Institute for Nuclear Physics to Inspire the Next Generation of a Highly Trained Workforce (INSIGHT)

Phases I & II Evaluation Report

August 2023

FRIB

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Participants

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FLORIDA INTERNATIONAL UNIVERSITY

VIRGINIA STATE

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Brookhaven National Laboratory

MICHIGAN STATE UNIVERSITY

HIPPO
Horizon-Broadening Isotope Production Pipeline Opportunities

Georgia State University

Los Alamos NATIONAL LABORATORY

GREAT–NS
BERKELEY LAB

NREMST

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NuSTEAM
Nuclear Science in Texas to Enhance and Advance Minorities

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Executive Summary

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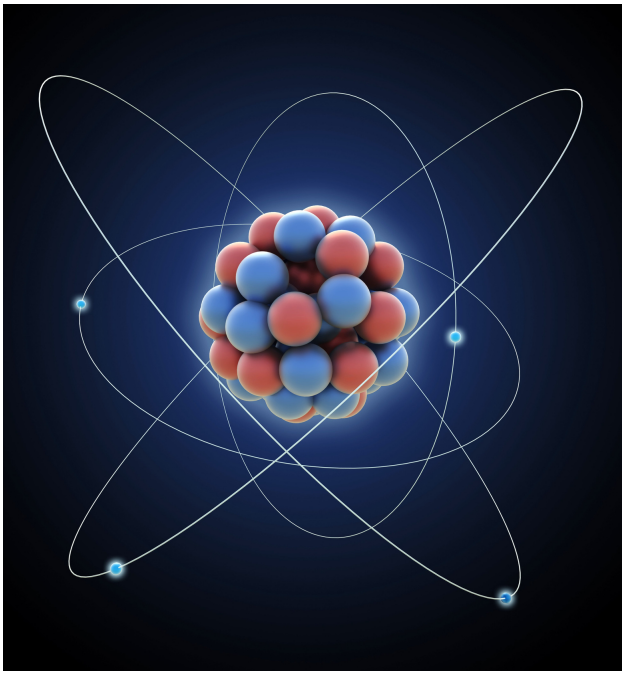
The Institute for Nuclear Science to Inspire the next Generation of a Highly Trained workforce (INSIGHT) is a resource enter that was funded by the Department of Energy Office of Nuclear Physics within the Office of Science in 2021as part of a two-year pilot program focusing on a “Research Traineeships to Broaden and Diversify Nuclear Physics” (DE-FOA-0002456). The INSIGHT evaluation team developed specific metrics tailored to address the goals of this FOA and worked with all 18 sites funded by this program. The awards were split into two cohorts: Phase I, which included sites with a start date in the Summer of 2021, and Phase II, which included sites starting in the Summer of 2022.

The evaluation efforts used an extended case study approach to evaluate the Phase I and Phase II cohorts, as well as their impacts on the overall program. The evaluation findings summarized below will be used to aid the INSIGHT resource center and other interested stakeholders in gaining perspectives regarding the implementation process of programs, quality of partnership development and engagement, and a nuanced understanding of how program elements impact students and ultimately impact students decision(s) regarding their participation in the nuclear physicist pipeline.

Executive Summary

PHASE I EVALUATION

The evaluation for Phase 1 focused on 4 aspects: implementation, institutional stakeholders and participants, experiences, and impact. A total of 39 students and 18 faculty and mentors were involved in this study, corresponding to 70% of the total expected number of participants that were either funded or participated in this program. The major findings were that students overall mainly had positive experiences (83% strongly agreed), felt supported (83% strongly agreed), and were motivated (83% strongly agreed) to pursue careers in nuclear physics and/or engineering. It was also found that administrative challenges did contribute to any negative experience that occurred.



Executive Summary

PHASE II EVALUATION

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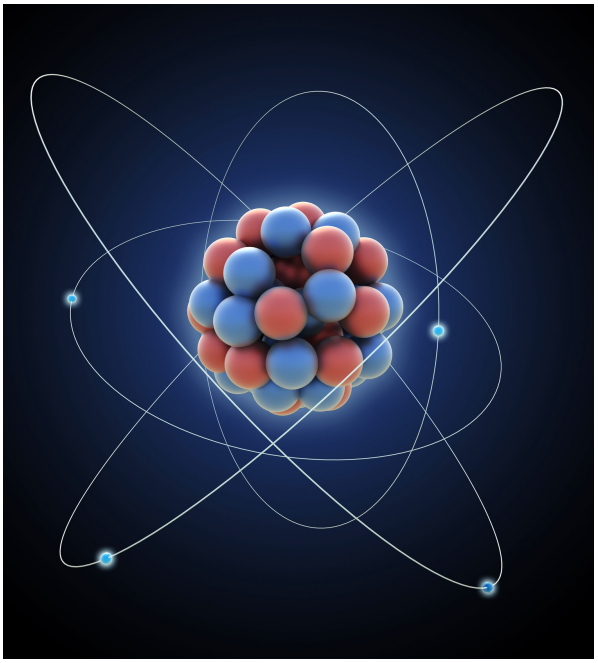
The evaluation for Phase II focused on participants, experiences, programmatic changes, and impact. In Phase II we track two cohorts of students with the continuation of students from Phase I and the first year of Cohort II. Phase II evaluation also included an analysis of the practices and experiences of coaches as well as mentors and faculty leads. Major findings were that students overwhelmingly enjoyed their experiences in the program. Students were motivated to pursue both graduate study and ultimately careers in nuclear physics and engineering.

