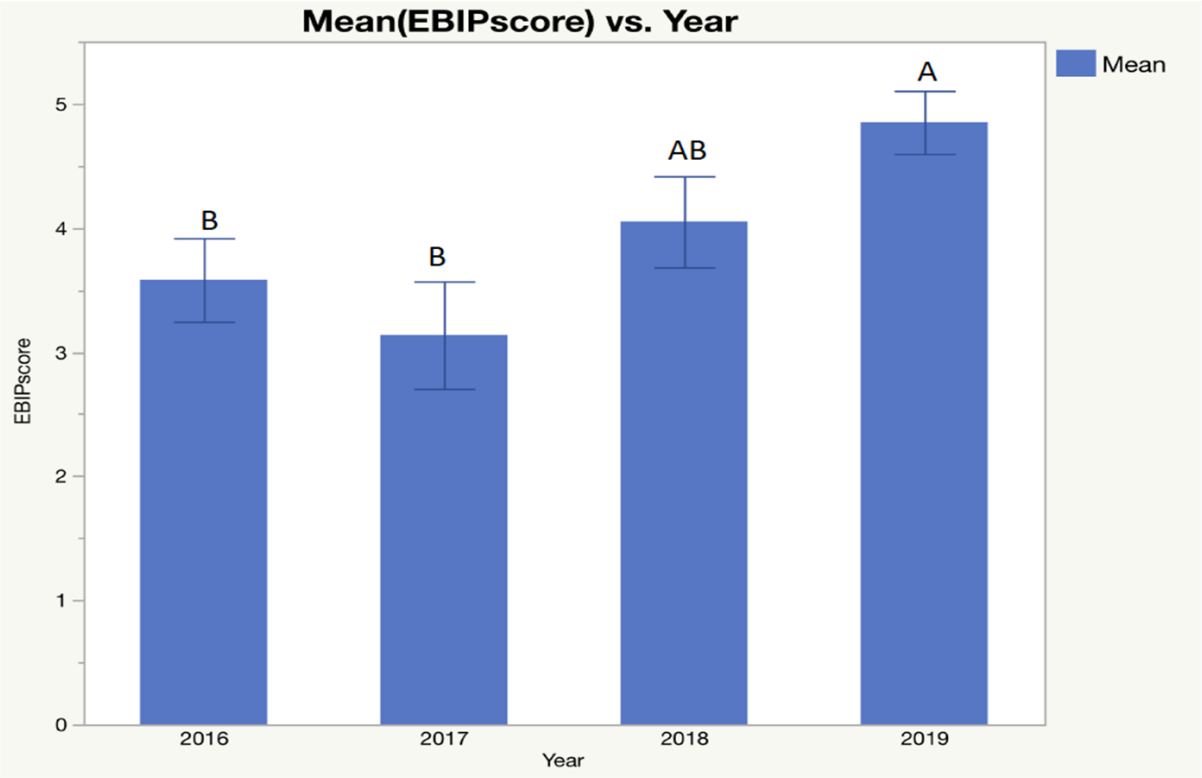
During that project, the WIDER team created the evidence-based instructional practices adoption scale (EBIP scale) to assess the instructional climate and measure EBIP adoption on campus (Landrum, Viskupic, Shadle, and Bullock, 2017). The EBIP scale was administered each year from 2016 through 2018 university wide and departmental data was shared with the DBS. In 2019 the GSP leadership team administered the survey

again and, in our analysis of differences in the observed mean on the EBIP scale increased in 2019 in comparison to the prior year.

We conducted an ANOVA test to determine if the means were different from one another and followed that with the Newman-Keuls stepwise means comparison, which indicates that the higher 2019 mean was significant when comparing 2016 and 2017 against the 2019 rate. Adoption levels between the 4 years were different (ANOVA, $F_{3,89}=3.8$, $p=0.01$) and the adoption was 1.27 points higher in 2019 than in 2016 and 1.72 points higher than in 2017 (Newman-Keuls stepwise means comparison; Figure 2).

Figure 2

EBIP Adoption Scale Year to Year Comparison



We concluded that EBIP adoption by the DBS faculty was higher in 2019 (n=20) compared to 2016 (n=31) and 2017 (n=22) but did not differ from 2018 (n=20). These data are an indirect measure of EBIP usage. In the next section, we discuss direct measures of EBIP usage in core DBS courses.

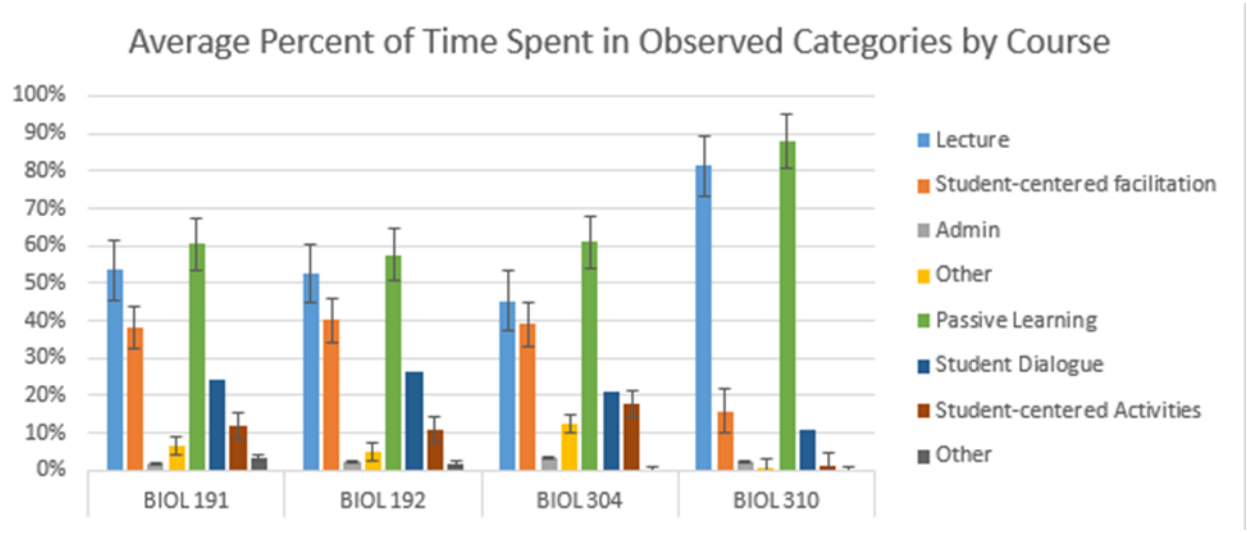
Measuring EBIP Adoption via Observation [3.b.]

The GSP leadership team enlisted the assistance of the Boise State Center for Teaching and Learning Instructional Transformation Project Manager, Brittnee Earl. Earl has extensive experience administering the Classroom Observation Protocol for Undergraduate STEM (COPUS) (Smith, Jones, Gilbert, & Wieman, 2013) and analyzing the resulting data to understand the patterns of faculty and student behaviors in STEM classes. During the academic year, Earl conducted observations of the core Biology courses (191, 192, 304, 310) according to the plans established in the Gateway Scholars proposal. BIOL 191 and 310 lecture sections

were observed three times each in fall 2018. BIOL 192 and 304 lecture sections were observed four times each, as these courses are taught by faculty pairs that split the content from weeks 1-8 and 9-16. In total, 47 course sections were observed between September 13 – December 4, 2018. In the spring term we planned to observe only the sections taught by faculty who had not been observed in the fall. Earl conducted four observations in the BIOL 192 lecture and two in the first half of the BIOL 304 lecture. The faculty member teaching the second half of the BIOL 304 lecture requested not to be observed since it was the first time teaching that course. The associated lab sections for BIOL 191, 192, and 304 were observed using the Laboratory Observation Protocol for Undergraduate STEM (LOPUS) instrument (Velasco, Knedeisen, Xue, Vickrey, Abebe, & Stains, 2016). A discussion including methods and brief analysis of the COPUS data for the lecture sections is included in Appendix C. Here we include a snapshot of the time spent in the observed course sections by category in Figure 3.

Figure 3

COPUS Observations in Core BIOL Courses (Fall 2018)



In the explanation of these COPUS data, Earl reported that a variety of active learning techniques were used during class (clickers, peer interactions, concept maps, individual thinking time, and whole class discussions). The most frequently used active learning strategies were think-pair-share, group polling, and "report outs" from small group work. Earl notes that the observed activities were qualitatively different across course sections and raises questions about the fidelity of EBIP application in the various courses. Questions regarding how EBIPS are used in courses are surfacing in the scholarly literature (e.g. Stains, Vickrey, & Allen, 2017). The objective 3 implementation team (Ulappa, Stieha, and Earl) are continuing to explore this question and intend to develop a publication examining these data more deeply.

BROADER IMPACT

A continuing focus on EBIPS through the Gateway Scholars S-STEM Grant has contributed to extending the progress to understand and adopt EBIPS made during the NSF WIDER PERSIST Grant.

Measuring EBIPS as Related to Rapport [3.b.ii.]

Theoretically, the use of EBIPS should be related to rapport as EBIPS, generally, reduce the barriers between faculty and students and increase interaction in the classroom. Immediacy or availability is believed to contribute to rapport (Ryan, 2014) and EBIPS, in contrast to traditional teaching, tend to reduce the barriers between students and teachers (e.g. darkened classrooms with all eyes on slides, one-way communication from faculty to students). The Professor-Student Rapport Scale – Brief (BPSRS) (Ryan, 2014; Wilson & Ryan, 2013) is used in this project as one measure of working to reducing such barriers.

While in the first year of this grant we administered the BPSRS via an electronic survey through an email link, this year we used a paper format and increased our rate of response from 58% to 87% across all the course sections. We have a high degree of confidence in the findings resulting from the implementation this year given this very high response rate (see Table 8). A full discussion of the methods and analysis of the BPSRS data is included in Appendix C.

Table 8

BPSRS Response Rates (2017 - 2018)

	Fall 2017			**Fall 2018**		
	# enrolled	**# completed**	**%**	**# enrolled**	**# completed**	**%**
BIOL 191	327	151	46%	262	243	93%
BIOL 192	151	101	67%	159	128[1]	84%
BIOL 304				84	73	82%
BIOL 310	85	73[2]	86%	111	98	88%
Total	**563**	**325**	**58%**	**616**	**538**	**87%**

[1] The average of part 1 and part 2 for BIOL 192 and BIOL 304 comprise the total number surveyed as the instrument was administered twice in these course sections. BIOL 304 first offered in fall 2018.

[2] The faculty member teaching BIOL 310 offered extra credit if the class reached more than an 80% response rate.

The Rapport Scale includes six items that are combined with a theoretical range from 6 to 30. The scale uses a 5-point Likert-type scale ranging from strongly disagree (1) to strongly agree (5) with a neutral option, neither agree nor disagree.

The instrument includes the following statements to comprise rapport:

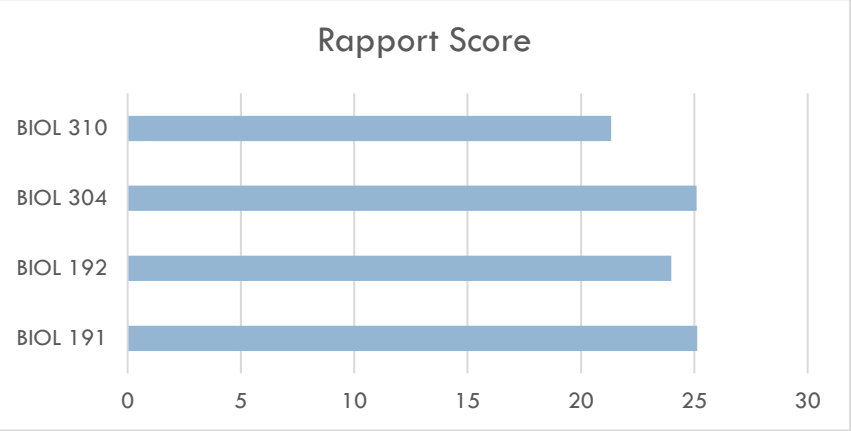
Q1 My professor encourages questions and comments from students.
Q2 I dislike my professor's class. (R)
Q3 My professor makes class enjoyable.
Q4 I want to take other classes taught by my professor.
Q5 My professor's body language says, "Don't bother me." (R)

Q6 I really like to come to class.
(Wilson & Ryan, 2013)

An analysis of the scale was conducted by research faculty statistician, Laura Bond. We note the spread of scores across the lecture sections do not vary widely (21.3 to 26.8) and we could find no significant differences in the rapport scores between sections. These scores suggest a relatively high level of rapport reported by students in these core biology courses.

Table 9

Rapport Scores by Course Section



Our analysis of the items in the scale revealed a statistically significant lower correlation between Q 1 (My professor encourages questions and comments from students) and Q6 (I like to come to class) ($r = .324$, $p = \leq .05$). It is possible this low correlation can be attributed to the way that active learning strategies are employed in some classes.

Table 10

Item Correlations for Rapport Scale

	Q1	Q2R	Q3	Q4	Q5R	Q6
Q1	1.000	0.348	0.499	0.487	0.417	0.324
Q2R	0.348	1.000	0.599	0.654	0.314	0.652
Q3	0.499	0.599	1.000	0.703	0.379	0.631
Q4	0.487	0.654	0.703	1.000	0.370	0.624
Q5R	0.417	0.314	0.379	0.370	1.000	0.310
Q6	0.324	0.652	0.631	0.624	0.310	1.000

In order to better understand this possibility, we need to more closely examine the way that faculty are implementing active learning strategies in core biology classes. We note there is a general fear among faculty who are beginning to use active learning strategies that their course evaluations may suffer (Henderson, Khan, & Dancy, 2018). Recent scholarship delves into negative student responses to active learning. This inquiry has shown that helping students understand why active learning techniques are valuable

(Cooper, Ashley, & Brownell, 2018) supports students' acceptance of these practices. Similarly, increased fidelity when employing evidence-based instructional practices also increases students' favorable views toward those practices (Stains & Vickrey, 2017). **Our work in the coming year will include a deeper dive into how faculty are implementing evidence-based practices in their classes.**

We also note a lower correlation between Q2R and Q5R (I dislike my professor's class and My professor's body language says "don't bother me"). Neither the data that we have collected nor the literature on rapport provides much explanation for this correlation. It is possible that when the student reports that they do not like the class, negative body language is not associated with that negative response.

