Getting Educators Involved in Real Research: The NITARP Model in 30 years

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Why is this important?

- The next 30 years of NASA Astrophysics *must* include a strong educational component.
- We need **scientifically literate taxpayers**.
- And teachers: Few schools would hire a football coach who had never played the game... but very few high school science teachers have ever done authentic science of any sort, or even simply worked with real data.
**WHY ASTRONOMY?**

- Every little kid loves dinosaurs and space.
- Most adults *STILL* love space.
- **Astronomy is a ‘gateway drug’** to physics, chemistry, geology, biology, computer science, math, art…
- 13 episodes of PBS *Cosmos* series, seen by over 500 million people (worldwide), 5M copies accompanying book (worldwide).
- Fox(!) producing upcoming *Cosmos* update, Spring 2014, w/ deGrasse Tyson.
How?

- **NASA is a brand unto itself.**
- Public recognizes NASA as inspirational.
- Best way to get kids and the rest of the public inspired is to bring science into the places where they are so that we can help inspire them.
- Get active researchers in contact with schools (and the public). Real-world applications of classroom concepts. Proven to engage kids.
- Provide someone for kids (and the public) to look up to. Humanize science. De-mystify science.
- One way we have been doing that is NITARP.
NITARP=NASA/IPAC Teacher Archive Research Program

- Teachers get an *authentic research experience using real data and tools.*
- A group of educators are paired with mentor astronomer;
- Write a proposal (peer reviewed!);
- Do research;
- Write up results;
- Take it to AAS, present in science sessions.
- → Model entire research process.
NITARP RESEARCH

- Research must include data housed at IPAC (Spitzer, WISE, Herschel, Planck, 2MASS, etc.)
- Research is all authentic; sometimes yields journal articles.
- NITARP+Spitzer predecessor: 38 science posters, 40 education posters, 7 astronomy journal articles.
NITARP TRIPS

Three trips:

- (1) Jan AAS to start (kickoff workshop),
- (2) visit Caltech/JPL for 3-4 days in Summer,
- (3) Jan AAS to present results

Can bring up to two students per educator on the second 2 trips.

- Raise money for additional 2 students.
NITARP REACH

- Educators then conduct 12 hrs PD/workshops locally/regionally/nationally – sharing the wealth.
- Aimed at high school teachers; middle school, community college, informal educators may also benefit.
THINGS THAT MAKE US SPECIAL

- Our program is aimed at **educators** for the multiplicative effect.
- We select participants from a **nation-wide** application process.
- Our program involves educators for at least **13 months** (Jan → Jan).
- **Our participants do real research.**
- Our participants present their **results** in the **same sessions** as professional astronomers, and they must ‘hold their own’ in that domain.
- Our participants are encouraged to involve **students** in the entire process.
PARTICIPANT REACTIONS

“I always thought just from programs on TV and in the classroom that astronomy was more or less completely figured out. Learning that it isn’t is pretty exciting.”

“Becoming empowered in the language and nature of inquiry and investigation was also life changing for our participants.”

New understanding of science
PARTICIPANT REACTIONS

“I was surprised at the number of young people [...] I am used to seeing older people as astronomers.”

- Astronomers are normal, friendly people!
- “I didn't anticipate meeting engineers and graphic artists.”

New understanding of scientists
“One evening, while working on some homework, I had the realization that THIS WAS REAL. There is no right answer, in fact, no one knows the answer. I can't just go and ask someone the answer. It was like a light bulb went off and I experienced a feeling of excitement and also felt a little bit scared. I thought to myself -- Is this how astronomers feel about their work? It was a great feeling and exciting that I too am part of this now.”

New understanding of the nature of science
PARTICIPANT REACTIONS

- “The number one thing that the new people should know is that this experience is one of the best they will ever have.”
- “I've been involved in many professional development activities and this is by far the best one I've ever done.”
- NITARP applications were 5x oversubscribed for 2013.

There is demand for this.
... IN 30 YEARS!

- This model works. It can be expanded.
  - More teams and more subjects.
- This sort of experience is the **deepest experience with data on a full spectrum of programs**; this is admittedly for the most dedicated participants drawn in by the other programs.
- But, if we change the way teachers think about science, we change the **students they teach through the rest of their careers**.
- Other fields have found similar effectiveness:
  - “In years three and four after program entry, participating teachers’ students passed Regents science exams at a rate that was 10.1% higher than that of nonparticipating teachers’ students.” – Silverstein et al. 2009, Science, 326, 440
... IN 30 YEARS!

- To support this reaching a broader base of educators, need training infrastructure to bring people along with the basic astronomy, math, computer science skills needed to do research.

- Envision an interlinked network of NASA programs feeding the need, working with each other as a coherent training stream, teaching the skills, including the basics of astrophysics (or other sciences) to prepare educators (of any sort) to do research (threads of this already starting).

- Envision this infrastructure will also include educational training and support for getting more data into the classroom in preparation for real research (threads of this already starting).
... In 30 Years!

- We would like to foster a **community of alumni educators** who have gone through the program.
- Should include **funding opportunities** to attend conferences to present research (science research **AS WELL AS** education research).
- Should include a **journal dedicated to student research** that includes a review process (with PhDs as the reviewers).
AAS this year – Jan 2013

2012 class finishing up; 2013 class getting going! ~85/~3000=~3%

We are changing the culture.
Let’s do it on a grander scale.