Overall, students not only had mostly positive experiences in the program, of the students that graduated from their institutions in Phase II, a majority of respondents also indicated that they had entered or were considering entering Physics graduate programs/careers. Likewise a majority of the respondents indicated they were interested in engaging in research projects. A need for more practical, hands-on experiences, information regarding graduate school application processes, and ore seminars and interactions with active nuclear physicists.



Major Goals

MAJOR GOALS OF EVALUATION

PHASE I

The major goals of Phase 1 evaluation were to gain insights regarding improving the development, adaptation, implementation, and replication of evidence-based practices and support strategies to ultimately increase under-represented groups' participation in nuclear physics. Additionally, the evaluation goals focused on gaining perspective regarding the implementation process of all programs, the quality of partnership development and engagement, and a nuanced understanding of how program elements impacted students and ultimately impacted decision(s) regarding their participation in the nuclear physicist pipeline.

Specifically for Phase 1, the evaluation focused on the initial implementation of the program; activities of institutional stakeholders, mentors, and coaches; quality of experiences and activities; and impact on students.

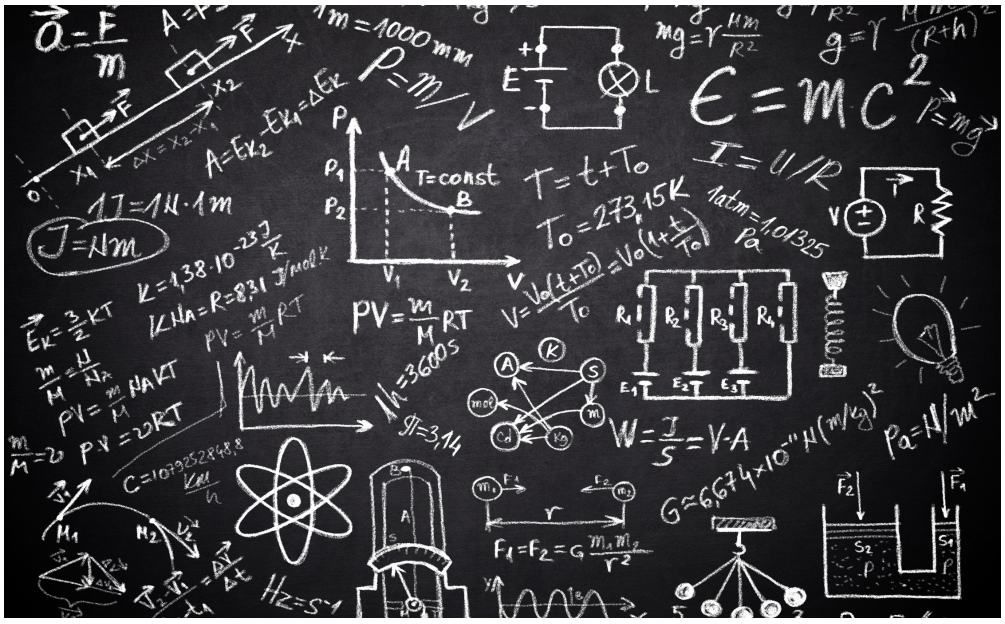
PHASE II

The major goals of Phase II evaluation expanded the goals of Phase I to gain deeper perspectives of the student experiences from both cohorts, as well as the impact of coaches along with mentors. Specifically for Phase II, the evaluation focused on the impact of program practices including the use of coaches and research on student experiences as well as the future plans of graduating students in regards to nuclear physics.

