Program Policy Statement for Certificate in Data Science and Behavior

Part I. Program History and Purpose

A. The certificate will be granted at the completion of a two-year post-baccalaureate bridge program in Department of Psychological and Brain Sciences. The goal of the program is to provide students with two years of focused training that will prepare them for either a job in data science or a PhD program involving data science, psychology, or neuroscience.

B. This program serves applicants who have graduated from an undergraduate institution but have not developed research experience and quantitative skills needed to succeed in applications to doctoral programs, or as candidates for non-academic data science roles. Lack of opportunities to conduct research in a lab is a major barrier to students who wish to pursue a higher degree or high-paying careers, and this issue is exacerbated by racial, ethnic, and socioeconomic inequality in these fields. Students in this program will receive hands-on training and experience in research, and they will acquire advanced technical skills that will support their progression to better opportunities.

C. The certificate is sponsored by an NSF grant.

D. The first term when first students may enroll is Fall 2023.

E. In a survey of graduate program directors in psychology departments, research experience was ranked as the most important factor for graduate admissions criteria, supporting the need for programs like this to provide such experiences to students who otherwise cannot afford to devote unpaid time to obtaining research experience. The market for data scientists is strong and growing. According to the Bureau of Labor Statistics, the number of data scientist positions is expected to grow 36% in 2021-2031 ("much faster than average"), and the median pay in 2021 was estimated to be $100,910.

F. The Certificate will be housed in the Department of Psychological and Brain Sciences in the College of Arts and Sciences.

Part II. Admission Requirements

A. A bachelor's degree from an accredited institution.

B. A resume.

C. Two letters of recommendation.

D. A statement describing the applicant's interest and intent to pursue a career in data science and behavior, either via a PhD program or industry

E. Optional: Applicants may submit standardized tests scores, written work, or other relevant materials.

F. Admission to the graduate certificate program is competitive. Those who meet stated requirements are not guaranteed admission, nor are those who fail to meet all of those requirements necessarily precluded from admission if they offer other appropriate strengths.

Part III. Certificate requirements

Students in the program will complete a series of courses, participate in mentoring activities, and conduct research in a lab. The student will complete a minimum of 22 credit hours in two years, with a minimum of three courses in statistics and/or data science (3 credit hours each), a minimum of three graduate-level courses in human behavior,

neuroscience, and/or professional development (3 credit hours each). Each semester the student will also enroll in PSYC 800 ("Psychological and Brain Sciences Colloquia") and participate in the Cognitive Area Seminar Series / Department colloquium (1 credit hour each enrollment, for four semesters). Substitutions for required/approved courses will be considered upon request and subject to approval by the department's Director of Graduate Education and the director of the postbaccalaureate program.

A. Required Courses:
  - PSYC 860 ("Psychological Statistics I")
  - PSYC 861 ("Psychological Statistics II")
  - One additional statistics or data science course from PSYC 878 ("Hierarchical Linear Modeling"), PSYC 879 ("Structural Equation Modeling"), PSYC 880 ("Analysis of Change"), or other course as approved.
  - PSYC 800 ("Psychological and Brain Sciences Colloquia"), each semester (4 semesters).
  - Three graduate-level seminar courses from the following list (or as approved):
    o PSYC 653 ("Introduction to functional Magnetic Resonance Imaging")
    o PSYC 621 ("Cognitive Neuroimaging")
    o PSYC 867 ("Seminar: Prejudice, Stereotyping and Discrimination")
    o PSYC 867 ("Seminar: Social Perception")
    o NSCI 643 ("Body and Space")
    o PSYC 633 ("Cognitive Neuroscience")
    o PSYC 642 ("Mental Representation and Memory")
    o PSYC 867 ("Seminar: Affective Neuroscience")
    o PSYC 867 ("Seminar: Professional Development").

B. Laboratory Requirement: A *research project* will be overseen by the primary mentor. The scholar and the research mentor will agree upon a set of clear subgoals and deadlines for project completion. The scholar will execute the research project, write their results in the style of a scientific journal article, and present their research in a presentation to their area.

   1) Schedule for the Research Project
      a. Research program outline: July 15 of the first year
      b. First draft of research project paper: October 1 of the second year
      c. Final draft of research project paper: November 15 of the second year
      d. Research oral presentation: First week of December of the second year
   2) Research Proposal: After developing research, writing and presentation experience during the project execution phase, students will have experience in research on a given topic. The next step is generating a novel empirical idea that can be executed via experimentation and data analysis. With guidance from their faculty advisor, students will write their own research proposal on a topic of interest to them. This research proposal will consist of two parts: a short literature review in which they

identify a "gap" in the literature, and then a section in which they identify a research question and design an experiment to empirically examine this question. The primary goal here will be to consider theoretical models in the scholar's field of interest and then design experiments to test existing models or introduce new models and/or hypotheses that explain previous findings better.

