Exploring NITARP’s Impacts on Teacher’s Knowledge, Attitudes, and Teaching

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This qualitative study describes how the NASA/IPAC Teacher Archive Research Program (NITARP) changed teachers’ thoughts about astronomy and what happened in their classrooms. Teachers reported increasing astronomy content knowledge, incorporating the use of real data, and implementing new skills, programs, and research into their curriculum. They also felt more confident in teaching how science is done. The results of this exploratory study showing positive impacts motivate us to more deeply study the underlying mechanisms in this and similar programs best poised to improve science education. Direct quotes from participants will be used as evidence to these findings.

### Results

#### How did teachers’ attitudes toward science and scientific inquiry change after participating in NITARP?

- **New discoveries/Changes in science**
  - Teachers often do not have the time to stay current with scientific discoveries.
  - “Certainly the different language that is spoken by scientists versus educators and learning to get more familiar with the scientific lingo and language was huge. That’s something that happens by being together in a room and talking about stuff. As a teacher, being able to translate too. Translate what the scientist is saying to my students” (Participant 5).

- **Astronomy Research Process**
  - “I came from industry and then I started teaching. And this whole idea that there’s a scientific method, I had never even heard of until I started teaching. And it’s like, the what? There’s steps to the scientific method? … It [NITARP] gave me more confidence from someone outside the teaching field coming into teaching. … I need to get these kids to think and think logically and that’s how you do science” (Participant 3).

- **Remote collaboration/Simulation of how scientists work**
  - “Having my students work in cooperative groups/research teams has added greatly to their research experiences. This modeling of how “real scientists” work has turned out to be quite successful” (Participant 3).

- **Conclusion**
  - Teachers realized scientists do not work alone; they collaborate, often remotely. The teachers modeled science as a collaborative effort with their students.

#### How are teachers’ classrooms different because of NITARP?

- **Incorporate more real data**
  - Traditional labs often have students verifying a known law.

- **The scientific research process**
  - Because of NITARP, teachers felt they were better able to explain the scientific research process. Often, the scientific method is taught as a series of linear steps as opposed to how the scientific research may not be linear and is often an iterative process.

- **Students’ Use of Archival Data**
  - Students can access research-quality data.

- **Conduct a research project**
  - Teachers are conducting independent research projects with their students.

- **Conclusion**
  - Teachers and students present their results at the AAS.

- **Exploring NITARP’s Impacts on Teachers in new ways**
  - Teachers navigate their 1st AAS conference.

- **Implement New (or more) Technology**
  - Teachers learned new skills and programs that were then implemented in their classroom.

- **Conclusion**
  - Teachers and students present their results at the AAS.

### Conclusions

- Teachers changed their classrooms in some way because of NITARP. Examples of this change include incorporating real data into labs and inquiry-based activities, integrated computer programs into curriculum, instructing students on how to access archival data, and involving students in research projects.

- Because of NITARP, teachers changed how they taught the scientific process. They no longer taught it as the scientific method with a series of linear steps. It is a method with its own “language,” it is often not linear, it may be an iterative process, and unexpected data may arise.

- Teachers realized scientists do not work alone; they collaborate, often remotely. The teachers modeled science as a collaborative effort with their students.

- To speak the language of science and to keep current with research, teachers must be immersed in the culture of science.

### References

- Link to NITARP: [http://nitarp.ipac.caltech.edu/](http://nitarp.ipac.caltech.edu/)

### Implications

This preliminary study suggests that there is a correlation between the years involved with NITARP and level of research teachers involve their students in. This suggests that if teachers are to continue to do research with their students, more experience is necessary than the first year. A mentorship program past the first year of NITARP may help teachers make that transition.