Annual Assessment Report
The Study of the Mind / Neuroscience Program
June 5, 2020

Program Changes

The interdisciplinary Neuroscience Program is completing its fourth year. The Neuroscience Program at Hendrix College is an exceptional undergraduate major since it incorporates required courses from the natural sciences, social sciences, and the humanities. Most undergraduate Neuroscience Programs only include two disciplines, usually psychology and biology. We emphasize the interdisciplinarity of neuroscience including philosophy, psychology, biology, and computer science. Student interest in neuroscience is growing. In 2017, we had three graduates; in 2018, there are five graduates; in 2019, there were nine neuroscience graduates, in 2020, there were six graduates. The continued growth of the Neuroscience Program will require careful supervision by the participating faculty in the coming years.

Over the last year, we have revised the Neuroscience program given changes in our faculty. We are now the Study of the Mind / Neuroscience program and offer a Major in The Study of the Mind and a Minor in Neuroscience. The changes we have made to the curriculum during the 2019-2020 year were based in assessment data from direct assessment and indirect assessment of the learning goals of the program over the past 4 years.

One major change to the program is a revision to our learning goals to make them more assessable (Please see Appendix 1 and Appendix 2 below). One change involved changing learning goals to include action verbs by which students could be measured. Another change to learning goals was to separate out learning goals that focused on foundational or core knowledge within disciplines on the one hand and integration across disciplinary boundaries on the other hand.

Another major change to the program was revision of our program, major, and minor (Please see Appendix 3 and 4 below). We changed our name from "Neuroscience" to "The Study of the Mind / Neuroscience" because we found through direct and indirect assessment that the upper level work in advanced neuroscience was not being delivered as we intended. We also changed the major from "Neuroscience" to "The Study of the Mind" and kept the "neuroscience" name for the minor. Most students valued a program that emphasized that interdisciplinarity was important for their experience in the major. We increased interdisciplinarity by changing the core courses: we removed BIOL 425 from the list (partly because we cannot staff the course) and CHEM 110 (because we discovered that what was necessary for learning in upper level courses was taught in BIOL 150) and we added CSCI 150 to increase our interdisciplinary engagement.

Another major change to the program is that we revised our assessment plan given that we have a new program. We outlined direct assessments and indirect assessments and summarized possible future goals in assessment for each learning goal. While we discussed all the learning goals for the past program in 2019-2020. Given that we have a new program we are going to start with assessing learning goals 1 and 2 in 2020-2021. We have assessed all the learning goals from the past program through our revision of the major last year. Our conversations need to start over in order to reassess the program more holistically. The major change going forward is to bring into the senior seminar an assessment rubric that the department members can used in the assessment of the work in the senior seminar. This enables us to connect the direct assessment measures to the learning goals of the program and in addition enables us to assess the thesis project in the senior seminar.

I have attached separately the direct assessment spreadsheet and the indirect assessment senior survey. In addition I have attached our program's senior assessment and our data from the senior survey.

Capstone Course

As an interdisciplinary program, we have been mindful of the need to make the capstone course a place to bring together, discuss, and showcase the broad knowledge that our majors have gained. The first four years have set a solid groundwork for growth and development of this course. The description of the senior capstone course is: "An advanced seminar in neuroscience for senior neuroscience majors only. Topics are chosen by the neuroscience faculty, and students have the opportunity to integrate and synthesize what they have learned in their neuroscience major." We will be revising the description for the capstone and the title for the capstone. However, the major change will be the use of an assessment rubric for the written and oral work in the course. I have attached the rubric below as Appendix 7. The Syllabus for the 2020 Capstone course stated: "The neuroscience capstone course culminates the neuroscience major. It brings all the majors together in their final semester in order to share information, learn from each other, and synthesize their work in neuroscience. The course is directed by one member of the neuroscience faculty with the participation of the other faculty. Each year the emphasis of this course is determined by the leading faculty member."

The capstone has been designed to help our program our six learning goals (see appendix 1). The first and second learning goals (core knowledge and techniques) are accomplished in other required courses and so are not directly relevant to the capstone course. The fourth and sixth learning goals concern the general academic skills of critical reading and thinking as well as oral and written communication. The capstone course involved working on the stages to produce a senior thesis project. Students were required to write papers on these topics and they presented two twenty-minute power point discussions in these areas. Scientific communication skills were further developed in the students' power point presentations for a general public.

Two different aspects of the capstone addressed the third learning goal of interdisciplinarity. In the past years of the senior seminar, neuroscience faculty presented guest lectures. They assigned and discussed different articles in neuroscience literature, with a focus on demonstrating the interdisciplinary nature of neuroscience.

Action Plan for Improvement

Throughout our revision of our major we consider a few challenges in original assessment plan. That assessment plan has been revised in light of the changes in our program, major, and minor.These challenges are due to two primary factors, our interdisciplinarity and the relative newness of neuroscience as a field. The fact that we are a very interdisciplinary program means that the majority of our courses are not housed within an integrated department. Our core courses (see appendix 2) come from three departments, Biology, Philosophy, and Psychology. These courses will be taught by Neuroscience Faculty for the foreseeable future and so will be straightforward to assess. Other required courses and electives may or may not be taught by members of the Neuroscience Program. Consequently, we will only be assessing courses that are taught by our contributing members at this time. After we have a couple years of assessment data, we will revisit this to determine if this targeted sampling approach is providing us with meaningful information. The second factor that presents us with a challenge is the lack of a standardized test for neuroscience. Based on conversations with outside assessors familiar with undergraduate Neuroscience Programs, it is unlikely that such a test will be created. Our current assessment plan is our best first effort and we are cognizant that this may require significant adjustments in the future. In addition, we will shift towards using a course paper in the senior seminar to begin assessing the final work of the students in light of projects required to write a senior thesis. We will base

adjustments on feasibility of the current plan and the quality of the data collected. Future plans may include using established rubrics for each key concept identified in the core courses.