Measure the impact of EBIPS in core DBS courses [3.b.]

The GSP assessment methods include an annual focus group with our Gateway Scholars. The 2019 focus group (n=3) helps us understand how the redesigned DBS courses and intentional focus on EBIPS are impacting our students.

As we reviewed these data, we note comments highlighting redesigned courses (BIOL 192) and newly designed courses (BIOL 306 and BIOL 485) with intentional focus on EBIPS connected to the American Association for the Advancement of Science (AAAS) Vision and Change report (2009). As Brownell, Freeman, Wenderoth, and Crowe (2014) explain:

> Vision and Change outlined a set of core competencies in addition to the five core concepts. These include the ability to: 1) apply the process of science, 2) use quantitative reasoning, 3) use modeling and simulation, 4) tap into the interdisciplinary nature of science, 5) communicate and collaborate with other disciplines, and 6) understand the relationship between science and society. (p. 205)

One of the questions we ask in the focus group is, "what are the moments where you feel like you are 'doing science?'" Examples that the students offer are drawn from courses, undergraduate research experiences, co-curricular experiences, and off campus positions (some of which have resulted from campus connections). Here, we provide excerpts with a few of the examples that support our progress to effectively integrate EBIPS in DBS courses with annotations connecting these examples to the AAAS core competencies:

- "I think it is 192 […] that's second semester general bio, […] we looked at a lot of stuff under the microscope and, it sounds kind of silly, but when you're looking down there it's like, whoa, this is science man!" *(1) Apply the process of science*
- "[…] my cell biology class [BIOL 192] he gives more of […] a medical look and so […] you're learning about these different types of proteins and enzymes and that's cool, but how do these apply […] and he'll show these type of drugs that can inhibit certain enzymes and then that stops cancer or certain things like that, that's when I'm like, 'oh, I see how what I'm learning is being applied'." *(3) use modeling and simulation (6) understand the relationship between science and society*
- "Last semester it was [BIOL 306], […] it's the communications biology class and being able to look at articles, different articles and stuff, and being able to analyze them and read them and apply what you learned from those. […] It's just kind of being able to have the knowledge to interpret what other people have done and kind of analyze that and also kind of move forward with that. I guess one of the big things I learned in that class was it's like you don't have to make an overall huge impact in a field to kind of make a difference I guess. Cause you're able to focus on one specific thing, then […] you'll be able to make a difference [….] So you can't just kind of look at something and be like, I'm

going to cure cancer and then just do it, it starts with one tiny part and then kind of working off that." *(1) Apply the process of science* (*5) communicate and collaborate with other disciplines*

- "I'm taking an animal behavior class right now and we are doing independent research projects […]. I think like designing the experimental design is always a good practice to […] think about, 'how should I collect these data to be able to analyze them and what is my analysis going to look like?'" *(1) Apply the process of science*
- "Oh, Biology 485, so that was kind of a cool class because it was in conjunction with independent research going on in a lab. […] It wasn't like a typical class, […] the culminating project was to create a poster and we […] presented it to different faculty and graduate students and undergraduate students. So I've done quite a few poster presentations at this point and that always feels cool. *(1) Apply the process of science* (*5) communicate and collaborate with other disciplines*

These students' voices provide a glimpse into the sense-making that students are drawing from their learning and illustrate the process of beginning to identify as and think like biologists – a goal of the GSP.

Developing Science Identity and Self Efficacy [3.b.i.]

Above we discussed measurements of rapport, While the focus group provides solid evidence of students developing a sense of science identity and self-efficacy, in fall 2017, we began developing an instrument designed to help us better understand students' growing sense of identity as a biologist.

The biology self-efficacy items were written to correspond with the core outcomes identified in the AAS Vision and Change report which also was used to guide the DBS learning outcomes. The survey was administered to the GSP students in 2017 and 2018. The data presented here are aggregated from both years as the n for each year is small (n=44). As efficacy and identity can change as students experience the program, we are interested in the overall sense of self-efficacy and identity indicated by this group of students as a whole.

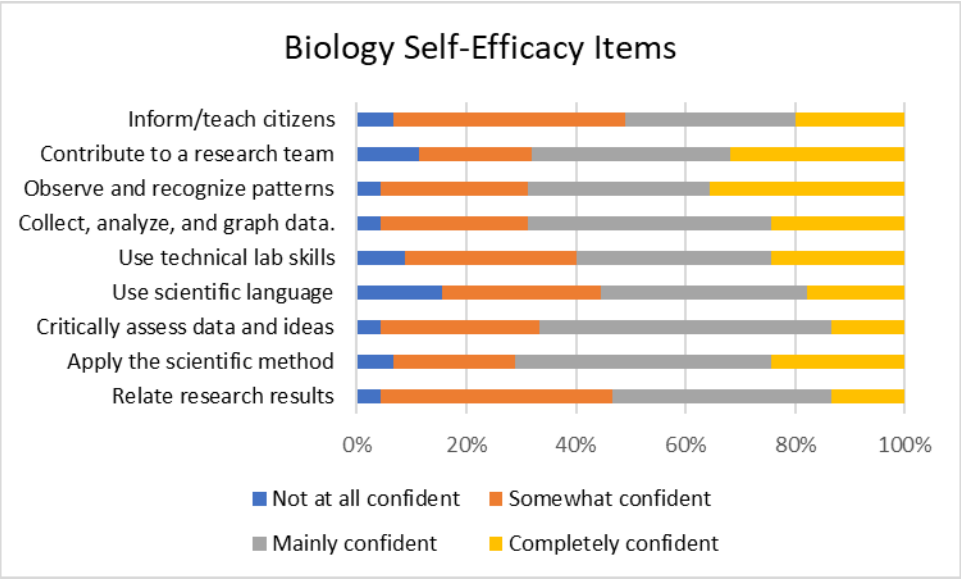
The self-efficacy questions included on the survey are included below and in Figure 4 we share the percentages of responses at the four confidence levels reported.

I can:

- inform or teach fellow citizens about biological facts and theories related to everyday societal controversies.
- contribute to a research team conducting original, biologically related research.
- carefully observe people, the environment, and organisms to recognize patterns.
- use quantitative and technical skills to collect, analyze, and graph data.
- use technical science skills in a biology laboratory.
- use scientific language and terminology to explain biologically related facts and theories.
- critically assess data and ideas found in scientific research literature.
- apply the scientific method of analysis.
- relate results and explanations of one research study to another research study.

Figure 4

Biology Self-Efficacy



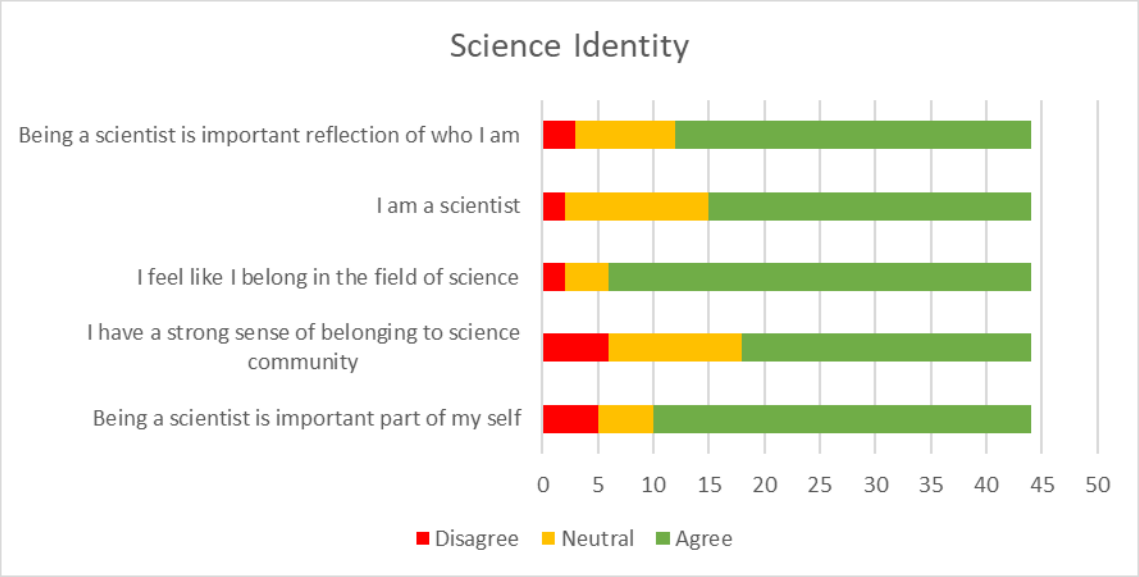
A set of science identity questions are included on the instrument as well. These items provide an additional indirect measure of the connection that students have with STEM generally, and with biology:

- In general, being a scientist is an important part of my self-image.
- I feel like I belong in the field of science.
- Being a scientist is an important reflection of who I am.
- I have a strong sense of belonging to the community of scientists.
- I am a scientist.

Students responded to these five items that pertain to science identity using a 5-point Likert-type scale from strongly disagree to strongly agree. **We note the strong agreement with a sense of belonging in the field of science, which is one of the stated goals of this grant.** As stated above, the relatively small number of student responses in these data (n=44) limits the conclusions we can draw at this time. For this report, we have reduced the data to 3 categories, agree (combines strongly and somewhat agree) and disagree (combines strongly and somewhat disagree) to increase the readability of figure 5. We are collecting self-reported demographic variables with the responses and, in year 3 of this project, we will analyze the data for emergent patterns associated with core courses the students have taken and experiences including mentor meetings and involvement in research labs.

Figure 5

Science Identity Scores



In addition, one of the questions in our focus group assesses students' science identity as we see this phenomenon expressed as "when I am 'doing' science." Finally, rapport, which we are measuring with the Brief Professor-Student Rapport Scale, is also theoretically correlated with psychological belonging (Ryan, 2014). Each of these data sources is discussed in this section.

Analysis of COPUS and BPSRS Data for Relationships between Rapport and Pedagogical Approaches [3.a.]

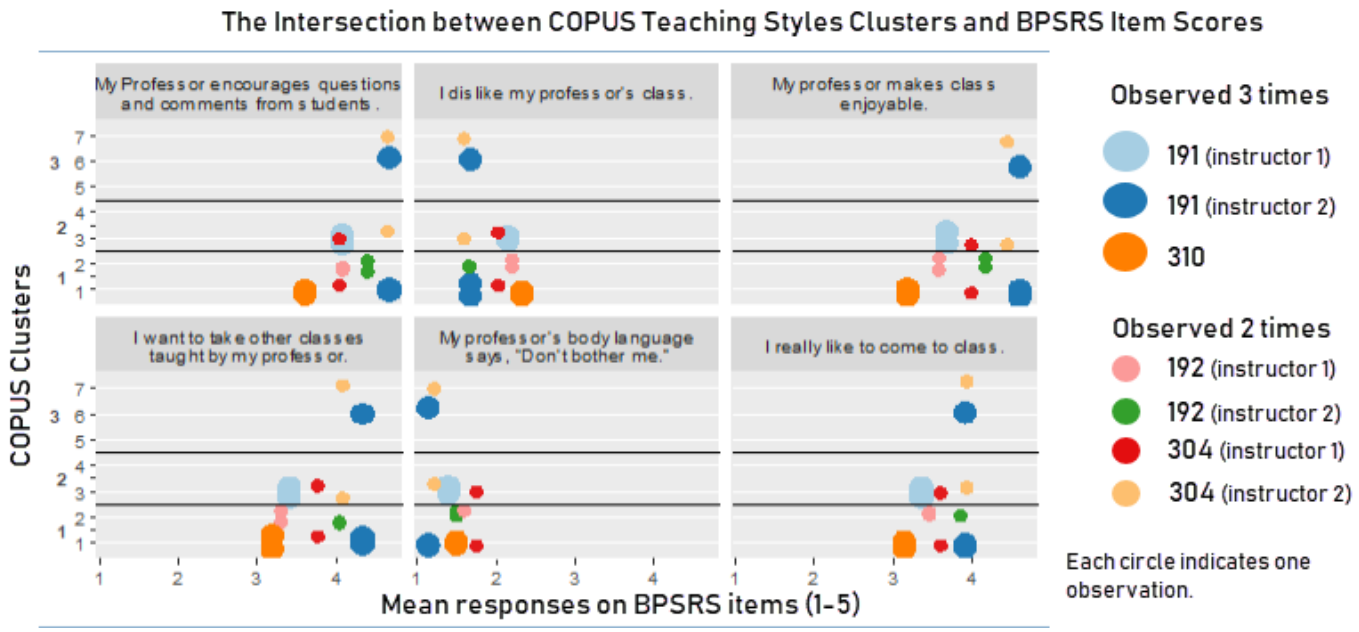
As discussed above, there is a theoretical thread that connects the COPUS and professor-student rapport. To tease out those threads, we are looking closely at the intersecting data. Figure 5 (below) requires some explanation. The circles in the figure represent the COPUS observations. Courses that were observed two times per professor (BIOL 192 and BIOL 304) are indicated by a smaller diameter circle whereas those observed three times (BIOL 191 and BIOL 310) are indicated using the larger diameter circle. The various lecturers are denoted by the color of the dot (see "lecture" key in Figure 5). In this figure, we have disaggregated the rapport scale into its items. While these data are inconclusive (the range of rapport has very little statistical differentiation) we provide these figures for consideration.

