**STEM and ELs: A Collaborative Effort**

June 7, 2011

Paula Hooper Ph.D., Senior Science Educator and Learning Research Scientist
in the Institute for Inquiry at the Exploratorium

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NCELA is operated under contract ED-04-CO-0094/0002 from the US Department of Education to The George Washington University. Our mission is to provide technical assistance information to state education agencies, local education agencies, and others regarding the education of English language learners.
Welcome to the webinar on “STEM and ELs: A Collaborative Effort.” Today’s webinar is hosted by the National Clearinghouse for English Language Acquisition, NCELA, located at the Graduate School of Education and Human Development at The George Washington University, funded through a contract with the U.S. Department of Education's Office of English Language Acquisition.

NCELA's mission is to provide technical assistance information to state and local educational agencies on issues pertaining to English language learners.

My name is Kathia Flemens, Ph.D., Senior Research Associate at NCELA and your webinar facilitator.
Note: The contents of this webinar, including information or handouts, do not necessarily reflect the views or policies of the Department of Education nor does the mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government.
Our Presenters:

Dr. Paula Hooper works as a Senior Science Educator and Learning Research Scientist in the Institute for Inquiry at the Exploratorium.
Success for English Learners in Science Technology Engineering and Math (STEM) involves....
Partners in Innovation... Integrating ELD and Science

USDOE Investing in Innovation (i3) Grant
2010 - 2015

Research and Evaluation Team:
Inverness Research Inc.
Center for Research, Evaluation, and Assessment (LHS)
Institute for Inquiry
resources & knowledge about science teaching & learning
close connection with local and national ELD expertise

SVUSD
resources & knowledge about teaching & learning in K-5 classrooms

Integration of ELD & Science
support for language acquisition and academic achievement

"Let's give them science to talk about!"
Goal

to explore the integration of science learning and English Language Development through a collaborative approach to professional development that supports the improvement of classroom practice
Overview

• rationale for integrating science and ELD
• professional development to support integration of science and ELD
• classroom practice that is enabled by
• next steps: The best answer is a question???
Environment for Learning

Culture of Inquiry - engagement, wonder, questioning
**Inquiry** is a multi-faceted activity that involves making observations, posing questions, planning investigations, using tools to gather evidence, analyzing and interpreting data, proposing answers, explanations, and predictions, and communicating results.

- National Science Education Standards, NRC
Inquiry-based science can be a particularly good setting for nurturing academic language.

**Practical view**
- Students’ achievement not increasing adequately by using traditional ELD strategies
  
  “Let’s give them something interesting to talk about ... science.”

**L2 Acquisition view**
- The acquisition of English as a Second Language (ESL), particularly academic language, is developed through using L2 in a context and for a purpose.
- Science experiences are good contexts for ELD because making sense of phenomena requires using language in various forms.

**Science & Literacy view**
- Science process skills are resonant with language and literacy learning skills (Stoddard, Pinal, Latske, & Canaday 2002; Pearson, Moje, & Greenleaf 2010).

**Sociocultural view**
- Children make meaning particularly well when they can express themselves in ways that acknowledge their cultural lives and value their cultural practices (Rogoff & Gutierrez 2003; Lee 2007; Rosebery & Ballenger 2008; Warren & Rosebery 2008).
QUESTIONS?
Institute for Inquiry

National Center for K-8 Science Education
Leadership Development

Professional Development Workshops
- Fundamentals of Inquiry
- Assessing for Learning
- Classroom Strategies for Teaching Inquiry

Impact (1995-2010)
- 5000 lead teachers & district professional developers, university faculty, museum educators
- 160 projects, 600 districts, 42 states

On-line Professional Development Curriculum
Institute for Inquiry Foundations

Intellectual challenge driven by curiosity

Making sense of puzzling experiences

Constructing new knowledge

Ownership of process

Sense of satisfaction
Professional development that is transformative and translatable is necessary to help teachers come to understand why inquiry is a particularly good way to learn science and implement stronger classroom science learning practices (even if not “full-blown” inquiry).
Essential Elements for Professional Development in Inquiry

Transformative experiences (vision & motivation)
change in thinking about the nature of science
change in thinking about the nature of teaching & learning

— necessary but not sufficient —

Translatable experiences (practical application)
develop usable knowledge (pedagogical principles)
develop classroom strategies
QUESTIONS?
Professional development

Curriculum resources & materials

On-going follow-up

Shifts in classroom practice toward inquiry-based science

Become opportunistic about using science as a context for supporting academic language development
Sonoma Valley Unified School District

Workshops
- Immersion into ELD and science integration
- Address cultural dimensions of ELD

Study Groups
- Reflect on classroom practice
- Examine students’ work

Classroom Practice
- Teach hands-on science units based on understanding of inquiry teaching/learning & ELD

Leadership Opportunities
- Co-present PD
- Host classroom visits
- Review & refine model curriculum units
QUESTIONS?
How can we design model curriculum units that support teachers in using science as an opportunity to nurture ELD?

