SAINT LOUIS UNIVERSITY.

Program Assessment: *Annual Report*

Program(s): Neuroscience

Department: Interdisciplinary: Biology & Psychology

College/School: Arts & Sciences

Date: 8/7/18

Primary Assessment Contact: Drs. Tony Buchanan and Judith Ogilvie

1. Which program student learning outcomes were assessed in this annual assessment cycle?

Program Learning Outcome #2: *Students will be able to synthesize information to formulate hypotheses, design experiments and engage in scientific research.*

2. What data/artifacts of student learning were collected for each assessed outcome? Were Madrid student artifacts included?

Our assessment plan called for collecting information from three sources to assess Learning Outcome #2: NEUR 3550: Neuroscience Lab, Capstone projects, NEUR 4950: Senior Residency/ Senior survey

For NEUR 3550: Neuroscience Lab, students performed two independent projects in which they were required to synthesize information to formulate hypotheses, design and perform experiments, and give a presentation on their results. The instructor, Dr. Alaina Baker-Nigh, developed a rubric (attached), which she used to grade the presentations.

For capstone projects, we collected information on the type of project each student selected for their capstone and the name of their mentor.

For the Senior survey, students were asked a series of self-assessment questions about how much they gained in research knowledge from their coursework and laboratory experience.

Madrid courses are not applicable to this assessment report.

3. How did you analyze the assessment data? What was the process? Who was involved?
NOTE: If you used rubrics as part of your analysis, please include them in an appendix.

A rubric was used to assess student performance on two independent projects in NEUR 3550: Neuroscience Laboratory. Dr. Baker-Nigh collected and assembled the data. Drs. Baker-Nigh and Judy Ogilvie analyzed the data. Three rubric categories ("Procedure," "Data Presentation," and "Conclusions & Future Directions") were identified as most relevant to Program Learning Outcome #2. For each rubric category, student scores from two projects each semester were averaged to assess competency. The "Procedure" category assessed experimental design, as students described the original experiments they had carried out in each independent project. The "Data Presentation" category assessed hypothesis formulation as well as engaging in research, as students stated the hypothesis their experiment was designed to test and described and interpreted the results of each project. The "Conclusions & Future Directions" category assessed experimental design, as students described original follow-up experiments that could be conducted in response to each project's results.

Information on participation in research activities was collected from Banner and capstone research project mentors. For Capstone projects, Zack Thatcher was primarily involved in collecting the data; Drs. Ogilvie and Tony Buchanan performed the analysis.

Finally, students were asked for self-assessment on a senior survey and which courses were most beneficial.

A link to a Senior Survey was sent to all students enrolled in NEUR 4950, a 0 CR course required for the Neuroscience degree. Reminders were sent to students who did not comply, clearly stating that their response is a graduation requirement and a degree could be withheld if they did not complete the survey. Twenty-two of the 23 graduating students completed the survey. Drs. Buchanan and Ogilvie were involved in writing the survey questions, collecting the data, and analysis.

4. What did you learn from the data? Summarize the major findings of your analysis for each assessed outcome.
NOTE: If necessary, include any tables, charts, or graphs in an appendix.

From the Neuroscience Lab, assessment is based on group presentations from two experimental modules (one covering Cell Culture Neurite Growth and the other on the Crayfish Autonomic Nervous System). Students worked in groups of 2-4 (with one student participating singly). Student performance was assessed based on the attached rubrics. Briefly, scores were based on student description of laboratory procedures, presentation of data, as well as organization, grammar, accuracy, and overall quality. Scores demonstrated improvement in the second project compared to the first. Average student performance data combined for the Fall semester of 2017 and the Spring semester of 2018 were all above 90% (see Table 1 for details). We consider these results to be well above the 'proficient' level of competency (defined as 75% correct performance).

