



The Effect of an Authentic Science Research Experience on Teachers and Students through NITARP



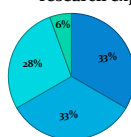
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As part of the NASA/IPAC Teacher Archive Research Project program (NITARP), four high school teachers participated with selected students in a research project using archival Spitzer data to search for young stellar objects in two bright-rimmed clouds: BRC 27 and BRC 34. Our scientific research findings are presented in another poster, 337.05, Johnson et al. A key initiative in science education is integrating authentic scientific research into the curriculum. Since NITARP funds a limited number of teachers and students, our group investigated the role of team leaders (both teachers and students) in educating and inspiring other teachers and students. This project allows our students to assume an active role in the process of project development, teamwork, data collection and analysis, interpretation of results, and formal scientific presentations. This poster presents our observations on methods used by student team leaders in disseminating the information to other students within the school, as well as to other local schools and interest groups. Since three of the four teachers on our team are female, we have also looked at how these teachers inspire young women to participate in this program and to pursue STEM (Science, Technology, Engineering, and Math) careers. This opportunity was made possible through the NITARP program and was funded by NASA Astrophysics Data Program and Archive Outreach funds.

What was the best part of the NITARP research experience?



- Data analysis and working with new computer software
- Collaboration with Astronomy professionals and other students
- Engaging in authentic scientific research
- Learning about Astronomy



Infrared versus visible light at the Jet Propulsion Laboratory

Observations

- A typical high school science laboratory experience is comprised of activities where students verify known concepts. Experiments are done in a “sterile” environment and are designed so that students work toward the “correct” answer. NITARP teachers and students do **authentic research** that does not have previously known results. Students learn that data are not “clean” or perfect and that research requires much reevaluation and many techniques to extract what the data are telling us.
- All students felt that the teachers were **patient and knowledgeable** about Astronomy. Students believed that the teachers worked hard to **train and guide** them.
- All students enjoyed the opportunity to work **alongside** their teachers. Students felt that teachers **respected** them and added to the **authenticity** of the project.
- While students appreciated working with authentic scientific data, they felt **frustrated** with **mistakes** and **recalculations** of data. Nevertheless, students were excited about increasing the scientific **knowledge** of the YSOs in BRC 27 and BRC 34.
- All students felt that interaction between groups could be improved and would like to see an increased use of **social networks** in **communicating** between the groups.

“I love real science. I think it’s better when you don’t know the answer; thus, you double check for human error constantly...However, in a high school science classroom everyone will reach the same conclusion because there is only one answer.” ---A. Rameswaram



Team Minnesota

“Each student brought a unique array of skills and knowledge; this allowed us to band together and to teach each other along the way. Without interacting with the other teams, I think the project would have been much more difficult.”
---K. Badura



Team Florida



Team Florida

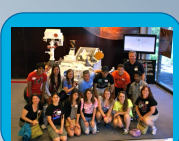


Summer visit to Spitzer Science Center

“I think the best part of the project was probably the atmosphere of it. Not only were we studying at Caltech, a place filled with so much intellectual curiosity and openness that it’s nearly palpable, but the warmth of the shared camaraderie between the teams made the experience so much better.”
---M. Nishida



Team Illinois



Team Oregon



“The female mentors definitely inspired me to pursue a science major in college. I was inspired not only by the knowledge and wisdom of the female mentors, but also by the dedication they brought to their field and the passion they had for teaching high school students about their profession. I am now planning on pursuing a career in Aerospace Engineering with a minor in Astronomy.”
---T. McCanna

As team leaders, how did the summer training prepare you to disseminate the scientific research to your team?

- Helped Team Leaders to gain a deeper understanding of the material and the confidence to train new students in the project.
- Developed a bond between the other teams



“My hope is to continue training students and explore additional targets in the universe. It’s an exciting prospect that will power our Astronomy team for years to come.” ---D. Sartore

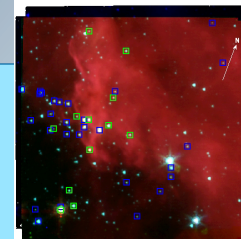
Eighteen students participated in the NITARP research experience. Five of the students were male and thirteen students were female. Ten students were able to start their research experience with a summer visit to Caltech/Spitzer Science Center for training. The remaining eight students were trained by the team leaders as well as the teachers involved in the project. Data were collected from a survey about their experiences.

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

How did working with female mentors affect your experience in the NITARP research project?



- Enriching experience to work with women who are dedicated to the field of science. Encouraged or reaffirmed a commitment to a STEM career.
- Felt very comfortable working with the female students and female mentor teachers. Allowed students to really focus and collaborate on the project without prejudice.
- Not interested in pursuing a career in science.



BRC 27

For our research findings, please see the companion poster 337.05, “Spitzer-Selected Young Stellar Objects in Two Bright Rimmed Clouds” by Johnson et al.