2023 Assessment Report for Neuroscience and Behavioral Biology

Contact: Keith Easterling, PhD, MPH (keaster@emory.edu)

Submitted May 2023

Introduction

Following advice given after our 2021 report, this report presents quantitative data from a few areas rather than attempting to address each of the NBB Student Learning Outcomes. In response to feedback on the 2021 report, we add a new assessment of one Learning Outcome, and examine inclusion-diversity and graduation rates across all students.

NBB Student learning outcomes

1. Students will be able to articulate concepts and methodologies of the interdisciplinary field of Neuroscience and Behavioral Biology, including evolution and animal behavior, molecular, cellular, and developmental biology, and systems, social, cognitive, and behavioral neuroscience.
2. Students will be able to evaluate scientific literature critically and to formulate hypotheses and design scientific experiments.
3. Students will be able to engage in the research process through undergraduate honors research, independent research projects, and coursework.
4. Students will be able to communicate scientific information in a clear, reasoned, and stylistically appropriate manner both verbally and in writing.
5. Students will be able to evaluate the ethical dimensions and societal implications of research in Neuroscience and Behavioral Biology.
6. Students will have the foundation to successfully pursue a post baccalaureate education and/or professional career.

Sections of the report:

A. About the Neuroscience and Behavioral Biology program.
B. Summary of 2021 report and feedback, addressing Outcomes 1, 3, 5, and 6.
C. Student perception of the curriculum.
D. Assessing critical reading and writing, addressing Outcomes 2 and 4.
E. Examining diversity and diversity in research participation, addressing Outcome 3.

Department Chair

5/25/2023

Date

A. About the Interdisciplinary Neuroscience and Behavioral Biology Program

History and Mission

The Neuroscience and Behavioral Biology (NBB) interdisciplinary program was founded in 1998, as a joint effort of the departments of Anthropology, Biology, and Psychology. It offers a Bachelor of Science degree, and it has been directed by Paul Lennard (Tenured Biology) since it was formed. In its second year, Emory College began hiring full-time teaching faculty, and a permanent office suite was created for them in 2002. Though there is no formal "department" designation for NBB, there are currently 7 full time lecture-track faculty appointed solely in the NBB program. The expertise, enthusiasm, and commitment of a large and diverse group of faculty from all ranks, and from many departments and Schools of Emory University contribute to the program, especially its research-mentoring work. From the first graduating class (12 students), NBB has grown to become one of the largest majors at Emory, with an expected 2023 graduating class of 175 students.

Mission: Our educational mission is to convey a unique interdisciplinary degree-granting program that is a synthesis of neuroscience and of behavioral studies, one that provides a breadth and focus not found in traditional Biology, Psychology, Neuroscience or Anthropology undergraduate programs.

Major requirements

The NBB major requires 17 courses across 5 departments. First-year work (Foundation) includes 2-semester sequenced laboratory courses in both Biology and Chemistry. These sequences are typical of those required in other natural science majors (Biology, Chemistry & Physics) that award a BS. They are followed by 4 "Core" courses and 7 "Elective" courses, taken over the following 3 years.

Foundation courses: two quantitative courses (one statistics and one calculus or computer science), two semesters of Biology with lab, and two semesters of Chemistry with lab.

Core courses: ANT 200 (NBB 201) Foundations of Behavior, BIOL 360 (NBB 301) Introduction to Neurobiology, PSYC 353 (NBB 302) Behavioral Neuroscience, and NBB 401W Perspectives in Neuroscience and Behavior or NBB 402W Global Neuroscience & Behavior.

Electives: Seven approved courses of three or more credit hours are chosen primarily from Psychology, Anthropology, and Biology course lists. But choices include offerings from other ECAS departments and courses from the Laney graduate school (24 Honors students).

Course offerings

NBB course lists can be found at https://nbb.emory.edu/academics/course-descriptions/index.html. Foundation fall and spring sequence courses (i.e., Biology & Chemistry) typically begin each fall. BIOL 360 (NBB 301) is offered every semester. PSYC 353 (NBB 302) is offered each spring. The Core courses ANT 200 (NBB 201) and NBB 401W are offered each fall semester. NBB 402W is offered every summer (in Paris) to the approximately 20 students accepted to the study abroad experience. Including courses cross-listed with other departments,

NBB offered 90 total courses in 2019-20, 85 courses in 2020-21, and 79 courses in 2022-23 (28 Fall/40 Spring/11 Summer). This reflects a steady decrease of 5/year, and a relative shortage in

the Fall when all primary NBB faculty are scheduled to teach NBB 401 concurrently. Across 4 items on the senior survey (below) 76.5 % of seniors agreed that there were sufficient electives offered. This may mean that 1) student perceptions don't track data well, or 2) class size increases partially compensate for fewer offerings.

