NYU Biology QBIST T32 Training Program

Annual Report for Advisory Committee

Directors: David Gresham, Christine Vogel
Reporting period: Academic Year 2019/20

Purpose

This report outlines the progress made in the Quantitative Biological Systems Training (QBIST) Program, funded by an NIH T32 training grant, during the first year of its implementation in the 2019-2020 academic year. The report evaluates successful components and describes improvements for the coming year. Based on this report, the Advisory Committee is asked to provide feedback on priorities and areas of improvement for the 2020-2021 academic year.

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Report

1. Summary of program goals

The NYU Biology NIH T32 Training grant started in July 2019. The funded proposal comprised 3 main goals:

1. Enable trainees to develop and apply advanced computational and data science skills to complex biomedical research questions.
2. Cultivate trainee skills in mentorship and leadership and provide opportunities for experiential learning through mentorship activities that promote an inclusive environment within the biomedical research enterprise.
3. Enable trainees to actively explore and pursue biomedical career paths outside the traditional academic trajectory.

Progress toward these goals was achieved in three major ways:

A. Initiation of the QBIST Workshop attended by all second year PhD students in the NYU Biology PhD program. This workshop comprises lectures on diversity and inclusion, career development, and responsible conduct of research. See **Appendix 1** for the 2019-2020 syllabus.

B. Mentoring the four QBIST trainees (2nd year of their PhD) to secure an internship position outside academia during the summer following their 2nd year of PhD studies

C. Training for <u>all</u> 2nd year PhD students in mentoring with the goal of participating in one of the mentoring opportunities offered at the department (i.e. high school and undergraduate summer research programs).

Note that these goals were modified from the original proposal to reflect funding cuts.

2. Program Activities during the 2019-2020 academic year

During the first year of the QBIST program we successfully implemented all aspects of the QBIST program. The QBIST Executive Committee selected 4 students with whom the Directors worked closely over the academic year to prepare for an internship during the summer of 2020. The preparation included identification of internship opportunities, refinement of trainees' resumes, writing application letters, and corresponding with contacts at the targeted institutions. All four trainees made substantial progress in pursuing internship opportunities. However, due to the COVID-19 based shutdown between March 13-June 9, 2020, and the subsequent disruptions that resulted from the pandemic, all four internships were postponed to summer 2021.

We successfully implemented the first year of the QBIST workshop introducing new sessions on career development, mentoring, and the responsible conduct of research. The COVID-19 based shutdown resulted in the cancellation of two QBIST classes on diversity/inclusion and mentoring (**Appendix 1**). All students will be invited to participate in those classes during the subsequent academic year (2020/21).

We asked all second year students an anonymous survey and received 11 responses. The major results are presented in **Appendix 3** and additional details are available in the survey result spreadsheet (**Appendix 4**). As can be seen, most PhD students currently plan to pursue a career in academia (**Figure 1**). Students are particularly interested in improving quantitative skills and large-scale genomics skills (**Figures 2-3**). Amongst soft skills, students listed project management as their primary interest, followed by improving writing skills (**Figure 4**). Students felt that in 2019-2020 they improved the desired quantitative skills (**Figures 5, 6**) and perceived improvements in soft skills mostly focussed on presentation and teaching skills (**Figure 7**). Accordingly, project management and writing skills remain the top priorities for desired future improvements for students (**Figure 8**). Students appeared largely unaware of various soft skill courses offered at NYU.

All QBIST course elements received consistently high evaluations with respect to usefulness, with average scores being greater than 4 out of 5 for all but two course elements. Note that lectures 3 to 8 also fulfill the requirement for training the Responsible Research Conduct as requested by the National Institutes of Health.

During the first year of the program the QBIST Directors also formed an Advisory Committee as described in the original proposal comprising:
- Susan Anton - Professor at the NYU Department of Anthropology and Acting Dean of the Graduate School of Arts and Science
- Jan Plass - Paulette Goddard chair in Digital Media and Learning Sciences at the Steinhardt School of Culture, Education, and Human Development at NYU
- Liam Holt - Assistant Professor at the Department of Biochemistry and Molecular Pharmacology at NYU Grossman School of Medicine

We constructed a webpage to host all QBIST related activities and to highlight our trainees and resources (https://as.nyu.edu/content/nyu-as/as/departments/biology/academics/phd/qbist-program.html)

3. Planned Activities for the 2020-2021 academic year

Based on the positive evaluation of the QBIST workshop components by the second year PhD students, we will retain the existing workshops. In addition, we will add the following components and activities during the 2020-2021 academic year:

1. Ensure that the component on diversity and inclusion occurs and students from the prior year's cohort are able to attend
2. Ensure that the workshop on mentoring/leadership occurs and students from the prior year's cohort are able to attend
3. Introduce a new module to the QBIST workshop on Racism and Science which will include a lecture on the history of racism in science by David Gresham
4. Introduce a new session on Entrepreneurship and Startups presented by the NYU Entrepreneurial Institute to the QBIST workshop
5. Increase awareness amongst students for existing writing workshops, such as those offered by the NYU School of Journalism on Science Communication
6. Ensure that second year QBIST trainees are able to undertake internships - possibly by seeking remote internship opportunities.
7. Enable first year QBIST trainees to undertake internships that were delayed due to the COVID19 pandemic - possibly by seeking remote internship opportunities.
8. Enhance integration between quantitative courses through collaboration between instructors teaching Biostatistics (Kris Gunsalus and Manny Katari), Applied Genomics (Davd Gresham and Manny Katari) and Machine Learning (Rahul Satija). We will meet to discuss syllabi and ways of enhancing continuity between courses.

4. Appendix 1: 2019-2020 QBIST Workshop syllabus

Lecture	Day	Date	Time	QBIST Workshop	Instructor
1	Friday	Sep 13	3-5pm	Introduction to the QBIST Program	David Gresham and Christine Vogel
2	Thursday	Jan 16	2-5pm	Employment Application and Interviewing	Christine Ponder
3	Thursday	Feb 13	4-6pm	Ethical Considerations in Research with Animal	Lee-Ronn Paluch/ Mark Klinger
4	Thursday	Feb 20	4-6pm	Responsible Data Analysis, Management & Sharing	Vicky Steeves/Nick Wolf
5	Thursday	Mar 5	4-6pm	Survival Skills for a Career in Research	Tony Movshon
6	Wednesday	Mar 11	4-6pm	Publication Practice	Claude Desplan
7	Thursday	Apr 9	3-5pm	Mentor/Trainee Responsibilities and Collaboration in Science and Conflict of Interest	Chiye Aoki
8	Thursday	Apr 16	4-6pm	Ethical Considerations in Research with Human Subjects and Research Misconduct	Jane McCutcheon
9	Canceled			Teamwork, Leadership, and Management	Christine Ponder
10	Canceled			Diversity and Inclusion	TBD

5. Appendix 2: Notes on the role of the Advisory Committee

From grant proposal:

Advisory committee assessment criteria

On the basis of the annual report, and discussion with QBIST program trainees, the QBIST program advisory committee will provide critical assessment of the extent to which:

- Program faculty foster the integration of quantitative and traditional biological sciences
- Program faculty are engaged in activities that promote trainee career development
- Program faculty are promoting the adoption of best practices in scientific rigor,reproducibility, and responsible conduct of research
- Trainee/mentor relationships are serving the best interest of the trainee

Protocol for Responding to Advisory Committee Critique

The QBIST program advisory committee will provide a written summary of their assessment of the program that will include suggested strategies for addressing any issues that they have identified. The annual report from the QBIST program advisory committee will be reviewed and discussed by the entire QBIST program executive committee at their annual meeting. Subsequent annual reports by the QBIST program directors will explicitly address issues outlined in the annual report. To promote transparency, the annual QBIST program advisory committee report will be posted on the QBIST web portal.

6. Appendix 3: Results of the survey

We asked <u>all</u> 2nd year students an anonymous survey, we received 11 responses. All tabulated responses are listed in **Appendix 4.**
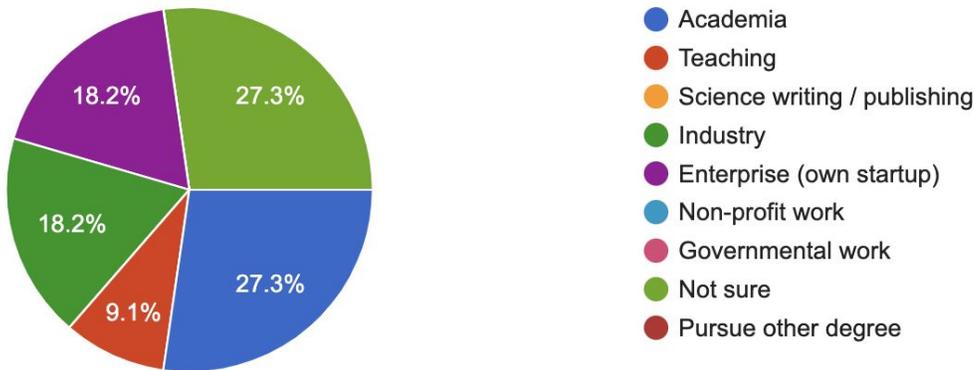

