

The TIMESTEP Research Apprenticeship Program

Research Workforce Training for Sophomores Majoring in Physics and Astronomy at UofA

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The TIMESTEP Research Apprenticeship program centers student retention and career advancement, designed to support sophomores majoring in Astronomy and Physics to enter the research workforce and continue in their major. The program focuses on early intervention, targeting rising sophomores with *no* prior research experiences, requiring a minimal GPA and offering students paid positions. The program builds student belonging and confidence by pairing each student with a near-peer graduate student mentor and offering weekly research readiness workshops that ensure all students have the skills they need to succeed.

2025-2026 Program Demographics

Since 2022, the Apprenticeship Program has supported 45 Astronomy and Physics sophomores to participate in paid research positions. 15 students were funded to participate in Fall 2025.



2025-2026 Research Apprenticeship Cohort

Apprentice Demographics (15 total)

47% Asian/Black/Hispanic

47% Female

20% PELL Recipient

27% Eligible for Federal Work Study

Graduate Student Mentors (4 total)

Four graduate students were paired with 3-4 apprenticeship students. The Graduate students serve as near-peer mentors, ensuring students are making progress through weekly mentoring meetings and running skills workshops.



TIMESTEP Graduate Students: Noah Franz, Vikram Manikantan, Eden McEwen & Meredith Stone

Research Faculty Supporting Students (11 total)

Computing/Theoretical Research

Dr. Zarah Brown (LPL)

Dr. Carl Fields (Astronomy)

Dr. Tim Eifler (Astronomy)

Dr. Eduardo Rozo (Physics)

Hardware/Instrumentation

Dr. Haeun Chung (Astronomy)

Dr. Ewan Douglas (Astronomy)

Dr. Dan Marrone (Astronomy)

Observational Astronomy

Dr. Kate Alexander (Astronomy)

Dr. Dennis Zaritsky (Astronomy)

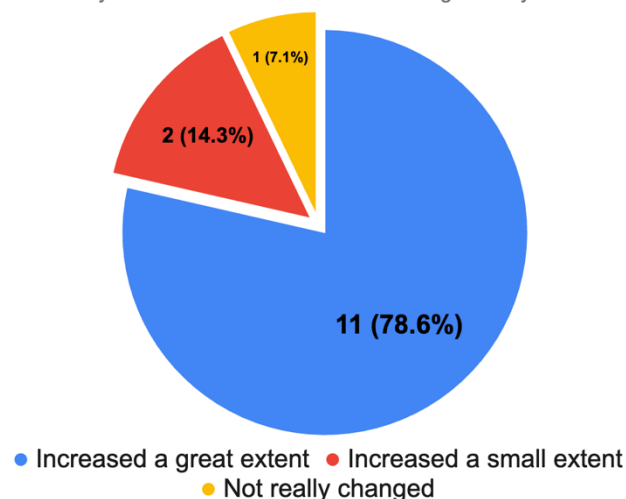
Dr. Virginie Faramaz (Astronomy)

Dr. Ann Zabludoff (Astronomy)

Goal 1: To help students succeed in their major and graduate by building student confidence and a sense of belonging

The TIMESTEP Apprenticeship engages students early in their academic careers, reaching them within their first two years of their degrees with the aim of increasing retention of students with limited prior research experience opportunities. Students are mentored by an external graduate student and trained through weekly technical workshops with a peer group to boost their confidence in their abilities to succeed.

How has your confidence to do research changed this year?



- 100% of the 2025-2026 cohort reported that the Apprenticeship **motivated them to continue their undergraduate degree at UA**, with 67% reporting that the program *significantly* impacted their motivation.
- 93% of the 2025-2026 cohort report **feeling more confident in their ability to conduct research**.
- 73% of the 2025-2026 cohort **report stronger performance in classes**.
- Apprenticeship students have high graduation rates: **88% of all apprenticeship students from 2022-2023 and 2023-2024 cohorts have graduated** (15/17, where the last two are planning to graduate in May 2027).