Faculty

We finished 2023 with 8 Core faculty in NBB, In the fall, we will add two additional Core NBB faculty, and lose one (our Associate Director). We have 26-38 Associated ECAS faculty outside NBB http://catalog.college.emory.edu/academics/departments/nbb.html and https://nbb.emory.edu/people/index.html . Though the website numbers are not updated, our staff count of ECAS faculty is 7 in Anthropology, 9 in Biology, and 22 in Psychology. An additional 46 Associated faculty in other departments (including the medical school) are formally affiliated with NBB. A list of all faculty can be found at https://nbb.emory.edu/people/index.html.

The task of program assessment rotates among individual faculty periodically. Currently, all NBB faculty meet weekly in the Fall while teaching NBB401; learning goals are often discussed there. Most faculty contribute their NBB 401 grade data for the assessment, and receive the report afterward. NBB by-laws require a curriculum committee with meetings each semester; that committee last convened before the pandemic.

Students

Demographically, NBB students reflect the diversity found at Emory, but in different proportions from those seen in general ECAS data; see section E for details.

B. Summary of previous report

Student perception of the curriculum

A community needs assessment conducted in 2016 and reported in 2019 identified two curricular needs. **(1)** Students expressed desire for a Neuroanatomy course. Dr. Crutcher taught one from 2016-2022 and we have made a point, in advising, to highlight NBB 424 and ANT 305, which have larger neuroanatomy components. We are now considering how to handle neuroanatomy. **(2)** Engagement with ethical questions (*Learning Outcome 5*) was also identified as a weakness. We have added new Neuroethics courses (led by professors Gillian Hue and Paul Lennard), and a Neuroethics Minor has now been officially approved. It is described here: https://nbb.emory.edu/academics/minor-in-neuroethics.html.

Retention of core material

After our last report 2021, and to assess Learning Goal #1, we planned to create a new assessment quiz equally representing NBB 201 Foundations of Behavior, NBB 301 Introduction to Neurobiology, and NBB 302 Behavioral Neuroscience. We do have a new quiz and one year of data in time for this 2023 report.

Methods

During the last two weeks of the NBB401 class in the fall of 2022, 127 students completed a new online assessment quiz (concept inventory) on material covered in the 3 previous required-core NBB courses (NBB201, NBB301 & NBB302). The 24 multiple-choice exam questions on the quiz were taken directly from exams given in those courses. One point was awarded by NBB 401 instructors for completing the exam, and response rate was 88%.

Three exams are typically given in each course, and 2 questions were sampled from each exam, 6 per course, to assess how well students acquired and/or retained NBB information and concepts across 2 years and three courses. This is a crude measure of concept articulation-mastery (learning goal #1), but it does correspond directly to assessments designed and administered by a panel of at least 3 NBB faculty across courses.

Results

As shown in the table below, a majority of senior NBB majors enrolled in NBB 401 correctly recalled answers to concept inventory questions with an accuracy of >50%. The distribution is positively skewed, and it serves as a baseline for assessing changes in concept articulation-retention (learning goal #1) across subsequent years. Although these data are not inconsistent with percentages reported in the literature for retention of biomedical information at 2 years, the existence of a population of students (<17%) correctly responding to less than 44% of the questions can be interpreted in more than one way. 1) Perhaps making the incentive (extra point) for responding to our assessment non-contingent on correct responding simply caused a small portion of students to quickly answer our 4-choice questions almost randomly (expected 25%), thus earning their reward. 2) We can also interpret our data to indicate that opportunities exist for refining pedagogy in our core courses that will enhance understanding and retention over time. To this end, we will share these data with teaching faculty and assess our opportunities for improving performance in subsequent years.