Academia
Teaching
Science writing / publishing
Industry
Enterprise (own startup)
Non-profit work
Governmental work
Not sure
Pursue other degree

Figure 1. Current career goals for time after PhD

Programming in Python
Programming in R
Machine learning
Statistics
Data mining
Evolutionary analysis
Ecological analyses
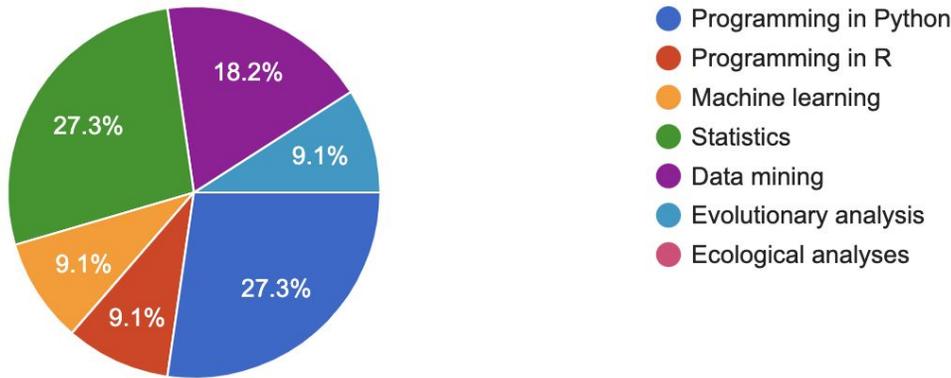
Figure 2. Most important quantitative skill students wished to improve (starting their PhD).

Genome-scale techniques (sequencing, proteomics)
Genetics
Imaging / Developmental biology
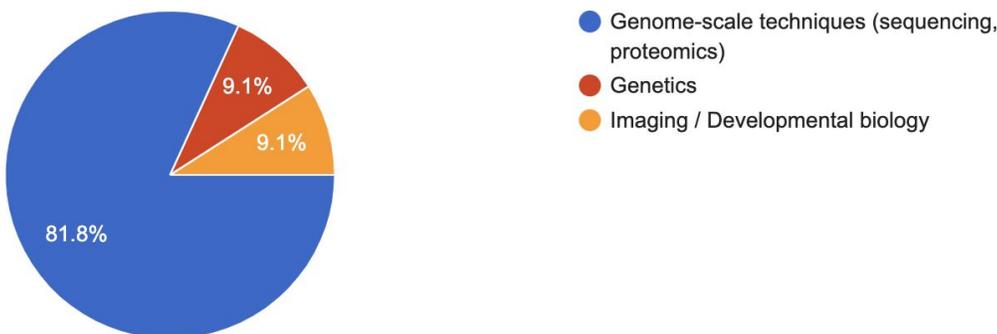
Figure 3. Most important experimental skill students wished to improve (starting their PhD).

Leadership
Project management
Teaching
Mentoring
Teamwork
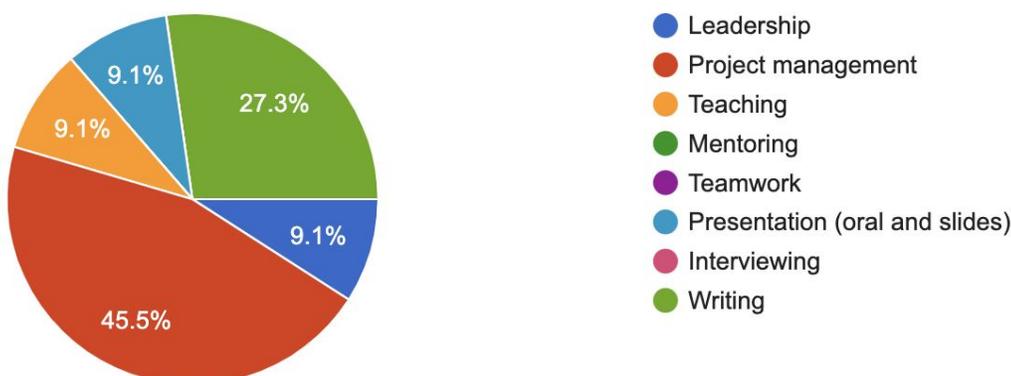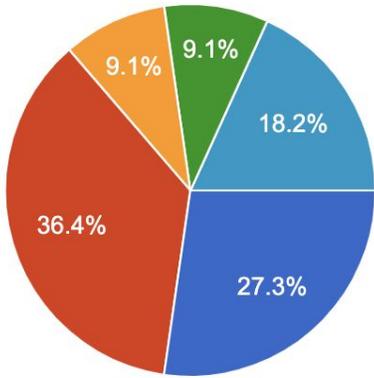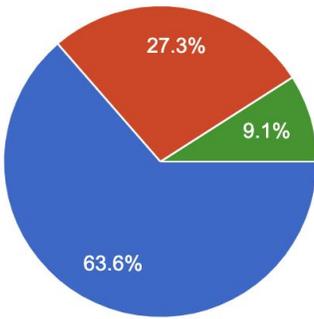**Presentation (oral and slides)**
Interviewing
Writing

Figure 4. Most important soft-skill students wished to improve (starting their PhD).