In the COPUS we saw that there were differences between the core courses in the distribution of lecture and student-centered activities from the faculty perspective. To simplify findings, COPUS data can be condensed into three clusters to describe a teaching style: (1) lecture, (2) active lecture, (3) active learning. These styles are signified in Figure 5 on the Y axis It is not unusual for a faculty member to be observed teaching in one cluster on one day and in another on a different day. In Figure 5, the horizontal lines dividing the charts into three segments represent observed teaching in these quadrants. To illustrate, the faculty member teaching BIOL 191_2 (large blue circle) was observed on 3 different days, on two days professor 191_2's teaching style was observed as "lecture" and on the third it was observed as active learning. Looking closely at the item, "my professor encourages questions and comments from students" the mean score for that item is 4.68 (n = 131). It seems logical that a professor who uses an active learning style 1/3 of the time would encourage comments and questions.

Although the intent of this report is not to critique teaching, we note that courses that tended more consistently to use a lecture style (COPUS cluster 1) seem to have lower rapport ratings. For example, when considering the item "my professor makes class enjoyable," even though 191 (instructor 2 has two observed classes that are lecture style, at least part of the time that faculty member uses active lecture. The students' responses to the BPSRS items suggest that these students find more enjoyment in this course section than students do in the other course sections (although the differences between instructors are not statistically analyzed in this report). We believe that these data can provide more insights about the ways that active learning is employed in STEM classes and we intend to continue this analysis as part of our broader impact efforts.

Figure 6

Intersections between COPUS and BPSRS



Close the assessment loop through data sharing meetings with faculty [3.c.]

COPUS and Brief Professor-Student Rapport Survey Data Sharing

The DBS core course faculty were invited to attend a conversation with co-PI's Juliette Tinker and Vicki Stieha as well as Brittnee Earl. Following a brief overview of the NSF Gateway Scholars Program, and its five objectives, we discussed the analysis of data collected through the COPUS and BPSRS instruments during the fall. Most of the time during the meeting was spent discussing questions raised by the faculty. Many of the questions focused on resources to "emphasize active learning," and making better use of learning assistants. The faculty also reviewed the LOPUS data from labs associated with their courses and discussed ideas to reduce "wait time" in labs as well as to institute a "no phone" policy (in response to the observation that students were waiting for lab instructors and spending time on their phones). In concluding, the faculty were open to continuing to collect data as needed and reviewing it in non-judgmental ways. As researchers, we acknowledge that it is difficult to broach teaching critique and we are seeking strategic ways to help faculty think about ways they can continue to improve their teaching practices.

Enhance Learning Assistance Program in BIOL courses [3.d.]

Learning assistants are assigned by the university centrally by looking at courses with high failure rates and then gaining the agreement of the faculty. DBS currently has learning assistants in BIOL 191 and 192. As 304 was new starting in fall 2018, there was no learning assistant assigned. BIOL 310 does not have a learning assistant assigned as its failure rate is not high enough to warrant assigning one to the class.

It was our initial intent to enhance the learning assistance offering for biology courses, however, upon further investigation we found:

- Biology majors are struggling with courses outside of the biology department (math, chemistry, etc.);
- Focus group data suggests our cohort of working students cannot attend the scheduled learning assistance sessions.

Based on our review we concluded that Gateway Scholars (and DBS students broadly) would be better served by making learning support available more flexibly. We would like to pilot a Biology Instructional Center to make learning support available to students at a time when they can utilize the help. We do not currently have enough funding to fully roll out such a center, but we are investigating options to try out a few approaches and will be seeking funding for such a center in a future grant application.

Objective 3 Insights

We note the following positive insights in this year's data supporting Objective 3:

- Support from the WIDER grant and DBS curriculum change aligns with AAAS standards based on our analysis of the focus group data.
- Students are experiencing active learning to some extend in large intro courses for majors and we note an upward and significant change in EBIP usage among faculty over the last several years.

We also note areas that need improvement to meet the goals set forth in this objective:

- Improvements are needed to support DBS students in math and chemistry courses. Efforts in this area need to include helping students understand how mathematics and chemistry are integral to biology (not just as another course to take).
- Gateway Scholars find it difficult to attend learning assistance sessions due to conflicts (e.g. working and commuting). DBS will create a space for biology students to gather on campus so that they can more easily find other students for peer assistance with homework with and ask for help. We note the space available for this purpose is a hallway in the MATH building. While less than optimal, we see it as a first step toward a more suitable space. We will continue working toward a better solution to accommodate a greater percentage of our 800 students.
- The BPSRS instrument, as we are using it, is not providing as the insights that we hoped it would. We anticipated that we might see helpful patterns when we examined rapport in light of teaching style (COPUS) but we have not been able to discern significant patterns yet.

OBJECTIVE 4: ENGAGE STUDENTS IN CO-CURRICULAR ACTIVITIES REPRESENTING DIVERSE CAREER PATHS

Objective 4 focuses on developing a cohort experience for Gateway Scholars Program participants so that this group of students will experience a variety of learning experiences exposing or immersing them in

activities related to the diverse career paths that a biology major may pursue. Objective 4 is supported by the following goals and measures:

4.a. Continue offering BIOL 198 to GSP students
- 4.a. 1. Students will develop 4-year academic plans in the BIOL 198 course
- 4.a.2. Continue evaluating BIOL 198 and disseminate findings (Goal for 2019-20) about the impact this course is having on participating students

4.b. The GSP program will provide 6 or more co-curricular events per year designed to help scholars explore diverse career paths

4.c. The GSP will provide 2 or more field trips per year designed to support career exploration and cohort building.

4.d. Encourage and document student engagement in undergraduate research experiences (UREs) with a target of 25% of GSP students participating in a URE.

Objective 4 Activities in 2018-19

Biology 198 to support cohort building a co-curricular engagement [4.a.]

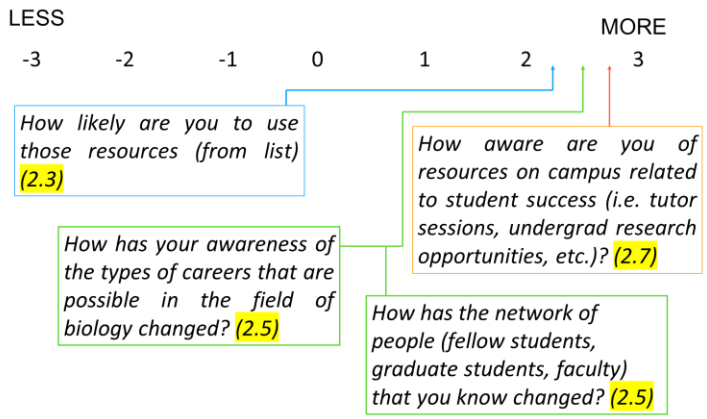
In fall 2017, incoming freshman and sophomores were encouraged to sign up for Biol 198 (Perspectives in the Biological Sciences), a course created for the Gateway Scholars. Feedback from the 10 students in the course indicated it was a valuable experience to familiarize themselves with the university and frame their thinking about learning. That semester, monthly cohort events were held during the class time, so attendance was generally high for those events and attendance dropped in the spring. Students indicated that interactions with upper division students in biology was beneficial and that they would like to add more medical related events to the cohort event list.

In fall 2018, eight freshman and sophomores new to the Gateway Scholars program enrolled in Biol 198. The course instructor added a class session including a panel of Gateway Scholars juniors and seniors so the Biol 198 students could ask questions and get advice. A few curricular elements were changed based on feedback from the prior class (e.g. developed lessons on learning and neurobiology; removed content about "grit," as suggested by steering committee member, Dr. Sharon Patterson).

At the end of the semester, students reported they had an increased awareness of the campus resources and were more likely to use them and had expanded their awareness of biology careers and their professional network. Figure 7 highlights a few of the findings (means score for several BIOL 198 questions are included); see the full instrument in Appendix D.

Figure 7

BIOL 198 Impact Scale



Additionally, open ended questions asked students to share the impact the GSP has had on them. A few examples of the comments related to the Biol 198 experience from students who took the course in fall 2017 and 2018 are below:

> "Biol 198 has developed my critical thinking abilities and encouraged a more comprehensive approach to learning."
>
> "Biol 198 helped me realize my potential as a scientist. Dr. Ulappa handed out worksheets that were helpful for understanding what happens to your brain as you learn. Overall, I think my self-image was improved by this course."
>
> "I think Biology 198 helped open my eyes to new fields that I could pursue in Biology. I had never thought about studying ecology or even geology after college, but now, I am excited to see what new fields I can pursue."
>
> "This class showed many opportunities within the biology department and different programs on campus. It was helpful to have someone come in and talk about certain research programs and scholarship opportunities."

Students will develop 4-year academic plans in the BIOL 198 course [4.a.i.]

In fall 2017, during BIOL 198, Dr. Ulappa explained that students needed to create a 4-year academic plan by the end of the academic year and then to go over that plan with DBS advisor Cox.

During the focus group (2018) students discussed the challenges of academic planning and suggested creating the academic plan during the BIOL 198 course (for those enrolled) where students could ask questions and get suggestions from the instructor. This recommended change was adopted in the 2018-19 BIOL 198 class. The GSP students were also encouraged to talk to their program mentors about their 4-year plans which fostered meaningful interactions and a starting point for developing the student-mentor relationship. We will continue to develop 4 year plans as part of the BIOL 198 curriculum.

GSP Co-curricular events to help scholars explore diverse career paths [4.b. and 4.c.]

We included a more diverse array of topics for the monthly cohort events and continued to advertise them through the Gateway Scholar Blackboard page and tracked attendance to these events electronically via OrgSync[2] (Blackboard announcements, fliers and original attendance data file are in Appendix D). While co-curricular events were initially conceived for the GSP cohort, one broader impact under this objective was to partner with the Biology Club for two department-wide events focused on undergraduate research and faculty interactions (*Faculty Lightening Talks & Social* and *Undergraduate Research and Scholarship Info Session*). The Faculty Lightening Talks event was attended by approximately 70 people. As we cannot require events of the GSP students, we have worked to build excitement and emphasize the community aspects of the events.

"Just seeing these small trips that you do has been helpful kind of seeing what other options are out there" (Focus group participant, 2018).

Other undergraduate and graduate students and faculty attended these events as well. In total, nine events were held during the year with 59 GSP students (includes duplication) attending for 98 hours total during the 2018-19 academic year (see Appendix D for a summary of the event attendance for each). These events varied from outdoor activities (local hike), career inspiration (guided tour of the BSU Biomolecular Research Center, DBS Faculty Lightning Talks and Social, Histology Lab Visit), information about research opportunities (undergraduate research poster session in Biol 485, undergraduate research opportunities in STEM Info session, scholarship/REU information session), and student information and community building (Gateway Scholar student success panel, pizza and focus group).

Photo 1: Social following the 2018 Faculty Lightning Talks

During the focus group (2019) students told us that these events are helpful to them as they think about their next steps whether those include upper division courses or plans following graduation. For example, a graduating senior shared, "something else that I think helped inform my next steps after graduation was talking to other graduate students and my advisor, that's been really informative." Another shares the value of the events, "[…] the different visits [have] shown, I guess, all the other fields that are out there because, like just having a biology degree, I guess you can pretty much really go into anything."

BROADER IMPACT

While originally intended to meet the goal of creating co-curricular activities for the GSP students, an increased focus on events connecting GSP students to other biology students, graduate students, and faculty are drawing interest from all these constituents. The generative energy has strengthened the Biology Club and these leaders are assuming more ownership of similar co-curricular opportunities in the department.

[2] OrgSync is an event planning and involvement tracking software system available through Boise State's central information technology services.

Encourage and document student engagement in undergraduate research experiences (UREs) with a target of 25% of GSP students participating in a URE [4.d.]

Students in our program are introduced to research and faculty in serval ways (e.g. Biol 198, GSP and biology department events and curriculum, and the GSP mentor program) and they reach out on their own as well. 11 of our 32 (34%) scholars participating formally in research in some way, according to our documents. DBS Student Research Program manager, Brittany Archuleta, collects information each semester on which students in the department participated in undergraduate research and has shared that data with us (summarized in the table below for our scholars). In the coming year we will expand our documentation efforts to include research conducted outside of the DBS as our students likely participate interdisciplinary research (e.g. health sciences, environment studies, chemistry, and engineering). We are working with the Office of the Registrar to create a student group in our student information system which will allow us to identify students participating in undergraduate research and to identify correlated positive outcomes undergraduate research (a high impact practice).

Table 11

GSP Students in Undergraduate Research Experiences

GSP Student	**Faculty/Supervisor**	**Semesters**	**URE position title**
Rafael Gomez	Lisa Warner	Fa 17, Sp 18, Fa 18, Sp 19	Independent Study BIOL 496
Briana Grantham	Lisa Warner	Fa 17, Sp 18, Fa 18, Sp 19	Independent Study BIOL 496
ShaKayla Moran	SaraJane Gillette	Fa 17, Sp 18	WS Student Laboratory Tech 1
Julianna Ramirez	Neil Carter	Fa 17, Sp 18	Student Research Tech 3
Alyssa Celedon	Kristen Mitchell	Sp 18	Biol 496
Sadie Ranck	Julie Heath	Su 18, Fa 18, Sp 19	HERC and Biol 479 and Student Research Tech 1
Serena Sheldon	Sven Buerki	Fa 18, Sp 19	Biol 479
Brandi Taylor	Pete Koetsier	Sp 19	Biol 493
Peyton Vasquez	Brad Morrison	Sp 19	Lab Intern
Ben Balzar	Eric Hayden	Sp 19 and Su 19	VIP 200
Brittany Rushing	INBRE faculty	Su 2019	INBRE

Objective 4 Insights

While we will be recruiting freshman and sophomore students next year (year 3 of the GSP), in the final two years of the grant we will be focusing on upper division students to enable us to support four years of grant recipients' education. We are, therefore, going to open BIOL 198 to students outside the GSP cohort. This is a broader impact of the Gateway Scholars S-STEM Grant, and we see it as providing a beneficial support for DBS majors in the future.

