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The New York City Louis Stokes Alliance for Minority Participation Bridge to the Doctorate: A Model for Underrepresented Students' Transition to the Doctoral Program 2008 to 2022

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THE NEW YORK CITY LOUIS STOKES ALLIANCE FOR MINORITY PARTICIPATION BRIDGE TO THE DOCTORATE: A MODEL FOR UNDERREPRESENTED STUDENTS TRANSITION TO THE DOCTORAL PROGRAMS 2008 TO 2022

Abstract

The NSF supported New York City Louis Stokes Alliance for Minority Participation (NYC LSAMP) Bridge to the Doctorate (BTD) at the City University of New York (CUNY) had an objective to recruit and retain recent NYC LSAMP STEM graduates into a research/academic career that leads to the completion of a Ph.D. degree at CUNY or at other doctoral granting institutions. Nine cohorts of the NYC LSAMP Scholars (110 participants) were supported at CUNY. Roughly 33 % of the NYC LSAMP participants were enrolled in the City College Grove School of Engineering. Most of the students (Cohort 1-9) have been enrolled in MS programs at Brooklyn College, City College, Hunter College, John Jay College, the College of Staten Island, Lehman College, Queens College and directly in the doctoral programs at the CUNY Graduate Center. The NYC LSAMP Cohorts at CUNY were not based at any one campus site, as the CUNY Graduate Center on inception of the program was the primary institution that grants the Doctoral degree in CUNY. Bridge to the Doctorate Scholars were engaged in a series of activities designed and implemented to ensure the transition to doctoral programs. These activities serve to create a learning community of scholars across the campuses given the fact that the participating students take courses and conduct research at different campuses. Bridge to the Doctorate Scholars are also offered the opportunity to integrate an International Research Experience into their training during their stay in the program. Program design, best practices, and operation and comparisons to other diversity programs and national data will be presented along with the career outcomes of the over 100 participants. Of the 33% in engineering (of these 97% completed the MS degree). To date over 50% of the NYC LSAMP Scholars have completed their Doctoral degrees.

Introduction

The NSF supported New York City Louis Stokes Alliance for Minority Participation (NYC LSAMP) in Science, Technology, Engineering and Mathematics (STEM) has spearheaded the increase in CUNY's annual baccalaureate degree production among underrepresented groups (African-American, Hispanic, Native American and Pacific Islanders). From inception in the 1991/1992 academic year, the Alliance member campuses of the City University of New York have graduated over 18,000 underrepresented minority students with baccalaureate degrees in STEM (end of Phase 5 in 2018). The NYC LSAMP involved 17 of CUNY's 18 academic campuses, including the CUNY Graduate Center (CUNY GC), CUNY's Ph.D. degree-granting unit. The NYC LSAMP Undergraduate and Graduate Research Program was the heart of the NYC Alliance. The program also included faculty mentoring, research experiences on or off CUNY campuses, research enrichment, career development, and international research [1-9].

Bridge programs have been utilized at many points of the educational pathway and in diverse disciplines to move participants through the STEM/educational lifecycle [10-13]. The duration can be from a monthlong program for incoming freshmen to a two-week course for students moving to second year chemistry. At the graduate level, the NIH BRIDGES program has a

similar mission to the BTD program, and many institutions have invested in the approach and have variations on the approach. However, all include research as a core of the activities to prepare the participants for doctoral study. The NSF program differs due to the scale of at least 12 students per cohort spread across the US with mature Louis Stokes Alliance programs.

Several barriers to graduate education specific to underrepresented minorities have been identified [14-20]. To address some of these challenges, the BTD program as envisioned would provide continuity for the Level 1 students participating in the NYC LSAMP. The design of the BTD programs attempts to actively remove some of these barriers for high performing students (GPA of 3.0 or higher). The cohort model is used to create a learning community with faculty mentorship, a stipend and educational allowance to remove the financial barriers, GRE preparation to address preparation for doctoral programs requiring the GRE scores, development of communication/soft skills, as well as the opportunity for international research experiences.

NYC LSAMP Level 1 undergraduate students are ideally positioned to pursue graduate education by virtue of the participation in research at the campuses, REU programs, summer internships at DOE labs, experiential experiences and co-op internships. Level 1 students/Research Scholars are full-time students in a mentored research relationship with faculty and must show progress towards completion of the baccalaureate degree to continue participation in the program. Selection to the BTD represented a continuity to the next phase of the students development (graduate study) at the baccalaureate institution if graduate programs are available, or at other LSAMP institutions nationwide hosting a BTD program.

