Course Background

Behavior Neurobiology (PSYCH 381) is a mandatory upper division course for psychology majors. The content of the course was selected to provide upper-level knowledge on the principles of behavioral neurobiology as they relate to the 5 core competencies outlined by the American Psychological Association: (1) knowledge base in psychology, (2) scientific inquiry and creative thinking, (3) ethical and social responsibility, (4) communication, and (5) professional development.

I created the course, although I did receive input from other professors in the department who have taught the course in the past. This course presents many unique challenges. My main challenge has been to gauge what the students are prepared to learn in the course. Although it is an upper-level course, some students have reported having very little exposure to neurobiology while other students are hungry to know as much depth on the topic as possible. In the first semester, I overestimated the general readiness of the students to engage in the material, and several students reported in my student ratings that they felt lost. This feedback was shared with me after the next semester had already started but I have started to make changes to address this concern. I changed textbooks to a more basic text which has solved some problems while presenting new challenges. Specifically, sometime the text give definitions but does not explain why they are important or do not provide enough information about them to be meaningful. I am confident that by addressing these problems, my ratings next Fall semester will be much higher than they were last semester.

Learning Outcomes

The course outcomes are determined by the department and are as follows.

1. The brain, experience, and behavior -All Sections

Students will develop their understanding of how the brain influences one's experience of the world and one's behavior in it.

Measurement: In-class quizzes and/or exams on assigned textbook reading, lectures, and class discussions and written reports and/or in-class presentations of self-selected articles from the scientific literature.

Contributes to 1 program outcomes

2. Scientific methods and behavioral neurobiology -All Sections

Students will identify scientific methods, especially those of cognitive neuroscience, that are valuable in behavioral neurobiology.

Measurement: In-class quizzes and/or exams on assigned textbook reading, lectures, and class discussions and written reports and/or in-class presentations of self-selected articles from the scientific literature.

Contributes to 2 program outcomes

3. Diseases, trauma, drug usage, hormones, and genes -All Sections

Students will extend concepts and research findings to diseases, trauma, drug usage, hormones, and genes.

Measurement: In-class quizzes and/or exams on assigned textbook reading, lectures, and class discussions and written reports and/or in-class presentations of self-selected articles from the scientific literature.

Contributes to 1 program outcomes

Course Activities

Assigned reading. The assigned reading for the first semester was challenging for some students and they reported that they stopped reading early in the semester. This semester I am using another book, which has proved to be just as dense in terms of definitions but provides little explanation of neurobiology. Both authors focus heavily on animal research methods and studies. In contrast, students are more interested in the relevance of neurobiology to human psychology. I am in pursuit of a better textbook for next semester, one that provides clear links between neurobiology and human behavior.

Lectures. Lectures are organized to (1) teach behavioral neurobiology across units of analysis including genes, neuromolecules, cells, circuits, and physiology, behavior, self-report, and paradigms, (2). learn methods in neurobiology, and (3) learn about clinical cases of diseases, trauma, and drug abuse.

Pop quizzes. Quizzes align with each of the course objectives. They occur after the students have read the assigned reading, I have lectured on the material, and have given the students an opportunity to ask for clarifying questions on the material. The questions are similar to the questions on the mid-term exams and provide additional practice for students.

Exams. The exams align with each of the course objectives. Exam questions reflect the material that was covered in at least two places in the course: the assigned reading and that were also covered in lecture. This gives the students ample opportunity to learn the material before being tested. Some of the students did so well on the first mid-term exam (e.g., received 112%), I gave students the option to forgo the second mid-term, with the encouragement that they use their time to study for life rather than another exam. Other students performed more poorly than they would have liked on the first mid-term exam (e.g., 46%); I gave students the option to better prepare for the second mid-term with the option to replace their first mid-term exam score with their second, if they do better. To help these students, my TA and I have started providing review sessions every Friday.

Experiential Neuroimaging Assignment. Students attend a magnetic resonance imaging (MRI) scan conducted by Dr. Kay at the MR Facility during the class period. Students were given neuroimaging software to answer questions about the brain scans, identify the x,y,z coordinates for specific brain regions, and identify the names and functions of brain region coordinates. This experience gives the students the most innovative information on how behavioral neurobiologists use MRI to study the brain.