Major Goals

ACCOMPLISHMENTS UNDER THESE GOALS

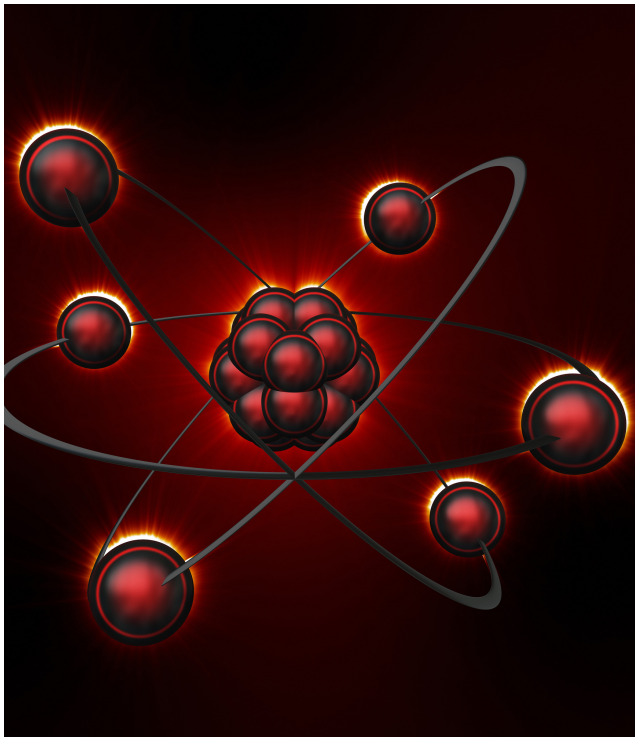
The evaluation activities for Phase I and Phase II included a pre-survey for students and mentors, student focus group discussions held at the beginning of program participation, as well as Phase I and Phase II check-in interviews with students, mentors, coaches, and site leads. Lastly, students who graduated from the program upon completion of Phase II were given post-surveys regarding their experiences. This information was compiled with the post-survey information of the Phase I cohort to provide an more complete view of the program impact. The findings of these studies are presented in this report.



Findings

SUMMARY OF PHASE II FINDINGS

Overall, students not only had mostly positive experiences in the program, of the students who graduated from their institutions in Phase II, 83% of the respondents also indicated that they strongly agreed with considering entering Physics graduate programs/careers. 100% of students responded that they enjoyed their experience in the program.



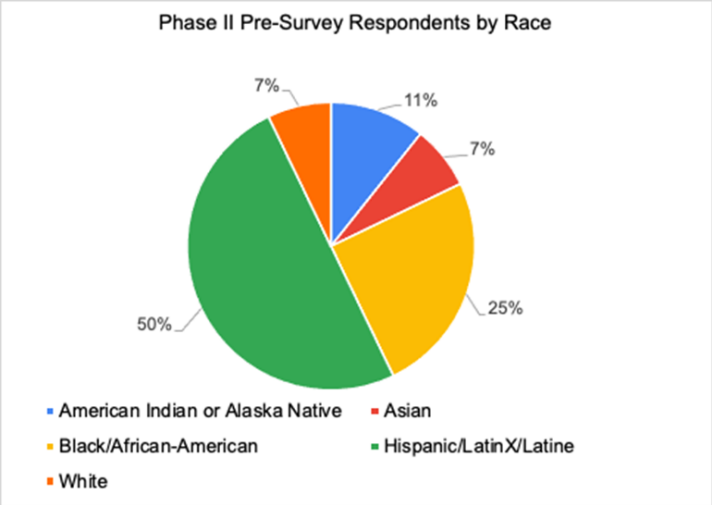
In attempting to understand more regarding the impact of mentors and mentor experiences, mentors and site leads shared through qualitative data that they found the administration of Phase II to be more organized than Phase II. Mentors generally saw the program have a positive impact on students and the students' views on physics careers and graduate programs. Mentors also noted certain practices that were important in student success such as in-person meetings.

Findings

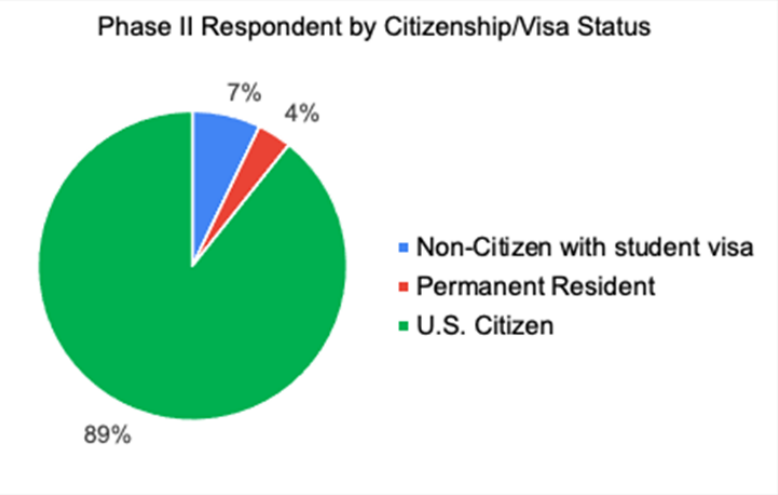
OBJECTIVE I: WHO ARE STUDENTS ENTERING THE PROGRAM

