Physiology and Neuroscience (NSC) Baccalaureate Degree

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ACADEMIC YEAR COVERED BY THIS REPORT: 2020-2021

I. PROGRAM LEARNING OUTCOMES

Graduates will be able to • 1) Predict physiological outcomes of alterations to neuronal membrane properties and ion concentrations. • 2) Predict how neurons will respond to various stimuli at the synaptic level. • 3) Demonstrate quantitative literacy by correctly using equations, accurately making calculations, and interpreting information provided in graphical form. • 4) Demonstrate the ability to solve novel problems. • 5) Demonstrate the ability to implement the scientific process – make observations, formulate a testable hypothesis, analyze the scientific literature to provide background information, develop a rationale, design an experiment, report results, and make conclusions. • 6) Demonstrate the ability to communicate effectively (oral & written).

II. PROCEDURES USED FOR ASSESSMENT

A. Direct Assessment

Direct Assessment *For questions on the NEU 3100 midterm and final exams, most of the questions used to assess the program learning objectives are application style questions that are admittedly challenging and require a solid understanding of the concepts taught in class in order to then apply them to new situations. LO 1) Data were collected during both the midterm and final exams in NEU 3100 (How the Nervous System Works I) and compared between the two exams. Data were collected from all students in the course, and thus, are representative of all students who took the course. LO 2) Data were collected during the final exam in NEU 3100 (How the Nervous System Works I). Data were collected from all students in the course. LO 3) Data were collected from specific questions on the midterm and final exams in NEU 3100 (How the Nervous System Works I). Data were collected from all students in the course, and thus, are representative of all students who took the course. LO 4) Data were collected from specific questions on the final exam in NEU 3100 (How the Nervous System Works I). Data were collected from all students in the course, and thus,

are representative of all students who took the course. LO 5) Data were collected from a written document in NEU 3200 (How the Nervous System Works II). This assignment was designed to have students develop a logical follow-up experiment to one that we discussed extensively in class. Data were collected from all students in the course, and thus, are representative of all students who took the course. LO 6) Data were collected from oral presentations during a group project in NEU 1020 (The Neuroscience of Learning) and written and oral projects in NEU 3200 (How the Nervous System Works II). Data were collected from all students in these courses, and thus, are representative of all students who took the courses.

B. Scoring of Student Work

Scoring of Work LO 1) There are scoring rubrics used for all questions on the midterm and final exams in which students can earn varying amounts of points depending upon elements of the questions which are correct or not. Dr. Patrick Sonner (course instructor) did the scoring. LO 2) There is a scoring rubric used for this question on the final exam in which students can earn varying amounts of points depending upon elements of the questions which are correct or not. Dr. Patrick Sonner (course instructor) did the scoring. LO 3) There are scoring rubrics used for all questions on the midterm and final exams in which students can earn varying amounts of points depending upon elements of the questions which are correct or not. As well, there are some points given out for students showing their work and incorporating appropriate units. Dr. Patrick Sonner (course instructor) did the scoring. LO 4) There are scoring rubrics used for all questions on the midterm and final exams in which students can earn varying amounts of points depending upon elements of the questions which are correct or not. Dr. Patrick Sonner (course instructor) did the scoring. LO 5) There was a scoring rubric used to assess students' written documents and their ability to implement the scientific process. Dr. Patrick Sonner (course instructor) scored half the class and Collin Vinson scored the other half of the class. LO 6) There were scoring rubrics used to assess student's ability to communicate effectively, in both NEU 1020 and 3200. In NEU 1020, Dr. Kathy Engisch (course instructor) provided the scoring, while in NEU 3200, Dr. Patrick Sonner (course instructor) and Collin Vinson (GTA) both scored each oral presentation individually and then averaged the combined scores. For the written project in NEU 3200, Dr. Patrick Sonner scored half the class and Collin Vinson scored the other half of the class.