Experiential Model Assignment. Students create a model (a drawing that can be viewed on a single page) of the nervous system that includes the major neural pathways discussed in the course (somatosensory pathways, motor control pathways, audition, memory, and emotion circuits). Their models include neurotransmitters, cell types, and the brain regions associated with these pathways. The models provide the students with a functional conceptualization of how neurobiology relates to behavior.

Assessments of Student Learning

      1. Exam 1 (100 points): The first mid-term covers the material from the genes unit of analysis through the circuits unit of analysis and includes 50 multiple-choice questions. The questions reflect the material covered in both the readings and lecture (Appendix 1). Last semester the exam covered much more information in a single mid-term exam (Appendix 2). Students requested more exams to break up the material. This semester I will do so.

      2. Exam 2 (100 points): The second mid-term covers the material since the previous exam through sensation and will include 50 multiple-choice questions. The questions reflect the material covered in both the readings and lecture. I have not yet written this exam.

      3. Final Exam (100 points): The final requires students to draw and explain the pathophysiology of 5 unique clinical cases. These cases will be related to each of the 5 major pathways included in the students model assignment. At the bottom of the model assignment instructions, I have included 5 case examples to help the students prepare for the final (Appendix 3).

      4. Pop quizzes (100 points): There are 10 pop quizzes throughout the course. Students are able to earn up to 10 points each. These quizzes cover major points from the assigned readings and occur after the lectures on the related topics so that students are able to ask questions on the material before they are quizzed. They are allowed to drop their lowest quiz score.

      5. Experiential Neuroimaging Assignment (50 points): Each student will need to attend a magnetic resonance imaging (MRI) scan conducted by Dr. Kay at the MR Facility during the class period. Each student will be provided with a copy of the scan. You will need to download neuroimaging software to your personal computer and use this program to answer questions, identify the x,y,z coordinates for specific brain regions, and identify the names and functions of brain region coordinates (Appendix 4)

      6. Experiential Model Assignment (50 points): Each student creates a model (a drawing that can be viewed on a single page) of the central nervous system that includes the major pathways discussed in the course (somatosensory pathways, motor control pathways, audition, memory, and emotion circuits). The model also includes neurotransmitters, cell types, and the brain regions associated with these pathways (Appendix 5).

Each assignment measures the achievement of each course learning outcome. Indeed, if students are able to answer question on the exam about neurobiology (its methods and clinical relevance), able to identify brain regions with their functions in a 3D MRI, and are able to draw the nervous system with associated neurotransmitters, brain regions, cell types, and behaviors they have achieved the objectives of this course.

Student Achievement of Learning Outcomes

1.   The brain, experience, and behavior

Several students reported that they felt lost most of the semester. The students may have learned more about the brain, experience, and behavior than they realized. They performed well on the final exam which assessed their ability to apply their knowledge of behavioral neurobiology to clinical cases. The average on the final was 91%. The students' high-quality models also demonstrated that they knew the material better than they perhaps realized (Appendix 6). However, the mid-term suggested that they struggled with more structured assessments. The average was 83% but included a hefty curve. The exam questions I personally were likely too difficult for the students level of understanding and my department chair has recommended I make the exams less difficult. This semester, I have used the questions from the textbook test bank and these new questions resulted in much higher performance by most students. However, many students struggled on the new exam, suggesting that the course objectives are not being met for a good number of students.

2. Scientific methods and behavioral neurobiology

The students learned about many of the methods used in behavioral neurobiology. These were assessed in the mid-term exam and in the Experiential Neuroimaging Assignment. Students averaged 94% on this assignment, suggesting that they learned the methods needed to describe MRI methods and identify brain regions.

3. Diseases, trauma, drug usage, hormones, and genes

The student's performance on the mid-term exam suggests that more could be done to help students understand the material related to these clinical topics. This semester, I have added a day per week to the application of behavioral neurobiology. I hope this will help the students perform better on this objective.

Overall, I feel that the students learned more than they realized in the course but that I need to make changes to the curriculum to help them solidify their knowledge. One thing I will do in the future is to allocate 1/3 of each exam to each of the course objectives. I will also identify a textbook that better aligns with the teaching objectives. My student rating was a bit lower than I expected 4.2/5. This may reflect that I was pushing the students to learn material that was beyond their preparation. The course GPA was indeed lower than the historical average. This semester, I have sought to calibrate the exams to the student's level of readiness.