Appendix 1

NEUROSCIENCE PROGRAM LEARNING GOALS

The Neuroscience Program's stated learning goals for our students are to develop:

1. A broad understanding of the development, organization, and function of the nervous system and the foundational assumptions of philosophy of mind and philosophy of science;
2. knowledge of the techniques and methods of neuroscience research and how the scientific method is used to address questions relevant to neuroscience;
3. an appreciation of the interdisciplinary nature of neuroscience that requires an integration of knowledge from multiple disciplines and levels of analysis;
4. critical reading and thinking skills that allow students to assess and contextualize neuroscience literature;
5. an understanding of the ethical issues in the field of neuroscience and the approaches neuroscientists use to confront them; and
6. oral and written scientific communication skills.

Appendix 2

STUDY OF THE MIND / NEUROSCIENCE LEARNING GOALS

Upon completion of the requirements for the major in The Study of the Mind and the Minor in Neuroscience, students will:

1. Understand, explain, predict, and model the relationships between the brain and nervous system, cognition, behavior, and the environment.
2. Rigorously apply the scientific method to questions that arise from the study of the mind and brain.
3. Gain foundational knowledge from philosophy, psychology, biology, and computer science.
4. Integrate the concepts, principles, and methods from multiple disciplines pertinent to the study of the mind.
5. Demonstrate critical reading and thinking skills that allow students to assess and contextualize interdisciplinary literature in the study of the mind and neuroscience.
6. Demonstrate an understanding of the ethical issues in the field of study of the mind and neuroscience and the approaches researchers use to confront them.
7. Demonstrate competency in oral and written scientific communication skills.

Appendix 3

NEUROSCIENCE PROGRAM ASSESSMENT PLAN

The Neuroscience Program's stated learning goals for our students are to develop:

7. A broad understanding of the development, organization, and function of the nervous system and the foundational assumptions of philosophy of mind and philosophy of science;
8. knowledge of the techniques and methods of neuroscience research and how the scientific method is used to address questions relevant to neuroscience;
9. an appreciation of the interdisciplinary nature of neuroscience that requires an integration of knowledge from multiple disciplines and levels of analysis;
10. critical reading and thinking skills that allow students to assess and contextualize neuroscience literature;
11. an understanding of the ethical issues in the field of neuroscience and the approaches neuroscientists use to confront them; and
12. oral and written scientific communication skills.

LEARNING GOAL 1

A broad understanding of the development, organization, and function of the nervous system and the foundational assumptions of philosophy of mind and philosophy of science

No standardized test exists to assess knowledge of neuroscience (i.e., Major Field Test, GRE Subject test). A number of other Neuroscience departments/programs (ACS and beyond) were contacted and it appears that no one has developed a comprehensive means of assessment at this time. Consequently, our program will assess this learning goal by sampling from existing assessments that exist within our core courses. Future options may include developing course or major specific pre- and post- tests.

Students who successfully complete the following courses should achieve this learning goal:

- PSYC 220 Brain and Behavior
- PHIL 350 Philosophy of Mind
- PHIL 390 Philosophy of Science
- BIOL 325 Cellular and Molecular Neuroscience
- BIOL 425 Systems Neuroscience

Classroom teachers for each of these courses will identify the most important or foundational concepts that a Neuroscience major should retain. Faculty will then identify a pre-existing and course-specific means of assessing these concepts. Examples for assessing an individual concept include, but are not limited to, a single question or grouping of questions, a paper or essay, or a quiz. The program will keep annual records of the following:

1. The key concepts for each core course
2. The means of assessment for each concept
    - For example, the text of the question(s) or paper/essay prompt
3. The scoring rubric or key for each means of assessment
4. The mean student score for the means of assessment
    - For PSYC 220, this should include declared Neuroscience major *and* all students
    - For all other courses, this should include declared Neuroscience majors *only*

LEARNING GOAL 2

Knowledge of the techniques and methods of neuroscience research and how the scientific method is used to address questions relevant to neuroscience

The program will keep annual records of the following:

1. The number of declared majors presenting posters and papers at state, regional, and national meetings and the citations for each presentation
2. The number of declared majors who are authors on research publications, and the citations for each publication
3. The number of declared majors who write research or review papers in each course and the title of each paper
4. The subjective student perspective provided in the Neuroscience Senior Survey

Future assessment goals may include using a faculty-developed rubric to assess the use of the scientific method and specific techniques in select courses.

LEARNING GOAL 3

An appreciation of the interdisciplinary nature of neuroscience that requires an integration of knowledge from multiple disciplines and levels of analysis

The program will keep annual records of the following:

1. The number of distinct 4-letter codes achieved *within the major* by each graduating senior
   - for example: BIOL, PSYC, PHIL, CSCI, etc.
2. The subjective student perspective provided in the Neuroscience Senior Survey

Future assessment goals may include using a faculty-developed rubric to assess an interdisciplinary paper from the capstone course.

LEARNING GOAL 4

Critical reading and thinking skills that allow students to assess and contextualize neuroscience

The program will keep annual records of the following:

1. The number of declared majors presenting posters and papers at state, regional, and national meetings and the citations for each presentation
2. The number of declared majors who are authors on research publications, and the citations for each publication
3. The number of declared majors who write research or review papers in each course and the title of each paper
4. The Neuroscience Capstone grade
5. The subjective student perspective provided in the Neuroscience Senior Survey

LEARNING GOAL 5

An understanding of the ethical issues in the field of neuroscience and the approaches neuroscientists use to confront them

The program will keep annual records of the following:

1. Certificates of completion of either the human subjects or animal subjects training course offered by the NIH Office of Extramural and Intramural Research, respectively. These will be conducted as part of the capstone course.
   - Human subjects course: https://phrp.nihtraining.com/index.php

    - Topics: codes and regulations, respect for persons, beneficence and justice
  - Animal subjects course: https://oacutraining.od.nih.gov/public_menu.aspx
    - Topics: animal care and use policies, occupational health and safety, animal health and well-being, animal care and use procedures
2. The subjective student perspective provided in the Neuroscience Senior Survey

Future assessment goals may include using a faculty-developed rubric to assess an ethics discussion, paper or presentation from the capstone or other core course.