Legend:
- Programming in Python
- Programming in R
- Machine learning
- Statistics
- Data mining
- Evolutionary analysis
- Ecological analyses

Figure 5. Quantitative skill students felt they improved in 2019/2020.
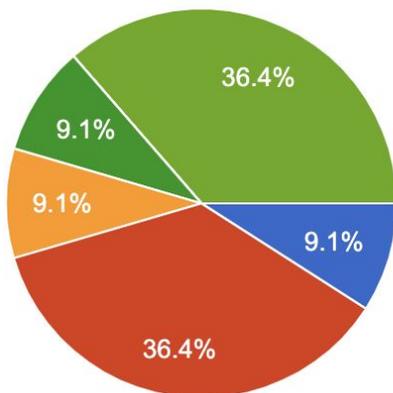

Legend:
- Genome-scale techniques (sequencing, proteomics)
- Genetics
- Imaging / Developmental biology
- NA

Figure 6. Experimental skill students felt they improved in 2019/2020.
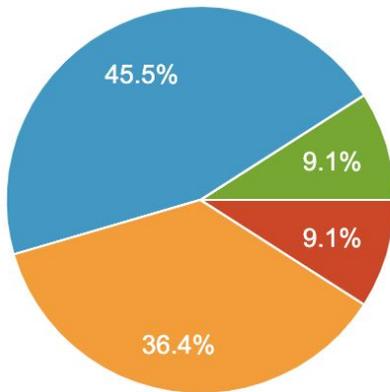
Legend:
- Leadership
- Project management
- Teaching
- Mentoring
- Teamwork
- Presentation (oral and slides)
- Interviewing
- Writing

Figure 7. Soft skill students felt they improved in 2019/2020.

Legend:
- Leadership
- Project management
- Teaching
- Mentoring
- Teamwork
- Presentation (oral and slides)
- Interviewing
- Writing

Figure 8. Soft skill students wish to improve in the coming year.
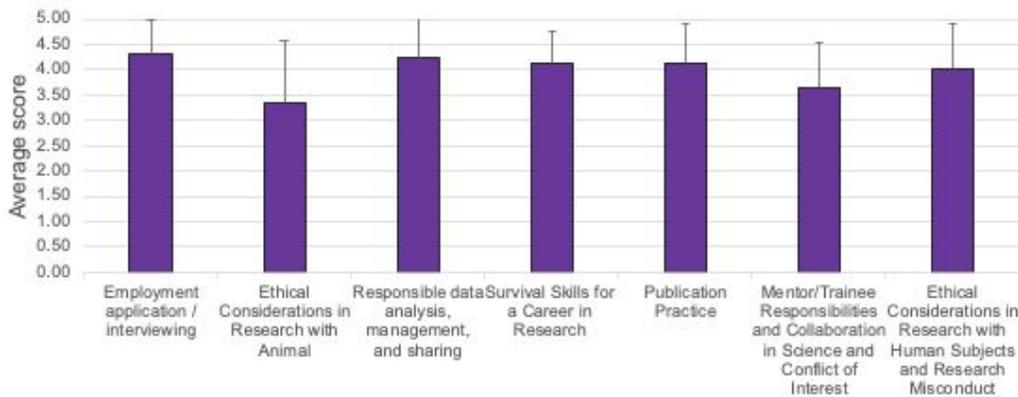
Figure 9. Evaluation of usefulness of QBIST workshop components (1 = not very useful, 5 = very useful).

Responses to "Which kind of QBIST workshop components should be added in future? What would be most useful for your career planning?":

- A more interactive component could be useful for all of the above courses.
- Ethics within society and research (ie standards for science vs ethnic groups etc)
- People from industry discussing how industry jobs and academia differ. The internship will offer an opportunity to experience this, but it would be nice to get a broad overview.
- project management, negotiation skill
- Introduce more classes about Nanopore Sequencing and analysis
- More on publication practice.
- Would be great if QBIST could provide some internship opportunities to the international students (which constitutes more than half of the class).