To understand who was participating in the program, demographic information was collected from student participants upon entry. The areas of focus were race/ethnicity, gender, citizenship status, class standing, and major(s). Of our participants, 93% were from marginalized racial identities, 50% identified as men and 39% as women. In regards to class standing 61% were seniors and 28% were juniors. Of the majors represented 68% were physics majors, indicating that a majority of students entered the program with an existing interest in physics generally.

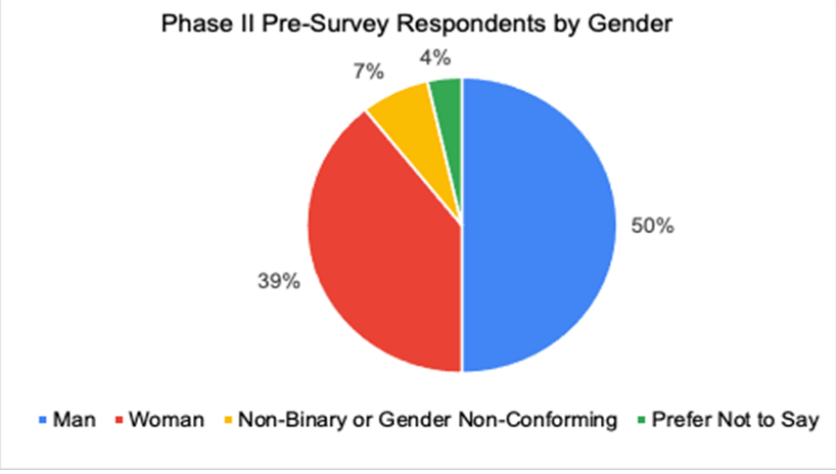
RACE/ETHNICITY



CITIZENSHIP STATUS

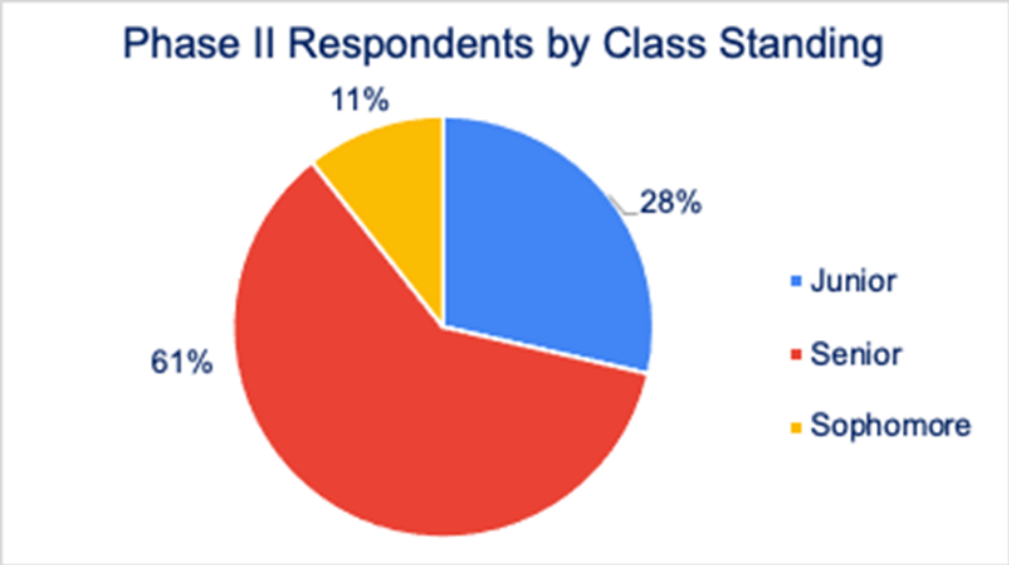


GENDER



Findings

CLASS STANDING



MAJORS

There are a number of majors represented in the program. The majority of students (68%) were Physics majors.

Participants responses included:

- Astronomy
- Engineering
- Computer Engineering
- Mechanical Engineering & Physics

"I think the most beneficial thing about the internship has probably just been being able to actually do physics"

-Student Participant

Findings

OBJECTIVE 2: WHAT ARE THE ATTITUDES, PERCEPTIONS, & EXPERIENCES OF STUDENTS ENTERING THE PROGRAM?