LEARNING GOAL 6

Oral and written scientific communication skills

The program will keep annual records of the following:

1. The number of declared majors presenting posters and papers at state, regional, and national meetings and the citations for each presentation
2. The number of declared majors who are authors on research publications, and the citations for each publication
3. The number of declared majors who write research or review papers in each course and the title of each paper
4. The number of students who give oral presentations in each course and the titles of those presentations

SUMMARY OF DATA TO BE COLLECTED ON AN ANNUAL BASIS

All materials will be requested at the end of each semester by the chair of the assessment sub-committee. Records will be maintained electronically and sent to the program chair upon assimilation each year.

The program will keep annual records of the following:

1. Key concepts, means of assessment of each concept, scoring rubric or key and mean student scores from the following courses: (relevant course instructors)
    - PSYC 220 Brain and Behavior: all students and declared majors
    - PHIL 350 Philosophy of Mind: declared majors only
    - PHIL 390 Philosophy of Science: declared majors only
    - BIOL 325 Cellular and Molecular Neuroscience: declared majors only
    - BIOL 425 Systems Neuroscience: declared majors only
2. The number of declared majors presenting posters and papers at state, regional, and national meetings and the citations for each presentation (all program faculty, and students)
3. The number of declared majors who are authors on research publications, and the citations for each publication (all program faculty, and students)
4. The number of declared majors who write research or review papers in each course and the title of each paper (all program faculty)

5. The number of students who give oral presentations in each course and the titles of those presentations (all program faculty)
6. The Neuroscience Capstone grade (course instructor/program chair)
7. The number of distinct 4-letter codes achieved within the major by each graduating senior (program chair)
8. Certificates of completion of either the human subjects or animal subjects training course for each graduating senior (student assessment/part of capstone moving forward)
9. The subjective student perspective provided in the Neuroscience Senior Survey (assessment chair

Appendix 4

THE STUDY OF THE MIND / NEUROSCIENCE PROGRAM ASSESSMENT PLAN

The Study of the Mind Assessment Plan

Upon completion of the requirements for the major in The Study of the Mind and the Minor in Neuroscience, students will:

1. Understand, explain, predict, and model the relationships between the brain and nervous system, cognition, behavior, and the environment.
2. Rigorously apply the scientific method to questions that arise from the study of the mind and brain.
3. Gain foundational knowledge from philosophy, psychology, biology, and computer science.
4. Integrate the concepts, principles, and methods from multiple disciplines pertinent to the study of the mind.
5. Demonstrate critical reading and thinking skills that allow students to assess and contextualize interdisciplinary literature in the study of the mind and neuroscience.
6. Demonstrate an understanding of the ethical issues in the field of study of the mind and neuroscience and the approaches researchers use to confront them.
7. Demonstrate competency in oral and written scientific communication skills.

CURRICULUM MAPPING (See Also Appendix A)

NEUROSCIENCE MAJOR

Course	LG1	LG2	LG3	LG4	LG5	LG6	LG7
BIOL 150		I	I				I

CSCI 150	I		I				
PSYC 220	I	D	I (from biology and psychology, but not the others; although those disciplines are *introduced*, they are not substantial parts of the course)				
Statistics		D		I			
PHIL 350	D	I theoretical	D	I	M	I	M
PHIL 390	D	I theoretical	D	M	M	I	M
BIOL 325	M	D	D	D (mainly biology, chemistry, and physics)	D	I	D
NEUR 497				M		M	
4 electives	D	D	D	D	D	D	D

NEUROSCIENCE MINOR

Course	LG1	LG2	LG3	LG4	LG5	LG6	LG7
BIOL 150		I	I				I

PSYC 220	I	D	I (from biology and psychology, but not the others; although those disciplines are *introduced*, they are not substantial parts of the course)				
BIOL 325	M	D	D	D	D	I	D
PHIL 390	D	I theoretical	D	M	M	I	M
2 electives	D	D	D	D	D	D	D

LEARNING GOAL 1

Understand, explain, predict, and model the relationships between the brain and nervous system, cognition, behavior, and the environment.

Direct Assessment— Rubric for assessment of major assignment— midterm, final, or course paper— that focuses on foundations from the following courses: PSYC 220 Brain and Behavior, CSCI 150 Foundations of Computer Science, PHIL 350 Philosophy of Mind, PHIL 390 Philosophy of Science, and BIOL 325 Neurobiology. Classroom teachers for each of these courses will identify 2 key questions that reflect the most important concepts that students should retain from the core courses. Each of these key questions should appear in an existing assessment instrument, such as a midterm, comprehensive final exam, or course paper. For each key question data will be collected on: 1) The text of the question; 2) The scoring rubric for the question; 3) The mean student score for the question.
and Capstone Thesis Rubric RLG1.

Indirect Assessment— The student perspective provided in the Neuroscience Senior Survey question 5.1.

LEARNING GOAL 2

Rigorously apply the scientific method to questions that arise from the study of the mind and brain.

Direct Assessment— Capstone Thesis Rubric R4 and R5 and Capstone Thesis Rubric RLG2

Indirect Assessment— The student perspective provided in the Neuroscience Senior Survey question 5.2.

Future assessment goals may include using a faculty-developed rubric for Statistics, Brain and Behavior, or Philosophy of Science to assess the use of the scientific method and specific techniques in select courses.

LEARNING GOAL 3

Gain foundational knowledge from philosophy, psychology, biology, and computer science

Direct Assessment— Capstone Thesis Rubric R3 and Capstone Thesis Rubric RLG3 and rubric for assessment of major assignment— midterm, final, or course paper— that focuses on foundations from the following courses: PSYC 220 Brain and Behavior, CSCI 150 Foundations of Computer Science, PHIL 350 Philosophy of Mind, PHIL 390 Philosophy of Science, and BIOL 325 Neurobiology. Classroom teachers for each of these courses will identify 2 key questions that the foundational knowledge gained from the core courses.

Indirect Assessment— The student perspective provided in the Neuroscience Senior Survey question 5.3.

LEARNING GOAL 4

Integrate the concepts, principles, and methods from multiple disciplines pertinent to the study of the mind.

