How K-12 Teachers of Earth Science Connect Earth Science Research to Their Teaching and Professional Learning (STAPLES) : A MINNESOTA CASE STUDY PART 1

Kate S. Pound, kspound@stcloudstate.edu, Earth & Atmospheric Sciences, St. Cloud State University, 720 Fourth Avenue South, St. Cloud, Minnesota
Karen M. Campbell, kmc@umn.edu, National Center for Earth-surface Dynamics, University of Minnesota, 2 Third Avenue SE, Minnesota
Kate Rosok, kate.rosok@mpls.k12.mn.us, North Community High School, Minneapolis, Minnesota
Jill Baumtrog, jill.baumtrog@wayzata.k12.mn.us, Wayzata Central Middle School, Plymouth, Minnesota

ST. CLOUD STATE UNIVERSITY
A tradition of excellence and opportunity

Visit Part II of this study at:
ED31B-0530
Weds 16 Dec (AM)

See accompanying hard copy of the STAPLES survey (below) for full details.

Poster & Final Report will be posted at: www.nced.umn.edu

Session ED13B
Paper: 0599

Acknowledgements

We would like to thank the Earth Science teachers who took the time to respond to this survey, as well as Bakary Sanogo at St. Cloud State University who set it up in Surveymonkey. Lee Schmitt at the Center for Global Environmental Education at Hamline University facilitated availability of the STAPLES survey on the MESTA Listserv. Administration of the STAPLES study to survey participants was authorized by the St. Cloud State University Institutional Review Board: www.stcloudstate.edu\osp\IRB

"So many of my students see science as something that they read in a book, not applicable to them. So it is up to me to share with them the possibilities that exist beyond the classroom. If I can get even a few students to be excited about science, I have done my job"

Context and Motivation

The Science Teaching and Professional Learning in the Earth Sciences (STAPLES) research team and survey evolved in response to:

1. Our experiences in Earth Science professional development, which have led us to the conclusion that the most effective and most-needed Earth Science professional development incorporates hands-on learning of content, jointly facilitated by pedagogy experts and Earth Science professionals.
2. Our interest in continuing to develop effective professional development workshops for K-12 teachers of Earth Science. We want to find the most effective way to build teacher understanding of (and connection to) Earth Science research, as well as facilitate the transfer of the knowledge, understanding, and connection to students. This was contingent on getting a snapshot of current teacher practices and needs.
3. The need for NSF-style Broader Impacts that include effective outreach and education components.
4. Our consideration of the recent report by the NSF Advisory Committee for Environmental Research and Education "Transitions and Tipping Points in Complex Environmental Systems" (2009, 56p.)

Preliminary Review of Results

The following themes dominated teacher responses:

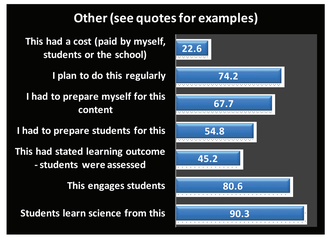
- Students are engaged by trips to Nature Centers, Museums, Labs etc. and by field investigations / data collection.
- Students are engaged when their teachers share personal science experiences, or involve a 'real scientist' – **BUT** the scientist must be knowledgeable about the level of student understanding and group dynamics.
- Students are engaged when their views of the world are extended through use of videos and DVDs or media links to current events.
- Teachers use books as ongoing resources
- Teachers use websites for quick updates to current knowledge
- Teachers learn most at Inquiry-based hands-on workshops
- Teachers welcome any means of building their content knowledge
- Teachers are more effective and inspired when they build connections with other teachers at meetings & workshops
- Teachers find that mandated district professional development does not provide adequate content knowledge; they build content knowledge other ways.
- Teachers are very concerned about funding to support good classroom teaching and content-driven professional development
- Preparation time is a major consideration in use of curricula and field trips

The Study Group

Our survey was distributed to Minnesota Earth Science teachers that are on the Minnesota Earth Science Teachers Association (MESTA) Listserv (total members 152), and through a variety of other electronic means. We received 90 responses, of which 10 were from out-of-state. The response rate of MESTA members was 53%. The licensed Earth Science teacher population in Minnesota is 770, hence 10% of the licensed Minnesota Earth Science teacher population was sampled.