Bridge To The Doctorate (BTD)

The Bridge to the Doctorate (BTD) of the NYC LSAMP at CUNY had an objective to recruit and retain recent LSAMP STEM graduates into a research/academic career that leads to the completion of a Ph.D. degree at CUNY or at other doctoral granting institutions. Nine cohorts of the BTD Scholars Cohorts 1-9 (2003 through 2015) with (101 participants) supported at CUNY. The objectives of the BTD program were to recruit and retain recent NYC LSAMP STEM Graduates into a research/academic career that leads to the completion of a Ph.D. degree at CUNY or at other doctoral granting institutions. The LSAMP Bridge program at CUNY in contrast to other BTD programs was not based at any one campus site as the CUNY Graduate Center on inception of the program was the primary institution that granted the doctoral degree in CUNY. This later changed as the Grove School of Engineering at City College became the institution that conferred doctoral degrees in Engineering. Students accepted to the BTD program were eligible to attend all campuses at CUNY that hosted graduate programs in STEM. The approach presented by the NYC LSAMP builds on the efforts established over the previous years of activities in increasing the number of underrepresented minorities in STEM. Central to the approach is changing the atmospherics regarding undergraduate inclusion in research and establishing a CUNY wide list of partners at the student, faculty, and staff level.

Methods Employed

LSAMP graduates from the National LSAMP pool of graduates, and NYC LSAMP graduates who have completed no more than one full-time semester equivalent of graduate study constituted the group invited to apply for the Bridge to the Doctorate program. NYC LSAMP senior undergraduates were allowed to participate in Bridge activities but received no funding at

the BTD level per the requirements of the funding agency. Bridge students were the beneficiaries of a proactive retention and professional enrichment program that included academic and research mentoring, GRE workshops, roundtable discussions with advanced doctoral students, faculty and administrators, and attendance and participation at local and national professional conferences and an intensive research experience. The at-large faculty pool associated with the CUNY Graduate Center, and CUNY Institute/Center Directors served as Bridge faculty/research advisors. The NYC LSAMP utilized the partnership with Brookhaven National Labs to provide cutting-edge research training during the academic year and summer terms and international partners to provide research non-CUNY experiences as a component of the training of all selected BD scholars.

Program Activity

A series of activities were designed and implemented to ensure the transition to doctoral programs. The activities served to create a learning community of scholars across the campuses given the fact that the participating students take courses and may conduct research at different campuses. Each monthly meeting followed a standing agenda format focusing on three or more of the activities listed in Table 1. Senior NYC LSAMP Scholars were also allowed to participate in BTD activities and are encouraged to apply directly to doctoral programs nationally and to compete for Graduate Research fellowships. BTD scholars also act as peer mentors and role models to undergraduate NYC LSAMP Scholars. Workshops on science and engineering presentations, writing workshops, the transition to graduate school, and survival skills in graduate school are conducted by NYC LSAMP doctoral students and BTD Scholars. BTD Scholars come from a variety of disciplines, have graduated from ten BA/BS degree granting units of CUNY, with five graduating from non-CUNY schools.

Table 1. Bridge to the Doctorate Program Activity

Bridge Scholar Activity	Description
1. Academic Coursework	Nine credits per semester, course advising by mentor and review of academic progress
2. Research	Course, thesis as well as International Research
3. Applications to Doctoral Programs	Submission of at least five applications to doctoral programs, utilizing Project 1000 infrastructure, and submissions to AGEP sites.
4. Graduate Fellowship Funding Applications	Ford, Sloan, NASA, DOD, NIH, NOAA and the National Science Foundation Graduate Research Fellowship among others.
5. GRE Preparation	Continuously available to ensure GRE score needed for matriculation into a doctoral program and securing fellowship funding
6. Presentations at Professional Society Meetings & Publication of Research	End of semester reports in the format used by the leading journal in the

	discipline. Timely publication of completed research work in referred journals and/or conference proceedings. Building the curriculum vitae.
7. Peer Mentoring	Monthly meetings, discipline and course specific.
8. Urban University Conference Series - Transition & Gathering of Science Scholars, other AGEP, AMP, ABRCMS, SACNAS and the NSF-HRD Joint Annual Meeting, Professional Societies Meetings, Bridge Retreats	Workshops on transition and survival in graduate school and the professoriate. Presentation of research work, networking with other Bridge Scholars and NSF funded programs
9. Monthly Meeting with Project Director and Administrator	Reviewing, advising and updates on the progress of the students. A standing agenda covers items 1-6 above. A monthly calendar is published with 4 to 5 BTD speakers (10 minute research presentations with Q&A each meeting).

Program Structure

BTD students represented the Level 1 students participating in NYC LSAMP programs who were research assistants. Selected students had one or more years of research experience and showed promise for graduate study. Numerous barriers have been identified for URM graduate school attendance and financing the degree was one of them. In administering the BTD program the students received monthly stipend support ($2,500 for up to 24 months).

All selected BTD students received a monthly stipend of ($2500 or more as the rate changed during the duration of the program) and educational benefits during the duration of their stay in the program. Each BTD participant is empowered to design a program of training to accomplish the BTD program goals with the choice of the mentor/research (including international research) and participating in value added activities of the BTD program.

