NITARP: Impact Assessment, 2005-2013

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Background: NITARP, the NASA/IPAC Teacher Archive Research Program, gets teachers involved in authentic astronomical research. We partner small groups of educators with a mentor professional astronomer for a year-long original research project. The teams echo the entire research process, from writing a proposal, to doing the research, to presenting the results at an AAS meeting. This program differs from other programs that we know of that get real astronomy data into the classroom in that: (a) Each team works on an original, unique project. There are no canned labs here! (b) Each team presents their results in posters at the AAS, in science sessions (not just education sessions). The posters are distributed throughout the meeting, in amongst other researchers' work; the participants are not "given a free pass" because they are educators and students. (c) The 'product' is the scientific result, not a curriculum packet. (d) Because the teachers work with students throughout this project, the teachers have already begun to adapt their project to fit in their classroom environment. **Here, we describe highlights of an impact assessment survey conducted of NITARP alumni in June 2013.**

BY THE NUMBERS…Since 2005, we have had 38 science posters (+5 this AAS), 40 education posters (+6 this AAS), and 7 refereed astronomy journal articles come out of NITARP work. 80 teachers have participated (+7 for 2014 class), from 33 (+1) states. ~200 different students (gr 7-13) have travelled to AAS and/or Caltech.

← The NITARP delegation to the 2013 winter AAS meeting in Long Beach, CA – consists of the 2012 class finishing up (teachers +students) and the 2013 class starting up (teachers).

- **OUR GOAL** is to give teachers an *authentic research experience such that they understand more about how science really works*.
- **WE SELECT** teachers from a national competitive application process. For 2012, 4 times as many people applied as we had advertised spots; in 2013, we were 5 times oversubscribed, and in 2014, 4.5 times oversubscribed.
- **Ideal applicants** are already familiar with the basics of astronomy (e.g., what is a magnitude) and quantitative measures of astronomical data (e.g., what is a FITS file), but have not yet done research. Most of our educators are high school teachers, but also 8th grade, community college, & informal educators participate.
- No school would hire a football coach who had never played the game, and yet most science teachers have never done real scientific research.

We work with **teachers** specifically because of the leveraging and impact possible through them to their students and communities.

IMPACT SNAPSHOT : Based on a survey conducted in 2013 of 40 alumni spanning 2005-2013 …:

- ~360 student trips.
- 1500 students at home who didn't travel but worked on aspects of the project (avg ~20 per educator).
- ~7300 students worked with on smaller aspects of the project (avg ~100 per educator).
- ~13,000 students benefited from skills/resources the educator learned about via NITARP (avg ~183 per teacher).
- ~21,000 students taught by NITARP educators PER YEAR. (Research in other fields suggests that simply being taught by a science teacher who has done real research makes an impact on the students' learning; Silverstein et al. 2009, Science, 326, 440.)
- ~4300 other educators reached with NITARP information, everything from "scientists are normal" through working with them on data (avg ~60 per teacher).
- Countless presentations given, articles written up in these teachers' communities, informing the general public about NASA, astronomy, science.
- Schools with NITARP teachers are 70% public/30% private.
- Schools with NITARP teachers have between 0-65% of students on free/reduced lunch → we are not just reaching elite students.
- Our educators often move up and out of the classroom into positions affecting science education at a district, region, state, or national level.

What our participants are saying…

Communities beyond the classroom

Most of my students are from families that have little or no education - many of the parents of my students are illiterate and don't speak English. **The NITARP program [..] introduced my students, and then their families, to the possibility that real science is within the reach of the students**. Since half my students are female, and over 60% are Hispanic, many Latinas were introduced to these possibilities for the first time.

My NITARP experience is giving me opportunities to teach/engage with students/parents/community members in ways that I would not be able to otherwise. This program also is reaching FAR beyond the current students that teach. I have community members, students of all ages, international students, and people from neighboring communities asking about the program, the work we are doing, and commenting on how great it is. This type of program matters - and is needed, respected, and important to all communities - but critical to rural students and teachers.

More & better science in the classroom

As a result of NITARP, **I am a better teacher**.

The junior/senior astronomy class has grown from 20 students eight years ago to 118 students this year. This is due in part to the impact of the NITARP experience.

[Because of NITARP,] I now design lessons with the goal of **getting students to do more of their own searching** for answers, instead of being "handed" that information by teachers in lecture or power point presentations. It is so much more exciting.

My NITARP experience made my science department realize that **we need to bring the use of real data into our curriculum**. […] Having worked with NITARP doing archival research, I am now working with my dept. chair to bring a research component into all our science classes. The experience that I had with NITARP was so inspiring that I am more than willing to donate my time for this.

As a result of this program, I am inspired to include real data in my astronomy course.[..] My focus on incorporating real science into my classroom has inspired other teachers in my department to do the same, and generally **improved the level of science teaching at my school**.

As a result of this program...my life has been altered forever. **I will never be the same educator I was before.**

Reaching even farther out

The impact of NITARP and all my NSF training has been phenomenal. It doesn't always translate to numbers, though. […] For example, **I'm now a Science Instructional Coach** who works mainly with teachers and [from the district level] I'm able to impart accurate information about what scientists really do to middle school science teachers who don't really know what that is. I'm able to help them design lessons and science fair projects that allow students to experience authentic research activities. [...]

We seem to be doing something right!

The NITARP program **ranks at the top** of the dozens of professional development programs in which I have participated.

[student:] I cannot put into words how amazing and priceless the experience was.

It has been the **most rewarding experience** of my teaching career.

This program has opened many doors for all of us. It has been the **greatest experience** in my life and my students' lives.

NITARP has easily been the **best professional development program** I in which I have participated. It provides an excellent connection between authentic research and many of the topics that we study in class.

You and this program (NITARP) have been truly remarkable and has already **changed my life forever**. I'm just waiting to see what happens next.

NITARP is incredible in the way that immerses teachers and students in a research project using real data - one that has never been done before. To have the chance to do research with NASA scientists, to attend AAS conventions, and to present the findings of the group to others was truly phenomenal - **the best professional development I've ever done**. Beyond comparison, really. And the **impact that it will have as I teach for the next 20 or 30 years could also be phenomenal**.

I just wanted to let you know that this 38 year veteran teacher believes [NITARP] is one of the **greatest types of professional development I have ever done.**

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