

Expanding STEM Opportunities for Rural High School Students Through Mentored Discovery Science Experiences

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Aspirnaut's Summer 2023 Cohort and Staff



Issue



Consistently high-poverty counties in America are disproportionately rural, with 1 in 4 rural children living in poverty. One possible pathway out of poverty for rural students is the pursuit of science, technology, engineering, and math (STEM) careers, as the mean annual salary for science and engineering occupations in 2019 was more than twice that of all other jobs.

However, many rural students lose motivation to pursue STEM careers: the lack of opportunities to learn in STEM fuels the development of a rural-suburban gap in career aspirations. Interestingly, this gap grows throughout high school, but does not exist prior. Therefore, grades 9–12 are ideal for implementing interventions that empower students to pursue STEM.

A diverse workforce with expertise in STEM is imperative to drive innovations in solving complex societal and medical problems. Therefore, there is a critical need for novel approaches that increase the recruitment of high school students from rural and diverse backgrounds into STEM fields. However, few STEM enrichment programs expressly target rural students, making Aspirnaut a unique organization within the STEM outreach field.

Organization



For 15 years, Aspirnaut has brought diverse high school students from all over the nation to Vanderbilt's campus to experience discovery science firsthand.

Aspirnaut's 6-week summer program has now served 334 students, of which 88% pursue STEM in college and 69% enter the STEM workforce/pursue advanced STEM degrees. The program also emphasizes professional development, college preparation, and holistic wellness, equipping students for success in college and beyond.

Breakdown of Aspirnaut's Past High School Cohorts



This year, Aspirnaut is also piloting a Research Experience in Chemical Biology (ARECB) at Wynne High School in rural Arkansas. By bringing cutting-edge research equipment and instruction directly to students, ARECB will eliminate barriers to participation in science. After a three-year pilot, ARECB is projected to develop into a scalable model for future rural outreach.

Project Overview



I split my time evenly between working with high schoolers in Asprnaut's residential summer program while also planning the ARECB pilot at Wynne High School. My outputs, roles, and responsibilities were as follows:

Summer Program

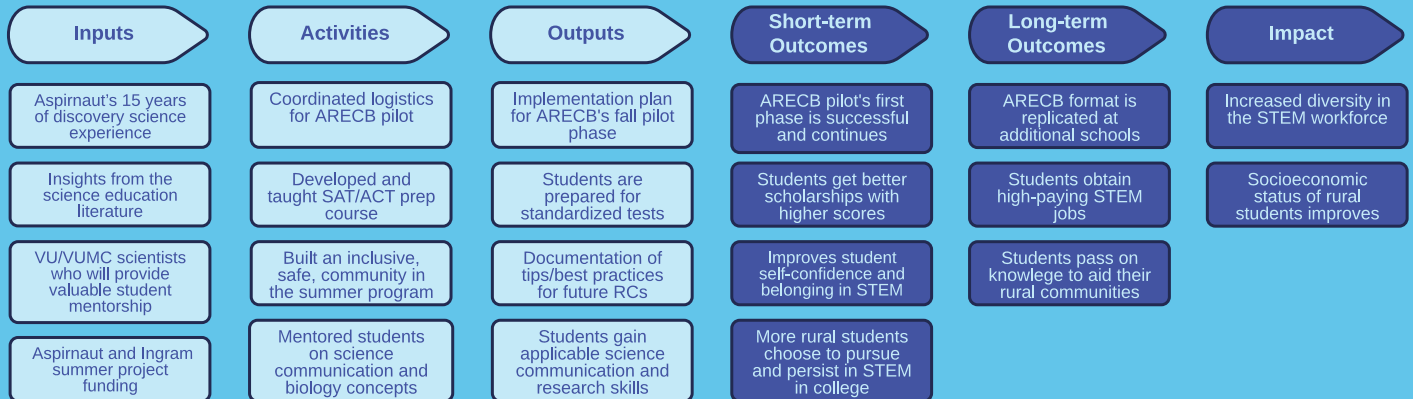
- Served as a **Residential Counselor**, responsible for coordinating daily logistics for the high school program and building an inclusive community through events and excursions
- Updated the **Residential Counselor Handbook** by documenting seven pages of recommended policies and tips for future counselors
- Served as a **science communication consultant**, improving students' self-confidence in their abilities by helping them revise and prepare for their oral and poster presentations
- Developed and taught an **SAT/ACT prep course**, with the goal of improving student scores to help them obtain better financial aid/scholarships
- Wrote and implemented an **Impact survey** that assessed changes in students' self-confidence in their science skills and scientific belonging/identity

ARECB

- Designed the state-of-the-art **Asprnaut Chemical Biology Research Lab**, which is being built at a temporary campus in the wake of the tornado that devastated Wynne High School
- Interfaced with Asprnaut staff and school district administrators to **coordinate visions and initial logistics** for program implementation
- Constructed a **schedule and implementation plan** for the fall semester that exposes students to a wide range of biology and chemistry content while focusing on teaching laboratory techniques
- Developed **templates for the lab and lecture materials** that will be used to fill out the curriculum for the fall semester
- Detailed ARECB's **innovative pedagogical approach** in a **whitepaper** that has been sent to Arkansas government officials and potential donors

Logic Model

Assumptions: Students will be motivated by participating in science with relevance and real impacts. Lack of access to hands-on STEM opportunities is decreasing rural students' motivation to pursue STEM. Pursuing STEM helps low-income students obtain high-paying jobs to improve their socioeconomic status.



Impact



My self-efficacy and identity surveys told a clear story: **high school Asprnauts came in with an existing desire to pursue science-related careers and left with increased self-confidence about their scientific ability and sense of belonging within the scientific community.** These metrics should be associated with **increased persistence in STEM fields.** Based on student feedback, I believe the inclusive, supportive community built by the resident counselors positively influenced these results.

While ARECB is yet to begin, having an **implementation plan** in place is setting us up for success this fall. Rather than hindering our efforts, rebuilding from the tornado allowed us to develop an **innovative lab space** that will support a multi-year discovery science experience.