C. Indirect Assessment

Indirect Assessment There are two primary indirect assessments currently in use by our program. The first is the set of end of course assessments provided by Wright State University, across all courses in the program. The second is the Student Assessment of Learning Gains (SALG) survey given to all students at the end of NEU 3100 and NEU 3200. The SALG assessment is much more specific to the

learning outcomes for both NEU 3100 and NEU 3200. Finally, going forward, we would like to incorporate an end of program assessment for the program learning outcomes. This could be given to students in both final senior capstone courses, NEU 4020 and NEU 4040. Thus, since all students must complete one of the capstones to finish their degree requirements, we would be able to have all students take the end of program assessment survey. We recently completed this and will implement the survey for the first time this Spring 2022.

III. ASSESSMENT RESULTS/INFORMATION:

LO 1 – based upon 2 midterm exam questions and 2 final exam questions LO 2 – based upon 1 question on the final exam LO 3 – based upon 2 questions on the midterm and 3 questions on the final exam LO 4 – based upon 3 questions on the final exam LO 5 – based upon a written document analyzing a research article; also based upon group presentations of this analysis LO 6 – For NEU 1020 it is based upon a group oral presentation. For NEU 3200 it is based upon an individually written document and an oral group presentation SALG – Indirect Assessment survey at the end of NEU 3100 and NEU 3200

LO 1 - The average of the 2 midterm questions were split from Fall 2019 to Fall 2020 (10.8% increase and 1.5% decline, respectively). The average of the 2 final questions were split, with one decreasing slightly and the other increasing slightly from Fall 2018 to Fall 2019 (7.5% decline and 0.5% increase, respectively). LO 2 - The averages of the question were rather low in Fall 2019 and Fall 2020, with a decrease in Fall 2020 (4% decline). LO 3 - As these are based upon the questions mentioned above for LO 1 and LO 2, the summary results are basically the same overall. There are some decreases year over year and some increases in the outcome. LO 4 - There were decreases in two of the questions (7.5% and 4%, respectively) and a minor increase (0.5%) in one of the learning outcomes, year over year. LO 5 - Although not included in last year's program assessment, data has been compared between the assignment in Spring 2020 to Spring 2021. Overall, there were some gains on the written document (average grades of 83.05% to 87.41% in Spring 2020 and spring 2021, respectively). It is unclear why there was a slight improvement as the assignment was completed in person in the Spring 2020, but online in the Spring 2021. Perhaps students had more time to be able to focus on writing a strong document during the pandemic. LO 6 - While NEU 1020 is a new course, the group oral presentation assignment is similar in nature to that previously conducted in NEU 1000. However, they had not previously been graded individually. So, it is difficult to compare the results against previous years. That being said, the 4 graded elements (content, discussion, slides, and oral) all averaged between 2.75-2.87 out of 3 points. These are strong scores indicative of excellent outcomes. The NEU 3200 results indicate that overall, the data for the written document and oral presentation improved (1.5% and 2.4% increases, respectively) from Spring 2020 to Spring 2021. As such, the grades on this assignment were quite strong. SALG - The overall results are encouraging as the average responses for understanding of concepts in NEU 3100 were all increased from Fall 2019 to Fall 2020, with the

exception of 2 concepts whose mean scores stayed the same year over year. For Fall 2020, all conceptual understanding scores ranged from 4.2 to 4.8 out of 5 (with a 4 indicating students self-identifying with good gains to a 5 indicating students self-identifying with great gains) across all topics in the course. In Fall 2019, the mean scores across all topics in NEU 3100 ranged from 3.7 to 4.7 out of 5. For Spring 2021 we implemented the SALG for the first time in NEU 3200. While we have no other semester to compare it to, we were very pleased with the results, which ranged from a 4.5 to 4.8 out of 5 across all topics in the course.