ATTITUDES, PERCEPTIONS,& EXPERIENCES

The pre-survey attempts to set a baseline understanding of student participants' attitudes upon entering the program as well as any background experiences that may impact how they experience the program. The responses are as follows:

I think I will enjoy participating in this program

Mostly agree and strongly agree (96%)

I am interested in pursuing a career in physics/nuclear physics

85% of students were interested in pursuing a career in physics/nuclear physics

I am interested in engaging in research/research projects

All respondents agreed (14%) or strongly agreed (86%)

I have experience engaging in research

71% or respondents answered Yes
29% of respondents answered No

I can easily access academic support if needed

Mostly Agree or Strongly Agree (83%)

Findings

OBJECTIVE 2: WHAT ARE THE ATTITUDES, PERCEPTIONS, & EXPERIENCES OF STUDENTS ENTERING THE PROGRAM?

MAJOR CONCERNS

The pre-survey attempts to set a baseline for understanding student participants' attitudes upon entering the program as well as any background experiences that may impact how they experience the program. Students expressed concerns about what they may experience in the program. The major themes of their concerns were in no particular order:

1. Performance and Abillity
2. Capacity
3. Balance w/ other Commitments (school/work)
4. Fit and Inclusion

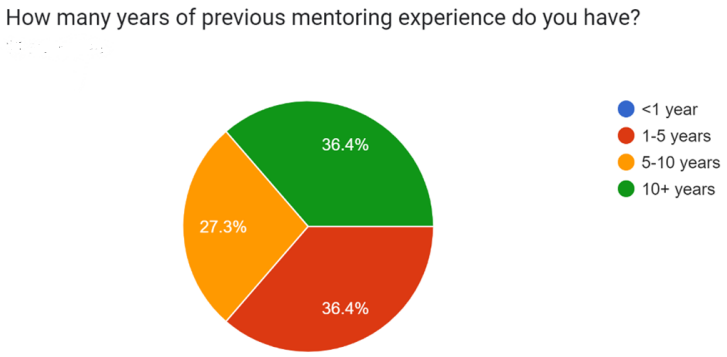
Findings

MENTORS

Mentors who participated in the program were experienced. Of the survey respondents, 63.7% had 5 to 10+ years of experience. Mentors were motivated to participate in the program as a mentor mostly by being able to work with students and offer opportunities to those often excluded from physics and science research, having a strong desire to mentor students, and supporting members of underrepresented groups in physics.

OBJECTIVE 3: WHO ARE THE MENTORS WHO ARE IN PHASE II OF THE PROGRAM?

EXPERIENCE



MOTIVATIONS

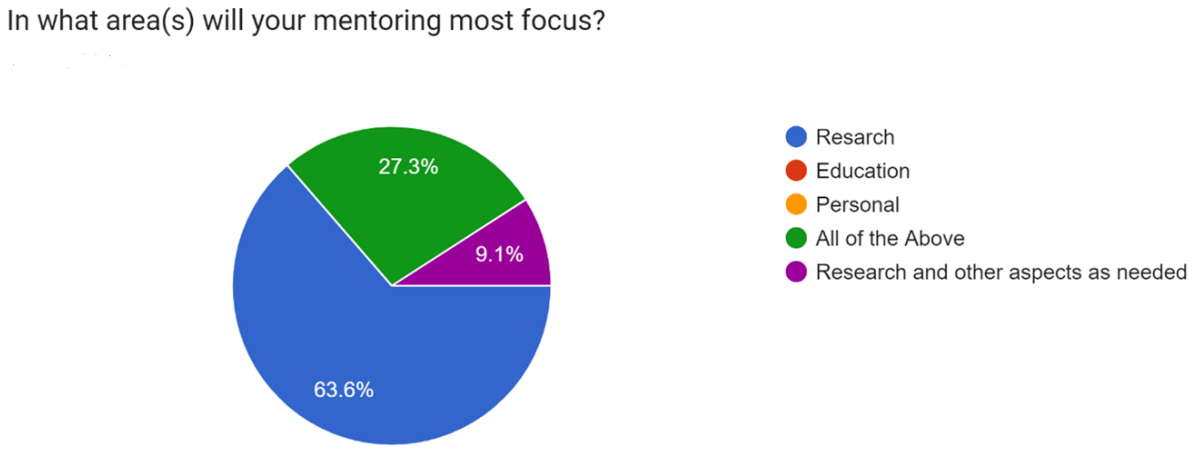
- The chance to provide research opportunities to students.
- Working with undergraduates and interested in enhancing diversity.
- Providing access to research opportunities that circumvent or rebalance the inequities of privilege.
- During my entire career I have felt a strong desire to mentor students.