The addition of an impact survey at the end of the BIOL 198 class has been informative as only a small portion of the scholars can attend the focus group each year. By adding this instrument to our assessment efforts, we are gaining a more diverse set of voices in our feedback loop. We will also share the outcomes of our assessment in a publication or presentation as we contend the blend of community building, networking support, and content about learning (cognition and social learning related content) are benefitting our students.

We note that the number of GSP students participating in at least one event was higher in fall 2017 (n=29) than it was in fall 2018 (n=16). One of the reasons for this decrease is that we collaborated more with the Biology Club, and students were attending events that were encouraged by the GSP, but not labeled GSP events. Additionally, we opted to plan fewer events during the BIOL 198 course to focus on other important content.

BROADER IMPACT

Given BIOL 198's demonstrated success, as the number of lower-division students in the GSP wanes, we are opening the course to any biology major while keeping the course small (24) to preserve it's community feel.

OBJECTIVE 5: SUMMARIZE AND REFLECT

The focus of objective 5 is to summarize and reflect on the effects of overall project & activities implemented in objectives 1-4 on retention, student success, degree attainment, and diversity. In addition, in meeting this objective, we work to apply project outcomes to provide broader impacts, draw conclusions, and make program plan adjustments.

5. a. Measure progress on objectives by collecting data and measuring via:
    - 5.a.i. Annual Focus Group (Objective 1, 2, 3, and 4)
    - 5.a.ii. COPUS Instrument (Objective 3)
    - 5.a.iii. Brief Professor-Student Rapport Scale (Objective 3)
    - 5.a.iv. Self-efficacy and Biology Science Identity (SEBSI) Assessment (Objective 4)

5.b. Student retention, academic performance, degree attainment data (Objective 1, 2, 3, and 4)
5.c. Distribute summary of annual report to faculty for feedback and future action.
5.d. Summarize and disseminate broader impacts

Objective 5 Activities in 2018-19

Data collection and analysis (indirect and direct assessment) [5.a.i – 5.a.iv]

As described in the previous sections, we have used focus group data [5.a.i], COPUS data, [5.a.ii], BPSRS data [5.a.iii], and self-efficacy and biological science identity data [5.a.iiii] to better understand the department's progress toward cohort building, increasing active-learning in core biology courses, supporting at-risk advising, building a mentor program, and using curricular and co-curricular activities to support students' exploration of biology related career paths.

In this section we will focus on student retention/graduation data and academic performance data as a key indicator of our progress toward the program goals. The DBS is working to increase degree attainment by high ability, low-income students through the Gateway Scholars. Included in that population are underrepresented students and, while not the sole focus of our activities, we are looking carefully at the ways our efforts are supporting sub-groups within the NSF defined population for S-STEM funding (high ability and low-income). Three research questions guide our inquiry into these data:

1. What effect does participation in the S-STEM program activities have on the students' self-efficacy, biological science identity (SEBSI) and their academic success?
2. How do students perceive the student-faculty and peer-peer relationships in DBS?
3. How do faculty members reform their pedagogies to integrate active learning in the biology core courses (BIOL 191, 192, 304, and 310)?

While we do not yet have enough data collected to have conclusive findings relative to these questions, we are making progress toward that goal.

Self-Efficacy and Biological Science Identity (SEBSI) [5.a.iv]

We modified existing items designed for student self-report about science self-efficacy and science identity by focusing them on biological science. Whereas in our original proposal we referred to this instrument as the SESI, we have chosen an acronym that is more descriptive of the instrument, SEBSI. The SEBSI has 14 items that are divided into two scores. Nine are summed for a self-efficacy score. The possible responses range from not at all confident (1), somewhat confident (2), mainly confident (3) and completely confident (4), thus the theoretical range for the self-efficacy score is 4 to 36. Five items are summed for the Biological Science Identity score. These items use a 5-point Likert-type scale from strongly disagree (1) to strongly agree (5) with a midpoint, neither agree nor disagree (3). The theoretical range for the Biological Science Identity score is 5 to 25.

We have collected 51 responses to the survey over the two-year period. Eight students began the survey but did not complete it. Their responses were removed from the response set for analysis leaving 43 complete surveys for analysis.

We are sharing a (very) preliminary analysis of some data from the SEBSI. 10 of the students completing the SEBSI survey were in the first cohort of the GSP and have completed the survey twice. We would like to see the students' self-efficacy and science identity would both increase as students' experience more facets of the degree (courses, interactions with faculty and peers), as well as the co-curricular experiences (UREs) and working with mentors. In 70% of the repeated measures the score goes up from 2017 to 2018. 70% of the Biological Science Identity scores also increase from 2017 to 2018. It is also possible that a student's self-efficacy score might go down with experiences that are challenging (e.g. organic chemistry) or when their initial self-efficacy was not calibrated with their performance. Table 11 also includes self-reported responses about the year of college, undergraduate research participation on a faculty led team in DBS (URE BIOL) or

in another department (URE other). The last column asks the students how many meetings they had with their mentors per year. Note that college year may be the same for subsequent administrations if students remain at a level (e.g. they were a rising junior in the first year they completed the SEBSI and in the second year they are still a junior by count of credits). No conclusions can be drawn at this point about correlations relative to research question 1. In year 3 we will add variables including grades and retention in the program as the cohort repeats the survey.

Table 12

Two-year SEBSI Data

Participant	Self-Efficacy Score	Up, down, same	Biological Science Identity	Up, down, same	College Year	URE BIOL	URE other	Mentor meetings
1	25		15		3	1	0	1
1	34	↑	18	↑	4	1	0	1
2	24		21		1	0	0	1
2	33	↑	25	↑	2	0	0	1
3	20		18		1	0	0	1
3	23	↑	19	↑	2	0	0	2
4	30		23		3	0	0	1
4	34	↑	25	↑	4	0	0	1
5	28		23		2	0	1	2
5	27	↓	25	↑	3	0	1	2
6	28		23		3	0	0	1
6	30	↑	25	↑	4	1	0	1
7	25		23		4	0	0	1
7	19	↓	19	↓	4	0	0	1
8	30		25		1	0	0	3
8	31	↑	25	≡	1	0	0	1
9	31		21		1	0	0	3
9	32	↑	21	≡	3	0	0	1

10	30		23		3	0	1	2
10	28	↓	25	↑	4	1	0	1

Key: up (↑), down (↓), remains the same (≡)

Students' Expressions of Relationships in DBS [5.a.iv]

Our second research question asks how students perceive the student-faculty and the peer to peer relationships in the department of biological sciences. Two sources of data inform this question, the BPSRS and the focus group data. Both sources suggest a health student-faculty rapport.

The BPSRS analysis is discussed in Appendix C. As explained in the Objective 3 discussion (3.b.ii.), there is not much variance between students' scores for the core Biology course faculty. The scores suggest general satisfaction with the faculty. There are no differences by students' gender, race or cultural identity, or status as a Biology or non-Biology student. Because the brief version of the Rapport survey is primarily focused on the student-faculty relationship, these data do not provide data for us to ascertain the quality of student to student relationships.

Our next step to investigate this research question includes adding more questions about these central relationships for powerful teaching and learning: that between peers and the students' relationship with the content in the course. In the coming year, we will add questions to the instrument that are guided by self-determination theory (Ryan & Deci, 2017) to help us understand if there are correlations between the use of evidence-based teaching practices and psychological variables associated with greater levels of students' intrinsic motivation to persist.

How do faculty integrate active learning practices into their core biology courses? [5.a.ii]

In our discussion of objective 3, we noted that the DBS has been encouraging and measuring EBIP adoption using direct and indirect measures. These data demonstrate that there is a significant positive change in stated EBIP usage by both self-report data and empirical measurement through the COPUS instrument. While some progress remains to be made relative to fidelity of application and we note active learning appears to be more engaging in some courses than others, the overall trend is notably positive. In the discussion for objective 3 we detailed our efforts to correlate evidence-based teaching practices with rapport. We have not been able to identify a significant correlation though active teaching practices would theoretically increase the overall rapport in classes.

Student retention, academic performance, degree attainment data [5.b.]

Our data tracking for the GSP asks the enrollment status of cohort students as DBS majors from the census date[3] of a given term to the census date of the next term. If a student changes their major during the term, that change is not officially recorded in the data reporting until the census date of the next term.

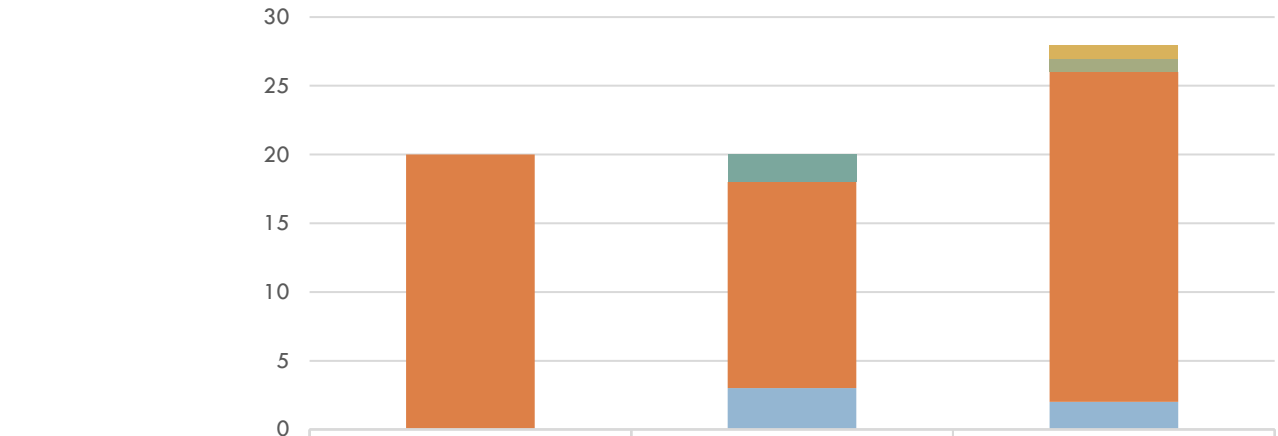
The goal of the GSP is to retain and graduate students in BIOL or another STEM major. If a student switches their degree to another STEM major, they are counted as "retained in STEM." As figure 7 demonstrates, only

[3] The Boise State census date for the fall semester is October 15th and the spring semester census date is March 15th. There is no defined census date for the summer term.

one of the active GSP students has changed to a non-STEM major. A total of five have graduated with a Biology major (does not include spring 2019 graduates).

Figure 8

Term to Term Retention for GSP Students



	Fall 2017 1179	Spring 2018 1183	Fall 2018 1189
Not Enrolled	0	2	0
Switched STEM to Non-STEM	0	0	1
Switched other STEM	0	0	1
Retained in Plan	20	15	24
Graduated in Plan	0	3	2

Comparing all BIOL majors to the GSP majors, by percentages, the GSP students (although far fewer in number) are retained and graduated at higher rates, however, it is our intention to improve outcomes for ALL Biology students as we also improve the conditions to foster student success for the Gateway Scholars.

Table 13

Comparing BIOL Major Retention to GSP Retention (Fall 2018)

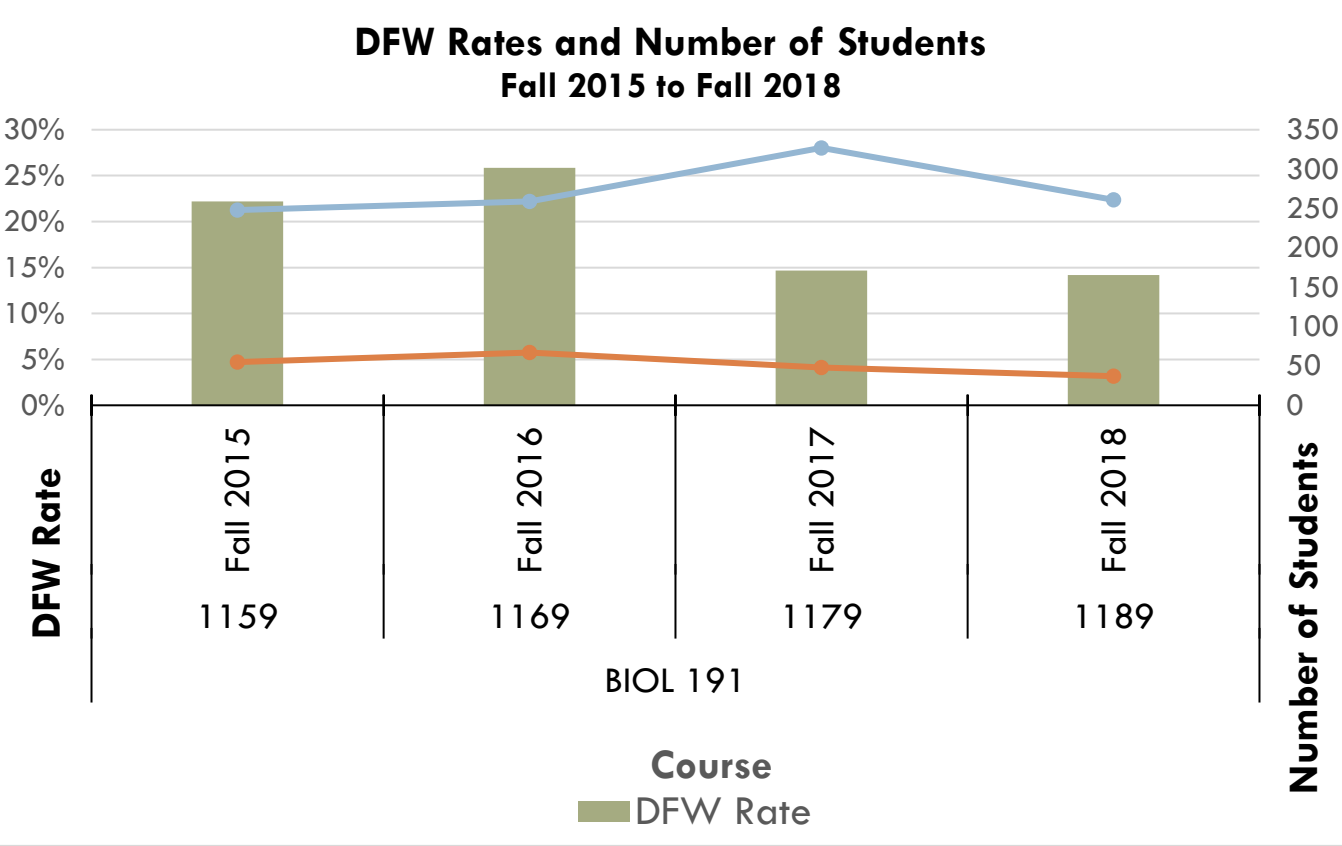
FALL 2018 comparison	All BIOL %	All BIOL #	GSP%	GSP #
Not enrolled	10%	80	0%	0
Switched STEM to Non-STEM	6%	49	4%	1
Switched to other STEM	2%	12	4%	1
Retained in Plan	75%	574	89%	24
Graduated in Plan	6%	49	7%	2

DFW Rates for Core Biology Courses

Theoretically, the increase in EBIP usage discussed in objective 3 should contribute to lower D, F, W rates in core biology courses. Indeed, when we look closely at the trend in these failure and withdrawal rates, we see a downward trend from fall 2015 (22.2%) to Fall 2018 (14.2%).

