

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

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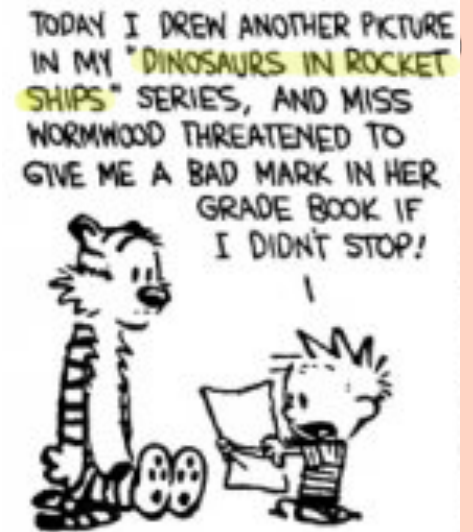
WHY IS THIS IMPORTANT?

- 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.
- And **politicians**: “U.S. Lawmaker Proposes New Criteria for Choosing NSF Grants.”



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



PARTICIPANT REACTIONS

- “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! $\sim 85/\sim 3000 = \sim 3\%$!



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