For the capstone projects, we found that 35% of the students participated in a hypothesis-driven research project for their capstone, 30.4% enrolled in advanced coursework that emphasized hypothesis-driven research, 30.4% chose an in-depth writing project such as a thesis or writing a Wikipedia page that required reading, understanding and interpreting primary literature that may have emphasized hypothesis-driven research, and 4.3% opted for an experiential learning experience (see Table 2 for details). We did not find this data to be very constructive in assessing Learning Outcome #2. Collecting the data on what each student was doing for their capstone was challenging, particularly since ~40% of the students had capstone mentors outside of the Neuroscience program. We had planned to send an assessment rubric to each mentor, which would be more informative, but informal conversations made it clear that faculty were unlikely to be responsive. Our assessment tool would be in addition to (and probably not aligned with) the assessment that they chose to use for the projects and the request would require extra work at the end of the semester when faculty are already very busy. In addition, capstone projects are not necessarily expected to focus on the Learning Outcome #2.

Self-assessment questions from the senior survey asked how much students gained in research knowledge from their coursework and laboratory experience (see Table 3 for details). 100% of graduating Neuroscience majors reported some gain in their ability to synthesize information to formulate hypotheses, design experiments and engage in scientific research. Specifically, the majority of students (63%) reported a large or very large gain in their ability to synthesize information and formulate hypotheses with 32% reporting moderate and 5% small gain. Fifty-five percent of respondents indicated a large or very large gain in their ability to design experiments with 36% reporting moderate and 9% small gain. Also, 67% of respondents indicated a large or very large gain in their overall ability to engage in scientific research with 14% reporting moderate and 19% small gain. Finally, responses indicated that 80% of our graduating class of 2018 participated in research with a SLU faculty and 50% presented their research at a symposium or conference. We consider these results to be well above the 'proficient' level of competency (defined as 75% correct performance).

5. How did your analysis inform meaningful change? How did you *use the analyzed data to make or implement recommendations for change* in pedagogy, curriculum design, or your assessment plan?

Assessment data will be shared with all Neuroscience faculty at our August meeting. Overall, both indirect (self-reported) and the direct data indicate that we are successfully achieving Learning Outcome #2. We are especially pleased that the NEUR 3550: Neuroscience Laboratory is contributing to LO2 in a meaningful way. We are particularly mindful that the graduating class in 2017-18 was comprised of only 23 students and that all future classes are expected to be greater than 55 students. We are using these data to shape actions that are already underway to be able to scale up NEUR 3550. Specifically, we are ensuring that we can retain the elements of the course that are central to the success of this learning objective.

Since capstone projects are not necessarily expected to focus on the Learning Outcome #2 and since data collection was challenging, we are inclined to omit this from our assessment plan for LO2. We would welcome and appreciate feedback on this point.

Although data on the capstone did not contribute significantly to our assessment of LO2, this year's assessment did highlight several actions we are taking related to the capstone. First, we are networking with administration and faculty at the medical school in an effort to increase opportunities for independent research projects. Secondly, we will determine whether any of the capstone options currently available should be discontinued, modified, or expanded. We are initiating an evaluation of this question in conjunction with our Program Review, scheduled for the coming year.

6. Did you follow up ("close the loop") on past assessment work? If so, what did you learn? *(For example, has that curriculum change you made two years ago manifested in improved student learning today, as evidenced in your recent assessment data and analysis?)*

Last year, our assessment focused on Program Learning Outcome #1: *Students will be able to identify core concepts of neuroscience*. Due to the fire in Macelwane Hall, only data from NEUR 3500: Intro to Neuroscience 2 was used. Students performed at 83.5% on questions about core concepts of neuroscience, which were presented in exams in two sections of *NEUR 3500: Introduction to Neuroscience II: Behavioral & Cognitive*. This performance is above the proficient level (defined as 75% correct performance). There was, however, significant variability in student performance on this metric. In future assessments, we plan to address this variability across core concepts by having instructors from our core courses coordinate their instruction. NEUR 3500 was not taught in 2017-18, but Drs. Jill Waring and Brenda Kirchhoff, the instructors for Fall 2018, have reviewed the syllabus from NEUR 3400: Intro to Neuroscience 1 (taught by Dr. Fenglian Xu) and are working closely together this summer to rewrite the syllabus and schedule for NEUR 3500 to ensure consistency between the two sections of the course and to ensure the two courses function together as a sequence and not as two independent courses.

IMPORTANT: Please submit any revised/updated assessment plans to the University Assessment Coordinator along with this report.