LO 1 - Fall 2018 Midterm Q6=88.35%; Q19=90.91% Fall 2019 Midterm Q6=76.44%; Q19=86.15% Fall 2018 Final Q1=78.79%; Q4=76.82% Fall 2019 Final Q1=75.64%; Q4=79.04% *All scores are the average percentage students received on the respective questions. LO 2 - Fall 2018 Final Q13=64.77% Fall 2019 Final Q13=62.26% *All scores are the average percentage students' received on the respective questions. LO 3 - Fall 2018 Midterm Q6=88.35%; Q19=90.91% Fall 2019 Midterm Q6=76.44%; Q19=86.15% Fall 2018 Final Q1=78.79%; Q4=76.82%; Q13=64.77% Fall 2019 Final Q1=75.64%; Q4=79.04%; Q13=62.26% *All scores are the average percentage students' received on the respective questions. LO 4 - Fall 2018 Final Q1=78.79%; Q4=76.82%; Q13=64.77% Fall 2019 Final Q1=75.64%; Q4=79.04%; Q13=62.26% *All scores are the average percentage students received on the respective questions. LO 5 - NEU 1000 Fall 2018 Hypothesis=98.5%; Rationale=88.7%; Flow Diagram=93%; Design Elements=86%; Results=90.7%; Discussion=94.5% NEU 1000 Fall 2019 Hypothesis=96.9%; Rationale=98.2%; Flow Diagram=95%; Design Elements=96.6%; Results=93.8%; Discussion=90.9% *All scores are the average percentage students received on the respective questions. LO 6 - NEU 1000 Fall 2018 Final Project Hypothesis=87.5%; Background=95.8%; Rationale=85.4%; Flow Diagram=96.5%; Design Elements=95.1%; Results=90.3%; Conclusions=84.7% NEU 1000 Fall 2019 Final Project Hypothesis=97.9%; Background=91.7%; Rationale=94.5%; Flow Diagram=94.0%; Design Elements=85.4%; Results=89.8%; Conclusions=87.3% NEU 1000 Fall 2018 Oral Presentations Slides=93.0%; Speaking=95.0% NEU 1000 Fall 2019 Oral Presentations Slides=91.9%; Speaking=93.7% NEU 3200 Spring 2019 Written 92.25%; Oral 97.27% NEU 3200 Spring 2020 Written 87.97%; Oral 92.90% *All scores are the average percentage students received on the respective assignments. SALG - The detailed statistics for each surveyed element can be seen in the attached SALG survey (Statistics tab), along with open-ended responses in the Data tab. However, an encouraging result was that the students self-identified that they made between good and great gains in their understanding of the main concepts explored in the class (mean=4.6; n=23). Also, students self-identified that they made good to great gains in their understanding of the relationships between the main concepts in the course (mean=4.2; n=23).

IV. ACTIONS TO IMPROVE STUDENT LEARNING

Information Sharing and Actions Information regarding the assessment has been shared between faculty in the department associated with the program. Discussions were had regarding approaches and strategies to try and improve

learning outcomes. As a result, we began by changing our freshman and sophomore course sequence from NEU 1000 (freshman year) and NEU 2000 (sophomore year) to NEU 1010 and 1020 (freshman year) and NEU 2010 (sophomore year), in order to allow for more focused time in the coursework to aid in students developing and improving their scientific communication skills, as well as implementing the scientific process more effectively. Also, students felt that there was too much work involved in an introductory freshman course. Thus, the research related aspects will be moved to the sophomore level course (which will be assessed for the first time in the 2021-2022 academic program assessment). This new sequence just began this Fall 2020 semester. As such, we don't have any insight yet as to whether benefits to the associated learning outcomes will be gained. We also made modifications in NEU 3100 to spend more time on some of the associated topics in class to address the content specific learning outcomes. Since these alone didn't provide sufficient improvements, we will implement alternative strategies including more out of class homework assignments to improve their abilities to apply concepts learned in class to new scenarios. Also, going forward, we will annually spend time during a departmental education committee meeting providing results of the assessments and discuss strategies for improvement. Additionally, we have an Advisory Board which is comprised of an interdisciplinary group of faculty at WSU. We would like to share the results of our assessment with them and get their feedback on ideas for improvement.

V. SUPPORTING DOCUMENTS

Additional documentation, when provided, is stored in the internal Academic Program Assessment of Student Learning SharePoint site.