Interdisciplinary Minor in Neuroscience
Undergraduate Minor
Assessment Report from AY 2021-2022; Submitted November 1, 2022

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Mission Statement (no changes):
The interdisciplinary field of neuroscience is one of the most exciting and rapidly growing areas within the sciences. Our interdisciplinary minor in neuroscience draws from traditional natural and social science areas to help students better understand the structure and function of the nervous system and how activity within the nervous system gives rise to behavior. The neuroscience minor provides an interdisciplinary approach to studying these relationships, encompassing elements of biology, chemistry, kinesiology, philosophy and psychology.

Program Learning Outcomes (no changes):

PLO 1: Students will be able to describe the basic anatomy and physiology of the nervous system.

PLO 2: Students will be able to describe how the activity of the nervous system is related to behaviors (e.g., emotions, memory, mental illness).

PLO 3: Students will be able to critically evaluate the implications and limitations of neuroscientific research.

Neuroscience Minor Curriculum Map (the curricular map below was newly developed by the incoming director for Fall 2022):

	PLO1	PLO2	PLO3
Courses X Program Learning Outcomes	Students will be able to describe the basic anatomy and physiology of the nervous system.	Students will be able to describe how the activity of the nervous system is related to behaviors (e.g., emotions, memory, mental illness).	Students will be able to critically evaluate the implications and limitations of neuroscientific research.
Courses			
BIOL 105/105L: General Biology	I	I	I
PSYC 270: Biological Psychology	I	I	I
BIOL 115/116: Survey of Human Physiology	I	I	I
BIOL 350/351: Comparative Animal Physiology	D	D	D
BIOL 333/334: Endocrinology	D	D	D
BIOL 340: Animal Toxicology	D	D	D
KIN 340: Neuroscience	M	M	M
BIOL 368: Neurobiology	M	M	M
PSYC 319: Cognitive Psychology	D	D	D
PSYC 326: Learning and Memory	D	D	D
PSYC 351: Human Neuropsychology	D	D	D
	Key: I = Introductory		
	D = Developing		
	M = Mastery		

Assessment Schedule (Past Assessments):
As the incoming director, I have requested help and asked that any historical materials on file regarding the previous assessment history for the Neuroscience minor be shared for the purposes of this submission. Ella Frazer kindly reached out to inform me that the last assessment report for Neuroscience on record is from 2016-2017 (submitted Fall 2017), so it is important that we get back to a regular assessment practice. Moving forward, my goal is to establish a consistent assessment schedule and to seek the necessary materials and support from colleagues who teach courses in the minor to accomplish this goal. The first assessments of the Neuroscience minor will be direct assessments. The minor is comprised of different tracks, specialized for students from several different majors, and fluctuates in size (ranging from 70-150 since program assessment started). Because the minor director and the department to which this individual belongs do not control the scheduling or staffing of courses within the minor, our program assessment will use available courses with willing instructors.

2021-2022 Assessment:

We assessed the first and second program learning outcomes for Biological Psychology (PSYC 270):

PLO 1: Students will be able to describe the basic anatomy and physiology of the nervous system.

PLO 2: Students will be able to describe how the activity of the nervous system is related to behaviors (e.g., emotions, memory, mental illness).

Methodology Used:

This assessment relied on the collaborative efforts of myself and a Psychology Department assessment team comprised of five members (Dr. Violet Cheung, Dr. Benjamin Lev, Dr. Edward Munnich, and Dr. Indre Viskontas), with the help of three additional faculty members (Dr. Adam Bristol and Dr. Davina Chan). Each member of the team contributed to the effort of test development and administration.

To develop the test, experienced Biological Psychology instructors were asked to provide multiple choice exam questions with sound psychometric properties. The resulting item pool comprehensively sampled the content space of the course. The items were then evaluated based on how well they measured program learning outcomes 1 and 2.

Item selection was carried out with the goal of providing effective evidence of student mastery and offering diagnostic value for the teaching and learning process. Item difficulty level was one consideration. Obvious wrong answers were not provided among the four choices to avoid conflating students' common sense with their mastery of course-specific knowledge and raise chance level performance above 25% (i.e., 1 out of 4 choices) yielding artificially inflated scores. The final set of items

was sent to additional course instructors as well as two senior students for further feedback, and revised for clarity.

