

# Deepening Elementary Teacher Knowledge in “Hard Science” to Enhance Science Teaching

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# Students ask tough questions.....


- What makes black holes?
- What is the fabric of the universe?
- If you slap your hand down really hard, can you squish the coronavirus on the table?
- Do mommies throw up babies?
- Where does wind come from?
- How come the snow on the top of a mountain doesn't melt first, since it is closer to the sun?
- Are earthquakes caused by elephants jumping?



# Many teachers do not have the teacher preparation or professional development to fully understand the topics they are teaching.

- While answering, “I don’t know, but I’ll get back to you,” or “Why don’t we research that and find out” are good answers, being able to guide the students in the moment has the ability to take students deeper into their learning.
  - According to a survey of teachers in 2012, **just 44 percent of K-2 teachers felt they were “well prepared” to teach science**, compared to 86 percent who felt well prepared to teach reading. (“Will new standards improve elementary science education?”, The Hechinger Report, July 11, 2018)
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# How do we change this?

- Require that teacher preparation programs include courses in **physical, life and earth sciences**.
  - Provide ongoing professional development to presently working teachers to allow them to **keep up to date with scientific discoveries** and shifts in scientific thinking.
  - Offer support, encouragement, and funding to teachers who take **continuing education graduate courses** in science.
  - **California University of Pennsylvania**, in partnership with the **American Meteorological Society**, offers **high quality asynchronous online graduate classes** in Earth Science through their DataStream program, allowing full time working professionals to learn current science concepts.
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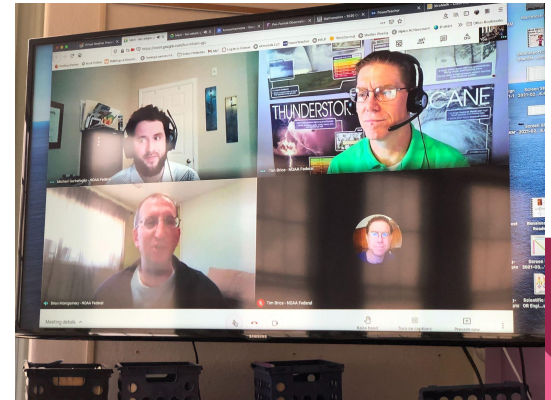
# NGSS approach is no longer the “inch deep and mile wide” approach to scientific topics.

- NGSS and 3D teaching asks teachers to **support students** as students seek answers to scientific questions and observed **phenomena**.
- Students create “**Driving Questions**” that steer the unit, while teachers guide discussion to be sure that **Disciplinary Core Ideas** are sufficiently understood by students.
- Teachers **without background knowledge, and the confidence that brings, are not able to support students** in deeper understanding of scientific concepts.



# Bringing Rich Experience to Students

- One of my students said “They like weather almost as much as you do!” about the National Weather Service meteorologists we had just had a virtual field trip with.
- Lesson plans developed during the graduate courses are immediately useful in classrooms. (Link to lessons on Resources page.)
- Graduate credits valid for teacher recertification.
- Confidence builder in science content for teachers.



# For more information--



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## Resources:

- **California University of Pennsylvania, American Meteorological Society DataStream Certificate**, <https://www.calu.edu/academics/graduate/certificates/american-meteorological-society-datastream/index.aspx>
- **Report of the 2012 Nationals Survey of Science and Mathematics Education**, <http://www.horizon-research.com/2012nssme/wp-content/uploads/2013/02/2012-NSSME-Full-Report1.pdf>
- **"Will New Standards Improve Elementary Science Education?"**, The Hechinger Report, July 11, 2018, <https://hechingerreport.org/will-new-standards-improve-elementary-science-education/>
- **Elementary Lessons on Weather, Climate and Oceans:** [https://drive.google.com/drive/folders/1w5bU7uwICo78NNLSHKRrZ2\\_bYeD9L4v8?usp=sharing](https://drive.google.com/drive/folders/1w5bU7uwICo78NNLSHKRrZ2_bYeD9L4v8?usp=sharing)