Table 1: Average Percent Performance Across Both NEUR 3550 Lab Projects

	Project #1: Crayfish Presentation			Project #2: Cell Culture Presentation			**Combined Data**			
	Procedure	*Data Presentation*	*Conclusions/ Future Directions*	*Procedure*	*Data Presentation*	*Conclusions/ Future Directions*	*Procedure*	*Data Presentation*	*Conclusions/ Future Directions*	
fall 17 avg	93%	97%	97%	94%	96%	98%	94%	96%	97%	fall 17 avg
fall 17 min	80%	95%	93%	85%	90%	87%	80%	90%	87%	fall 17 min
fall 17 max	100%	100%	100%	100%	100%	100%	100%	100%	100%	fall 17 max
fall 17 median	95%	95%	100%	98%	95%	100%	95%	95%	100%	fall 17 median
spring 18 avg	89%	91%	91%	91%	93%	98%	90%	92%	94%	spring 18 avg
spring 18 min	75%	75%	73%	70%	80%	87%	70%	75%	73%	spring 18 min
spring 18 max	100%	100%	100%	100%	100%	100%	100%	100%	100%	spring 18 max
spring 18 median	93%	90%	93%	100%	95%	100%	95%	90%	100%	spring 18 median
17-18 avg	90%	93%	93%	93%	94%	98%	**92%**	**94%**	**96%**	**17-18 avg**
17-18 min	75%	75%	73%	70%	80%	87%	70%	75%	73%	17-18 min
17-18 max	100%	100%	100%	100%	100%	100%	100%	100%	100%	17-18 max
17-18 median	95%	95%	93%	100%	95%	100%	95%	95%	100%	17-18 median

Table 2: Capstone projects				
Capstone options	**# students**			**Mentor****
Hypothesis-driven research projects				
BIOL 4980 Advanced Independent Study	5			**Xu-3**, Fowler-Finn, Janowiak
PSY 4800 Undergraduate Research	1			**Anch**
PSY 4880 Capstone Research Project	2			**Anch/Waring**
Subtotal		*8*	*35%*	
Coursework emphasizing hypothesis-driven research				
PSY 4900.01 Critical Thinking about Psych	4			Kinnucan
Biology Graduate level course*	3			**Stark-2**, Wang-1
Subtotal		*7*	*30.4%*	
Thesis or other writing project that may emphasize hypothesis-driven research				
HR 4960.01 Honors Senior Capstone	2			Christina Garcia & **Buchanan**/Jillon Vander Wal
BIOL 4970 Library Project	5			**Ogilvie**
Subtotal		*7*	*30.4%*	
Experiential learning project				
PSY 4870 Capstone Practicum Project*	1			Sokol
Subtotal	*Subtotal*	*1*	*4.3%*	
Total		**23**		
* exception to the approved Neuroscience curriculum, but approved capstones in the Biology/Psychology curriculum				
Note: PSY 4879 is included in the approved Neuroscience curriculum starting in 2018-19				
**Mentors in bold are Neuroscience Faculty				

Table 3: Senior Survey Results						
Question	**Student Response**					
	no gain or very small gain	***small gain***	***moderate gain***	***large gain***	***very large gain***	
Your ability to synthesize information to formulate hypotheses.	0%	5%	32%	36%	27%	
Your ability to design experiments.	0%	9%	36%	32%	23%	
Your ability to engage in scientific research.	0%	19%	14%	38%	29%	
	Yes, with Biology faculty	***Yes, with Psychology faculty***	***Yes, at SLU SOM***	***Yes, other***	***No***	
Did you conduct research while at SLU?	20%	28%	16%	16%	20%	
	Yes	***No***				
Did you design and carry out research under the supervision of a neuroscience instructor in a class or to satisfy a capstone requirement?	55%	45%				
Did you present your research at a symposium or conference?	50%	50%				

Neuroscience Laboratory Crayfish Autonomic Nervous System **Oral Presentation**	**Name(s):** **Date:**

