

# Teacher Research Experiences (TRE): An Example from Educational Research

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# The TRE: What Do We Know?

- Participants find the TRE a valuable experience (Dresner & Worley, 2006)
- Follow-up after TRE is often lacking (Pop et al., 2010)
- One well-developed longitudinal study indicates an increase in student achievement after teacher participation (Silverstein et al., 2009)

Dresner, M. & Worley, E. (2006). Teacher Research Experiences, Partnerships With Scientists, and Teacher Networks Sustaining Factors From Professional Development. *Journal of Science Teacher Education*, 17, 1-14.

Pop, M, Dixon, P., & Grove, C. (2010). Research Experiences for Teachers (RET): Motivation, Expectations, and Changes to Teaching Practices due to Professional Program Involvement. *Journal of Science Teacher Education*, 21, 127-147.

Silverstein, S., Dubner, J., Miller, J., Glied, S., & Loike, J. (2009). Teachers' Participation in Research Programs Improves Their Students' Achievement in Science. *Science*, 326(5951), 440-442.

# Educators and Science Research

- Standards for Staff Development (NSDC, 2001), National Science Education Standards (NGSS, 2010; NRC, 1996) and strategies for professional development of math and science teachers (Loucks-Horsley et al., 2003) recommend that teachers become involved in the activities of individuals involved in the field

Loucks-Horsley et al. (2003). *Designing professional development for teachers of science and mathematics* (2<sup>nd</sup> ed.). Thousand Oaks, CA: Corwin Press.

National Research Council (NRC). (1996). *National science education standards*. Washington DC: National Academy Press.

National Staff Development Council (NSDC). (2001). *Standards for staff development*. Oxford, OH.

Next Generation Science Standards (NGSS). (2013). *Next generation science standards*. Washington DC: National Academy Press.

# The TRE as a Form of Professional Development

- Teacher Research Experience (TRE) as a form of professional development may:
  - Provide an opportunity to experience science while working with practicing scientists
  - Enhance science teachers' beliefs about science and scientists
  - Change teachers' practices to reflect science practices

Dixon, P., & Wilke, R. A. (2007). The influence of a teacher research experience on elementary teachers' thinking and instruction. *Journal of Elementary Science Education*, 19(1), 25-43.

Jeanpierre, B., Oberhauser, K., & Freeman, C. (2005). Characteristics of professional development that effect change in secondary science teachers' classroom practices. *Journal of Research in Science Teaching*, 42(6), 668-690.

# An Example from a TRE: Statement of the Problem

- Science teachers do not often have experience in science or with practicing scientists
- Can lead to a naïve beliefs and understandings of how science is practiced, which may translate into deficiencies in science classroom practices and instruction
- May lead to an naïve beliefs and understandings of scientific processes in students

# Methods: Overview

- Six concurrent mixed methods case studies
- TRE: 12 day experience aboard the *RV Atlantis* with *DSV Alvin*; interactions w/ scientists, crew & other teachers participating in the TRE
- Scientist “think aloud”
- Qualitative data coded and entered into meta matrices; themes identified within and across cases

# Sample

<i>Teacher</i>	<i>Years Teaching</i>	<i>School Type</i>	<i>Education</i>	<i>Previous TRE</i>
Barbara	20	Suburban High School	BA Biology; MS Marine Education	Yes
Bonnie	5	Urban 7-12; Magnet	BS Biochem; MS Public Health	No
Courtney	7	Suburban High School	BS Natural Science & Math; MA Biology	No
Kathy	30	Suburban High School	BS Phys. Ed.; Grad classes in science	Yes
Ned	1	Suburban Middle School	BS Biology; Grad classes in science	No
Tammy	9	Urban Middle; Magnet	MBA; MS Education; Grad classes in science	No

# Scientific Research Groups

<i>Teacher</i>	<i>Recruitment Dynamics</i>	<i>Microbial Ecology</i>	<i>Fish</i>	<i>Deep Sea Corals</i>
Barbara				√
Bonnie		√		
Courtney	√			
Kathy	√			
Ned			√	
Tammy				√



# Recurring Themes

<i>Teacher</i>	<i>Re-energized; Inspired; Chance of a Lifetime</i>	<i>Bringing the Experience Back to Students</i>	<i>Interactions with Scientists / Crew/Teachers</i>
Barbara	√	√	√
Bonnie	√	√	√
Courtney	√	√	√
Kathy	√	√	√
Ned	N/A	√	√
Tammy	N/A	√	√

# Theme: Re-energized / Inspired

- *Barbara*: Re-energized and excited; able to share the experience with students
- *Bonnie*: “When teachers come back to school inspired, it inspires students to learn”
- *Courtney*: “Chance of a lifetime”
- *Kathy*: “Rejuvenates the soul and rekindles enthusiasm for teaching”



# Theme: Bringing the Experience Back to Students

- *Barbara*: Integrate real research so students can see what scientists do
- *Kathy*: Infuse valuable first hand experiences in the classroom
- *Ned*: Students get a sense of what is going on now in science
- *Tammy*: Show how science class can connect with the real world



# Theme: Interactions with Scientists/Crew/Teachers

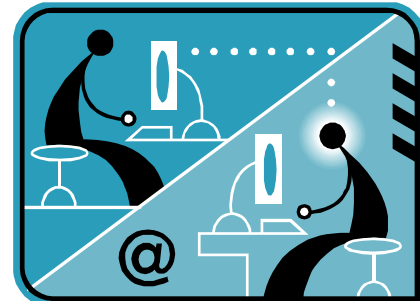
- Intimidation
- Cooperation / collegiality among scientists
- *Bonnie*: Concern of being “useful” to the scientists
- *Kathy*: Teachers need to prove their willingness to work
- *Tammy*: New image of science and scientists

# Value of the TRE

<i>Example</i>	<i>How Valuable</i>	<i>Why Valuable</i>
Colleagues	Moderate	“meet new people that have the same interests”
Experiences	High	“experiences I can draw upon”
Perspective	High	“able to work side by side with scientists”; “viewpoint of what it’s like to do research”
Re-energized	Moderate	“after 21 years...I need to be recharged”; “re-enthuse...yourself [in] real science”
Resources	High	“connect what [students] are doing...with real life”
Science Meetings	High	Became “aware of all the research...[and] how interconnected” it is
Timing	Low	Should “take place during a vacation period”

# Dissemination: During the TRE

- All teachers communicated with students and school (email, web sites, blog)
- All teachers shared digital images with each other for posting on web sites
- One teacher asked students to develop interview questions for scientists
- Three teachers emailed ship coordinates to classes to plot ship's course and weather



# Dissemination: Post TRE

- All shared digital images from the TRE with students, faculty and staff
- One teacher re-established National Ocean Sciences Bowl team
- One teacher invited a *DSV Alvin* pilot to speak at a marine science symposium for students
- Two lesson plans developed and implemented during the school year
- Three teachers proposed a new course

# Recommendations for Providers of TREs

- Facilitator needed to work with teachers and scientists; not the same as researcher/evaluator
- Pre cruise interactions necessary
- “Education Panel”
- Regular science meetings
- Daily meetings of teachers and facilitator
- Walk away from TRE with products
- Cohort of 2-3 teachers on TRE
- Follow-up with teachers regarding implementation of TRE into curriculum
- Teachers need a defined role in the TRE (not simply organizing a web site)







Thank you!

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