Though some mentors had no expectations of the program, a number of mentors were expected to support students through undergraduate research and mentoring.

The mentors looked mostly to working with and interacting with students and giving students opportunities, interacting/meeting people involved in other programs. Their major concerns were in the area of navigating working remotely and designing appropriate research projects that are also of interests of students.

OBJECTIVE 4: WHAT ARE THE ATTITUDES, PERCEPTIONS, AND EXPECTATIONS OF MENTORS IN THE PROGRAM?

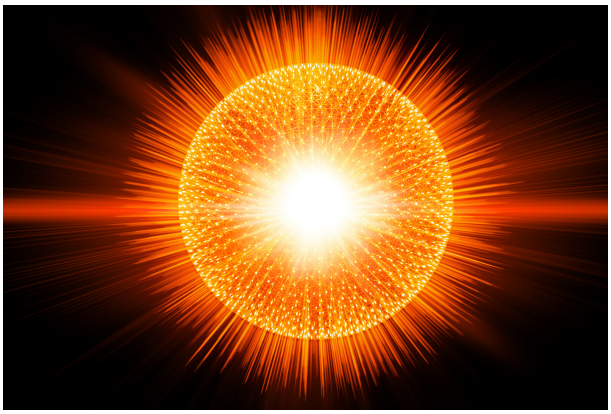
AREAS OF FOCUS



EXPECTATIONS

- Great way to connect with students
- To meet students with widely varying backgrounds, interests, and experience in research, and plan to interact with the students on an individual basis to provide them with an experience that fits their needs.
- This program to be a positive experience for the students and for me.
- To start with a small number of students that will grow over time.

End of Year 2 Findings



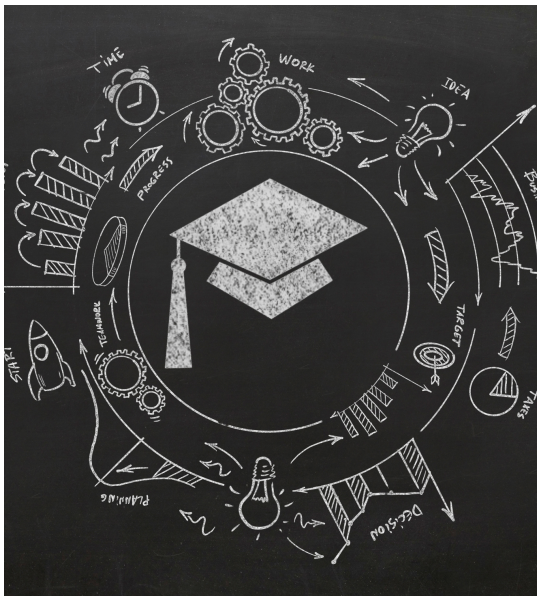
Objective 1: Overall Student Experiences

Objective 2: Student Experiences w/ Research

Objective 3: Student Supports

"[I LEARNED]HOW TO FIGHT IMPOSTOR SYNDROME AND FEEL MORE CONFIDENT OF MY ABILITIES. I INCREASED MY PHYSICS EXPERTISE AND RESEARCH EXPERIENCE. AND THE IMPORTANCE OF COLLABORATION AND THAT IT IS OK TO NOT KNOW EVERYTHING BUT TO DO YOUR BEST TO BE PREPARED/TIME MANAGEMENT...."- STUDENT PARTICIPANT

Overall, an overwhelming majority (87.5%) of students strongly agreed that the program was a positive experience. There were a few experiences that participants qualitatively reflected as negative. Participants did express a desire for more cross program collaboration and moments to meet and network with students at other institutions.



Findings

OBJECTIVE 1: OVERALL STUDENT EXPERIENCES

EXPERIENCES

Positive Experiences	Negative Experiences
Networking/Group Work	Needed more workshops on CV writing and applying to graduate school
Presenting Research/Conferences	Not enough collaboration with other students and sites
Getting New Learning	
Hands-On Experience	
Coding/Programming	

"I think this program really reaffirmed that this is what I want to do and that I want to keep doing research and being able to have access to people who are actually working professionals in the field, I think has been really beneficial."

-Student Participant

Findings

OBJECTIVE 2:STUDENT EXPERIENCES WITH RESEARCH

EXPERIENCES

Overall, students reported a general positive experience with engaging in research. Some students shared that they desired to have more hands-on research experiences as a part of the program.