Figure 9

DFW Comparison for BIOL 191 (Fall 15-Fall 18)



The changes in BIOL 310 are not as large, however, they still represent a downward trend. The pattern in BIOL 192 is different. While the spring term DFW rate decreases steadily from 23% in 2015 to 14% in 2018, the fall term rate remains relatively consistent across the four-year timespan. We note the fall and spring faculty are different in all these courses. A deeper look into the BIOL 192 COPUS data and these grade differences is warranted.

Table 14

D, F, W Rate for BIOL 192 and BIOL 310

Term	# Enrolled	# Earned D, F, W	DFW Rate	Term	# Enrolled	# Earned D, F, W	DFW Rate
192							
FA 2015	167	30	18.0%	SP 2015	161	37	23.0%
FA 2016	126	23	18.3%	SP 2016	156	35	22.4%

FA 2017	146	21	14.4%	SP 2017	147	14	9.5%
FA 2018	158	31	19.6%	SP 2018	183	26	14.2%
310							
FA 2015	70	7	10.0%	SP 2015	112	7	6.3%
FA 2016	93	4	4.3%	SP 2016	118	10	8.5%
FA 2017	86	6	7.0%	SP 2017	94	1	1.1%
FA 2018	112	7	6.3%	SP 2018	114	2	1.8%

BROADER IMPACT

The DFW rates in core biology courses are inversely related to the increased use of EBIPS by biology faculty members. This finding is consistent with the scholarship on the use of EBIPs as effective pedagogy for all students.

Distribute summary of annual report to faculty for feedback and future action [5.c.]

In December 2018 the GSP leadership team met with the core Biology faculty to discuss BPSRS and COPUS data collected in their classes during that term. Faculty have been engaged in discussions about EBIPS and attending to diverse students in their classes. The full DBS faculty, however, has not yet reviewed the interim findings in this report. That meeting will take place in August 2019 so that the department can consider the implications and be involved in deliberating future actions.

Summarize and disseminate broader impacts [5.d.]

In its second year, the GSP has already fostered several broader impacts in the DBS. These impacts beyond the direct benefits to the Gateway Scholars include:

- Elevated focus on advising students has brought the need for additional professional advising assistance to the attention of college and university leaders. The department has been provisionally informed that additional support will be provided next year for DBS majors' advising. (See sections: Plans for Year 3.)
- Emphasizing the use and encouraging continuous development of active learning pedagogies has extended the work begun at Boise State and in the DBS during the NSF WIDER PERSIST grant. EBIP usage continues to improve in terms of fidelity to best practices and rates of usage.
- BIOL 198 was created to support students' development of a biological science identity and a growing awareness of the diverse career paths available for biology graduates. The Biology 198 class will be retained in the program as a recommended first or second year course in the major and opened to all students.

- While not previously included in the midterm grades initiative, BIOL 310 faculty will be asked to submit reports about students earning grades of C- or lower to the advising office so that Advisor Cox and his team can apply at-risk advising efforts to that group as well.
- Increasing emphasis on a culture of interaction and exchange of ideas between and among undergraduate students, graduate students, and faculty through co-curricular events has strengthened the fledgling Biology Club and lead to a dramatic increase in opportunities for interaction beyond the traditional classroom and laboratory settings.

GOALS FOR YEAR 3: 2019-20

Objective 1 Manage a faculty-mentored cohort program that provides scholarships and a coherent ecosystem of support for low-income, academically talented DBS students.

In the third year of the GSP we will:

1.a. Recruit upper division students who can reasonably complete the program during the grant period and maintain 20-25 scholars in the cohort. **NEW:** The GSP leadership will work with Boise State Admissions representatives to increase the potential pool of low-income academically talented students who are also from underrepresented groups. We will reach out to the College of Western Idaho to reach students completing Associates of Science (AS) degrees and promote the GSP scholarship.

1.b. Continue providing supports for students to meet with their faculty mentor twice per year.

1.c. Continue providing structures and supports for student-mentor program including:

1.c.i. Shared focus on SMART goals

1.c.ii. Mentor readings

1.c.iii. Continue building mentor training into faculty meetings using professional facilitators.

1.c.iv. **NEW:** Encourage biology faculty participation in the Center for Teaching and Learning BUILD certificate or Inclusive Excellence faculty learning opportunities. We will document the number of faculty participating in the program.

RECOMMENDATION: Invite Tasha Souza or Susan Shadle from the Center for Teaching and Learning to attend a faculty meeting at the beginning of the academic year and to discuss the array of Inclusive Excellence faculty development sessions available to faculty.

1.d. We will measure performance on this objective through student self-report forms documenting mentor meetings and through comments during the annual focus group or other student questionnaires.

Objective 2 Risk-based advising system with proactive advising for Gateway Scholars

In the third year of the GSP we will:

2.a. Continue to monitor on/off track students using the advising dashboard, reach out to students, and document via advising notes.

RECOMMENDATION: The biology department curriculum committee should review Degree Tracker to verify that the programming matches the recent curriculum changes.

2.b. Continue to encourage all Gateway Scholars students to meet with a professional biology advisor each semester.

NEW: In order to increase student access to timely advising DBS leadership will work with the university administration to decrease the advisor to student ration to meet recommended ratios (1:300).

NEW: Partially in response to the GSP Annual report the College of Arts and Sciences (COAS) has agreed to help STEM departments support outreach efforts such as the mid-term grades. Data will be collected regarding these outreach activities using a new advising notes query (see 2.c.) to monitor additional advising for biology majors.

RECOMMENDATION: the GSP Leadership team should establish a date for the DBS leadership to follow up with COAS leadership to ensure the advisor to student ratio is being appropriately addressed.

2.c. Continue advising documentation via advising notes for meeting and at-risk advising. **NEW:** A report to query the advising note system will be designed and utilized to provide more accurate reporting and verification of the measures for this outcome.

2.d. Continue to include discussions about advising related and student success issues with faculty at department faculty/committee meetings.

RECOMMENDATION: GSP leadership needs to share new findings from empirical studies highlighting the choices that lower income students are forced to make based on financial needs rather than educational ones (Soria, Weiner, & Lu, 2014). Increased awareness of lower income students in the department and their differential needs should be shared with the faculty to help inform decisions about policies including rigid attendance policies for students who are struggling to balance school, work, and family.

RECOMMENDATION: As Department Chair Kevin Ferris will be on sabbatical in the 2019-20 academic year, it is recommended that PI Oxford assist the interim department chair, Peter Koetsier, to schedule student success related topics to be discussed during faculty meetings.

2.e. Continue to collect and document midterm grades in all courses for Gateway Scholar students.

2.f. Continue to collect and document midterm grades in all core courses for all DBS students (Add BIOL 310 to the midterm grade data collected). **NEW:** Working with the department leadership in chemistry, explore a system to collect midterm grades for all biology majors in CHEM 308.

RECOMMENDATION: Advisor Cox or PI Oxford will share student grade performance overviews with the faculty to discuss possible supports for DBS students enrolled in CHEM courses.

Objective 3 Integrate evidence-based instructional practices in the DBS core

In the third year of the GSP we will:

3.a. Continue to encourage EBIP usage in core courses and labs and measure these efforts using the COPUS instrument and faculty self-report. **NEW:** We have learned that conducting the COPUS analysis once a year per faculty member is useful and more than that does not seem to yield a return on investment relative to the workload it creates.

3.b. Continue to measure impact of EBIPS in core courses

3.b.i. Student sense of biology identity (conducted in the fall semester). **NEW:** We will expand the administration of this instrument to all majors to determine if we see a difference in the

biology identity or self-efficacy based on the demographic and experiential data collected in that instrument. Our goal is to achieve a 60% response rate for all biology majors and a 90% response rate for our GSP students.

3.b.ii. Brief Professor-Student Rapport Scale (in core course lectures and labs). **NEW:** Using a hybrid methodology, we will collect the BPSRS data once per year with most data collected in the fall term using QR codes and having students use their own WIFI enabled devices in the classes. This method will save data entry time and maintain a high response rate (Response rate goal: 75%).

Further, BPSRS data that we are collecting does not appear to be nuanced enough to be actionable. There are few differences between sections, and we are not sure if that is a result of students' reluctance to be critical or a shortcoming of the instrument. **NEW:** We will add additional items to help us better understand the relationships in the core biology classes.

NEW: We will also offer the instrument to other biology courses for faculty who are interested in administering it.

3.c. More effectively close the loop through data sharing meetings with faculty. As discussed above, it is challenging for peers to directly address teaching approaches of their colleagues. The GSP leadership team will address ways to approach faculty about these data in a way that is respectful and honors the strengths each of the faculty bring to the department.

RECOMMENDATION: develop an approach to encourage faculty to establish an EBIP related teaching goal and to reflect on the impact that goal makes on their practice at the end of the year.

3.d. Maintain the current level of learning assistance support. **NEW:** The GSP Leadership team will work with interim department chair to explore ways we can expand access for biology majors for learning assistance in chemistry and mathematics classes. Note that the generic learning assistance program with scheduled meeting times established based on the learning assistant's availability appears not to be supporting students who have non-traditional work and family demands. A suitable solution must provide flexibility for working students. One solution may be to pilot a biology learning assistance center to investigate its efficacy as a first step toward enhancing learning assistance support for BIOL majors.

Objective 4 Engage GSP students in co-curricular activities to support cohort building

In the third year of the GSP we will:

4.a. Continue offering BIOL 198 to GSP students. **NEW:** The department will support opening BIOL 198 to permit non-GSP students to enroll and to encourage students to include this elective course in their first semester at Boise State.

4.a. 1. Students will continue to develop 4-year academic plans in the BIOL 198 course

4.a.2. Continue evaluating BIOL 198 and disseminate findings through an article or presentation about the impact this course is having on participating students

4.b. Continue provide 6 or more co-curricular events per year for GSP students to help scholars explore diverse career paths. There are several great student organizations that could be effective in linking our students to a community and expose them to careers and success in biology. Because of the high frequency and variety of events these clubs offer,

more of our students may be able to attend these that the monthly Gateway Scholars events. Additionally, our students could pick the clubs or topics most relevant to them and student feedback indicated this would be welcome. We plan to encourage our students to become part of a club or organization (like the Biology, Pre-medical, Pre-dental club, etc.) during their first year of the program and count participation in these clubs as meeting a recommendation of the award (i.e. to attend events) in addition to continuing our monthly Gateway Scholars events. We will provide them with information about each club at the start of the fall semester. **NEW:** As we did in 2018-19, we will open many of these events the biology majors at large (broader impact).

4.c. The GSP will provide 2 or more field trips per year designed to support career exploration and cohort building.

4.d. Increase the goal for URE participation from 25% to 35% given current engagement level. We understand from focus group data that there are many students who cannot participate in research. However, we will continue encouraging participation and looking for additional ways to afford students this opportunity. To support students' and help them attain a lab position in a faculty lab we will add a lesson to BIOL 198 focusing on how to write an email to a faculty member to express interest in undergraduate research and how to apply for various undergraduate research programs. **NEW:** We will begin using the newly created student group to track URE participation for biology majors and GSP students through our student information system. These data will be analyzed next year relative to positive student outcomes. **NEW:** We plan to hold the Scholarship and Undergraduate Research Opportunity Info Seminar sooner in the spring semester or at the end of the fall semester to increase the amount of time between this session and the due dates of applications.

Objective 5 Summarize progress toward program goals and reflect

In the third year of the GSP we will:

5. a. Continue to measure progress on objectives by collecting data and measuring via:
   - 5.a.i. Continue to conduct the annual Focus Group (Objective 1, 2, 3, and 4)
   - 5.a.ii. Continue to administer the COPUS Instrument (Objective 3)
   - 5.a.iii. Continue to administer the Brief Professor-Student Rapport Scale (Objective 3). In the discussion above we have noted that we are changing the schedule of data collection for the BPSRS to collect it from each professor's class once per year. **NEW:** We are adding items to our instrument that we believe will help us better understand the relationships in the classes we are evaluating and the students' perception of their competency in those classes.
   - 5.a.iv. Continue to administer the Self-efficacy and Biology Science Identity (SEBSI) Assessment (Objective 4). **NEW:** Correlate SEBSI scores with academic performance.