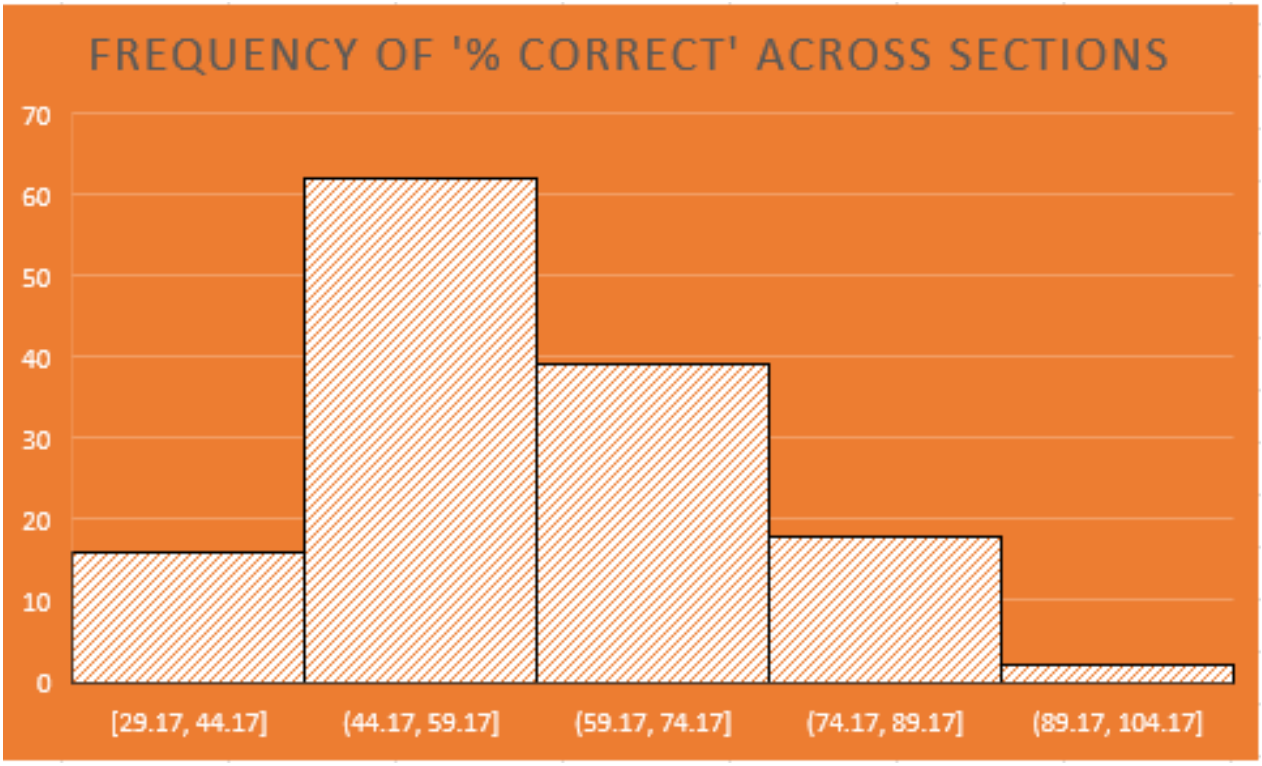

Figure 1: Frequency distribution of correct responses to the 24-question concept inventory (N=127)

Diversity Among All Majors

In our 2021 report, we reported on diversity among all majors, and among the majors doing independent research for credit. As part of this analysis, we compared demographic proportions (URM status, Pell Grant, first generation) among NBB majors to those of all students in Emory College. However, we did not gather enrollment rate or graduation rate data for NBB majors and compare them to those of our "foundation" departments (Anthropology, Biology, Psychology) or other natural science departments (Chemistry, Physics). We do that below.

Diversity and research participation

Our 2021 report discussed diversity in NBB and the extent of research participation (*Learning Outcome 3*). We had access to demographic information about students participating in research and proposed that we share the trend data with our Director of Undergraduate Research (Dr. Roesch) and continue examining that in the next report. We do so again in section E of this report.

Tracking NBB graduates

We gathered alumni data from 1998-2011 and found that NBB graduates have been able to pursue post-baccalaureate education and professional careers (*Learning Outcome 6*). We are working on getting data on more recent graduates, but since we have had few work-study students in the office since spring 2019, and we had full-time staff turnover, there are no new internal data to report. However, gathering accurate post-Emory data is notoriously difficult, and there is little evidence that medical school admissions data would diverge from institutional

or national trends. As it has in previous years, our recent (2023) survey of graduates (attachment) indicates that 78.5% have plans for healthcare and/or biomedical research careers. National data, even after a brief pandemic drop, indicate a steady increase in medical professional program admissions and strong growth in this job sector. Therefore, most of our majors are positioned for success in medical programs. If we gather future data, it will likely be designed to assess the more limited 20-30% who are planning non-health-related education or work; we are less certain whether they flourish after leaving Emory.

C. Student Perception

Methods

Data come from the NBB Graduation Survey Fall 2022-Spring/Summer. Survey completion is required for graduation. There were 171 respondents (some may be duplicates, given the discrepancy with our count of graduates for 2023). The 18 questions broadly cover future plans, availability of courses, self-perception of understanding and abilities, research experiences, advising, faculty and staff, and open-ended questions about courses and the major. In this assessment report, we report Likert-scale questions about course availability, course content and quality, and overall perception of the major. Qualitative analysis of open-ended responses will likely be reserved for future reports.

Results – course availability

Students agreed or strongly agreed with the following:

- There were sufficient elective offerings in Anthropology (67%; up 9% from 2021).
- There were sufficient elective offerings in Biology (80%).
- There were sufficient elective offerings in Psychology (87%).
- There were sufficient NBB elective offerings (72%).