STUDENT RESPONSES

Research Experiences
Presenting Research at Conferences
Great Grasp of Research
I learned about conducting research from many different angles, how to organize my code and results, how to and share communicate my results, and how to follow through with a lengthy project.
Lots of great research experience and opportunities to connect with others in the field (networking)
I learned how modern nuclear physics research is carried out

"I improved my coding skills, learned the basics of nuclear and particle physics and understood what is like to do research in a group."- Student Participant

Findings

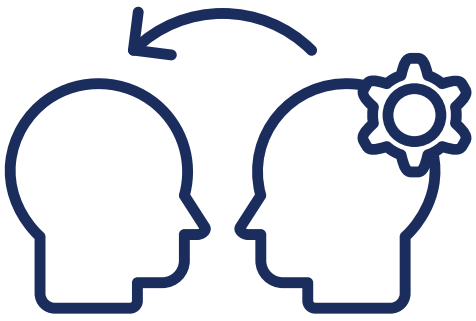
OBJECTIVE 3: STUDENT SUPPORTS

EXPERIENCES

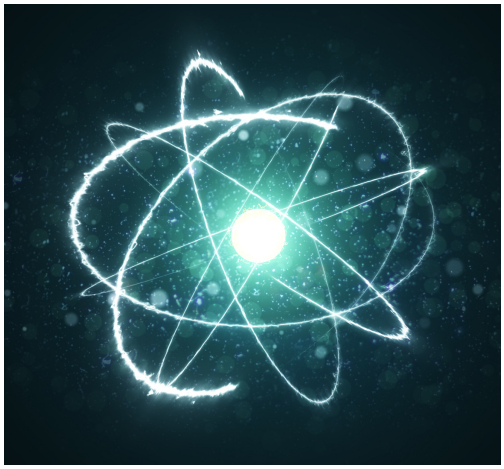
Though students acknowledged that they felt supported, they didn't easily identify the types of support provided. However, they did overwhelmingly identify their greatest support elements to be the faculty and mentors.

STUDENT RESPONSES

"Having many mentors to guide me each on different aspects of the program, my main TAMU mentor, my local mentor, and also the coordinators of the program guiding me through general problems that came up." -Student Participant



INSIGHT Phase II Graduates- Post-Survey



"I LEARNED ABOUT CONDUCTING RESEARCH FROM MANY DIFFERENT ANGLES, HOW TO ORGANIZE MY CODE AND RESULTS, HOW TO SHARE AND COMMUNICATE MY RESULTS, AND HOW TO FOLLOW THROUGH WITH A LENGTHY PROJECT...."- STUDENT PARTICIPANT

The evaluation team conducted a post-survey for program participants. The survey collected quantitative and qualitative data regarding students' attitudes, perceptions, and experiences of students exiting the program.

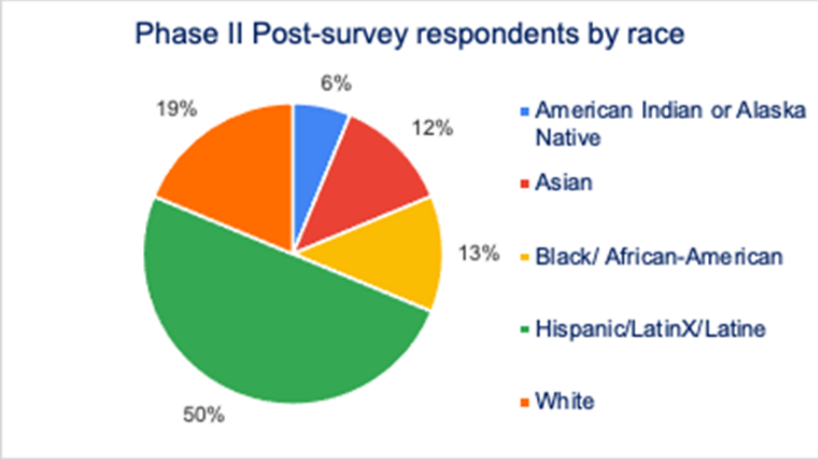
Students expressed that they ended Phase II by having a greater understanding of nuclear physics and STEM careers and research. Participants shared that participating in the program provided confidence in their understanding of nuclear physics concepts.