"For me this program solidified my choice of major. At first I wasn't for certain astronomy research was for me as I have never done it, but now that I have an idea of the inner-workings I have a newfound appreciation for astronomy and the people doing it." – 2025-2026 Apprentice

"The skills I've learned through the workshops have assisted me in my coursework. Learning about skills with coding as a whole has helped me become more confident in the more demanding tasks my coursework requires to complete." – 2025-2026 Apprentice

Many students reported feeling more confident in their abilities to succeed in their major because TIMESTEP instilled **a sense of belonging and offered emotional support**, citing TIMESTEP's unique near-peer grad student mentorship model and peer-cohort weekly meetings.

"Sometimes, during class I feel as though I am not intelligent enough to succeed in this degree. But seeing people who have also struggled succeed in research careers helps me regain my determination to keep trying." – 2025-2026 Apprentice

"The impact of feeling more confident in research and astronomy as a whole is very valuable. I feel like I belong which motivates my performance in class." – 2025-2026 Apprentice

"I feel a far greater sense of community within my career." – 2025-2026 Apprentice

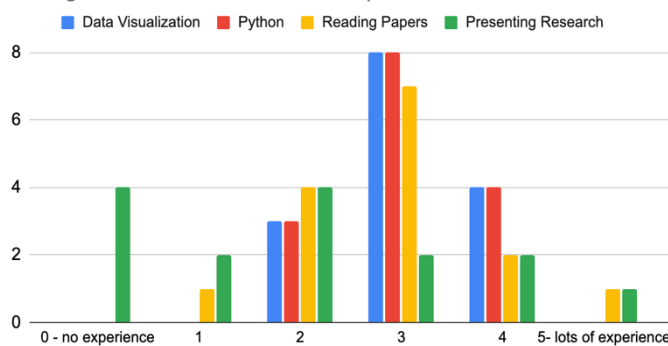
Goal 2: To prepare students to succeed in research and industry, through skill building and improved oral communication.

Students spend two semesters working with a faculty mentor and graduate students in a UA Astronomy, Physics or Planetary Science research lab, gaining hands-on experiences in instrumentation and computing.

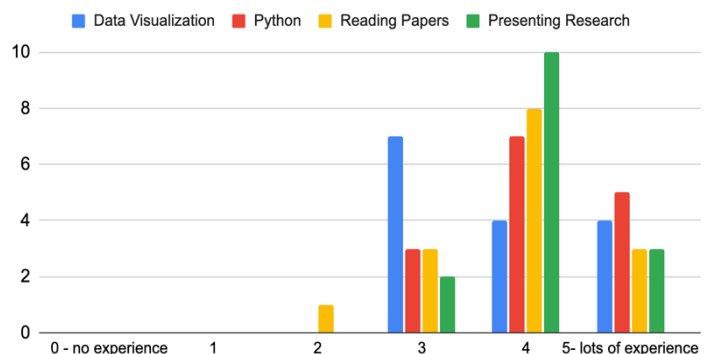
In addition, the TIMESTEP Apprenticeship offers weekly workshops that trains all students with a set of CORE Skills and a set of ADDITIONAL Skills that are dependent on the project (see table below). These skills are not embedded within the standard Physics/Astronomy curriculum. TIMESTEP Workshops now being adopted into a new research methods class, ASTR 276A, that will be offered in Fall 2026, administered by the program PI.

CORE Skills (completed by all apprentices)	ADDITIONAL Skills (project-dependent)
Reading scientific papers	Networking (SSH)
Literature review	Computer vision (image processing-eg)
Linux Command Line	Databases, SQL
Python	Drafting (r/t Solidworks, CAD)
Version control-Git, GitHub, Git Client	Soldering
Overleaf- LaTeX	3D printing
Debugging	Circuit design
Visualizing data (Matplotlib)	Bayesian inference
Presenting Scientific Results	Machine learning (e.g. PyTorch)
Basic optics	Microwave electronics and RF testing
	Digital signal processing