Results – course content and quality

Students agreed or strongly agreed with the following:

- My elective classes were intellectually stimulating (97%).
- My NBB core classes (NBB 201, 301, 302, 401) were intellectually stimulating (91%).
- I have a strong understanding of evolution and animal behavior after completing Foundations of Behavior (NBB 201) (85%).
- I have a strong understanding of the cellular basis of neurobiology after completing Introduction to Neurobiology (NBB 301) (87%).
- I have a strong understanding of how neural circuits influence behavior after completing Behavioral Neuroscience (NBB 302) (93%).
- I have a strong understanding of the intersection of neuroscience and behavioral biology after completing Perspectives in Neurobiology and Behavior (NBB 401) (89%).
- NBB 201, 301, and 302 helped prepare me for NBB 401 (74%).
- My introductory biology and chemistry classes prepared me for other NBB classes (80%).
- My statistics class (QTM 100) helped me to read and understand scientific literature (57%).
- QTM 100 helped me with other NBB classes (46%).
- As an NBB major, I was asked to write about ethical implications of NBB research (75%).
- As an NBB major, I was asked to debate or discuss ethical implications of NBB research (88%).

Results – perception of the major

Students agreed or strongly agreed with the following:

- I would recommend this major to an entering student (87%).
- If I had to do undergrad all over again, I would still decide to be an NBB major (78%).
- My NBB courses are more difficult than courses for other majors within Emory College (84%).

- If I chose another major, I think my GPA would be higher (57%).

Conclusions

1. Students are generally 2-5% more satisfied with the major than in our last report; while many (57-84 %) consider the courses difficult, they do not regret their choice and would recommend it to others.
2. Students are satisfied with the content of core NBB courses and electives but do not strongly feel that the core courses prepare them for the complex research papers selected for NBB 401W.
3. Fifty-Seven percent of students find QTM 100 valuable in helping them understand science, but 10% less valuable in general NBB courses. This could reflect a lack of statistical content in many NBB courses, or a mismatch between the statistics taught in QTM 100 and those used in required courses (e.g., NBB 401) papers, or in their research.
4. Engagement with ethical questions (*Learning Objective 5*) appears to have increased significantly since the 2021 report. It is most likely a response to required ethics assignments being introduced in NBB 401.

D. Assessment of Critical Reading and Writing

Methods

NBB 401W, Perspectives in Neuroscience and Behavioral Biology, is the senior capstone seminar required of all Neuroscience and Behavioral Biology majors. The class analyzes four recent research papers, spending 4-5 class periods discussing a paper in detail, followed by a talk and question/answer session with the researcher in whose lab the work was done. Each student writes a technical critique of the research and is graded on scientific content and written critical analysis.

This course provides an opportunity to assess Learning Outcomes 2 and 4. To do so without assigning extra work to students or requiring faculty to regrade assignments, we examined improvement during the course. We (1) compared scores on the first critique of the semester with those on the final critique and (2) compared scores on an original critique with those on a rewritten version (an option students were given to raise grades).

Although faculty are given wide latitude about how to run their sections of NBB 401W, all of us have similar learning goals, cover the same research papers, and give the same major assignments. Our rubrics vary somewhat, but all emphasize critical analysis.

Results

Assessment by Instructors (Table1 below) came from faculty who taught NBB 401W in Fall 2021 and Fall 2022 (six sections each year). There are gaps because records were not kept consistently for each year. Each section saw a clear increase between the first and final critique (+5.9% average across all sections and both years) and between the original and rewritten critique (+12.3% average across all sections and both years).

Table 1: Instructor Assessment of Writing Improvement

2021 Sections	Critique 1	Critique 4	N	Δ	Original	Rewritten	N	Δ
Instructor 1	81.6	95.0	20	13.4	71.4	92.9	7	21.4
Instructor 2	85.6	92.2	18	6.6	x	x	x	x
Instructor 3	85	91.6	17	6.6	x	x	x	x
Instructor 4	85.2	88.4	23	3.2	84.0	92.8	21.0	8.8
Instructor 5	81.6	95.0	20	13.4	71.4	92.9	7	21.4
2022 Sections	**Critique 1**	**Critique 4**	**N**	**Δ**	**Original**	**Rewritten**	**N**	**Δ**
Instructor 1	88.5	91	17	2.5	79.0	94.7	3	15.7
Instructor 2	88.9	91.4	16	2.5	78	92	1	14
Instructor 3	88	92.7	13	4.7	86.6	91.1	8	4.5
Instructor 4	85	92.2	19	7.2	x	x	x	x
Instructor 5	87	93	14	6	83	92.4	14	9.4

Preliminary conclusions and plans

1. NBB 401W improves the ability to *evaluate scientific literature critically* (Learning Outcome 2) and *communicate scientific information in a clear, reasoned, and stylistically appropriate manner* (Learning Outcome 4).
2. In prior reports, in addition to writing critiques, students proposed and presented follow-up experiments for the research they critiqued. They did this mid-semester (after the first two critiques) and at the end of the semester, (after last two critiques). Since that report, the majority of NBB faculty discontinued these NBB 401 assignments designed to address the ability to *formulate hypotheses and design scientific experiments* (Learning Outcome 2).
3. We plan to continue to gather data from NBB 401W and to encourage all instructors to keep consistent data for future analysis.