This test development process resulted in an instrument with 10 multiple choice questions that assessed PLO #1 (items 1, 2, 4, 5, 7) and PLO #2 (items 3, 6, 8, 9, 10).

The instructors agreed to administer the test in synchronous sessions during the last two weeks of the spring semester. The test started with a set of instructions and two questions regarding students' academic programs so that scores for Neuroscience minors could be isolated and analyzed separately from the larger dataset. The instructions assured students that their performance on the test would not affect their course grades. Students were instructed to work independently without consulting other sources. The test was administered to four sections of Biological Psychology offered in Spring 2021. Out of a total of 105 students enrolled in the four sections, 91 (86.7%) responded to the test and 85 (81%) completed the test. There were 16 Neuroscience minors. Nine of the 16 Neuroscience minors were Psychology majors and 7 held majors in other academic programs.

The assessment rubric was set by considering the course level and its intended goal in the interdisciplinary neuroscience minor curriculum. Biological Psychology is one of our two foundation courses for all minors. Our curricular map shows that this course aims to "introduce" students to PLOs 1 and 2 (whereas higher level courses have the respective aims to "develop" and "master" the PLOs). Our rubric classified student performance into the categories of 5 correct items = complete mastery of the outcome, 3-4 correct items = mastered most of the outcome, 2 correct items = mastered some parts of the outcome, 0-1 correct items = did not master outcome at level intended.

IV. RESULTS & MAJOR FINDINGS

What are the major takeaways from your assessment exercise?

This section is for you to highlight the results of the exercise. Pertinent information here would include:

a. how well students mastered the outcome at the level they were intended to:

PSYC 270 is a foundational course for neuroscience minors. The overall findings show strong evidence of mastery at the intended level, which was defined as mastery of at least some parts (2 out of 5 items correct) of the outcome to complete mastery (5 out of 5 items correct) of the outcome. In this case, for both PLO#1 and PLO#2, 94% of neuroscience minors (15 out of 16) demonstrated mastery at the intended level (only one student was below expectations for PLO #1). Looking more closely at the data, the distribution of responses skewed slightly lower for PLO#2 than for PLO#1 (e.g., 19% showed complete mastery of PLO#2 vs. 44% complete mastery for PLO#1). This pattern was expected given that an understanding of how activity within the nervous system gives rise to behavior is further developed through later courses in the minor. That said, we were pleased to see most minors demonstrating mastery at the intended level for both PLOs at this early stage in the minor.

a. any trends noticed over the past few assessment cycles

N/A

b. the levels at which students mastered the outcome based on the rubric used.

To address this, among many other options, one option is to use a table showing the distribution.

Results:

PLO #1 – Mastery Level Percentage - PSYC 270 – Neuroscience Minors (N=16)

Level	% Total Sample
Complete Mastery	43.8%
Mastered Most Parts	43.8%
Mastered Some Parts	6.3%
Did not Master at Level Intended	6.3%

*5 correct items=complete mastery of the outcome, 3-4 correct items=mastered most of the outcome, 2 correct items=mastered some parts of the outcome, 0-1 correct items=did not master outcome at level intended.

PLO #2 – Mastery Level Percentage - PSYC 270 - Neuroscience Minors (N=16)

Level	% Total Sample
Complete Mastery	18.8%
Mastered Most Parts	75.0%
Mastered Some Parts	6.3%
Did not Master at Level Intended	0%

*5 correct items=complete mastery of the outcome, 3-4 correct items=mastered most of the outcome, 2 correct items=mastered some parts of the outcome, 0-1 correct items=did not master outcome at level intended.

To summarize, what we have learned is that the foundational Biological Psychology course we require our minors to take is meeting our mission and PLOs #1 and #2 most of the time.

V. CLOSING THE LOOP

Description of how the results were shared with faculty and how your department/program responded to the results. This is where you should lay out any plans for future improvement or assessment of your program indicated by the results.

We find the outcomes from this initial assessment encouraging. As expected, outcomes for PLO 1 are exceptional and higher than PLO 2 as knowledge building is a core objective of our foundational courses, while critical thinking is a skill that is developed across courses in the minor. We were also encouraged to see relatively high consistency in curriculum across sections on foundation concepts in Biological Psychology, which suggests students are presented similar learning opportunities on core material. We also observed variation in the second half of the

semester, with a range of topics reflecting individual instructors' research expertise. This suggests that diverse perspectives and learning opportunities are being offered to our minors.