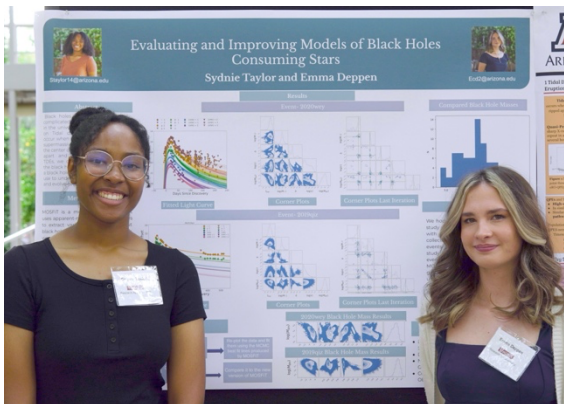
Pre-Program Assessment of Student Experience Level In Core Skills



Post-Program Assessment of Experience Level in Core Skills



Students self-reported substantial increases in their experience in research skills, such as: reading scientific papers, presenting their research, using Python, and visualizing data (see graphs above for pre-program and post-program results).

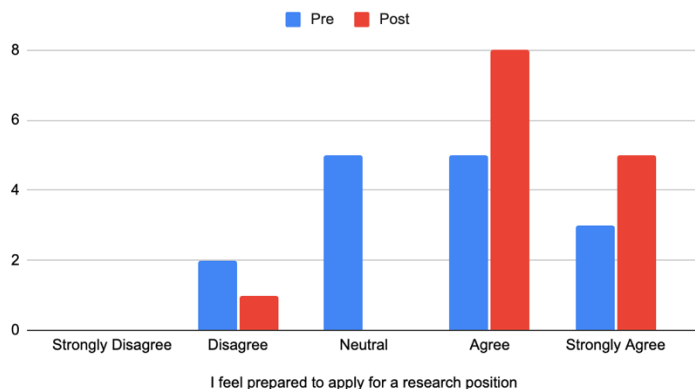


Students were trained by the graduate student mentors to create posters and present their findings through TIMESTEP workshops. Students presented posters about their final project results on April 27th at the annual TIMESTEP Apprentice Research Symposium (image, left).

"I gained experience presenting my work to people who possess varying levels of expertise. Tailoring the same poster presentation to both professors and other undergraduates as people walked by taught me a lot about how to communicate research effectively." – 2025-2026 Apprentice

Goal 3: For students to land a research or industry position post-Apprenticeship

I feel prepared to apply for a research position



After completion of the 2025-2026 Apprenticeship, students self-reported significant increases in their feelings of being prepared for research positions versus before the program (see graph).

Student career outcomes are strong: 11 out of 15 apprenticeship students secured research positions or industry internships for Summer 2026. 7 of those students are continuing to work with their TIMESTEP faculty mentor. A further 2 students will be working at Flandrau as a STEM Camp counselor.

Overall Program Outcomes:

- 82% of all apprentices since 2022 (45 students) obtained a **research position or industry internship** in the summer after the apprenticeship (42% in research and 40% in industry).
- 64% of all apprentices since 2022 (45 students) obtained **competitive national research fellowships or industry internships** in the summer after completion of the apprenticeship, including NSF REU placements.

"I got my JPL summer internship and my academic year project through connections I made during my TIMESTEP Apprenticeship." – 2024-2025 Apprentice, reporting in 2026

2026-2027 Outlook

The 2026-2027 cohort will be the largest to date, with 23 students selected to participate and matched with UA faculty in Astronomy, Physics and Planetary Science.

In addition, TIMESTEP staff and faculty are launching a new course, ASTR 276A, designed to support all sophomores majoring in astronomy to learn core skills in both the professional practice of research and also the foundational technical skills needed to pursue computational and hardware research.

Program Sponsorship



11 Faculty Research Groups Participated in the 2025-2026 program

The program lowers the barrier for faculty to support : early onboarding with mentorship. Goal to support faculty (how to get students early on. To engage with faculty in research).

Faculty are not prepared to take on students with no experience and

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