E. Diversity and Research Participation

The demographic data reported below come primarily from Emory's Office of Institutional research and Decision Support.

Overall Diversity among NBB Majors

Data on NBB student diversity by self-identified LGBTQIA or neurodiverse-psychological status has been requested by NBB faculty. It is not currently available, but it can be collected in our graduation survey. ECAS does collect some demographic data, and we examine those next. Diversity within NBB is expected to closely match the composition of students enrolled in ECAS. Though NBB students are a diverse group. relative to the College (ECAS), NBB has smaller percentages of International, Male and White students; there are relatively greater percentages of Asian and Female students. NBB has a greater proportion of Oxford continuees than ECAS as a whole; we think that this reflects our substantial staff outreach on that campus. NBB continues to grow as a proportion of ECAS. The demographic composition of NBB majors fluctuates over time, and this reflects general trends in ECAS admission, such as a lower number of males admitted. Since NBB demographic numbers diverge from those of ECAS, demographic proportions for all NBB students are the baseline against which we compare research student demographics.

Demographic Percentage	NBB Majors	NBB as % of ECAS	Asian	Black / African Amer.	Hispanic / Latinx	Two or More Races	Nonres. Alien / Intl.	Unknown/Other*	White	Male	Female	First-Generation	Non-First Generation	Oxford Continuee	Transfer Student	Pell Student
NBB Average#	450	8..1	36.3	8.1	11.6	4.9	7.4	1.3	30.4	30.1	69.9	14.8	85.2	21.0	4.3	20.6
ECAS Average			**23.0**	**8.1**	**11.0**	**4.4**	**16.7**	**1.1**	**35.2**	**41.0**	**59.0**	**14.0**	**86.0**	**14.0**	**6.0**	**20.0**
Fall 2015	376	6.7	33.2	9.6	7.4	5.1	6.1	2.1	36.4	35.1	64.9	11.7	79.0	20.5	1.9	24.7
Spring 2016	423	7.9	32.2	10.2	6.9	5.0	5.2	1.7	39.0	33.3	66.7	12.5	78.5	18.2	2.1	25.5
Fall 2016	344	6.2	32.3	7.3	9.0	6.4	6.1	1.2	37.8	30.2	69.8	12.2	80.8	23.3	1.7	24.7
Spring 2017	386	7.3	31.9	8.8	9.8	6.2	5.7	1.0	36.5	31.1	68.9	13.5	81.1	21.8	1.6	23.6
Fall 2017	351	6.4	31.9	7.7	11.4	5.7	8.0	1.1	34.2	27.6	72.4	14.2	82.1	20.5	4.6	22.8
Spring 2018	411	7.8	33.3	7.8	11.2	5.6	8.3	0.7	33.1	29.2	70.8	13.9	82.0	17.3	4.1	23.4
Fall 2018	375	6.6	34.1	6.9	12.8	4.8	9.6	1.3	30.4	29.1	70.9	13.6	83.2	19.7	3.7	22.4
Spring 2019	425	7.8	37.4	7.1	11.3	4.7	8.9	1.4	29.2	30.4	69.6	13.9	82.8	19.5	3.1	22.4
Fall 2019	387	6.8	38.2	7.8	11.9	3.1	6.7	1.6	30.7	32.3	67.7	14.7	81.1	23.8	3.9	19.4
Spring 2020	454	8.4	37.0	8.4	11.5	4.2	6.8	1.8	30.4	31.3	68.7	15.2	80.6	21.8	3.5	20.0
Fall 2020	389	6.9	38.3	9.0	9.8	4.1	7.5	1.3	30.1	29.8	70.2	16.7	78.1	24.9	3.6	21.1
Spring 2021	457	8.6	36.8	8.5	11.4	4.8	7.0	0.9	30.6	30.9	69.1	15.5	79.9	22.5	3.3	20.6
Fall 2021	430	7.3	36.3	8.4	12.1	5.1	7.2	1.4	29.5	30.9	69.1	16.7	83.3	30.2	6.0	20.5
Spring 2022	558	10.1	36.2	8.2	10.6	5.7	7.5	1.1	30.6	31.5	68.5	15.6	84.5	19.0	5.0	20.1
Fall 2022	498	8.6	34.9	8.2	8.5	6.0	6.4	1.0	30.9	30.9	69.1	12.9	87.1	17.9	5.2	12.8
Spring 2023	523	9.7	34.4	1.7	12.0	5.9	6.7	1.3	31.2	31.5	68.5	13.2	86.8	18.4	5.4	19.3

*Other includes unknown, American Indian/Alaskan Native and Native Hawaiian/Pacific Islander (each < 0.2%).
Demographic data are percentages of total NBB majors. *Based on data provided by Institutional Research.*
 # Averages are for the most recent 5 years. Larger than expected proportions shown in green, and lower in red.