Direct Assessment— Capstone Thesis Rubric R9 and RLG4 and Rubric from Interdisciplinary Senior Seminar paper

Indirect Assessment— The student perspective provided in the Neuroscience Senior Survey question 5.4.

Future assessment goals may include using faculty-developed rubrics for interdisciplinary components of core courses.

LEARNING GOAL 5

Demonstrate critical reading and thinking skills that allow students to assess and contextualize interdisciplinary literature in the study of the mind and neuroscience.

Direct Assessment— Capstone Thesis Rubric R1, R3, R6 and RLG5

Indirect Assessment— The student perspective provided in the Neuroscience Senior Survey question 5.5.

Future assessment goals may include rubrics for methods components or rubrics for literature reviews in core courses.

LEARNING GOAL 6

Demonstrate an understanding of the ethical issues in the field of study of the mind and neuroscience and the approaches researchers use to confront them.

Direct Assessment— Certificates of completion of either the human subjects or animal subjects training course offered by the NIH Office of Extramural and Intramural Research, respectively. These will be conducted as part of the capstone course.

- Human subjects course: https://phrp.nihtraining.com/index.php
  - Topics: codes and regulations, respect for persons, beneficence and justice
- Animal subjects course: https://oacutraining.od.nih.gov/public_menu.aspx
  - Topics: animal care and use policies, occupational health and safety, animal health and well-being, animal care and use procedures

Indirect Assessment— The student perspective provided in the Neuroscience Senior Survey question 5.6.

LEARNING GOAL 7

Demonstrate competency in oral and written scientific communication skills.

Direct Assessment— Capstone Thesis Rubric R2, R7, and R8 and RLG7 and Rubric from science communication Senior Seminar paper

Indirect Assessment— The student perspective provided in the Neuroscience Senior Survey question 5.7.

Future assessments may include rubrics for oral presentations and course papers in core courses.

Appendix 5

Catalog Description for the Neuroscience Major and Neuroscience Minor

Neuroscience is a unique, interdisciplinary study of the development, organization, and function of the nervous system and its relationship to behavior and cognition in human and nonhuman animals. Because this requires an integration of knowledge from multiple levels of analysis, the neuroscience major at Hendrix College offers an interdisciplinary approach calling on methodologies from biology, psychology, philosophy, chemistry, and computer science. Students are given the tools they need to pursue the study of neuroscience including foundational knowledge and the opportunity to pursue appropriate research experience in the field. The flexibility in electives allows students to focus on their own interests in biology, psychology, philosophy, and computer science, or even a unique interdisciplinary specialization. Working closely with their advisors, the neuroscience major prepares students with a competent interdisciplinary undergraduate foundation for graduate studies in a variety of fields.

Major in Neuroscience

14 courses distributed as follows:

- BIOL 150 *Cell Biology*
- CHEM 110 *General Chemistry I*
- PSYC 220 *Brain and Behavior*
- PSYC 290 *Statistics*
  or
  MATH 215 *Statistical Analysis*
  or
  BUSI 250 *Principles of Statistics*
- PHIL 350 *Philosophy of Science*
- PHIL 390 *Philosophy of Mind*
- BIOL 325 *Cellular and Molecular Neuroscience*
- BIOL 425 *Systems Neuroscience*
- NEUR 497 *Neuroscience Senior Capstone*
- Five electives chosen from either group:

  Group A (no more than 2 courses):
  BIOL 250 *Genetics*
  CSCI 135 *Robotics Explorations Studio*
  CSCI 150 *Foundations of Computer Science*
  MATH 130 *Calculus I*

PHIL 245 *Introduction to Logic*
PSYC 295 *Research Methods*

Group B (up to 5 courses):
BIOL/PSYC 300 *Comparative Animal Behavior*
BIOL 310 *Developmental Biology*
BIOL 320 *Animal Physiology*
BIOL 355 *Advanced Cell Biology*
BIOL 430 *Immunology*
BIOL 470 *Advanced Genetics*
CHEM 330 *Biological Chemistry*
CSCI 151 *Data Structures and Object-Oriented Development*
CSCI 235 *Intelligent Robotics*
CSCI 285 *Scientific Computing*
CSCI 335 *Artificial Intelligence*
PHIL 235 *Philosophy of Cognitive Science*
PHIL 280 *Free Will, Agents, and Intentions*
PHIL 320 *Human Nature*
PHIL 420 *Neurophilosophy*
PSYC 280 *Introduction to Psychopharmacology*
PSYC 320 *Cognitive Psychology*
PSYC 335 *Sensation and Perception*
PSYC 355 *Evolutionary Psychology*
PSYC 360 *Behavioral Neuroscience*
PSYC 366 *Behavioral Endocrinology*
RELI 358 *Embodied Minds, Language, And Religion*

Senior Capstone Experience

In the spring of their senior year, neuroscience majors will take NEUR 497: *Neuroscience Senior Capstone.*

Minor in Neuroscience

7 courses distributed as follows:

- BIOL 150 *Cell Biology (w/Lab)*
- PSYC 220 *Brain and Behavior*
- BIOL 325 *Cellular and Molecular Neuroscience*
- PHIL 390 *Philosophy of Mind*
- Three electives chosen from the following:
  BIOL/PSYC 300 *Comparative Animal Behavior*
  BIOL 425 *Systems Neuroscience*
  CSCI 235 *Intelligent Robotics*
  CSCI 335 *Artificial Intelligence*
  PHIL 235 *Philosophy of Cognitive Science*

PHIL 280 *Free Will, Agents, and Intentions*
PHIL 320 *Human Nature*
PHIL 350 *Philosophy of Science*
PHIL 420 *Neurophilosophy*
PSYC 280 *Introduction to Psychopharmacology*
PSYC 335 *Sensation and Perception*
PSYC 355 *Evolutionary Psychology*
PSYC 360 *Behavioral Neuroscience*
PSYC 366 *Behavioral Endocrinology*

Appendix 6

Catalog Description for the Study of the Mind / Neuroscience Major and Minor

The Study of the Mind Major

12 courses distributed as follows:

