

NITARP: Bridging the Gap Between the Traditional Science Classroom and Authentic Research



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Abstract:

The differences between what occurs in the traditional secondary science classroom and what happens in the actual research world were examined. Secondary classroom teachers often have limited, if any, research experience so a **disparity exists between classroom laboratory work and professional research**. Opportunities such as NITARP (NASA/IPAC Teacher Archive Research Program) provide research elements which help bridge this gap. NITARP teams are in a unique situation, with teachers and students joining to form small teams working alongside Caltech researchers on cutting edge investigations in astrophysics. The program provides key components and experiences in order to expand the skill sets that teachers bring into their classrooms, helping close the gap between the typical secondary science classroom and the world of the professional researcher. NITARP immerses participating teachers into a year-long training experience via online and face-to-face learning which translates into enhanced instruction at the secondary level. (See Rebull et al. poster 155.06 for more information about NITARP.)

Methods:

Sixty-one science teachers from across the US were surveyed to get a clear picture of authentic research experiences in their undergraduate programs as well as in their classrooms as professional educators. Here is a summary of the results:

- An overwhelming majority of educators experienced three or more laboratory courses as undergraduates (Figure 1).
- Significantly fewer educators engaged in undergraduate research (Figure 2).
- Fewer educators provide opportunities for authentic research opportunities for students.
- However, many educators offer opportunities for students to experience some science beyond the science classroom curriculum (Figure 3).

Notably, respondents were asked to rank the barriers to engaging in authentic research experiences as professional educators:

- Time, selected as the primary barrier.
- Limited opportunities.
- Other commitments, including athletic and family responsibilities. (Figure 4).

Formal Undergraduate Lab Training of Science Teachers

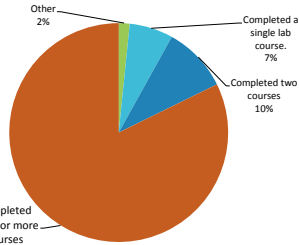


Figure 1. Most (84%) of the 61 science teachers from across the U.S. completed 3 or more lab classes as undergraduates.

Teachers' Research Engagement as Undergraduates

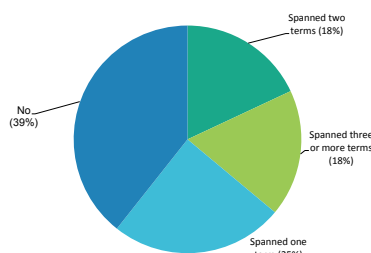


Figure 2. Many (39%) of the educators did not have research experiences at all as undergrads.

Teacher-Provided Opportunities for Student Research

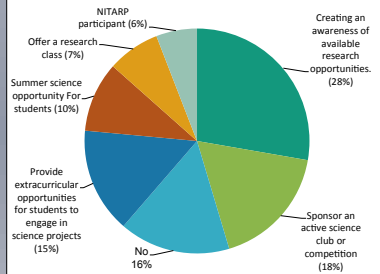


Figure 3. Most teachers surveyed offer various programs for their students to experience science beyond the classroom.

Why Science Teachers Do Not Become Involved in Authentic Research

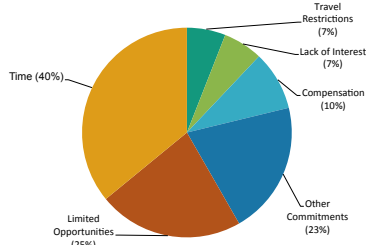


Figure 4. Time is the primary barrier for teachers becoming involved in authentic research experiences.



Image 1. Teacher-student research team at the Spitzer Science Center, Caltech, with Dr. Luisa Rebull.



Image 2. Teacher-student research team creating spectral energy distributions (SEDs) at the Spitzer Science Center, Caltech.

Conclusions:

Authentic research experiences, like NITARP, allow teachers to actively participate in the collection and analysis of data under the guidance of a mentor astronomer. The program requires a full year for completion of the project and provides:

- A rich depth of content knowledge for the participants that cannot be obtained by conducting scientific inquiry investigations.
- Opportunities for educators to learn alongside students as peers. This teacher-as-peer experience for students transforms their perceptions of research and encourages life-long learning.
- Educators use this experience to provide classroom opportunities for learning without “knowing all the answers” ahead of time.
- Educators become acutely aware of the nature of science and apply that experience to every lesson in the classroom.

Resources:

1. Rebull, et al. Poster 155.06
2. Johnson, M. (2002). Teacher as Researcher. *The Science Teacher*, 40-42. Retrieved December 6, 2017.



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