Moving forward, data from additional courses that have not yet been assessed should be evaluated. In my first year as minor director, I have taken steps toward building an assessment program by meeting with instructors who teach courses in the interdisciplinary minor to build a sense of community and collegiality and to explain the importance and relevant key points regarding assessment practices and the need to work together to support the minor in this way. I have met with faculty in Biology, Kinesiology and Psychology Departments. So far, I have been able to work with instructors who teach Neurobiology, Neuroscience, Biological Psychology, and Human Physiology to review course syllabi and identify student work that would provide direct measures we can use to carry out future assessments in each of these courses. I have further asked for support from my colleagues who teach in the minor to help with the evaluation of student work by considering serving on a neuroscience assessment subcommittee. I have started the process of creating rubrics for the student work assignments I have already identified as showing promise as direct measures for future assessments.

Working toward the further establishment and development of a functional and consistent assessment program, coupled with the advising load for this interdisciplinary minor has presented some formidable challenges. That said, we are encouraged with the progress that has been made and we look forward to continuing our assessments to evaluate student outcomes in each of our foundation, core and elective courses.

ADDITIONAL MATERIALS

(Any rubrics used for assessment, relevant tables, charts and figures could be included here)

Assessment Instrument

1. When a neuron is at rest, the difference in charge between the inside and outside of the cell is called the:

- o Action potential (1)
- o Threshold for excitation (2)
- o Resting membrane potential (3)
- o Concentration potential (4)

2. Immediately after an action potential, neurons are unable to fire for a period of time. This is referred to as:

- o Selective permeability (1)
- o The inhibition threshold (2)
- o The absolute refractory period (3)
- o The all-or-none law (4)

3. Which of the following experiments would be most informative in understanding the degree to which differences in genes influence generosity?

- o Compare generosity levels between siblings raised in the same home (1)
- o Compare generosity levels between unrelated children raised in different towns (2)
- o Compare generosity levels between a child and his biological vs adoptive parents (3)
- o None of the above would be informative (4)

4. The primary difference between an Excitatory Postsynaptic Potential (EPSP) and an Inhibitory Postsynaptic Potential (IPSP) is that:

- o EPSPs make the neuron more likely to fire an action potential and IPSPs make it less likely that a neuron will fire (1)
- o Only EPSPs decay over time and space (2)
- o Only IPSPs are graded (3)
- o EPSPs occur on the axon and IPSPs occur on the dendrites (4)

5. A drug that blocks or decreases the effect of a neurotransmitter is called a(n):

- o Agonist (1)
- o Antagonist (2)
- o Stimulant (3)
- o Depressant (4)

6. Due to the learned nature of tolerance, drug overdoses are most likely to occur:

- o When a user takes the drug at the same time every day (1)

- When a user consistently takes the drug in the same environment (2)
- When a user regularly takes the drug around the same people (3)
- When a user takes the drug in a novel environment (4)

7. In comparison to cones, rods are:
- More concentrated in the periphery of the retina (1)
- More effective in dim light (2)
- More important in color vision (3)
- Both more concentrated in the periphery of the retina and more effective in dim light (4)

8. Antidepressant medications are often serotonin agonists. This fact provides support for:
- The neurotrophic hypothesis (1)
- The monoamine hypothesis (2)
- The circadian rhythm hypothesis (3)
- The glutamate hypothesis (4)

9. A patient who cannot form new long-term memories for things like the names of people she just met, whether she's already had dinner or what happened after her brain injury has:
- a working memory problem (1)
- retrograde amnesia (2)
- anterograde amnesia (3)
- Parkinson's disease (4)

10. Imagine you are a neurologist and a person walks into your room with partial paralysis on the left side. What is your first guess at a diagnosis?
- The person might have Parkinson's Disease due to loss of cells in the substantia nigra (1)
- It is likely that she/he has a tumor in the thalamus (2)
- There is damage to the left motor cortex (3)
- The person likely had a stroke that affected his/her right hemisphere (4)