5.b. Continue to evaluate student retention, academic performance, degree attainment data (Objective 1, 2, 3, and 4)

5.c. Continue to distribute summary of annual report to faculty for feedback and future action.

5.d. Continue to summarize and disseminate broader impacts.

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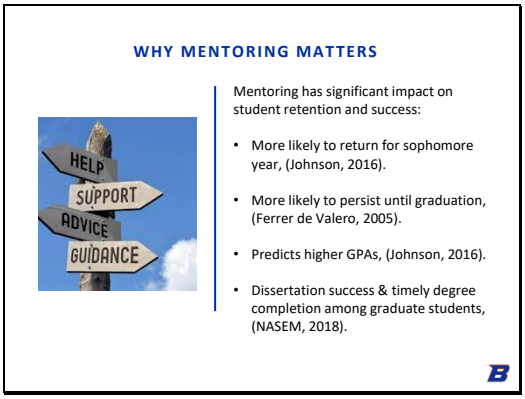
APPENDIX

Appendix A: Faculty-Student Mentor Supporting Material

Faculty Mentor Training Material presented by Catherine Bates

Slide 1

Slide 2



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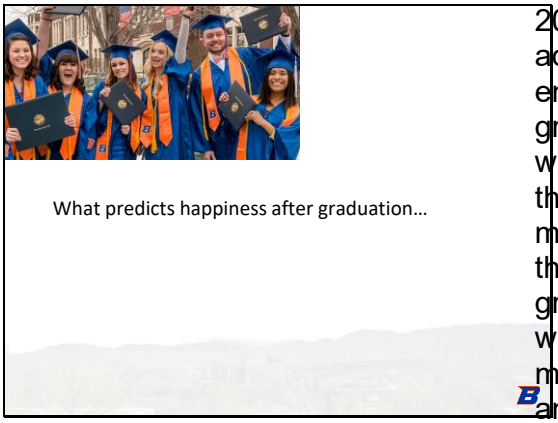
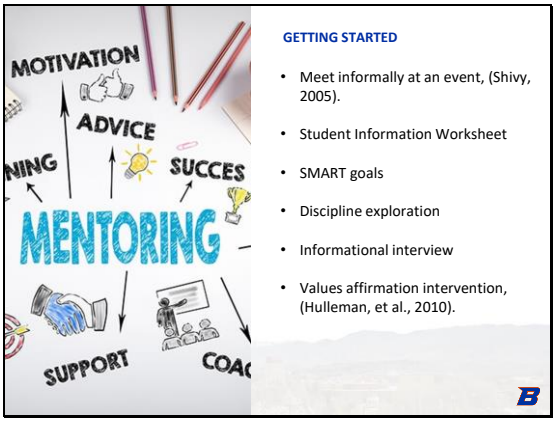


2014 Gallup study surveyed 30,000 adults to gauge workplace engagement or happiness after graduation. After surveying 30,000 what they found was it wasn't where they went to school, or what they majored in, or what extracurriculars they did--instead they found if the graduate recalled having a professor who cared about them as a person, made them excited about learning, and encouraged them to pursue their dreams, their odds of being engaged at work more than doubled, as did their odds of thriving in all aspects of their well-being.

Slide 4

Slide 5



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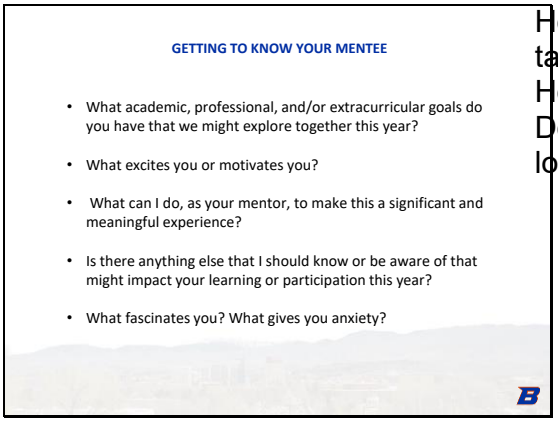
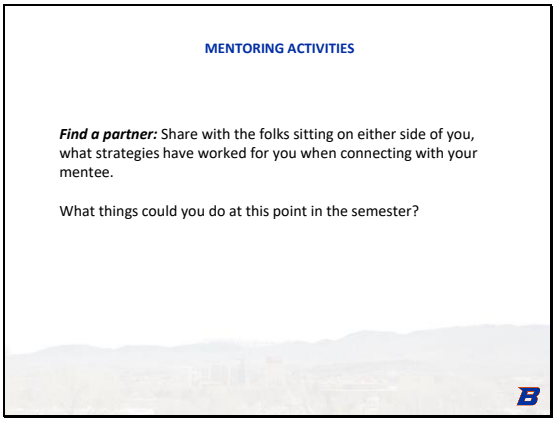


How many credit hours are you taking?
How many hours are you working?
Do you commute to campus? How long is your commute?

Slide 7



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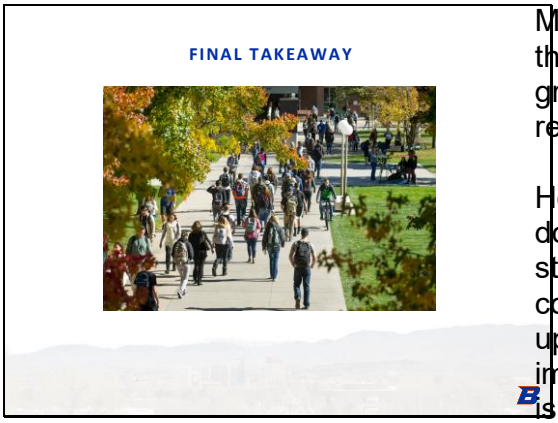

My final takeaway is that we often think to change retention and graduation for our students it requires rather big interventions.

However, there is so much we can do by simply connecting with students—meeting them over coffee—sending them a quick follow-up email that can have tremendous impact on their success. For me, that is super encouraging and motivating.

NSF S-STEM Gateway Scholars Mentor/Mentee emails

Emails sent to each faculty mentor and each student Mentee

Sept 19 and 20, 2018

Goals: to give faculty resources to prep for meeting with students and give students guidelines for what to expect via the meeting

For new students:

New students:

Hi XXX,

One of the benefits of being a Gateway Scholar is that you have the opportunity to meet one-on-one with a faculty member in our department who can act as a resource for you as you navigate the university and make

progress to your future goals. All our faculty mentors are looking forward to meeting their students and have told me they enjoy these out-of-class meetings to get to know students.

Your faculty mentor is: XXXX

Your mentor has been notified that you will be contacting them to set up a meeting and they are excited to meet you.

You are responsible for:

1) Emailing your mentor and setting up a meeting. Your mentor is expecting an email from you so please do this ASAP. Introduce yourself and propose some windows of time that would work for you to meet with them (at the bottom of this email is an e*xample* for you to refer to as you write your email to your mentor). Before your meeting, you should also check out your mentor's faculty website to learn more about what they do. Here is a link to the faculty webpages: https://biology.boisestate.edu/faculty-and-staff/faculty/

2) Complete the SMART goal worksheet: Crafting S.M.A.R.T. Goals are designed to help you identify if what you want to achieve is realistic and determine a deadline. Check out this video that explains the SMART goal method (link: https://www.youtube.com/watch?v=wGbmAH4mBPA) and complete the attached SMART form. ***You will take this completed form to your first mentor meeting and discuss with your mentor*** – so spend an hour or so working thru it.

3) *After* your meeting, fill out this form: https://goo.gl/forms/xLk0WEi5h79ViFqh2

Each time you meet with your faculty member, please document that time in this form. The link for this is under the Scholars Content section on the NSF Gateway Scholars DBS Blackboard site.

Feel free to contact me with any questions and be persistent with your mentor – if they don't get back to you in a week, it is okay to email them again ☺

Amy

<u>Example email to a faculty mentor:</u>

Dear Dr. Picklestien,

My name is Amy and I am a Gateway Scholar in the Department of Biological Sciences. I have been paired with you as a mentee and would like to schedule a meeting with you. Is there a time that would work for you in the next few weeks? I am open from 8 to noon on Thursdays and Fridays, if that is helpful.

This is my second year at Boise State and I am in the EEB track. I am interested in how animals make decisions and currently I am really enjoying my Chem 112 class. I will bring my SMART goals document with me to our meeting and am looking forward to talking with you.

Thank you for your time

Sincerely,

Amy Ulappa

For returning students:

Hi XXX,

One of the benefits of being a Gateway Scholar is that you have the opportunity to meet one-on-one with a faculty member in our department who can act as a resource for you as you navigate the university and make progress to your future goals. Based on feedback from the first year, we have made an effort to make the mentor meetings more meaningful and purposeful so please read all the details below and let me know if you have any questions or concerns.

Recall, your faculty mentor is: XXXX

Your mentor has been notified that you will be contacting them to set up a meeting and they are excited to meet you. All our faculty mentors are looking forward to meeting their students and have told me they enjoy these out-of-class meetings to get to know students.

You are responsible for:

1) Emailing your mentor and setting up a meeting. Your mentor is expecting an email from you so please do this ASAP. Introduce yourself and propose some windows of time that would work for you to meet with them (at the bottom of this email is an e*xample* for you to refer to as you write your email to your mentor). Before your meeting, you should also check out your mentor's faculty website to learn more about what they do. Here is a link to the faculty webpages: https://biology.boisestate.edu/faculty-and-staff/faculty/

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Each time you meet with your faculty member, please document that time in this form. The link for this is under the Scholars Content section on the NSF Gateway Scholars DBS Blackboard site.

Feel free to contact me with any questions and be persistent with your mentor – if they don't get back to you in a week, it is okay to email them again ☺

Amy

Example email to a faculty mentor:

Dear Dr. Picklestien,

My name is Amy and I am a Gateway Scholar in the Department of Biological Sciences. I have been paired with you as a mentee and would like to schedule a meeting with you. Is there a time that would work for you in the next few weeks? I am open from 8 to noon on Thursdays and Fridays, if that is helpful.

This is my second year at Boise State and I am in the EEB track. I am interested in how animals make decisions and currently I am really enjoying my Chem 112 class. I will bring my SMART goals document with me to our meeting and am looking forward to talking with you.

Thank you for your time

Sincerely,

Amy Ulappa

For faculty:

Hi XXX,

Thank you for participating as a mentor in the NSF Scholarships in STEM Gateway Scholars program. This year (yr 2 of the grant) we have 28 awardees and the goal of this program is to help support students in our department so they can make progress to their future goals.

Your role as a mentor is to be a resource for your mentee by meeting with them twice a semester. You all have specialized knowledge of how to navigate the university and also have a wide network of people (your colleagues, grad student or undergrads in your lab) that you can connect to your mentee.

Scholars in our program are academically high achieving and are an under-represented group in STEM (i.e. first-generation in college, minorities, women). One topic all students can benefit from is learning how to get the most out of college. This New York Times article is a good one and reading it may help give you ideas for what to discuss with your student.

https://www.nytimes.com/2018/08/17/opinion/college-students.html

Your student (s) is (are): XXXX

He/She (They) will contact you to set up the first meeting of the semester. I have provided them with an email template to use while contacting you to set up a meeting. *At the end of your first meeting, please schedule the second meeting before your student leaves.*

To help guide the first meeting, your student will set some SMART goals and bring that document with them to review with you. The SMART method is a way of setting specific, measurable, attainable, realistic, and timely (hence the SMART) goals and have been shown to give students an actionable path. Here is a link explaining SMART goals for undergraduates so you can familiarize yourself with the process:

https://www.umassd.edu/fycm/goalsetting/resources/smartgoals/

In your first meeting, please plan to review your student's SMART goals together and see if you can help them refine their plan or give them guidance on how to achieve them (ex: maybe they are struggling in chemistry and want to do well – luckily, you have a student in your lab who is a chemistry whiz so you can introduce them).

I am happy to answer any questions you have so send them my way~

Thank you for your involvement in this program!

Amy

Faculty Reminder Email with Supplemental Reading

DBS Gateway Scholars S-STEM student check-in (sent to faculty mentors February 2019)

Hi [name],

Thank you for participating as a mentor in the NSF Scholarships in STEM Gateway Scholars program. Most of you were able to meet with your student at least once in the fall and the feedback we had from students about these meetings was all positive, they loved talking with you one on one!

Feedback from our students indicates that they would benefit from more discussions with faculty when they are choosing their courses. Aside from formal advising, they are looking for more guidance on which courses to take to learn skills they will need in their careers, tips for doing well in courses that are difficult, and conversations about how to approach learning and balance.

As the date nears when students can enroll in courses, ***it is good timing to reach out to your student to invite them to meet with you and discuss courses*** or anything else (like how to apply for undergraduate research and experiences this summer!).

As a reminder, your student (s) is (are): [student name]

Please let me know if you have any questions or concerns and thank you for your involvement in this program!

Amy

Also, here is info about this program:

This year (yr 2 of the grant) we have 28 awardees and the goal of this program is to help support students in our department so they can make progress to their future goals.

Your role as a mentor is to be a resource for your mentee by meeting with them twice a semester. You all have specialized knowledge of how to navigate the university and also have a wide network of people (your colleagues, grad student or undergrads in your lab) that you can connect to your mentee.