Diversity in Enrollment and Graduation Rates

Thanks to the Office of Institutional Research and Decision Support, we were able to obtain cohort enrollment- and graduation-rate data for students in NBB, in "foundation" departmental majors (Anthropology, Biology, Psychology), and in other departmental science majors identified as "natural" (Chemistry and Physics). They pulled five years of first-time, full time Emory undergraduates as cohorts, allowing us to know how many enrolling NBB students are in demographic groups that are often underrepresented (URM, First-Generation, Pell) as a percent of total majors. URM consists of all identifying as Black or African American, Hispanic or Latino, American Indian or Alaska Native or Native Hawaiian, Other, or Pacific Islander. Students completing those primary majors in each demographic group were also processed as a percent of total completions per major. This allows us to see how students from typically underrepresented populations are attracted to, and retained in, NBB, compared to some other majors.

Enrollment Data

Across 5 years, Pell recipients enrolled in NBB and 5 other programs at similar rates, except for Anthropology, which had higher rates. First Generation students were attracted to NBB and Biology equally. NBB and Psychology had similar rates of URM enrollment (19-24 %), while Biology, Chemistry and Physics rates were lower (10-18 %). Anthropology (26-32 %) had the largest enrollment rate of URM students. Based on these data, NBB enrollment rates are higher than those of the traditional "natural sciences", and more akin to those of Psychology. Given the large number of NBB electives (>60 %) taught by our 22 Psychology faculty (cross-listed), this is not surprising.

Graduation Data

Increasing graduation rates among First-Generation and URM students is a national priority. Across 5 years, Pell recipients graduated at similar rates (25 – 32 %) in all 6 majors. The rates at which First Generation students graduated were very similar 14.4 - 15.2 %) across Biology, Chemistry, NBB, and Physics, but were slightly higher in Psychology (16.1%) and highest in Anthropology (19.0 %). As with First -Generation students, URM students in Biology, Chemistry, NBB and Physics graduated at similar rates (16.3 – 17.7 %), while Psychology (22.3 %) and Anthropology (26.8 %) rates were higher.

Since we don't have data on medical career planning by demographic group, we cannot say whether pre-medical profession coursework among URM and First Generation students is related to lower graduation rates. Our graduation survey data show that >75% of NBB majors plan on health careers. This means that beyond overlapping Biology, Chemistry and quantitative courses in their first year, the majority of them do add medical prerequisite courses in Physics (2), Chemistry (2) and Biology (2) to their NBB schedules in years 2-3. The most likely explanation for shared lower graduation rates for URM and First-Generation students in NBB, Biology, Chemistry, and Physics is simply the consequence of a higher degree of course overlap among all those majors. It is also important to note that the Anthropology and Psychology departments award BA and BS degrees, and that those are aggregated in this report. So we cannot truly determine if degree-type is a determining variable.

Research participation

We offer three courses for students doing mentored research:

NBB 399 (Introduction to Mentored Research, given every semester) is for students in a lab but not yet doing research (they may be shadowing, reading, attending lab meetings, etc.).
NBB 499R (Mentored Research, given every semester) is for students in a research lab. Most students enroll for 8 credits over two semesters to receive NBB elective credit.
NBB 495A and NBB 495BW (Honors Research, two-semester sequence) are for seniors working on honors projects. Most would have taken NBB 499 as juniors.

As shown below, research participation appears to be increasing, and the percentage of NBB majors graduating with Honors has reached almost a quarter of all graduates. This is in line with national estimates of 20-30%, depending on school.

From NBB 499 (requires independent projects) data alone, at least 60% of NBB graduates have some form of formal research experience; this course is taken by students doing research alone, or as a prelude to enrolling in the Honors (495) courses. This isn't inconsistent with what is self-reported on the 2023 NBB Graduation Survey (attached), where 68% out of 175 respondents agreed that "I had the opportunity to participate in at least one independent research project focused on neuroscience and/or behavioral biology with a faculty member.".

