

SUPPORTING TEACHERS' IMPLEMENTATION OF THE NEXT GENERATION SCIENCE STANDARDS – SCIENCE AND ENGINEERING PRACTICES

Susan Dahl | sdahl@fnal.gov
Fermilab National Accelerator Laboratory, Education Office

INTRODUCTION

CONTEXT

Fermilab, a Department of Energy lab, opens its doors for teachers and students to see and experience science. Administrators and teachers, scientists and engineers discuss real-world science to generate new ideas and understanding for classroom science.

ISSUE

Standards for Professional Learning and the *Next Generation Science Standards* present the opportunity to learn a new paradigm for science education together. To teach using NGSS science and engineering practices requires some experience with the practices. However, most K-12 educators have not been scientists.

ACTION

We provide an institute day at Fermilab where teachers and administrators participate in and reflect on activities that model science and engineering practices.

OBJECTIVES

Fermilab scientists and engineers are role models for science and engineering practices in the classroom.

Teachers:

- Use science and engineering practices during a challenge activity.
- Learn about science and engineering connections to classroom materials.
- Look for evidence of science and engineering practices during a workplace tour.
- Learn how scientists and engineers use these practices in their work.

As a result of these experiences, teachers will be able to:

- Log methods of a challenge activity and their reflections.
- Describe connections between the science and engineering practices and example classroom materials.
- List observations of science and engineering practices in the workplace.
- Describe how role models use science and engineering practices in their own work.

POINTS FOR DISCUSSION

- Extend Institute to a weeklong experience, provide more time for NGSS and for teachers to practice and develop increased ownership and practical materials.
- Decide which format — daily smaller chunks of content or a weeklong experience — would better serve the needs of schools or districts in light of practical issues such as time, substitutes and pressing demands.
- Determine how to best prepare scientists and engineers to discuss the practices. How much NGSS background do they need? How can they approach the topic of change to NGSS in a positive light?

ACTIVITIES

Challenge Activity



Leo Bellantoni, Senior Scientist



- Proton therapy requires a particle beam precisely targeted to treat cancer cells. In our **challenge activity**, teachers practice setting up to determine the stopping distance of a car given the height of the ramp. The challenge is to stop the car at the challenge distance once it is given. While exploring, teachers gather and analyze data, making a note of which science and engineering practices they use.
- After this experience, teachers **examine instructional materials** that incorporate the practices. Fermilab's Teacher Resource Center has an extensive, up to date core curriculum collection. Educators consider the best materials to support implementation of their science education vision.
- **Scientists and engineers** share how they use these practices in their work.

“As a scientist we use a wide range of skills of course and some take on more importance at different stages of our science or experiment. Sometimes I am at the ‘I’m banging on a rock’ stage and need to have the persistence to keep focusing, learning from the data. At other times, I feel like ‘I’m building a cathedral’ and we’re making incredible discoveries that may have significant impact on our field.”

CONCLUSION

The institute was piloted with Hinsdale Community Consolidated SD 181 in February 2014.

- 100% of teachers said the institute met the objectives.
- 100% of teachers said the challenge provided the opportunity to experience the practices.
- 88% of teachers said they found connections from the practices to instructional materials.
- 92% of teachers said hearing scientists and engineers talk about their work was relevant.

Private and public schools continue to spread the word, and the demand for the institute has grown. We have held three more institutes, and at least two are in discussion for the coming school year.

Each school or district has different needs, levels of NGSS knowledge and priorities for selecting materials. We have adjusted subsequent institutes to specifically address these needs and sometimes added an additional day to focus on instructional materials.

ACKNOWLEDGMENT & REFERENCES

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