Insight Phase II Graduates- Post-Survey

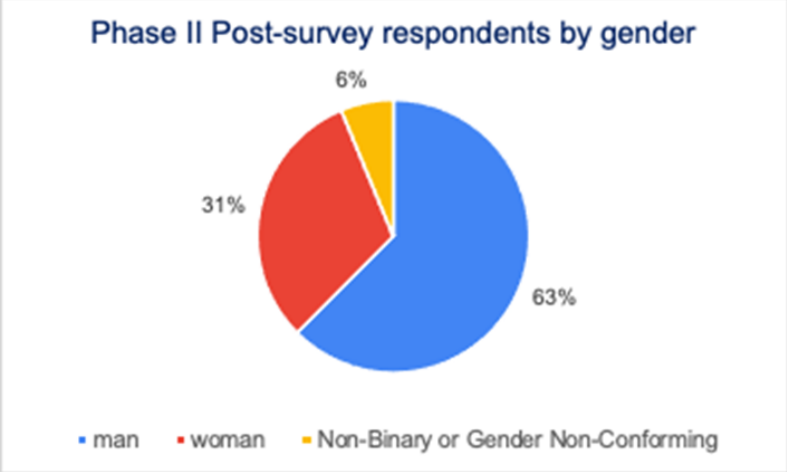
DEMOGRAPHICS

The evaluation team obtained the following information about the students who finished the program in 2023. 63% of graduates who responded are male and 31% are female: 6%-Non-Binary. 13% are Black/African-American; 50% - Hispanic/LatinX/Latine; 12% - Asian; and 6% American Indian/Alaska Native. When focusing on major of choice, 79.2% of respondents majored in physics.

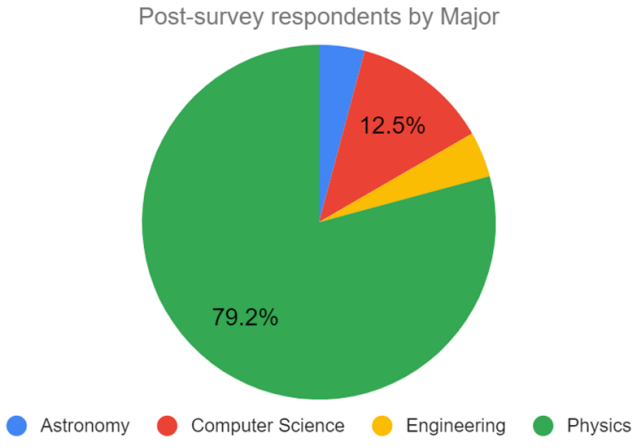
GRADUATES BY RACE



GRADUATES BY GENDER



GRADUATES BY MAJOR



Insight Phase II Graduates- Post-Survey

EXPERIENCES

Overall, students not only had mostly positive experiences in the program, of the students who graduated from their institutions after phase II, 45% have applied to and have been accepted into Ph.D. programs. Other students plan to apply to programs in the Fall of 2023 and enter the workforce. Students' responses regarding experiences in the program are reflected below.

All PROGRAM graduates stated the program met their expectations and they would recommend it to others.

All PROGRAM graduates either strongly agreed (5) or agreed(4) with the following statements:

I enjoyed my experience in this program

Strongly agreed (88%); Agreed (13%)

I am interested in pursuing a career in physics/nuclear physics

88% of respondents were interested in pursuing a career in physics/nuclear physics

I am interested in engaging in research/research projects

All respondents agreed (14%) or strongly agreed (86%)

I have experience engaging in research

Strongly agreed (94%)

Insight Phase II Graduates- Post-Survey

Expectations & Post-Graduate Plans

While participating in this program my mentor was supportive in aiding me through the process

Strongly agreed (100%)

Did the program meet your expectations?

Yes (100%)

Would you recommend this program to other students?

Yes (100%)

Graduate Programs to Which Participants Were Accepted

Texas A&M University
Michigan State University
University of Florida
Vanderbilt University
University of Wisconsin, Madison
University of Colorado, Boulder
Penn State
University of Illinois, Urbana-Champaign
University of California, Riverside
Georgia State University

Conclusion

The FRIB research team has found through their evaluation efforts that the INSIGHT program has had highly successful programs across the U.S. Each of these programs provide opportunities for mentorship and research experience to marginalized/minoritized groups. Every program was unique and had unique needs due to context and each contributed to the health of the science community.

When it comes to student feedback students were excited about research in nuclear physics and real-life projects. The program increased students' confidence in physics and problem-solving, a thirst for knowledge about what other options and opportunities exist in the area of experiential learning, Students also experienced improvement in networks (education, professional), and improved communication and presentation skills.

Conclusion

Major lessons learned during the 2 years was that getting these programs running is not an easy start. Likewise, refining these programs are involves constant adaptation and evolution. Moving forward programs should focus on providing in-person meetings for participants, facilitating networking between programs, specifically mentors, and ensure students receive clear communication and robust administrative support.

We appreciate the support of the U.S. Department of Energy and Michigan State University in our evaluation efforts. The team looks forward to learning more and reporting the impact of the overall program, the implementation process of programs, the quality of partnership development and engagement, and a nuanced understanding of how program elements impact students and ultimately their decision(s) regarding their participation in the nuclear physicist pipeline.

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