Research Participation	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
NBB 399R, Intro. to Mentored Research	17	25	29	34	57	36	27	51
NBB 499R, Mentored Research	49	59	73	67	72	71	84	139
NBB 495A and 495BW, Honors Research	25	19	20	25	25	33	31	45
Honors awarded	25	19	18	24	25	32	31	42
Number of NBB graduates		130	128	143	149	158	180	175
Proportion of graduating class with Honors		15%	14%	17%	16%	21%	17%	24%

Data retrieved from OPUS by NBB staff.
NBB 499 is typically taken by the same students in spring and fall; we report the maximum of the spring and fall enrollment to avoid double-counting.
NBB 495A and B is a two-semester sequence, so 25 means the same 25 students each semester.
Honors for 2022-2023 are estimated from NBB 495A enrollment (typically, all get Honors).

Diversity of research students

Research participation has grown over five years, as a percentage of NBB majors. There was a dip in the 2020-21 academic year, due to COVID-19 restrictions on campus activity, and then a return to the trendline in 2023. With NBB 499 enrollment as a proxy for participation in mentored research, the following table shows that, relative to NBB majors overall, there are 10% more Asian students. There are fewer White, Black, First-Generation, and Pell students.

Two-year trends among research students do not match those of students in the NBB major generally, with Asian participation greater each of the last 4 semesters, and enrollment in NBB 499 steadily decreasing among White and Male students over those same 4 semesters. Although numbers fluctuate, First-Generation and Pell students do not seem to be making gains in research that will match overall demographic trends in the NBB major.

Research Credit (NBB 499)	Research for Credit	% of NBB Majors	Asian	Black / African Amer.	Hispanic / Latinx	Two or More Races	Nonres. Alien / Intl.	Unknown/Other*	White	Male	Female	First-Generation	Non-First Generation	Oxford Continuee	Transfer Student	Pell Student
Res. Average#	79.1	17.6	46.3	4.9	9.7	5.1	7.5	1.8	24.8	34.6	65.4	11.0	89.0	22.1	4.6	14.4
NBB Average			36.3	8.1	11.6	4.9	7.4	1.3	30.4	30.1	69.9	14.8	85.2	21.0	4.3	**20.6**
Fall 2015	36	9.6	36.1	5.6	13.9	2.8	5.6	2.8	33.3	36.1	63.9	11.1	77.8	13.9	0.0	16.7
Spring 2016	49	11.6	34.7	4.1	12.2	2.0	4.1	2.0	40.8	42.9	57.1	12.2	81.6	10.2	2.0	20.4
Fall 2016	52	15.1	36.5	5.8	1.9	9.6	7.7	0.0	38.5	32.7	67.3	7.7	92.3	19.2	0.0	17.3
Spring 2017	59	15.3	40.7	3.4	6.8	10.2	5.1	0.0	33.9	27.1	72.9	11.9	88.1	23.7	1.7	22.0
Fall 2017	61	17.4	34.4	6.6	13.1	4.9	11.5	0.0	29.5	31.1	68.9	11.5	85.2	18.0	1.6	18.0
Spring 2018	72	17.5	40.3	5.6	9.7	6.9	8.3	1.4	27.8	27.8	72.2	16.7	81.9	25.0	1.4	25.0
Fall 2018	60	16.0	53.3	3.3	6.7	1.7	8.3	1.7	25.0	28.3	71.7	18.3	81.7	20.0	1.7	16.7
Spring 2019	67	15.8	50.7	3.0	11.9	3.0	7.5	1.5	22.4	34.3	65.7	17.9	82.1	25.4	3.0	14.9
Fall 2019	72	18.6	43.1	4.2	13.9	5.6	8.3	2.8	22.2	34.7	65.3	9.7	90.3	29.2	4.2	15.3
Spring 2020	85	18.7	44.7	4.7	10.6	5.9	11.8	2.4	20.0	35.3	64.7	8.2	90.6	28.2	3.5	12.9
Fall 2020	43	11.1	44.2	9.3	7.0	4.7	2.3	0.0	32.6	30.2	69.8	9.3	83.7	14.0	2.3	18.6
Spring 2021	69	15.1	50.7	5.8	5.8	5.8	0.0	0.0	31.9	33.3	66.7	7.2	85.5	20.3	4.3	13.0
Fall 2021	84	19.5	41.7	7.1	11.9	4.8	7.1	0.0	27.4	40.5	59.5	14.3	83.3	20.2	4.8	15.5
Spring 2022	100	17.9	43.0	4.0	14.0	6.0	8.0	0.0	25.0	39.0	61.0	15.0	85.0	24.0	6.0	16.0
Fall 2022	96	19.3	45.8	3.1	7.3	6.3	9.4	4.2	24.0	36.5	63.5	7.3	92.7	18.6	6.3	11.5
Spring 2023	115	21.9	47.8	6.0	7.0	5.2	7.8	3.5	22.6	30.4	69.6	6.0	94.0	19.1	6.1	13.0

*Other includes unknown, American Indian/Alaskan Native and Native Hawaiian/Pacific Islander (each < 0.2%).
Demographic data are percentages of total NBB majors. *Based on data provided by Institutional Research.*
 # Averages are for the most recent 5 years. Larger than expected proportions shown in green, and lower in red.