BIOL 150 *Cell Biology*
CSCI 150 *Foundations of Computer Science*
PSYC 220 *Brain and Behavior*
PSYC 290 *Statistics*
or
MATH 215 *Statistical Analysis*
or
BUSI 250 *Principles of Statistics*
or
SOCI 210 *Social Statistics*
PHIL 350 *Philosophy of Science (W2)*
PHIL 390 *Philosophy of Mind (W2)*
BIOL 325 *Neurobiology*
NEUR 497 *Neuroscience Senior Capstone*

Four electives from the following list, no more than two of which can be from the same discipline as identified by its four-letter code and at least two of which at the 300 and above level:

BIOL/PSYC 300 *Comparative Animal Behavior*
BIOL 250 *Genetics*
BIOL 310 *Developmental Biology*
BIOL 320 *Animal Physiology*
BIOL 355 *Advanced Cell Biology*
BIOL 430 *Immunology*
BIOL 470 *Advanced Genetics*
CHEM 110 *General Chemistry I*
CSCI 151 *Data Structures and Object-Oriented Development*
CSCI 235 *Intelligent Robotics*

CSCI 270 *Computational Humanities*
CSCI 285 *Scientific Computing*
CSCI 335 *Artificial Intelligence*
PHIL 245 *Introduction to Logic*
PHIL 235 *Philosophy of Cognitive Science*
PHIL 280 *Free Will, Agents, and Intentions*
PHIL 420 *Neurophilosophy (W2)*
PSYC 295 *Research Methods (w/Lab)*
PSYC 310 *Social Neuroscience*
PSYC 320 *Cognitive Psychology*
PSYC 335 *Sensation and Perception*
PSYC 355 *Evolutionary Psychology*
PSYC 360 *Behavioral Neuroscience*
RELI 358 *Embodied Minds, Language, And Religion*

The Neuroscience Minor

Minor in Neuroscience

Students may not declare a Neuroscience minor if they have declared a major in the Study of the Mind.

6 courses distributed as follows:

BIOL 150 *Cell Biology (w/Lab)*
PSYC 220 *Brain and Behavior*
BIOL 325 *Neurobiology*
PHIL 390 *Philosophy of Mind (W2)*

Two electives from the following list from two different disciplines as identified by its four-letter code:

BIOL/PSYC 300 *Comparative Animal Behavior*
BIOL 320 *Animal Physiology*
PHIL 235 *Philosophy of Cognitive Science*
PHIL 350 *Philosophy of Science (W2)*
PHIL 420 *Neurophilosophy (W2)*
PSYC 310 *Social Neuroscience*
PSYC 335 *Sensation and Perception*
PSYC 360 *Behavioral Neuroscience*

Learning goals for Major and Minor

1. Understand, explain, predict, and model the relationships between the brain and nervous system, cognition, behavior, and the environment.

2. Rigorously apply the scientific method to questions that arise from the study of the mind and brain.
3. Gain foundational knowledge from philosophy, psychology, biology, and computer science.
4. Integrate the concepts, principles, and methods from multiple disciplines pertinent to the study of the mind.
5. Demonstrate critical reading and thinking skills that allow students to assess and contextualize interdisciplinary literature in the study of the mind and neuroscience.
6. Demonstrate an understanding of the ethical issues in the field of study of the mind and neuroscience and the approaches researchers use to confront them.
7. Demonstrate competency in oral and written scientific communication skills.

Appendix 7

The Study of the Mind Capstone Rubric
2020-2021

Student Name:

Faculty Evaluator Name:

Category	Basic	Competent	Exemplary	Score
R1: Thesis Statement & Title	• Topic is not identifiable, statement is vague, does not take a position, is too broad, or is not debatable. • Title does not identify or agree with the thesis statement.	• Thesis statement is clearly identifiable, but may be too broad or does not take a position on the topic.	• Thesis statement is clearly identifiable, debatable, specific, and takes a clear position on the topic. The title identifies the thesis statement.	/5
R2: Abstract	• No abstract present or does not provide insight into thesis,	• Abstract present yet and provides basic overview of the topic.	• Concisely answers the "what?" "why?" "how?" and "to what end?"	/10

	argument or methodology • Significantly exceeds word limit.	• Abstract missing one of the following: thesis (purpose), argument (context), or methodology (content).	• Describes context, purpose, and content. • Engages the reader. • <250 words.	
R3: Introduction & Background	• The research question is not clearly articulated. • Does not connect to the "big picture." • Too technical for lay reader to follow. • Does not define critical terms. • Is incompletely and/or inaccurately referenced.	• The research question is identified, but not supported by context or significance. • Ambiguous or brief understanding of the "big picture" demonstrated. • Most fundamental concepts and critical terms are described. • Mostly accurate and complete referencing.	• States the research question, and its context and significance. • Demonstrates complete, clear and accurate understanding of the "big picture." • Includes well-organized description of basic knowledge necessary to follow content and arguments within the thesis. • Critical terms and abbreviations are defined. Completely and accurately referenced.	/10

R4: Analysis	• No synthesis or analysis of information presented. • Supporting information is noticeably one-sided. • Evidence is not presented to support major claims/arguments.	• Some synthesis and analysis of information from multiple sources and perspectives is evident. • Evidence is presented to support major claims/arguments, but is not critically assessed.	• Creatively synthesizes and compares/contrasts relevant information from multiple primary sources. • Critically and accurately assesses information presented. • Evidence/data from primary literature is used to support major claims/arguments.	/10
R5: Argument & Reasoning	• Arguments are not supported by evidence/data. • Argument does not support the thesis statement and/or conclusions presented. • Argument contains false information. • The conclusion of the argument does not agree with the goal of the argument.	• Most arguments are sensible and support the thesis statement, but do not completely convince the reader due to lack of evidence to support claims.	• Major arguments presented are supported by evidence/data. • All arguments are accurate and support the thesis statement. • The conclusion of the argument is relevant to the goal of the argument.	/10
R6: Summary & Conclusions	• Conclusions are unoriginal and/or are not supported by the arguments and evidence presented in the paper. • Limitations, significance, and feasibility of position presented not addressed.	• Conclusions are not novel, yet provide additional insight on the topic based on a reasoned assessment of the information presented. • Feasibility of individual contribution and future directions not fully addressed.	• Creates and defends a new position based on a reasoned assessment of the information presented. • Presents significance and limitations of conclusions. • Presents future directions that are salient, plausible and insightful.	/10
R7: Writing Clarity & Organization	• Paper contains excessively long sentences or paragraphs, undefined obscure terms or concepts, confusing sentences, erratic paragraphs, and/or no headings/subheadings.	• Most key concepts and terms are clearly defined. • Organization is somewhat choppy, but not erratic. • Most sections differentiated by headings/subheadings	• Carefully edited and proof-read. • Sentence and paragraph structure clear and well-organized. • Informative subheadings that aid	/10