	Points (100 total)					
Category						**Total**
Introduction (15 points)	• Description of the model organism we used in this lab (5 points)_____ • Why would your experimental variable impact crayfish autonomic function? (5 points)_____ • Previously published data relevant to the treatment selected; properly cited (5 points)_____					
Procedure (20 points)	• Description of the surgical/electrophysiological preparation we used in this lab (5 points)_____ • Includes variables used (5 points)_____ • What concentrations were chosen/details of exposure (5 points)_____ • Rationale for treatment (time period, dose) (5 points)_____					
Data Presentation (20 points)	• Statement of hypothesis (5 points)_____ • Interpretation of data/results is logical (5 points)_____ • Labeled images/well-described behavior (5 points)_____ • Appropriate comparisons (5 points)_____					
Conclusions & Future Experiments (15 points)	• What conclusions can be made from results? (5 points)_____ • What future experiments could be performed? (5 points) _____ • How would you have improved the experiment you designed? (5 points) _____					
Organization & Powerpoint Expertise (15 points)	• Well organized presentation (5 points) _____ • Concise slides (not too much information) (5 points) _____ • Easy to interpret slides (5 points) _____					
Grammar/ Punctuation/ Spelling (5 points)	**5** No grammar, punctuation, or spelling errors	**4** 1-2 grammar, punctuation, or spelling errors	**3** 3-4 grammar, punctuation, or spelling errors	**2** 5-6 grammar, punctuation, or spelling errors	**1** > 6 grammar, punctuation, or spelling errors	
Scientific Accuracy (5 points)	No errors in scientific accuracy	1-2 scientific errors	3-4 scientific errors	5-6 scientific errors	> 6 scientific errors	
Quality of Presentation (Eye contact, speaking presence) (5 points)	Excellent -Little to no reading directly from notes -Exceptional comfort and confidence exhibited	Very good -Little to no reading directly from notes -Comfort and confidence exhibited	Adequate -Some reading directly from notes -Some comfort and confidence exhibited	Poor -Reading mostly from notes -Little comfort or confidence exhibited	Very poor -Reading entirely from notes -No comfort or confidence exhibited	
					TOTAL POINTS	

Neuroscience Laboratory Cell Culture Neurite Growth **Oral Presentation**	**Name(s):** **Date:**

	Points (100 total)					
Category						**Total**
Introduction (15 points)	• Description of the cell type we used in this lab (5 points)_____ • Why would your experimental variable impact neurite growth? (5 points)_____ • Previously published data relevant to the treatment selected; properly cited (5 points)_____					
Procedure (20 points)	• Description of the cell culture system we used in this lab (5 points)_____ • Includes variables used (5 points)_____ • What concentrations were chosen/details of exposure (5 points)_____ • Rationale for treatment (time period, dose) (5 points)_____					
Data Presentation (20 points)	• Statement of hypothesis (5 points)_____ • Interpretation of data/results is logical (5 points)_____ • Labeled images/well-described behavior (5 points)_____ • Appropriate comparisons (5 points)_____					
Conclusions & Future Experiments (15 points)	• What conclusions can be made from results? (5 points)_____ • What future experiments could be performed? (5 points) _____ • How would you have improved the experiment you designed? (5 points) _____					
Organization & Powerpoint Expertise (15 points)	• Well organized presentation (5 points) _____ • Concise slides (not too much information) (5 points) _____ • Easy to interpret slides (5 points) _____					
Grammar/ Punctuation/ Spelling (5 points)	**5**	**4**	**3**	**2**	**1**	
	No grammar, punctuation, or spelling errors	1-2 grammar, punctuation, or spelling errors	3-4 grammar, punctuation, or spelling errors	5-6 grammar, punctuation, or spelling errors	> 6 grammar, punctuation, or spelling errors	
Scientific Accuracy (5 points)	No errors in scientific accuracy	1-2 scientific errors	3-4 scientific errors	5-6 scientific errors	> 6 scientific errors	
Quality of Presentation (Eye contact, speaking presence) (5 points)	Excellent -Little to no reading directly from notes -Exceptional comfort and confidence exhibited	Very good -Little to no reading directly from notes -Comfort and confidence exhibited	Adequate -Some reading directly from notes -Some comfort and confidence exhibited	Poor -Reading mostly from notes -Little comfort or confidence exhibited	Very poor -Reading entirely from notes -No comfort or confidence exhibited	
					TOTAL POINTS	