Honors

Students doing honors take NBB 495A and NBB 495BW in their final year. Their demographic makeup (below) differs from that of the larger pool of NBB 499 research students overall (above). Less than half the First-Generation students we'd predict from NBB demographics obtain Honors, and Pell Students remain underrepresented. We also see lower than expected Black and Hispanic participation. International student success is twice what overall NBB demographics would predict; they pursue Honors at higher rates.

Honors	Honors	% of NBB Graduates	Asian	Black / African Amer.	Hispanic / Latinx	Two or More Races	Nonres. Alien / Intl.	Unknown / Other*	White	Male	Female	First-Generation	Non-First Generation	Oxford Continuee	Transfer Student	Pell Student
Hon. Average#	31.2	19.1	38.8	1.3	6.7	5.4	14.4	1.3	31.2	29.5	70.5	5.8	94.2	23.7	3.5	12.5
NBB Average			**36.3**	**8.1**	**11.6**	**4.9**	**7.4**	**1.3**	**30.4**	**30.1**	**69.9**	**14.8**	**85.2**	**21.0**	**4.3**	**20.6**
2015-2016	24		20.8	4.2	4.2	8.3	4.2	0.0	58.3	29.2	70.8	8.3	87.5	4.2	4.2	12.5
2016-2017	19	14.6	36.8	0.0	5.3	5.3	5.3	0.0	47.4	47.4	52.6	15.8	84.2	21.1	0.0	10.5
2017-2018	18	14.1	16.7	5.6	11.1	11.1	0.0	0.0	55.6	33.3	66.7	11.1	88.9	22.2	0.0	22.2
2018-2019	24	16.8	29.2	0.0	16.7	8.3	16.7	0.0	29.2	25.0	75.0	4.2	91.7	20.8	0.0	25.0
2019-2020	24	16.1	33.3	0.0	8.3	0.0	8.3	4.2	45.8	45.8	54.2	0.0	100	12.5	4.2	4.2
2020-2021	33	20.9	33.3	3.0	3.0	3.0	21.2	3.0	33.3	21.2	78.8	9.1	84.8	27.3	0.0	9.1
2021-2022	31	17.2	48.4	0.0	3.2	6.5	9.7	0.0	32.3	25.8	74.2	6.5	83.9	22.6	9.7	9.7
2022-2023	43	24.6	46.5	2.3	4.7	9.3	14.0	0.0	23.3	30.2	69.8	7.0	93.0	27.9	2.3	14.0

*Unknown/Other includes American Indian/Alaskan Native and Native Hawaiian/Pacific Islander (each < 0.2%).
Demographic data are percentages of total Honors students. *Based on data provided by Institutional Research.*
NBB 495BW enrollment is a proxy for graduation with Honors, since nearly all who complete the class are awarded Honors.
For 2021-2022, NBB 495A is used instead (it is usual for only 2 students to drop between NBB 495A and NBB 495BW).
Averages are for the most recent 5 years. *Larger than expected proportions shown in green, and lower in red.*

Conclusions

1. Over 5 years, racial/ethnic diversity of NBB students did not reflect that of ECAS, with relatively larger Asian and Oxford-continuee populations, and fewer than expected White, Male, and International students.
2. Research participation is strong, with at least 50% of NBB majors having some formal research experience by graduation and 24% of recent graduates earning Honors. Thus, NBB majors as a whole *are able to engage in the research process through undergraduate honors research, independent research projects, and coursework* (Learning Outcome 3).

   However:
3. Mentored research (NBB 499) underrepresents White, Black, First-Generation and Pell students. Asian students participate in larger numbers than overall demographics would predict.
4. Black, Hispanic, Pell, and First-Generation students are underrepresented in the NBB Honors program. International students are overrepresented, while the rate at which Asian students transition from research experience (NBB 499) to Honors projects is lower than expected. Currently, Honors eligibility to attempt Honors in NBB is dependent on overall GPA (3.5+); we

do not have overall GPA data by demographic category (NBB) to assess whether GPA-eligibility in the 6th semester (end of junior year) accounts for differences among the demographics of students who've ever done research (NBB 499) and those who are allowed to enroll in Honors (NBB 495BW).

Thus:

5. In the absence of Emory and NBB data, published national trends tend to dominate departmental planning and practice. Our data will prompt discussion of ways in which we might better use data-driven practices to support those who are underrepresented in the major or in research-Honors relative to our NBB student population. With significant changes to the ECAS Honors system, past trends are unlikely to correlate with both research-based and Latin-based Honors in future years.