	• Few transitions used to aid information flow from one point to another. • Organization exhibits consequences of inadequate active planning for the clarity and organization of the presented material.	and connected by transitionary statements. • Some active organizational planning is evident.	comprehension and organization. • An organizational strategy illustrating evidence of active planning for presenting information clearly and effectively • Effective transitions to aid flow of information from one main point to another. • All key concepts and disciplinary language are clearly defined.	
R8: Writing Mechanics & Grammar	• Paper does not meet specifications of required formatting. • Many grammar and spelling errors. • Paper does not meet the minimum required number of pages (25). • References not cited in correct format.	• Most formatting requirements are met. • Only a few grammar or spelling mistakes observed. • Some references show inconsistencies in referencing style.	• Double spaced, 12 pt font, 1 inch margins, page numbers. • Correct grammar and spelling. • Meets paper length requirements (>15 pp.) • References cited correctly in Chicago style (in-text and bibliography).	/10
R9: Interdisciplinarity & Accessibility	• The argument is based on a single disciplinary perspective. Is only accessible to disciplinary experts.	• A few different disciplinary perspectives are used to support the thesis. Is accessible to most readers.	• The argument includes philosophical, psychological, biological, and computer scientific perspectives and is accessible to all readers	/5
R10: Originality & Creativity	• The topic, thesis, idea, or central argument is not original nor creative and is exactly the same as views discussed in sources.	• A few ideas and arguments are original, but many are similar to views discussed in sources.	• The topic, thesis, idea, or central argument is original and creative, and thus differs significantly from views discussed in sources.	/5
R11: **1st Reader Discretionary Points -	• Student did not advance any skills throughout writing and communication process	• Student showed some advancements in writing and communication during the thesis process	• Student exhibited tremendous growth in writing, professional, and/or communication skills	/15

Individual Growth/Work with Mentor	• Did not work with mentor and/or did not keep appointments	• Incorporated mentor feedback but rarely engaged with mentor	• Worked closely with mentor, attended regular meetings, incorporated feedback	
		SubTotal		**/100**
		*Late Penalty (10%/week)	-	%
		Total		**/100**

* Thesis presentation will not be scheduled unless final paper has been submitted.

**1st Reader discretionary points are only to be scored by the primary thesis adviser, in consultation with the 2nd reader

Comments to Author:

Briefly identify the strengths of the thesis:

Briefly identify the weaknesses of the thesis:

RLGs: The below assessment serves the purpose of assessing the Study of the Mind / Neuroscience program learning goals and should not be factored into the capstone thesis grade. Please identify the extent to which you feel this thesis indicates that the student as achieved each of the following Study of the Mind / Neuroscience Learning Goals.
1 = Has not achieved and 5 = Achieved to a high degree, ND = I cannot determine from the information presented in the thesis.

Learning Goal	1	2	3	4	5	ND
RLG1: Understand, explain, predict, and model the relationships between the brain and nervous system, cognition, behavior, and the environment.						
RLG2: Rigorously apply the scientific method to questions that arise from the study of the mind and brain.						
RLG3: Gain foundational knowledge from philosophy, psychology, biology, and computer science						
RLG4: Integrate the concepts, principles, and methods from multiple disciplines pertinent to the study of the mind.						
RLG5: Demonstrate critical reading and thinking skills that allow students to assess and contextualize interdisciplinary literature in the study of the mind and neuroscience.						
RLG6: Demonstrate an understanding of the ethical issues in the field of study of the mind and neuroscience and the approaches researchers use to confront them.						
RLG7: Demonstrate competency in oral and written scientific communication skills.						

Senior Survey Results - Quantitative	N = 4		
Courses & Faculty. Scale ranges from 1 (Very Satisfied) to 5 (Very Dissatisfied)	2020		
Question	***M***	***SD***	***Range***
Breadth of curriculum	2.25	0.50	2-3
Quality of curriculum	1.75	0.50	1-2
Availability of courses	2.50	1.73	1-4
Accessibility of faculty	1.25	0.50	1-2
Quality of instruction	1.25	0.50	1-2
Preparation for job	1.00	0.82	0-2
Preparation for graduate school	2.25	1.26	1-4
Advising. Scale ranges from 1 (Very Satisfied) to 5 (Very Dissatisfied)	2020		
Question	***M***	***SD***	***Range***
Availability of advisor	1.50	0.57	1-2
Helpfulness of advisor	1.75	0.95	1-3
Advisor's knowledge of requirements	2.00	1.41	1-4
Advisor's knowledge of my goals	1.25	0.50	1-2
Career advising	1.50	1.00	1-3
Graduate study advising	1.75	0.95	1-3
Resources. Scale ranges from 1 (Very Satisfied) to 5 (Very Dissatisfied)	2020		
Question	***M***	***SD***	***Range***
Research opportunities	2.00	0.81	1-3
Internship opportunities	2.25	0.50	2-3
Quality of library journal holdings in neuroscience	1.50	1.29	0-3
Quality of library book holdings in neuroscience	2.00	1.41	0-3
Overall. Scale ranges from 1 (Very Satisfied) to 5 (Very Dissatisfied)	2020		
Question	***M***	***SD***	***Range***
Overall quality of neuroscience program	1.50	1.00	1-3
My experience in Neuroscience courses contributed to the development of the following learning goals. Scale ranges from 1 (strongly agree) to 5 (strongly disagree)	2020		
Question	***M***	***SD***	***Range***
A broad understanding of the development, organization, and function of the nervous system and the foundational assumptions of philosophy of mind and philosophy of science	1.00	0.00	1-1
An understanding of the foundational assumptions of philosophy of mind and philosophy of science	1.00	0.00	1-1
Knowledge of the techniques and methods of neuroscience research and how the scientific method is used to address questions relevant to neuroscience	1.00	0.00	1-1
Knowledge of how to use the scientific method to address questions relevant to neuroscience	1.25	0.50	1-2
An appreciation of the interdisciplinary nature of neuroscience that requires an integration of knowledge from multiple disciplines and levels of analysis	1.25	0.50	1-2
Critical reading and thinking skills that allow you to assess and contextualize neuroscience literature	1.50	1.00	1-3
An understanding of the ethical issues in the field of neuroscience and the approaches neuroscientists use to confront them	1.50	1.00	1-3
Oral scientific communication skills	1.50	0.57	1-2
Written scientific communication skills	1.50	0.57	1-2