Scholars in our program are academically high achieving and are an under-represented group in STEM (i.e. first-generation in college, minorities, women). One topic all students can benefit from is learning how to get the most out of college. This New York Times article is a good one and reading it may help give you ideas for what to discuss with your student.

https://www.nytimes.com/2018/08/17/opinion/college-students.html

SMART Goals Activity Preparation (for students)

S.M.A.R.T. Goals for Fall 2018/Spring 2019 (this academic year)

YOUR NAME HERE

Purpose: Crafting S.M.A.R.T. Goals are designed to help you identify if what you want to achieve is realistic and determine a deadline. When writing S.M.A.R.T. Goals use concise language, but include relevant information. These are designed to help you succeed, so be positive when answering the questions.

Type your responses under each prompt.

Step 1: Think about your long term goals and answer the following (it's okay if you are unsure or if these change – just give it a try!)

1. Where do you see yourself in 5-10 years?

2. What kind of work are you doing? What is the career you have?

3. Why was choosing this goal important to you?

Step 2: Think about some intermediate goals you want to accomplish in your undergraduate experience and answer the following:

1. What do you need to accomplish in the next 2-5 years in order to reach your long-term goal or to help you formulate a long term goal? For example, do you need to explore one or more areas of interest? Who can help you do this? What kind of information will be helpful to you?

2. What do you need to do to do this year to make progress toward defining a goal or toward focusing your efforts? For example, can you identify the resources available to help you make decisions?

Step 3: Pick two short term goals for this semester and/or year that will help move you forward:

Initial Goal *(Write the goal you have in mind)*:

1. Specific (What do you want to accomplish? Who needs to be included? When do you want to do this? Why is this a goal?)

2. Measurable (How can you measure progress and know if you've successfully met your goal?):

3. Achievable (Do you have the skills required to achieve the goal? If not, can you obtain them? What is the motivation for this goal? Is the amount of effort required on par with what the goal will achieve?):

4. Relevant (Why am I setting this goal now? Is it aligned with overall objectives?):

5. Time-bound (What's the deadline and is it realistic?):

S.M.A.R.T. Goal (Review what you have written, and craft a new goal statement based on what the answers to the questions above have revealed):

Appendix B: Proactive Risk-Based Advising System for Gateway Scholars

The following email message is referenced in the discussion regarding Objective 2.e. and 2.f.: "At-risk Advising."
Example of outreach email for students who have a low midterm grade in BIOL core courses.
5-2019

> Good Morning!
> I'm reaching out to you because you might be having some trouble in Biol 304. I know it is a hard class and I want to be sure you have all of the strategies and options in order to succeed. If you would like to talk feel free to stop by during my "walk-in" hours on Tues & Thurs from 9:00 - 12:00.
>
> The deadline to withdraw from this class is Oct 26th. Definitely check with me - but sometimes this is the best option.
>
> Reach out and ask for help - you can do this!!
>
> Clay

Appendix C: Integrating Evidence-Based Instructional Practices into the DBS Core Supplemental Material

COPUS and LOPUS Report (Fall 2018)

Evidence-Based Instructional Practice Observations in Core Biology Courses via the COPUS and LOPUS Protocols

Methods

In 2018, the Gateway Scholars Research Team added Brittnee Earl, Instructional Transformation Project Manager for the Center for Teaching and Learning, to conduct Classroom Observation Protocol for Undergraduate STEM (COPUS) observations in the Biology core courses (BIOL 191, 192, 304, and 310) and

Laboratory Observation Protocol for Undergraduate STEM (LOPUS) observations in the associated laboratory sections for these core courses. Our decision to bring in a trained expert conduct the observations helped us increase rater consistency and to increase the likelihood that the observations would be conducted in a timely manner.

Earl conducted observations for all the faculty teaching these core classes and lab sections in the fall 2018 semester (see Table 16). In the spring term the research team decided to request observations only for the core faculty teaching in class sections that had not been observed during the fall semester. The department has two core courses that are taught in two eight-week segments each with separate faculty members responsible for teaching each segment (BIOL 192 and BIOL 304). The other two courses, BIOL 191 and BIOL 310 have one faculty member per section who teaches the entire 16-week semester. We observed the faculty teaching 16-week courses three times per term and faculty teaching eight-week segments two times each. The laboratory instructors were each observed two times and efforts were made to observe multiple lab instructors for a particular course within the same week to observe variations in teaching style with the same content. We strategically planned the observations early in the term (beginning in week 5) and attempted to complete them by week 11, however one observation was conducted in week 12. In addition, because the labs are three hours each and only one person was conducting the observation, each lab observation was limited half of the lab period. In order to capture the activities occurring across a full lab period, where possible the first lab observation focused on the first 90 minutes of a lab section and the second observation was focused on the last 90 minutes of the lab section.

Table 15

Courses and sections observed (fall 2018)

Course	**Instructor**	**Observation 1**	**Observation 2**	**Observation 3**	**Observation 4**
BIOL 191		*Week 4 or 5*	*Week 8*	*Week 13*	
	001	SEPT 24th	OCT 8th	NOV 30th	*n/a*
	002	SEPT 13th	OCT 25th	NOV 15th	*n/a*
BIOL 191 Labs		*Between Week 4 and 8*	*Between week 9 and 15*		
	L1	SEPT 24th	NOV 26th	*n/a*	*n/a*
	L2	SEPT 18th	DEC 4th	*n/a*	*n/a*
	L3	OCT 10th	NOV 28th	*n/a*	*n/a*
	L4	OCT 2nd	NOV 13th	*n/a*	*n/a*
	L5	OCT 4th	NOV 8th	*n/a*	*n/a*
	L6	SEPT 14th	NOV 30th		

	L7	OCT 5th	NOV 16th	*n/a*	*n/a*
BIOL 192		*Week 4*	*Week 7*	*Week 10*	*Week 13*
	Part 1	*n/a*	*n/a*	OCT 22nd	NOV 30th
	Part 2	SEPT 12th	OCT 1st	*n/a*	*n/a*
BIOL 192 Labs		*Between Week 4 and 8*	*Between week 9 and 15*		
	L1	SEPT 25th	NOV 27th	*n/a*	*n/a*
	L2	OCT 2nd	NOV 13th	*n/a*	*n/a*
	L3	SEPT 27	NOV 8th	*n/a*	*n/a*
	L4	OCT 4th	NOV 15th	*n/a*	*n/a*
BIOl 304		*Week 4*	*Week 7*	*Week 10*	*Week 13*
	Part 1	*n/a*	*n/a*	OCT 25th	DEC 6th
	Part 2	SEPT 18th	OCT 1st	*n/a*	*n/a*
BIOL 304 Labs		*Between Week 4 and 8*	*Between week 9 and 15*		
	L1	OCT 23rd	NOV 27th	*n/a*	*n/a*
	L2	OCT 3rd	NOV 7th	*n/a*	*n/a*
	L3	OCT 4th	NOV 1st	*n/a*	*n/a*
BIOL 310		*Week 4 or 5*	*Week 8*	*Week 13*	
	001	SEPT 13th	OCT 11th	NOV 13th	*n/a*

Summary of observations

A variety of active learning techniques were observed during the classes: clickers, peer interactions, concept maps, individual thinking time, and whole class discussions were observed with the least amount of frequency. In contrast, the most frequently observed active learning strategy was think, pair, share and group polling or report outs. While it is encouraging to see active learning take place, in some instances it did not appear to be as effective as one would hope and is likely the results of fidelity issues. In addition, the observer notes indicate highly variable participation and engagement from the students during activities in some courses. This was not the case in all classes and the difference appears to be related to a professor setting expectations, holding students accountable for participation, and maintaining a ample wait time after posing a question.

Engagement appeared to be higher in courses where the instructor added several elements of humor throughout the class session, when the instructor was enthusiastic about the topic, and/or when the instructors where responsive to student needs during class. For example, during one class period the engagement started to wane, and the instructor stopped in mid-sentence and directed the class to stand up and mirror their actions. The instructor then proceeded to complete several different motions and noises at the same time and students followed along, laughing while doing it. This lasted for about two minutes and then normal instruction resumed and engagement remained steady through the rest of the class period.

Instructor behaviors that indicated approachability (one factor in professor-student rapport) include informal interactions with students before or after class, being prepared and at the front of the room as students are walking in and making eye contact with them (e.g. rather than riffling through documents, or fiddling with technology, or showing up late). In addition, active listening (strong eye contact and leaning in or toward students) when they are asking question or talking, making sure to make look around the entire room while lecturing and creating personal connections with students. Faculty offered support for students by trying to build their confidence and providing encouragement, connecting peers to form study groups, providing research connections and giving verbal praise.

Figure 10

Distribution of Time Spent in Observed Categories (COPUS Observations, fall 2018)

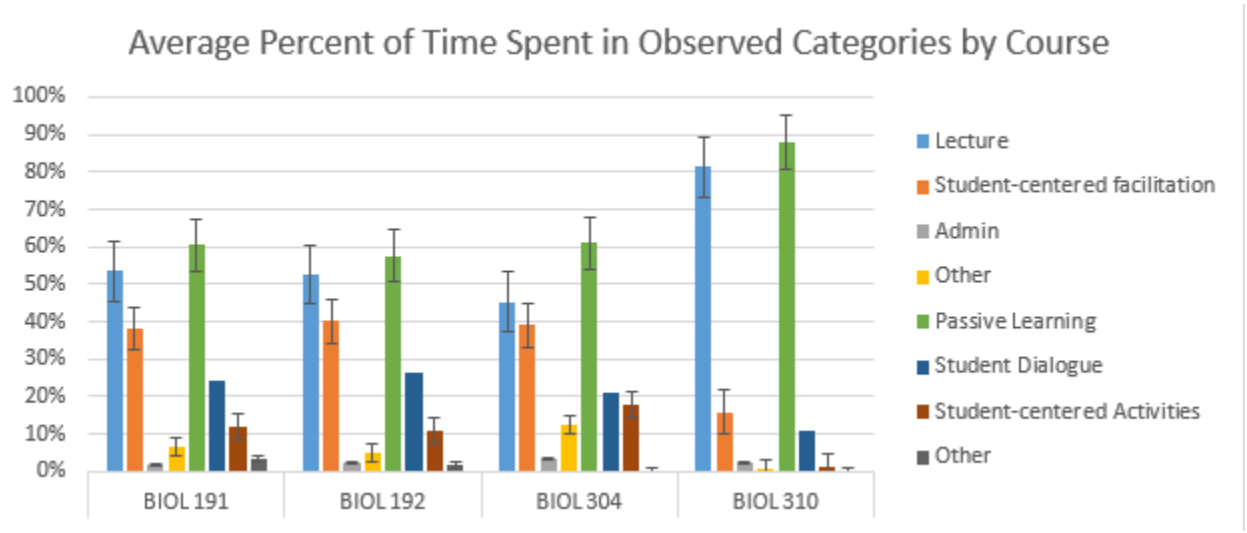


Table 16

Range and Average Percent of Time by Activity Category

Range and Average time spent in each category for all COPUS observations (n=17)			
	Category	**Range**	**Average**
Instructor	Lecturing	36-86%	56%

	Student-centered instruction/facilitation	10-56%	35%
	Admin	0-7%	2%
	Other	0-16%	6%
Students	Passive Learning	51-98%	65%
	Student dialogue	2-37%	22%
	Student centered activities	0-22%	11%
	Other	0-7%	2%

Issues that affect the learning environment were minimal but included environmental barriers (classroom layout/size) and other disruptions such as students talking during instruction or a large number of students leaving the classroom while instruction was still occurring. Instructor behaviors that are not conducive to rapport building and may be negatively perceived include a lack of approachability due to an instructor being unprepared and/or preoccupied before and during the first several minutes of class time. In addition, there were a couple of occasions were a lack of consideration for students' time when either the instructor was late to class or held the students beyond the class period to continue covering content were observed. Additional factors that likely would affect report are favoring one side/section of the room while lecturing and a delayed response to students to student needs (e.g. students raising their hands for long periods to ask a question without the instructor noticing that hands are raised or continuing to cover content rather than pausing to address the question).

It is important to note that across the four courses there was an obvious emphasis on providing relevant examples or pointing to recent research on specific topics, helping students to think like an expert, and being transparent about issues in the discipline for example how much still remains unknown in the discipline or long term reliance on a theories that later had been disproven, or where ethical issues exist. For example, when discussing a controversial topic in class one instructor noted "it is not the intent to convince you one way or the other, whether this is good or bad, but rather to just provide you with the facts and techniques."

Brief Professor-Student Rapport Scale Report

The leadership team for the Gateway Scholars Program proposed using the Professor-Student Rapport Scale – Brief version (Wilson & Ryan, 2013) because the instrument has been demonstrated to successfully predict student outcomes with a positive correlation between rapport between the professor and student. While there are other instruments that provide measures of rapport, the brevity of this instrument and the fact that the items were derived through students' descriptions of rapport (Wilson & Ryan, 2013), made it an attractive choice for this project. Ryan (2014) validated the reliability and internal consistency of the brief scale and compared it to other rapport scales and found the BPSRS correlated as expected with similar and dissimilar scales with convergent validity correlation values all $p < .01$. (p. 70). The Rapport Scale is found to be predictive of student outcomes including attitude toward professor (48%; $\beta=.69$), variability in motivation (43%; $\beta=.65$), amount learned (23%, $\beta=.48$) (p. 71). Because these outcomes mirror those we endeavor to

see from our core courses, the BPSRS is seen as a useful measure of the professors' pedagogies, affect, and behaviors in DBS core courses.

We administered the BPSRS in the first year of the grant using Qualtrics and requesting students' participation by direct email. Some of the faculty mentioned the survey in their classes while others did not, which lead to disparate completion rates by students. In 2018, the GSP Leadership team decided to administer the BPSRS using a paper form because we believed we would yield higher response rates and a better measure of the rapport in the classes. The paper administration did yield a higher return rate (87% compared to 58% in 2017). A comparison between the fall 2017 and fall 2018 response rates is included in Table 18.

