The NASA/IPAC Teacher Archive Research Program (NITARP): Lessons Learned

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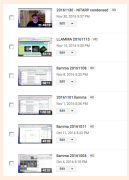
Abstract: NITARP, the NASA/IPAC Teacher Archive Research Program, gets teachers involved in authentic astronomical research. We partner small groups of educators with a professional astronomer mentor for a year-long original research project. The teams echo the entire research process, from writing a proposal, to doing the research, to presenting the results at an American Astronomical Society (AAS) meeting. The program runs from January through January, and involves 3 trips (AAS, summer research, AAS). Applications are available annually in May and are due in September. The educators' experiences color their teaching for years to come, influencing hundreds of students per teacher. In support of other teams planning programs similar to NITARP, in this poster we present our **top lessons learned from running NITARP for more than 10 years.** Support is provided for NITARP by the NASA ADP program.

Lesson #1: Finding the right scientists. Scientists need to *see the partnership as a partnership of equals*. They need to be patient; teachers are skilled, but have different skill sets than an undergraduate. Project must get a presentable result, in time, without programming.

Lesson : Finding the right educators. (~4 times oversub!) Savvy educators, already using data with students. (Inquiry labs, techniques.) ~~Savvy astronomers, but no research experience. Able to handle **lots** of email. Fluctuating time commitment, over 13+ months, for free.

Lesson : Mentor educators. Every team has one teacher who has been through NITARP before. Helps with translating scientist to teachers (and vice versa). Helps with logistics. Helps run meetings. Supports scientist in leading.

Lesson : Working across time zones. Teachers do not often work in real time across time zones. Many services are blocked by schools; we have a wiki. School email breaks a LOT! Regular telecons *essential*. Else, team dysfunctional.



Lesson : Telecon attendance. Telecons need to be a "safe space" for "dumb" questions; some teachers not comfortable with students on the call. Weekly telecons recorded; teachers can share them/parts with their students.

Lesson : Travel logistics. Teachers do not often travel for business, let alone on federal funds. For 2 trips, they they are invited to bring along minors, to whom they are biologically unrelated. Government travel rules require some outlay of cash; we can't pay for everything directly, and it must be reimbursed → stress on teachers. (Each school has different chaperone rules; we let the educators work that out.)

Lesson : Team chemistry. Paper applications only until 2016; now interviews. (G+: requires s/w installation!) Assemble sensible teams from the start (geographically, school size/resources, roles in schools). No work online until have met in person at first AAS; much team bonding then. Summer visit – super intense. **None of them have ever had a "research trip" like this**. "You are here to work." Kids freaked out by having to work for 8 hours. Teachers can be under stress because learning side-by-side with students. *If the team breaks, it breaks at that summer visit*. Most people do well. Non-HS educators do best on teams with other similar educators. If someone isn't pulling their weight, the team will wait for him/her .. But only for a while. **Reintegration is impossible after trust is broken**. Outright communication failures hurt, but using such failures as an excuse not ok. Feeling stupid is ok and part of a scientist's job; most people love it or hate it, but live with it. Some completely shut down and disengage because it is overwhelming and uncomfortable. Now we talk about this explicitly and often.

Lesson : Finding funding. NITARP is too "education-y" for science funding; too "science-y" for education funding. Small footprint: typically just 6 new teachers per year (+2 mentor teachers). Total of 104 educators from 34 states since 2005. OTOH, NITARP alumni reach >22,000 students/year. Program involves travel, and travel is expensive. We budget $1500/person/trip (before overhead). One educator is at least 3 and at most 7 person-trips (including students). Caltech charges ~66% overhead. (NASA travel restrictions hurt!)

Lesson : Credit (graduate or promotion). Caltech will not offer this. Different states/districts have different requirements. Every team learns something different, does something different; no way to standardize it. But they want it.

Lesson : Closing the loop. 12 hour PD obligation; plans part of application. *Getting them to tell us what they did is a challenge*. Generally can't stop them from sharing ☺. Many alumni have moved up and out of the classroom into higher-level administration, taking our experience with them! Need to chase down, trace longer-term impact.

Lesson : Curriculum products. Teachers involve students on their terms: do what they need/want/are able to do. As a result**, no teacher comes out of this with a solid, ready-to-implement lab or lesson**. They have bits and pieces; learning side-by-side with their students means no canned lesson development, but forces teachers to develop real-time lessons for students. Exposure to resources, explicitly folded into future lessons. We are a long-term resource ("Hey, do you know..?").

Lesson : Computer issues. Schools often prohibit software installation. So, we often use common programs like Excel, or web-based services. Windows is awful.

Lesson : Evaluation! Measuring this experience is *hard*! It is open-ended by design. Each team, each year, has different chemistry, measures 'success' differently. (Null result is still valid, still a poster, still real science! But probably not a journal article.) Each team studies something different, possibly using vastly different techniques and wavelengths (>5 orders of mag in wavelength!). Formal assessment tough; tried a few different approaches.