Neuroscience Senior Survey
Spring 2020 Hendrix College
Free Response Questions

Why did you choose to major in neuroscience?

- I was interested in learning more about the different functions of the brain and how the brain controlled different functions of the body.
- Because I am very interested in neurosurgery, so the major was perfect for me.
- The breadth of options.
- brains are cool!

Did the neuroscience major meet your expectations?

- i thought there would have been more higher level science classes involved
- Yes!
- Yes.
- yes, it exceeded my expectations. the interdisciplinary nature of neuro made me appreciate psych and philosophy much more than I did.

If you had it to do again, would you still major in neuroscience at Hendrix?

- No
- Yes
- Yes
- Yes

Comments?

Please comment on the workload for your neuroscience courses only. Were your courses too difficult, too time consuming, with too many projects? Were your courses too easy with not enough work expectations? Please be specific.

- big jump from brain and behavior to cell and molecular and systems neuro
- The workload for this major was very reasonable. They were all challenging, but not too difficult.
- Everything seemed fair.
- Systems Neuro was probably the hardest class I had at Hendrix, but the rest were reasonable. Brain and behavior should be a prereq to systems, because I was taking them at the same time, and brain and behavior was a much easier duplicate of systems.

What did you like most about majoring in neuroscience?

- learning about different experiments and case studies
- Learning so many cool things about the brain that I didn't know before.
- I could take "time off" from science and work on philosophy, and vice versa.
- taking philosophy courses that turned out to be awesome

What did you like least about majoring in neuroscience?

- requirements are not clear
- The systems of neuroscience class
- A good chunk of the classes listed on under the major were NEVER offered across four years.
- it felt a little easy overall. There were some hard courses (like phil and systems), but most felt a little too easy.

What do you think are the strengths of the neuroscience major, as it is presently constructed?

- broad view of neuroscience, studying how parts of the brain affect behavior, developing arguments
- The faculty are amazing, and its challenging but not too hard like BCMB.
- It is extremely interdisciplinary, which helps me to make connections that others may not.
- you have diversity in the classes you can take, but you also (more or less) have to take some classes outside of your comfort zone.

What do you perceive as weaknesses in the neuroscience major, as it is presently constructed?

- too much info packed into some higher level science classes, lack of higher level science classes, unproportionate amount of writing for philosophy vs science classes, mastering how to write scientific papers and research experience
- Not enough faculty members
- It does not require any research.
- it's probably easier than most majors, aside from a few courses.

Are there any neuroscience courses not presently offered that you would like to see developed?

- no but systems neuro should have been two semesters
- An anatomical brain course
- Neuroethics.
- one specifically on diseases that come from brain damage

In what ways has the Neuroscience Program prepared or failed to prepare you for meeting your future goals?

- there was a lot of memorization in science classes, but there wasn't always a lot of deep thinking. I am prepared for future graduate work because I found research experience outside of classes.
- This program has prepared me to take the MCAT for medical school.
- It has prepared me to go into many different disciplines or careers.
- Neuro helped me see just how awesome studying the brain is, and in the future I want to work with neurodegenerative diseases, so it prepped me well.

What advice would you give to someone who was considering majoring in neuroscience at Hendrix?

- realize your learning goals and ask your advisor how you can learn those skills or get experience that you need for future jobs
- Definitely do it!
- Make sure know how often courses are offered.
- Do it, it's fun and cool, as long as you're ok with doing some non-STEM stuff.

Overall, what can we do to improve the experience of Hendrix neuroscience majors?

- give students more chances to take more higher level stem classes outside of the neuro major, make requirements clearer, make an internship or research experience a component
- More faculty need to be hired so that more classes can be offered.
- try to avoid class-content overlap, which I'm sure is much easier said than done.

Do you have any final comments or observations about your experience as a neuroscience major at Hendrix?

- teamwork helped me learn a lot more in my neuro classes, and since this field requires a lot of learning from other disciplines, I think working together should be emphasized more here than in any other major
- Don't let this major die!!!
- The overlap of philosophy and stem is awesome, so making sure both remain required courses would be beneficial.

	NEUR Learning Goals					
Student Name	A broad understanding of the development, organization, and function of the nervous system and the foundational assumptions of philosophy of mind and philosophy of science	knowledge of the techniques and methods of neuroscience research and how the scientific method is used to address questions relevant to neuroscience	an appreciation of the interdisciplinary nature of neuroscience that requires an integration of knowledge from multiple disciplines and levels of analysis	critical reading and thinking skills that allow students to assess and contextualize neuroscience literature	an understanding of the ethical issues in the field of neuroscience and the approaches neuroscientists use to confront them	oral and written scientific communication skills
Baker, Alexis	4	3	4	2	4	2
Griffin, Haven	5	4	4	5	4	5
O'Donnell, Dylan	4	3	4	5	4	5
Onitsuka, Connor	5	4	4	4	4	4
Young, Ava	4	3	5	5	4	3

Identify the extent to which you feel the student achieved each of the following NEUR Program Learning Goals.