Schedule for the research proposal:
   a. Outline, January 15th of the second year
   b. First draft, March 15th of the second year
   c. Formal advisor feedback by April 1st of the second year
   d. Final drat on April 15th of the second year

C. Grade Requirements: To be awarded the Certificate, the student must have a cumulative GPA of 3.00 in the required courses. Grades of less than C- may not apply to the Certificate.

Part IV. Mentorship Plan

Research mentors will be full-time, tenure-track faculty at the University of Delaware who do research in behavior and/or neuroscience.

The mentor will be chosen as part of a Research Project Selection phase and will oversee the research projects of the students. University of Delaware faculty with relevant expertise will be solicited to post project descriptions. Each project description will be a short (one-two paragraph) summary of the research project, skills to be gained, and data analysis techniques that will be used. These will be graduate-level research projects at a similar level to first-year projects for graduate students. However, there will be no expectation of prior knowledge of the scholar. After review, students will submit a scored list of their project preferences and will be matched with faculty who will serve as their primary mentor.

The directors of the Bridge program will match students with primary mentors based on these scores and the students' research backgrounds and intentions, and with the consent of the matched mentor based on a review of the applicant's profile. All projects will be guaranteed by the primary mentor to be executable with existing lab resources. The student will be given access to the mentor's lab and resources for completion of the project.

A *research project* will be overseen by the primary mentor, in concert with the directors of the bridge program. The scholar and the research mentor will agree upon a set of clear subgoals and deadlines for project completion. The scholar will execute the research project, write their results in the style of a scientific journal article, and present their research in a presentation to the Cognitive Area Seminar Series.
Due dates for deliverables:
   - Research program outline: July 15th of the first year.
   - First draft of research project paper: October 1st of the second year.
   - Final draft of research project paper: November 15th of the second year

- Research oral presentation: First week of December of the second year.

A *research proposal* will also be a requirement. After developing research, writing and presentation experience during the project execution phase, students will have experience in research on a given topic. The next step is generating a novel empirical idea that can be executed via experimentation and data analysis. In graduate school interviews, a common question asked is about future research: what kinds of questions does the student want to address, and how would they address them? These interviews often happen early in spring semester, and it is important for Bridge scholars to have thought deeply about research ideas before interviewing. Additionally, employees from private industry in related fields (e.g., data science, user experience) will often expect that advanced candidates are able to reason from an abstract problem to proposed solutions. A research proposal will build such skills in complex problem solving to coherently address a larger concern. When starting the program, students may lack experience in research, and it would be difficult to expect them to come up with a novel research idea. However, after writing their research paper, students should have enough experience to begin asking their own questions. Therefore, with guidance from their faculty advisor, students will write their own research proposal on a topic of interest to them. This research proposal will consist of two parts: a short literature review in which they identify a "gap" in the literature, and then a section in which they identify a research question and design an experiment to empirically examine this question. The primary goal here will be to consider theoretical models in the scholar's field of interest and then design experiments to test existing models or introduce new models and/or hypotheses that explain previous findings better.
The due dates are as follows:
- Outline, **January 15th of second year**
- First draft, **March 15th of second year**
- Formal advisor feedback by **April 1st of second year**
- Final draft on **April 15th of second year**.

These deadlines are designed to help them prepare for graduate school and job interviews. Given that most Ph.D. interviews are in late January-February, Bridge scholars will be able to not only discuss research that they have completed, but also their own novel research ideas in interviews. Furthermore, we encourage the students to take these ideas with them. This project will also be useful for jobs in industry related to data science, as it will demonstrate the scholar's ability to synthesize research, identify problems, and instantiate plans for solutions.

Research projects and proposals will be judged as sufficient or not for completion of the certificate by their research mentor and the director of the certificate program.

Part VI. Financial Support
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Matriculated Bridge scholars will be in the program from September of their first year to May of their second year. Bridge scholars will be funded at the University of Delaware graduate student stipend rate (currently $29,333 for a 12-month period). Bridge scholars will be provided with their own computer, and can request research funding support from a $2,250/year funding pool with a brief application. Any additional research costs will be borne by the scholar's advisor.

Students admitted to the program from EPSCoR jurisdictions will be financially supported by the

NSF grant. Other students will be supported by commitments from the College of Arts and Sciences, and from the Graduate College, related to the grant. The current funding structure allows us to support 5-6 students per cohort for the duration of the NSF grant.