- 3 units per grade level - Earth Science, Life Science, Physical Science
- Guided Inquiries - accessible to a variety of teachers

What classroom practices will help teachers to be opportunistic about using science to nurture ELD?

Classroom Discourse: Science Talks

Written Communication: Science Notebooks
Unit: Land Snails Investigations

**Explore**
- What can we observe about snails?
- What makes a good written description?
- What are the snails’ body parts?

**Investigate**
- How do we plan an investigation?
- What do snails eat?
- How do snails move on different surfaces?

**Interpret & Communicate**
- What did we find out about what snails eat?
- How can we communicate what we found out?
- What have we learned about snails?
Explore

Snails

What they Look Like:
- Snails have weaknesses: Salt
- Snails are little
- Snails are slimy
- Snails have a shell; it is their home
- Snails have antennae
- Snails have saliva
- Snails look like Slugs but with a shell
- Snails have a fragile shell
- Snails have thin antennae
- Snails look like snakes without a shell
- Snails are brown
- Snails look like a stick when they stand still

What they do:
- Snails move slowly
- Snails can hide in their shells
- Snails antennae go in when they are touched
- Snails shells can fall off
- Snails shells can break easily
- Snails can be poisonous
- Snails leave slime
- Snails can eat leaves
- Snails can live anywhere
- Snails like wet things
- Snails can live in water
- Snails can crawl
- Snails can live in dirt

ADJECTIVES
- Pretty
- Slimy
- Wet
- Skinny
- Gross
- Nasty
- Soft
- Sticky
- Rough
- Brown
- Squishy
- Fancy
- Sharp
- Hideous
- Stinky
- Dull
- Disgusting
- Ugly
I Notice...

Snails have a big foot.
Snails have a red mouth.
Some snails are faster than others.
Snails have really long tentacles.
Snails do not have any bones.
Snails leave slime when they move.
Snails stick when they are still.
Some snails are sleepy.
Snails have little mouths.
Snails wake up when they get wet.
Snail tentacles move out and in.
The snail's mouth is at the bottom.
I Wonder...

Can snails live in the sun? Can snails eat paper?
Do snails eat pizza? Can snails move on water?
Do snails eat plants? Do snails eat sandpaper?
Do snails eat wood? Do snails have hair?
Do snails have teeth? Do snails move faster in water?
How do snails breathe? How long could a snail live in my desk?
How fast does a snail move? Do snails follow lights?
Can a snail live without a shell? How do snails live under rocks?

Can snails stick to metal? Can snails eat spaghetti?
Do snails eat sandpaper? Do snails eat wood?
Do snails have hair? Do snails have teeth?
Do snails move faster in water? How do snails breathe?
How long could a snail live in my desk? How fast does a snail move?
Do snails follow lights? Can a snail live without a shell?
How do snails live under rocks?
# Investigation Plan

<table>
<thead>
<tr>
<th>Student 1</th>
<th>Our Plan</th>
<th>Student 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>What kinds of foods do snails eat?</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials:</th>
<th>First we will gather all our materials.</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Snails (x 4)</td>
<td></td>
</tr>
<tr>
<td>• Pieces of 4 different foods</td>
<td></td>
</tr>
<tr>
<td>• A tray</td>
<td></td>
</tr>
<tr>
<td>• Hand lens</td>
<td></td>
</tr>
<tr>
<td>• Flashlight</td>
<td></td>
</tr>
<tr>
<td>• Pencil</td>
<td></td>
</tr>
<tr>
<td>• Paper</td>
<td></td>
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</tbody>
</table>

Next we will arrange food on the tray.

Then we will place the snails in the middle of the tray or near each food.

Finally we will watch the activity of each snail.

We will observe any bite marks, food that is less than what we started with, and which food the snails liked the best or the least.
Students talk, listen, read, write and use process skills in the context of science investigations.
Professional Development

Teachers reflect on their own learning, how integrating science and ELD effects their students’ learning, and ways to create further opportunities for learning.
Professional development

- Become opportunistic about using science as a context for supporting academic language development
- Shifts in classroom practice toward inquiry-based science

Curriculum resources & materials

On-going follow-up

Support teachers
Next steps: The best answer is a question ... ??

How do teachers who progress through the workshops, study groups and teaching of curriculum units begin to:

- understand science learning and ELD differently?
- understand how a focus on discourse and writing practices helps science to become supportive of ELD?

How do students progress in understanding science ideas and academic language proficiency?

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QUESTIONS?
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- For more information or if you have additional questions contact: Paula Hooper, Ph.D. at phooper@exploratorium.edu or
  - Questions regarding the webinar contact: Kathia Flemens, Ph.D. at kflemens@gwu.edu.

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