1 = Has not achieved and 5 = Achieved to a high degree; ND = Cannot determine from my experience with the student

2019-20 NEUR Senior Assessment of Department Learning Goals

	Capstone	Milestone	Benchmark
A broad understanding of the development, organization, and function of the nervous system and the foundational assumptions of philosophy of mind and philosophy of science	Baker, Griffin, O'Donnell, Onitsuka, Young		
knowledge of the techniques and methods of neuroscience research and how the scientific method is used to address questions relevant to neuroscience		Baker, Griffin, O'Donnell, Onitsuka, Young	
an appreciation of the interdisciplinary nature of neuroscience that requires an integration of knowledge from multiple disciplines and levels of analysis	Baker, Griffin, O'Donnell, Onitsuka, Young		
critical reading and thinking skills that allow students to assess and contextualize neuroscience literature	Baker, Griffin, O'Donnell, Onitsuka, Young		
an understanding of the ethical issues in the field of neuroscience and the approaches neuroscientists use to confront them	Baker, Griffin, O'Donnell, Onitsuka, Young		
oral and written scientific communication skills	Griffin, O'Donnell, Onitsuka	Baker, Young	

Vision for Student Learning Goals						
Student Name	**I1. investigating and researching underlying causes and connections**	**I2. synthesizing evidence from multiple sources**	**I3. designing ways to answer their questions**	**I4. acquiring the skills to evaluate arguments and evidence critically**	**I5. developing independent, nuanced, and thoughtful analyses**	**I7. communicating their findings effectively and persuasively through written, oral, experiential, visual, or other appropriate methods**
Baker, Alexis	C	M	C	M	M	M
Griffin, Haven	C	C	C	C	C	C
O'Donnell, Dylan	C	C	C	C	C	C
Onitsuka, Connor	C	C	C	C	C	C
Young, Ava	C	C	C	C	C	C

*Enter whether these students met these LGs at the Capstone (4), Milestone (3), Milestone (2), or Benchmark (1); Use "ND" if you do not have enough information to assess the student

**See VSLG_I_Rubric tab for details on criteria for meeting C, M, and B categories

Learning Goal	Capstone (4)	Milestone (3)	Milestone (2)	Benchmark (1)
I1. investigating and researching underlying causes and connections	Explores a topic in depth, yielding a rich awareness of its larger context.	Explores a topic in depth, yielding insight into its larger context.	Explores a topic with some evidence of depth, providing occasional insight into its larger context.	Explores a topic at a surface level, providing basic facts and little insight into its larger context.
I2. synthesizing evidence from multiple sources	Synthesizes in-depth information from relevant sources representing various points of view/ approaches.	Presents in-depth information from relevant sources representing various points of view/ approaches.	Presents information from relevant sources representing limited points of view/ approaches.	Presents information from irrelevant sources representing limited points of view/ approaches.
I3. designing ways to answer their questions	Identifies multiple approaches to address their question that apply within a specific context.	Identifies approaches to address their question, only some of which apply within a specific context.	Identifies only a single approach to address their question that does apply within a specific context.	Identifies one or more approaches for to address their question that do not apply within a specific context.
I5. developing independent, nuanced, and thoughtful analyses	Organizes and synthesizes evidence to reveal insightful patterns, differences, or similarities related to focus.	Organizes evidence to reveal important patterns, differences, or similarities related to focus.	Organizes evidence, but the organization is not effective in revealing important patterns, differences, or similarities.	Lists evidence, but it is not organized and/ or is unrelated to focus.
I6. making connections among different bodies of knowledge	Independently creates wholes out of multiple parts (synthesizes) or draws conclusions by combining examples, facts, or theories from more than one field of study or perspective.	Independently connects examples, facts, or theories from more than one field of study or perspective.	When prompted, connects examples, facts, or theories from more than one field of study or perspective.	When prompted, presents examples, facts, or theories from more than one field of study or perspective.
I7. communicating their findings effectively and persuasively through written, oral, experiential, visual, or other appropriate methods	Communicates, organizes and synthesizes information from sources to fully achieve a specific purpose, with clarity and depth, using a format in ways that enhance meaning, making clear the interdependence of language and meaning, thought, and expression.	Communicates, organizes and synthesizes information from sources. Intended purpose is achieved. Uses a format to explicitly connect content and form, demonstrating awareness of purpose and audience.	Communicates and organizes information from sources. The information is not yet synthesized, so the intended purpose is not fully achieved. Uses a format that connects in a basic way what is being communicated (content) with how it is said (form).	Communicates information from sources. The information is fragmented and/or used inappropriately (misquoted, taken out of context, or incorrectly paraphrased, etc.), so the intended purpose is not achieved. Is not thoughtful about the format.
I8. reflecting on their studies and being prepared to engage with the world based on their inquiry and deliberation	Reviews prior learning (past experiences inside and outside of the classroom) in depth to reveal significantly changed perspectives about educational and life experiences, which provide foundation for expanded knowledge, growth, and maturity over time.	Reviews prior learning (past experiences inside and outside of the classroom) in depth, revealing fully clarified meanings or indicating broader perspectives about educational or life events.	Reviews prior learning (past experiences inside and outside of the classroom) with some depth, revealing slightly clarified meanings or indicating a somewhat broader perspectives about educational or life events.	Reviews prior learning (past experiences inside and outside of the classroom) at a surface level, without revealing clarified meaning or indicating a broader perspective about educational or life events.

2019-20 NEUR Senior Assessment of the "I"
VSLGs (except I5 & I8)

	Capstone	Milestone	Benchmark
I1. investigating and researching underlying causes and connections	5		
I2. synthesizing evidence from multiple sources	4	1	
I3. designing ways to answer their questions	5		
I4. acquiring the skills to evaluate arguments and evidence critically	4	1	
I5. developing independent, nuanced, and thoughtful analyses	4	1	
I7. communciating their findings effectively and persuasively through written, oral, experiential, visual, or other appropriate methods	4	1	