Steps Planned or Taken to Improve Teaching and Student Learning

I am in the process of making several changes to the course to address student comments and to improve the course. First, I am working to identify a textbook that aligns more fully with the course objectives. Switching textbooks this semester did not meet this objective. It solved some problems but introduced several unexpected problems (it made the material simpler but made more students confused because it does not provide the detail needed to understand several concepts). Second, I am taking the advice of my mentor (Dawson Hedges) to ease up on the students and calibrate my expectations to their current level of readiness. Doing this semester has resulted in much better improvement on the mid-term than last semester. Third, I will better align the exams to assess each of the course objectives so I can analyze their test performance for each. I have invited a veteran of the course to attend my class this week and he will provide me with additional feedback on areas to improve. I also plan to attend a lecture of another faculty member who has received positive reviews from students in this course.

Describe your experience in implementing your Citizenship Project proposal. What worked and didn't work? What has resulted from these activities?

My citizenship project proposal was to get on a department committee, be on 2 more dissertations committees, and become more involved in a Sleep Society. Most of these goals were met; I joined a department committee, was invited to be on one more dissertation committee, and joined the curriculum committee of the American Academy of Sleep Medicine. I've learned that getting involved is easy, but that making a perceptible difference through citizenship is more difficult to quantify. My goal is to do good work in my citizenship so that I will be invited to greater and greater responsibility. I believe that this citizenship project helped me get the ball rolling and that I will have many more opportunities as a result of my hard work.

Scholarship Strategies Project— Final Report Guidelines

Final Report due mid-February 2018

(1) Evaluate your success in accomplishing your scholarly goals (activities or products).

- My goal to submit three peer-reviewed manuscripts as the first author was not achieved. I submitted one paper as first author which is currently under review. I also mentored a student on a second paper. I wrote two other papers but due to mixed and confusing findings I decided in conjunction with my co-authors to not submit one of the papers and the other paper I was not able to obtain approval from the senior author to submit. I learned from these failed papers how important it is to select wisely which papers to spend time on. I have realized the importance of having my own data so that my fate is in my own hands. Over the past 8 months I have collected considerable amounts of data that is my own and this will allow me greater freedom in submitting papers.
- My goal to submit a session proposal to the SLEEP meeting was successful. I recently received word that I will be the chair of a session on Somnoimaging, a new field in sleep research that I am defining and promoting.
- My goal to submit a major grant application was not achieved. I am currently running two major project (one of which is a funded MEG). I felt it would be best to delay my applications until next year. I nevertheless, submitted a grant to receive funding to receive fMRI neuroimaging training. My application is currently under review.
- My goal to read a book on how to write more in research articles was achieved. My goal to implement the suggestions of doing daily writing was not successful.
- My goal to collect half of the participants for the currently approved projects was not quite achieved. I currently have 11/28 participants for one project and 32/80 participants for the other project. Additional time is needed to recruit a large enough sample to begin publishing with these data.
- My goal to forge a collaboration with a new faculty member in the department was successful. I started collaborating with the chair of the department.

(2) Describe your experience in applying the strategies you targeted to enhance your scholarly productivity. Have any of these strategies become a useful part of your regular work habits?

The strategies to do daily scheduled writing and to find ways I can more effectively help colleagues use sleep research to answer their research questions, have both proven to be much easier said than done. I regularly try to find time to write but find that this negatively affects my teaching performance. I have also be much to learn about how to collaborate as a sleep expert with faculty. I am going to look for training opportunities to hone my collaboration skills.

(3) If appropriate, revise the paragraph(s) from your faculty development plan where you identify the themes, topics, methods, or applications that will serve as the organizing structure of your program of scholarship.

My research aims to discover the pathophysiology of insomnia and the role of sleep disturbance in risk for psychiatric disorders. To reach these aims, I will conduct secondary analyses on data collected in previously conducted projects. I will also reach this goal through my ongoing studies conducted at Brigham Young University. This remains an appropriate representation of my goal.

(4) Describe what you learned from this process and your plans for enhancing your future scholarly productivity.

I learned how difficult it is to reach my research writing goals while prepping new courses every semester, mentoring students, conducting new research, etc. I wrote 3 papers over the summer but found doing this during the teaching semester was much more difficult. The past two semesters, with the addition of two new projects being in full swing and teaching new course was much more difficult than I anticipated when I wrote my research plan. I am adapting and finding new ways to make things happen. I also learned how important it is for me to achieve research independence.