Extending the Invitation

Supporting learners from gateway experiences through participating in astronomical research

Wendi B. Laurence, John C. Gibbs, Robert J. Marshall, Michael A. Murphy, Laura A. Orr, Luisa M. Rebull, Christi J. Whitworth

[1]*Portland State University (Portland, OR),* [2]*Glencoe High School (Hillsboro, OR),* [3]*Carnegie Science Center (Pittsburgh, PA),* [4]*Ravenscroft School (Raleigh, NC),* [5]*Ukiah High School (Ukiah, OR),* [6]*Caltech (Pasadena, CA)* [7]*Pisgah Astronomical Research Institute (Rosman, NC)*

Challenge

What critical junctures would we encounter and what supports would enable learning as educators and students tackled astronomical research for the first time?

See our companion science poster 345.15 Gibbs et al.: WISE Identified Young Stellar Objects In BRC 38.

Context

NITARP provides a forum in which educators conduct authentic astronomical research with guidance from practicing astrophysicists within an interactive professional learning community. As educators learn to conduct astronomical research, they are simultaneously creating educational outreach programs that connect other educators and secondary students to the research process. This means that, at any given time, participants may be learning astronomical content knowledge, field-specific research methodology, computer programs or devising teaching curricula and methods to extend the research experience to others.

Methodology

This was not a formal education research project, but rather is comprised of our reflections and students' comments submitted to NITARP. To support future groups, we directed our reflection to look for the new skills that were needed and the critical junctures (Laurence et al. 2007) where learning might be thwarted. Next, we discussed what supports were successful in bridging these critical junctures. We initially identified three critical junctures: visualization, grappling with software, and team research and engagement practices. In the students' comments to NITARP, we noted another category emerge: creating a new picture of science. Below, we have listed each of the critical junctures, a short definition and examples of comments and supports that help continue the learning process.

Team Research and Engagement Practices

Teamwork skills and norms that allow for the conversations that explore data that does not come with THE answer.

"I was surprised that there were no clean, concrete examples. A lot of the time we had to look at information and make decisions and assumptions based on the data and our previous knowledge. No one was going to tell us that a star we were looking at was definitely a YSO." (Student)

Overheard:
"Did you get your issue sorted out?" "Which issue?"
"But your SED does not look like mine…"

Grappling with Software

Varied skill levels, multiple programs, platforms, versions and trouble-shooting experience.

[As a group, it helped if we had the] "Ability to have help come from many people – student to student, student to adults, etc." (Educator)

New Picture of Scientific Research

NITARP helped students see science research differently.

"..the astronomy shows I love to watch are way, way, way simplified." (Student)

"I figured out it is a competitive field, it really is fun, it is very different than the science we do in school (in a good way)." (student)

Visualization Skills

Constructing a visualization of the objects in question based on multiple sets and types of data.

[It helped when we] "Create[d] photometric tiles…of each wavelength for side-by-side comparison with [the] SED." (Educator)

"We made data cards that held images, SEDs, CCDs, literature quotes and placed them on tables to "see" the object in multiple ways." (Educator)

Understanding increased with …"Guidance…and explanations of reasons for each type of data" (Educator)

We gratefully acknowledge funding via NASA Astrophysics Data Program funds and NASA/IPAC Archive Outreach funds.