



WHO WANTS SCHOLARSHIPS? EXPERIENCES FROM A COMMUTER EDUCATIONAL INSTITUTION

Bhaskara Kopparty(PI)¹ Kristin Huysken(CoPI)² Daniel Kelly(CoPI)³ Vesna Kilibarda(CoPI)⁴ Michael LaPointe(CoPI)⁵

Kevin McElmurry(Evaluator)⁶

¹Computer Information Systems ²Geology ³Chemistry ⁴Mathematics ⁵Biology ⁶Sociology

Indiana University Northwest

NSF S-STEM Award: 1458617

Abstract

Advancing Indiana Math and Science (NSF-AIMS) targets students from 19 area high schools and 7 community colleges in Northwest Indiana and Chicagoland area. Scholarships are awarded to academically talented students with financial need. In the first four years, we awarded 23 scholarships covering their federally-determined financial need up to \$10,000. We also recognized five academically qualified applicants without financial need as NSF-AIMS Scholars. Students in the program participate in several cohort style interventions including an activity-based week-long orientation, a first-year STEM seminar, and designated cohort classes. Prior years' scholars served as mentors for subsequent years.

In yearly surveys, scholars report feeling successful, supported, and recognize that the experiences have a positive influence on their learning, performance and success. Major challenges have included recruiting a large applicant pool that meets both the academic and financial qualifications defined in the grant, recruiting community college graduates, attracting a candidate pool interested in STEM majors other than biology, and lack of faculty release time to organize and oversee activities associated with the program.

Introduction:

IU Northwest is a regional campus of Indiana University. It is a 4-year degree granting urban, commuter campus that serves mainly undergraduate students from a seven county region in Northwest Indiana. Our student population is majority female and is made up of approximately 42% traditionally underserved minority groups.

The NSF-AIMS scholarship program attracts students to eight B.S. degree programs in science, technology, and math, through a combination of academic and social interventions. Scholarships are awarded based on academic credentials (GPA and test scores for incoming freshmen, and GPA for community college graduates). The amount of the scholarship is based on the student's financial need as determined by their federal financial aid application.

In the NSF-AIMS program, scholars are linked academically and socially through shared experiences. Academic and peer support are intertwined through placement seminars, peer-led instruction, field trips, First-year STEM seminar, and cohort classes. The scholars have opportunities to become instructional leaders, participate in faculty-mentored research, and internships. One major goal of NSF-AIMS is to increase the number of women, African American, and Hispanic graduates entering STEM-related jobs and graduate programs. Our experiences can inform the NSF and investigators in developing guidelines and proposals for successful S-STEM programs.



Fig. 1. NSF-AIMS team with first cohort

Support Services and Interventions:

Orientation Activities: The NSF-AIMS orientation takes place the week before classes begin and is required of all NSF-AIMS scholars. The orientation is a week-long activity-based project, where teams of students with faculty and student mentors engage in an interdisciplinary research project. During the first four years of the grant, the orientation was centered around a current and regionally relevant scientific problem (Figures 2-3).



Fig. 2. Students collecting water samples and water quality data using a Sonde probe at the Marquette Park Lagoon in Gary, Indiana



Fig. 3. Students preparing samples for incubation, and conducting counts for total fecal coliform and e.coli.

Central themes for the NSF-AIMS orientation have included diversity in the IU Northwest prairie, and water quality issues in local rivers, lagoons and lake Michigan. The week included lectures, hands-on activities (including programming in Python, developing games, and GIS), and field projects in all of our STEM disciplines. Faculty in our STEM departments have been generous with their time and have eagerly engaged the NSF-AIMS scholars.

Support Services and Interventions (Continued):



Fig. 4. Water quality testing



Fig. 5. Orientation final presentation

Academic activities were combined with opportunities for socialization and cohort building. AIMS scholars from the previous cohort participate as student mentors, thus facilitating continuity and community among AIMS Scholar cohorts. Student teams engaged in data collection and analysis, and interpretation and significance of their findings.

The final day of the orientation, student teams presented their findings to students and faculty (Figure 5). The orientation program concluded with a field trip exploring the ecosystem surrounding the South Shore of Lake Michigan and a potluck picnic prepared by STEM clubs and faculty. At the end of activities students gave feedback on the activities. The results of these surveys are used for continuous improvement of the Orientation (Figures 5-6).

Cohort Experiences: The NSF-AIMS scholarship recipients and scholars are advised into common English, Speech and Math classes for developing the cohort connections. Because of the varied dual credit courses that were taken by the students and schedule conflicts, only some of the students were able to benefit from the cohort experiences.

First-Year STEM Seminar: During the course of this grant, NSF-AIMS students were required to take a seminar course connected with the AIMS program. This course was taught by two of the PIs, and has served 37 students. The course was designed around best practices for first year seminar courses. Guest speaker scientists, field trips, and other active-participation events make up more than two-thirds of the course. The experience is capped off with a presentation about an interdisciplinary science topic of the student's choice to IU Northwest science faculty and students. Yearly assessment of the various activities was performed with end-of-semester surveys, and was instrumental in improving the course experiences for students.