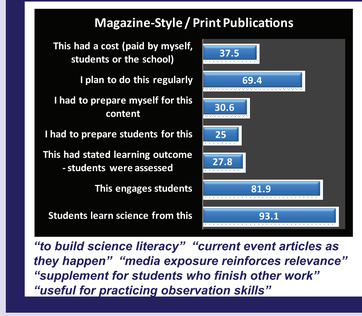
These data provide a current local snapshot of Earth Science teachers already connected to Earth Science-specific Professional Development Opportunities. Our experience with Professional Development for Earth Science teachers suggests that the concerns and needs of the sample population reflect that of the larger Earth Science teacher population. We hope these responses can be used as the initial basis for a broader regional and national dialog regarding the development of broader impacts that include teachers' voices.

How do K-12 Teachers Connect Students to Earth Science Research?

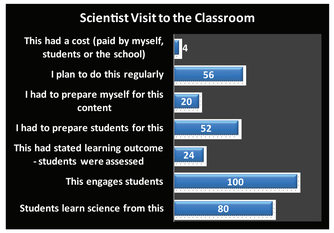


"Personal experiences such as my trip to a glacier, volcano or ocean"
"they need to interview a professional in their field"

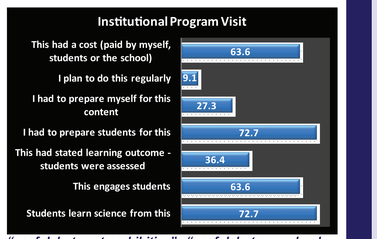
"My students do not have much experience with ...how the world works outside their apartment/house, school, stores. Pretty much a total nature deficit"
"Videos/DVD's .. show content I can't cover otherwise"



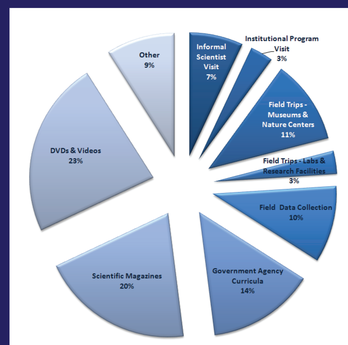
"to build science literacy" "current event articles as they happen" "media exposure reinforces relevance" "supplement for students who finish other work" "useful for practicing observation skills"



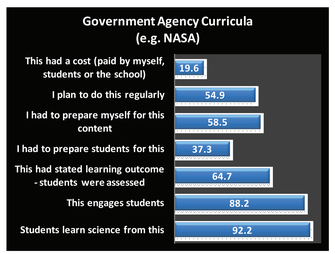
"Effective/usefulness depends on the visitor"
"it reinforced the curriculum, plus students learn more from visitors"
"it connects my young students to the real world and to people actually doing this job. I want them to view science as a career option"



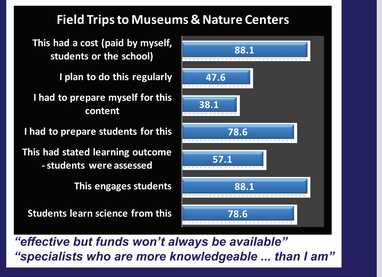
"useful, but cost prohibitive" "useful, but our school does not have funding to do this on an annual basis"



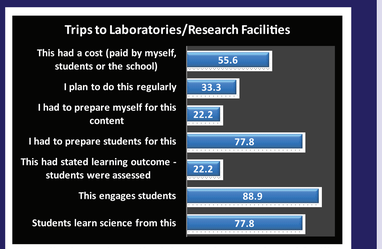
Weighted percentage of teachers using each approach to connect their students to Earth Science research



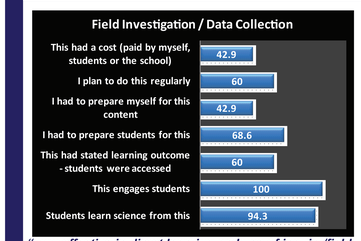
"using this prepared curriculum is a time-saver for me" "I have never found an activity or lab that did not have to be modified for my ... students" "some ... these curriculum are very effective, others are ... too 'dumb -downed' for students" "better than textbooks, ...current"



"effective but funds won't always be available" "specialists who are more knowledgeable ... than I am"



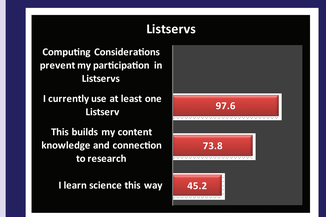
"it really depends on the laboratories people and facility to make this worthwhile"



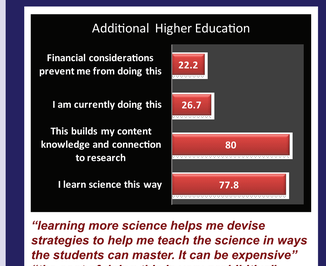
"very effective in direct learning and use of inquiry/field skills" "would be more effective if I had field trip money but we just went outside the school"

How do Teachers Build Their Own Connection to (and Knowledge of) Earth Science Research?