Table 17

Comparison of BPSRS Response Rates Year to Year

	Fall 2017			**Fall 2018**		
	# enrolled	**# completed**	**%**	**# enrolled**	**# completed**	**%**
BIOL 191	327	151	46%	262	243	93%
BIOL 192	151	101	67%	159	128[1]	84%
BIOL 304	n/a	n/a	n/a	84	73[1]	82%
BIOL 310	85	73[2]	86%	111	98	88%
Total	**563**	**325**	**58%**	**616**	**538**	**87%**

[1] The average of part 1 and part 2 for BIOL 192 and BIOL 304 comprise the total number surveyed as the instrument was administered twice in these course sections.

[2] The faculty member teaching BIOL 310 offered extra credit if the class reached more than an 80% response rate.

Method

The BPSRS survey questions and a set of demographic questions were reformatted to be taken on paper and the lab instructors for BIOL 191, 192, and 304 were asked to distribute them to students to be taken during lab classes. No individually identifying information was collected on the survey. In BIOL 192 and 304 the instrument was administered twice – the first time (in week 7 or 8 of the 16-week term) included questions about the lecture professor and the lab instructor, and the second time (in week 13-14) only asked questions about the lecture instructor. This modification is necessary as these two courses are taught in two eight-week segments, each with a different professor. The BIOL 191 lab instructors were asked to administer the instrument in week 9-10. In BIOL 310, which does not have a separate lab section, the surveys were administered during the lecture class during week 9-10.

The lab instructors gathered the surveys in a large manila envelope, and they were asked not to look at the completed instruments. An office assistant sorted and scanned the completed surveys so that they could be coded by a graduate assistant in accordance with the IRB research protocol for this project.

The research team added research faculty member, Dr. Laura Bond to the Gateway Scholars team to conduct an analysis of the BPSRS and to look at possible correlations with the COPUS observation data.

BPSRS Analysis

The six items on the instrument are:

Q1 My professor encourages questions and comments from students.
Q2 I dislike my professor's class. (R)
Q3 My professor makes class enjoyable.
Q4 I want to take other classes taught by my professor.
Q5 My professor's body language says, "Don't bother me." (R)
Q6 I really like to come to class.

The Rapport score is calculated after reversing (R) the scores for items Q2 and Q5. The theoretical range for the Rapport score is 6 to 30. The scale uses a 5-point Likert-type scale ranging from strongly disagree (1) to strongly agree (5) with a neutral option, neither agree nor disagree.

Cronbach's Alpha was calculated for the Rapport items, combining all responses across lecture courses and sections. The six-item scale was found to be highly reliable ($\alpha = .854$). Inter item correlations range from $\alpha = .310$ to $\alpha = .703$ (see Table 2).

Table 18

Item Correlations of Rapport Scale

	Q1	Q2R	Q3	Q4	Q5R	Q6
Q1	1.000	0.348	0.499	0.487	0.417	0.324
Q2R	0.348	1.000	0.599	0.654	0.314	0.652
Q3	0.499	0.599	1.000	0.703	0.379	0.631
Q4	0.487	0.654	0.703	1.000	0.370	0.624
Q5R	0.417	0.314	0.379	0.370	1.000	0.310
Q6	0.324	0.652	0.631	0.624	0.310	1.000

There is a lower correlation between Q6 (I really like to come to class) and Q1 (My Professor encourages questions and comments from students) ($r = .324$, $p = \leq .05$). There is a very high correlation between Q3 and Q4 (My professor makes class enjoyable and I want to take other classes taught by my professor). We expand on this finding in the discussion below.

An analysis of the items' contributions to the Cronbach Coefficient Alpha (Table 17) indicated that Q5R (My professor's body language says, "Don't bother me") did not contribute much to the overall scale for the lecture section date, however, it does not seem to reduce its alpha much either.

Table 19

BPSRS Cronbach Coefficient Alpha

	Raw Variables		Standardized Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
Q1	0.520	0.852	0.528	0.846
Q2R	0.685	0.822	0.675	0.819
Q3	0.759	0.808	0.751	0.804
Q4	0.767	0.804	0.760	0.802
Q5R	0.446	0.861	0.447	0.860
Q6	0.676	0.824	0.666	0.820

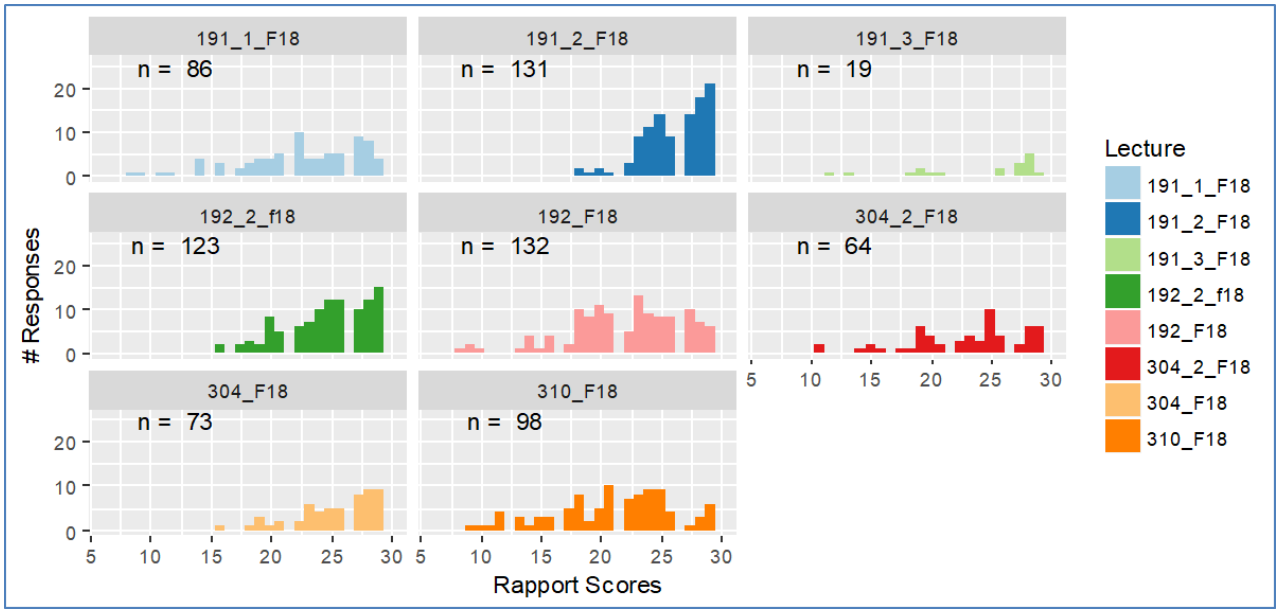
Because we questioned the contributions that Q5R makes to our understanding of rapport in these classes, we wanted to explore possible differences in students' responses to that rapport item when comparing responses about the lecture instructor and the lab instructor. Since Q5 asks about body language being off putting, it seems logical that student-professor proximity in a lab (as opposed to a large lecture hall) would make body language more prescient.

To compare the lab and lecture responses to Q5R we included data from students enrolled in BIOL 191, 192, and 304 (BIOL 310 responses were excluded as there is no separate lab section). Additionally, non-responses to Q5R for the lecture or lab sections were excluded pairwise reducing the n to 610 for a paired T-test. A paired-samples t-test was conducted to compare students' response to Q5R for lecture instructors and to Q5R for lab instructors. There was a significant difference in the means scores for the instructors ($M = 4.57$, $SD = .82$) and lab instructors ($M = 4.70$, $SD = .66$); $t(609) = -3.38$, $p = .0004$. In the discussion we comment on ways we might understand this difference.

In addition to the item level analysis, we conducted an analysis of the calculated Rapport score for each core course (see histograms in Figure 1 comparing the combined rapport score for each section). Although the shape of the curve in each table appears to be different and found no statistically significant differences by course section in the calculated scores which range from 21.3 to 26.8. Because we were interested to know if demographic variables correlated with Rapport scores, we also analyzed these data for each section by students self-reported demographic variables including gender, first-generation status, minority status, academic year and whether the student was a biology major. Again, p-value tests for the null hypothesis that there is no difference among categories ($p<.05$) indicated that the means comparison by group is not significantly different.

Figure 11

Comparison Histograms by Section Using Rapport Scale



Discussion

In 2017-18, some differences were found when comparing items across course sections, however, the overall Rapport scale scores were consistent with those reported here. These scores suggest a relatively high level of rapport with faculty reported by students in these core Biology courses. The high rate of response gives us confidence that the picture we are getting through this measure is representative of the students' perspective. While there are differences in the fall 2018 mean Rapport scores across course sections that may reflect the students' perceptions of the various professors teaching these classes, there is not enough variability to indicate a statistical difference.

During discussions with the faculty (December 2018) reviewing the Rapport data, there was some discomfort with the wording of Q5 (My professor's body language says, "Don't bother me"). Recall, the origin of these items in Wilson, Ryan, and Pugh (2010) is wording that is derived from students. This student-centered item points to an element of the teacher-student relationship which is central to affective learning. Our analysis of these data indicates that it is neither contributing nor diminishing from the overall alpha of the combined scale. When considering whether there would be any value in removing item 5 from the scale, we considered the large lecture hall setting and the smaller lab settings and wondered if, when considered pairwise, if the students perceived a difference in the body language of their lecturers versus their lab instructors. A comparison of this item did indicate a difference on this item and the students' perception was a stronger level of disagreement with the statement, "my professor's body language says, "don't bother me." In a smaller lab class, taught by Graduate Assistants with minimal background in teaching, this question might provide valuable insight for the instructor and the faculty who are supervising those instructors. Thus, keeping the item in the scale is recommended.

As noted, there is a low correlation between Q1 (My professor encourages questions and comments from students) and Q6 (I like to come to class). It is possible this low correlation can be attributed to students'

resistance to active learning in the classes. While faculty understand that implementing EBIPS involves far more than requiring students to answer questions, students may experience some EBIPS as answering questions. Seidel and Tanner (2013) highlight the types of active and passive resistance that students may demonstrate in the face of a faculty member who is experimenting with active learning in a large lecture. In order to better understand this possibility, we need to more closely examine the way faculty are implementing active learning strategies at in core biology classes. We note there is a general fear among faculty who are beginning to use active learning strategies that their course evaluations may suffer (Henderson, Khan, & Dancy, 2018). Recent scholarship is delving into the small number of negative student responses to active learning and demonstrating that helping students understand that active learning why active learning techniques are valuable (Cooper, Ashley, & Brownell, 2018) while working to reach greater levels of fidelity with evidence-based instructional practices also increases students favorable views toward those practices (Stains & Vickrey, 2017).

The analysis of the classroom observations conducted for this project begin to shed light on these questions. While we have begun analysis of the connection between Rapport and active learning strategies, more work needs to be done in this area including engaging faculty in an exploration of their own understandings of active learning and possible experiences with student resistance to close the loop.

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Appendix D: Engaging students in co-curricular activities

Biology 198 Impact Survey Instrument

Biol 198 Interactive Reflection *No need to record your name*

Nov 28, 2018

Part one:

Rank each topic from most impactful/useful (1) to least (11) and do not use the same rank twice. In general, think also of the accompanying prompts and journals for each topic when you consider your choices.

Topic, Presenter	---
Neurobiology of learning & Mindset, Dr. Ulappa	
Social behavior & learning, Dr. Ulappa	
Biology + Chemistry, Dr. Charlier	
Success strategy panel with other Gateway Scholars	
SMART goals	
Framing failure, Dr. Stieha	
Undergraduate Research Opportunities, Catherine Bates	
Metacognition and expert thinking	
Information Synthesis and teaching, Dr. Atkins	
4 – year planning workshop	
Bio-medical research center visit	
Motivation and barriers	

Briefly discuss two topics from the list above that you think would be most useful to ALL biology students and *why*?
What is a topic that we did not discuss in this course that you think would have helped you this semester or could be useful to future students?
Was there one reading/video/activity/discussion that really resonated with you? If so, what was it and what did you take from it?

Part Two:

Compare the "you of today" to the "you of the first week of the semester" and rate how you have changed in that time related to the topics below.

A) How aware are you of resources on campus related to student success (i.e. tutor sessions, undergrad research opportunities, etc.)?

Less aware no change more aware

-3 -2 -1 0 1 2 3

B) How likely are you to use those resources (from part A)?

Less likely no change more likely

-3 -2 -1 0 1 2 3

C) How often do you reflect on how you learn and make decisions based on the knowledge?

Less often no change more often

-3 -2 -1 0 1 2 3

D) How has your awareness of the types of careers that are possible in the field of biology changed?

There are fewer than I thought no change There are more than I thought

-3 -2 -1 0 1 2 3

E) How has the network of people (fellow students, graduate students, faculty) that you know changed?

Gotten smaller no change Expanded

-3 -2 -1 0 1 2 3

F) Has your perception of scientists/faculty members changed and if so, how?

Supporting material for objective 4.b.

Flier disseminated through Blackboard and email inviting students to attend fall 2018 events or GSP scholars.

The goal for objective 4.b. was to provide 6 or more co-curricular events per year. That goal was exceeded as shown in the table below.

Table 20

GSP Scholar event attendance 2018-19

Title	**Date**	**Attended**	**Event time (hours)**	**Student hours**
Local hike with the Outdoor REC	9/30/18	6	6	36
Gateway Scholar Student Success Panel	9/20/18	12	1	12
Undergrad research poster session for Biol 485	12/8/17	9	1	9

Undergrad Research Opportunities in STEM Info Session	11/1/18	11	1	11
Guided Tour of the BSU Biomolecular Research Center	11/8/18	9	1	9
DBS Faculty Lightning Talks and Social	11/27/18	6	2	12
Scholarship/REU Info session	1/29/19	1	1	1
Histology Lab Visit	3/28/19	2	1	2
Pizza and focus group	4/16/19	3	2	6
Total		**59**	**16**	**98**