Major Outcomes: Bridge To The Doctorate (2003-2012)

Many BTD participants did not stay two years as BTD Scholars in CUNY. This has allowed the NYC Alliance to maximize the BTD funding to support one or more additional students per cohort on their way to doctoral study. BTD Students in CUNY are not required to stay in CUNY to complete the Ph.D. degree. Some BTD students did not receive a master's from the campus and moved to a doctoral program. On average 50% (four of the seven campuses) go on to completing the doctoral degree (Tables 2 and 3).

Table 2: BTD School of origin and Doctoral Degree completion

Master's College/University	Number	Doctoral /MD Recipients
City College	39	20
Lehman College	11	5

Brooklyn	9	2
College of Staten Island	7	4
Hunter College	6	2
Queens College	6	3
John Jay College	1	1

BTD scholars earned 79 master's degrees from the CUNY campuses, 12 started at the CUNY GC doctoral program and 7 left for industry positions primarily from Computer Science and Electrical Engineering. Currently 3 BTD scholars are still enrolled in doctoral degree programs at the CUNY GC.

Table 3: NYC LSAMP Bridge Scholars: Discipline

Discipline	Number of BTD Scholars	Accepted to Doctoral Program	Completed Doctoral degree
Anthropology	2	1	-
Biochemistry	6	5	3
Biology/Life Sciences	29	14	14
Biomedical Engineering	6	4	2
Chemical Engineering	5	4	4
Chemistry	6	4	2
Civil Engineering	3	2	-
Computer Science	10	5	1
EAS/Geosciences	4	3	1 (1)
Electrical Engineering	13	10	6
Mathematics	9	6	3 (2)
Mechanical Engineering	3	3	2
Physics	3	2	1
SBE Sciences (Psychology)	2	2	1
Total	101	65	40

BTD scholars leaving the doctoral pipeline or electing to seek employment in industry are seen mostly in the disciplines of Computer Science and Electrical Engineering that are closely aligned with the tech sectors. BTD Scholars in the Biological Sciences accepted into doctoral programs all completed the degree as dis scholars in Chemical Engineering. Notable, students in Biological Sciences who remained at CUNY all completed the degree. BTD scholars who left on completing the master's degree report the insufficiency of the doctoral packages as a reason for their departure.

Table 3: BTD Doctoral Degree Recipients at CUNY and NON CUNY Institutions

Doctoral University	Number	State
CUNY Graduate Center	13	NY

SUNY Stony Brook	3	NY
University of Rochester	1	NY
Cornell University	1	NY
Columbia University	1	NY
Rutgers University	2	NJ
Princeton University	2	NJ
New Jersey Institute of Technology	1	NJ
Yale University	1	CT
University Connecticut	1	CT
Penn State University	1	PA
Harvard University	1	MA
University Michigan	2	MI
Roosevelt University	1	IL
University Maryland	1	MD
Georgia Tech University	1	GA
Morehouse College of Medicine	1	GA
University Texas Arlington	1	TX
University of South Florida	1	FL
University Florida	1	FL
Stanford University	2	CA
University California Merced	1	CA
University Washington	1	WA
Trident University	1	NA

The NYC LSAMP program developed a close working collaborative relationship with the Swedish Royal Institute of Technology, Maastricht University, University of Graz and Technical University of Graz), and was able to leverage financial resources, existing programming, and an international research network for BTD Scholars to successfully integrate International Research into their training. Examined outcomes of NYC LSAMP participants are in-keeping with a recent study[8]. Participants report high levels of satisfaction with the program, viewing the activity as an important component of their professional, educational, and academic experience and advancement in the workforce and in graduate school. For example, the specialization of sites at the Swedish Royal Institute of Technology, Maastricht University, University of Graz and Technical University of Graz in Material Science/Engineering, Neurosciences and Biological Sciences have resulted in eight peer-reviewed publications [21-20] and no doubt were important in securing acceptances to universities outside of CUNY.

- Forty (40%) Bridge to the Doctorate Scholars received the Ph.D. degree.
- Two (2%) received the MD degree.
- Sixty-five (64%) Bridge to the Doctorate Scholars have gained acceptances to Doctoral programs.

- Twenty-nine (45%) Bridge Scholars were accepted into doctoral programs at the CUNY Graduate Center.
- Thirty-six (55%) Bridge Scholars matriculated into Doctoral Programs outside of CUNY.
- Forty Bridge Scholars started their studies at a Community College or graduated from a Comprehensive College of CUNY.
- Twenty-one Bridge to the Doctorate Scholars started studies at a Community College.
- Thirteen (13%) Bridge Scholars received doctoral degrees from CUNY.
- Twenty-seven (27%) Bridge Scholars 27 received doctoral degrees from non CUNY institutions.

BTD scholars obtained doctoral degrees from 24 different institutions and is largely due to the decision from the onset of viewing the BTD Program as a vehicle to the doctoral degree at any institution not just from the CUNY GC. Institutions in the states of New York, New Jersey and Connecticut accounted for 65% of the doctoral graduates. Engineering and the Biological Sciences accounted almost equally for 73% of all BTD doctoral recipients. A large number 35% graduating from the doctoral program at the CUNY GC.

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