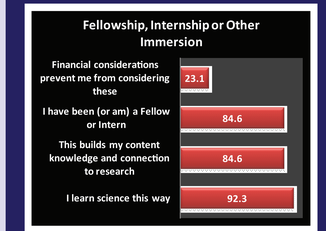
"books can be re-visited (unlike a workshop) and I can refer to them as needed"
"I like to be able to understand it myself before I feel comfortable teaching it"
"more in-depth info than ... middle school text"



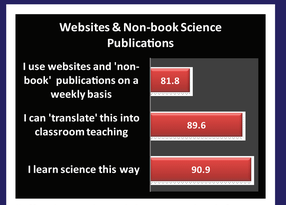
"It keeps me connected to other Earth Science teachers"
"rarely effective for science; good way to share information professionally"
"helps you know what some of the issues are and opportunities"



"learning more science helps me devise strategies to help me teach the science in ways the students can master. It can be expensive"
"the cost of doing this is very prohibitive"

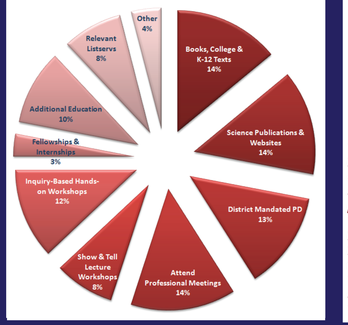


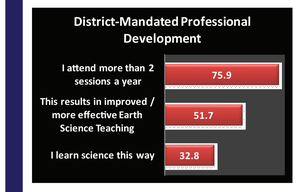
"The content that I learned was very good. I struggle to directly connect it to the content I need to teach, however. It is often too advanced for my students. But it helps me see the big picture, and I know more about what scientists do in their workday"
"This is the best way to be a better teacher, by being a student from time to time!"
"I meet great professionals and I learn a great deal of cutting edge content"



"effective and a quick way to check for changes in information within content area"
"textbooks are already outdated when published ... have to keep current"

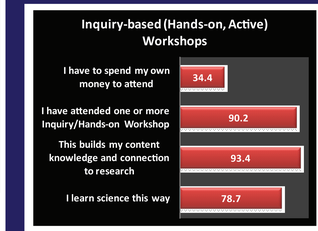
Weighted percentage of teachers using each approach to build their own connection to & understanding of Earth Science Research



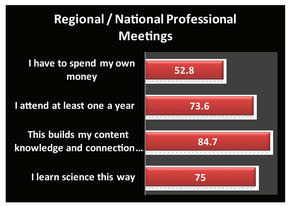


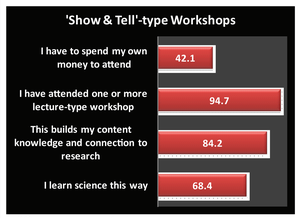
"Our district's prof. dev. is not as effective as it could be because it doesn't target specific content areas. We all go to the same sessions and discuss general classroom management / pedagogy"
"NOT ONE is related to science. It is always a huge disappointment to me that our district has such little focus on science teaching ... this includes methods, research, and content"
"Provides sharing, collaboration, standardization with Colleagues"
"Too much standardized test data analysis"

"I like to get ideas and have a student/administration hassle-free time to be thinking about my teaching"
"I really become inspired by these things"
"They have a bigger impact on instructional strategies than content knowledge"
"not very effective to learn science; useful to network and build relationships"



"I can bring the hands-on ideas right to my classroom. It is also a wonderful way to meet and interact with other teachers"
"effective; it is sometimes over stimulating"
"Provides opportunities to try curriculum or lab equipment before requesting expenditure"
"Learning hands on gives me numerous new ideas that I can use immediately in my class .."





"One more way to increase my knowledge"
"Not effective for me" "any new information or new ideas is vital to effective curriculum"