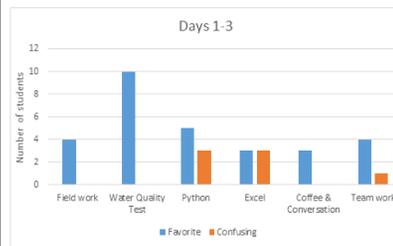


Fig. 6. Students' opinions about different activities in the open-ended part of survey in 2018

Activity	Days 1-2		Days 3-5	
	Mean	Median	Mean	Median
Positive impact on my academic performance	4.4	5	4.1	4
Feel comfortable in joining this program	4.7	5	4.6	5
Contribute to my team's activities	4.6	5	4.4	5
Working as a team resulted in a better result	4.2	5	4.2	4
Approach my team members for support	4.6	5	4.3	4
Offer my assistance to team members	4.4	4	4.1	4
Got to know senior NSF AIMS Scholars	4.3	4	4.4	4
Feel comfortable approaching the professors	4.7	5	4.2	4

Fig. 7. Summaries of students' surveys (Likert scale 1-5, with 5 Strongly Agree in 2018)

Knowledge Generation:

Last year Indiana University Northwest developed the Summer bridges in sciences, humanities and arts modelled on successful NSF-AIMS orientation activities including the field trip to the Indiana Dunes and the picnic.

The NSF-AIMS course developed for the first year experience is an excellent model for adoption at our and other institutions.

Several scholars presented their undergraduate research at the annual Geological Society of Americas Conference in 2018.



Fig. 8. Water quality sampling at Lake Michigan.



Fig. 9. Students working on Data Analysis

Number of Scholarships awarded:

	Fall 2016	Fall 2017	Fall 2018	Fall 2019	Total	
By Year	5	11	5	5	26	
By Gender:	Male					
	Female	15	11			
By Race:	African American	Asian	Hispanic/Latino	Caucasian	Not Reported	
	3	5	6	8	4	
	By Major:	Biology	Chemistry	CIS	Geology	Mathematics
		18	2	5	1	0

Applicant data for 2016-2018:

Table below presents demographic data for the combined 2016, 2017, and 2018 applicant pools. The demographic characteristics of this combined pool of applicants closely approximates the general demographic characteristics of the campus with the exception of the underrepresentation among African Americans.

Table 1: 2016-18 Combined Applicant Pool Demographics					
Ethnicity	N	%	Gender	N	%
Caucasian	42	42%	Male	36	36%
African American	12	12%	Female	64	64%
Hispanic	22	22%			
Asian/Pacific	10	10%			
Other	6	6%			
No Answer	8	8%			
Total	100				100%

Major Challenges:

Several key challenges arose in administering the NSF-AIMS scholarship program. Most of these problems stem from initial recruitment rather than retention or performance of scholarship students.

Recruitment and Eligibility. The initial plan was to reach out to local high schools and community colleges within the northwest Indiana region; this area is both ethnically and socioeconomically diverse, and we believed that there would be many students who fulfilled the baseline academic and financial requirements. While several eligible applicants were found each year, it was a continuing frustration that there were many more applicants who did not qualify under either the financial or academic requirements. One side of this was partially ameliorated with the 'NSF Scholars' designation, where we invited academically strong students to participate in the various AIMS programs despite not being able to award them any scholarship money.

Community College Applicants. IU Northwest is proximally close to many different community colleges, including sharing a building and resources with an Ivy Tech Community College. However, there were very few applications coming from 2-year community college students. Even after applications were submitted, there were continuing obstacles in recruiting the qualified students into the IUN program. Our takeaway was that monetary issues were not the only thing that hold students back from upgrading their associate's degree into a bachelor's degree. Other conjugate systems in addition to the scholarship need to be in place to address those needs.

Competing Financial Aid. Unsurprisingly, students who met the academic and financial need requirements of the AIMS program also qualified for financial assistance from other governmental programs. IU Northwest underwent a transition in the Financial Aid department, causing some internal chaos for identifying need and determining the awards we could give to students. While we have sorted the majority of issues from the transition, we still need to optimize the process so that the most aid can be awarded to students.

Biology Majors. Within the College of Arts and Sciences at IU Northwest, Psychology and Biology dominate the population of students with a specifically declared majors. This also translated into a lack of scientific diversity in our applicant pool; the vast majority of eligible applicants were Biology majors. There was weight given to non-Biology major applicants in an effort to promote diversity in the yearly cohorts, and the support systems (Summer Bridge, First Year Seminar) incorporated many interdisciplinary elements to give students a scientifically diverse experience. This has resulted in some switches away from Biology majors to the other science areas at IU Northwest (Chemistry, Geosciences, and Computer Science).

Program Administration Time. The NSF-AIMS team strives to be as efficient as possible, so that we can have the largest impact with the resources from the S-STEM grant. A key factor we overlooked in this is the significant time required to make all of this work so smoothly. While many hours have been put into organizing all of the quality programs we have put together, we would strongly encourage other teams to pay more mind to faculty release funding than we did.

Conclusions:

Advancing Indiana Math and Science has succeeded in recruiting students to pursue STEM majors at IU Northwest. The first cohort of scholars will graduate in 2020. The High Impact practices of Orientation, First year Seminar, and Undergraduate Research have proved successful in our efforts to retain STEM students.