

THE GEORGE WASHINGTON UNIVERSITY  
WASHINGTON DC

**NCELA**  
National Clearinghouse for  
English Language Acquisition and  
Language Instruction Educational Programs

*presents*

## ***STEM and ELs: A Collaborative Effort***

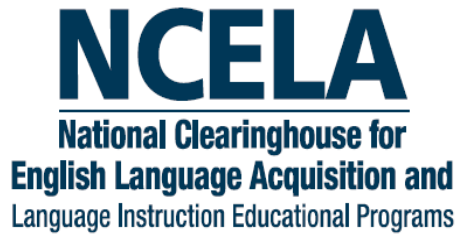
**June 7, 2011**

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.**



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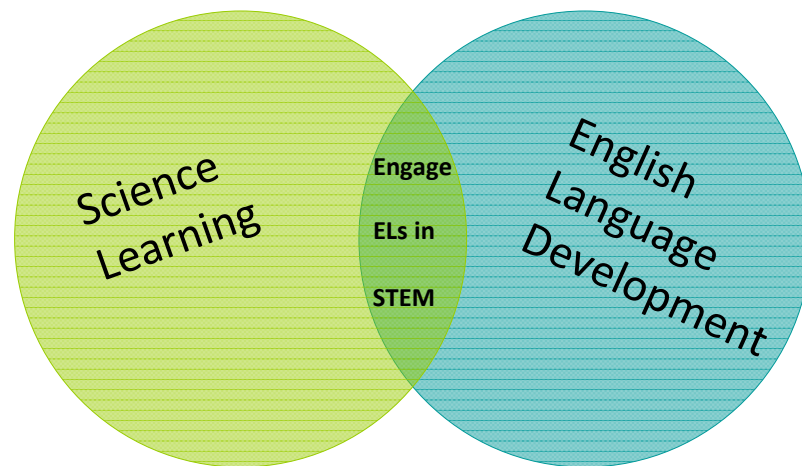
### **Our Presenters:**

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....



## Collaboration





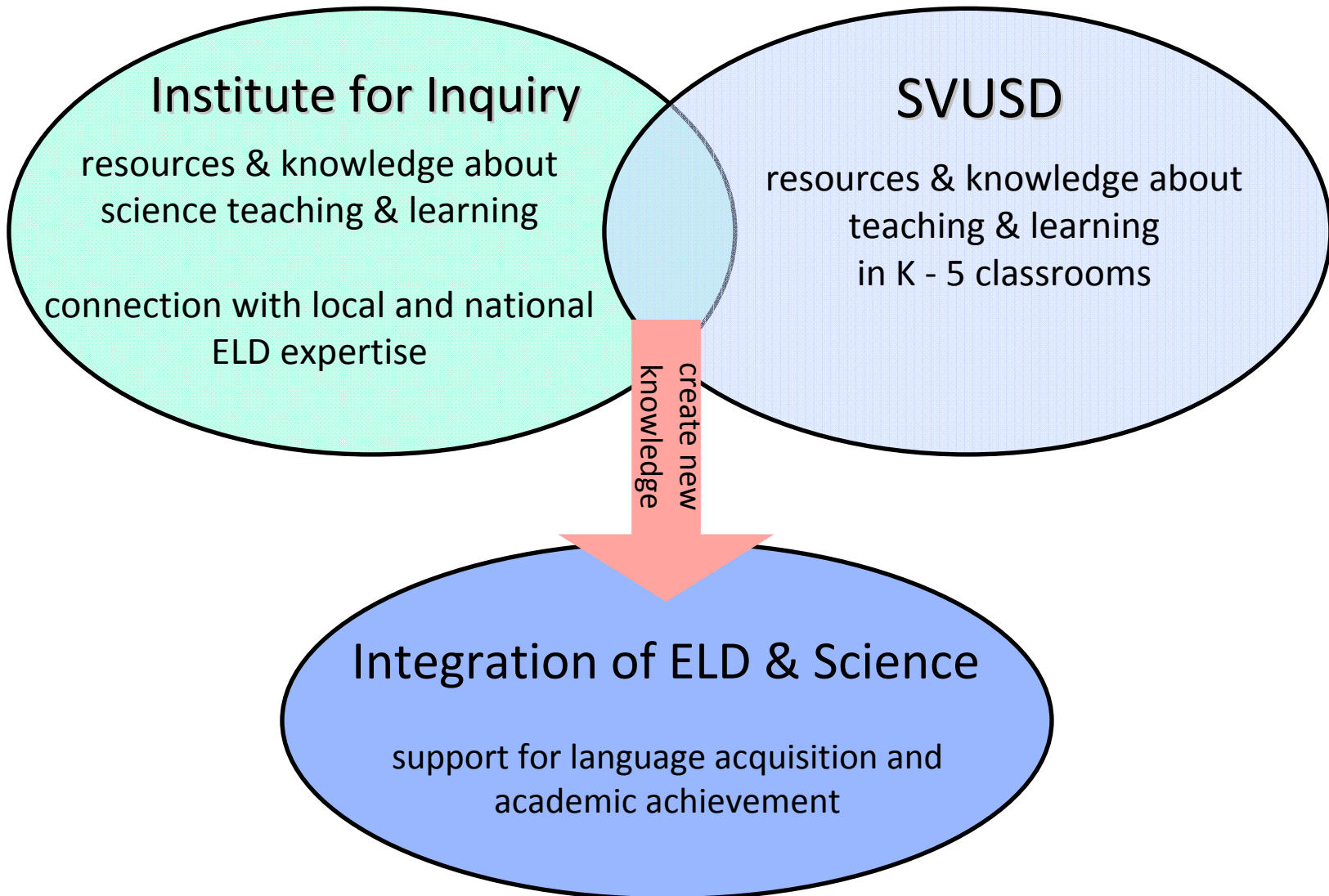
& Sonoma Valley Unified School District

*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)

*"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**

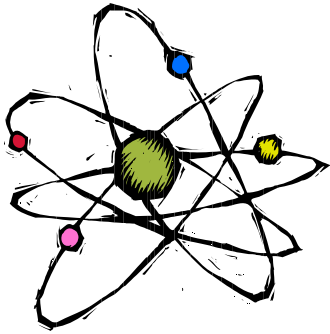
- The acquisition of English as a Second Language (ESL), particularly academic language, is developed through using L2 in a context and for a purpose.
- Science experiences are good contexts for ELD because making sense of phenomena requires using language in various forms.

## **Science & Literacy view**

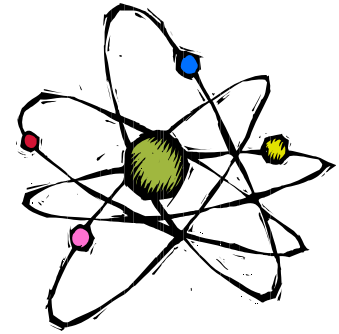
- Science process skills are resonant with language and literacy learning skills (Stoddard, Pinal, Latske, & Canaday 2002; Pearson, Moje, & Greenleaf 2010).

## **Sociocultural view**

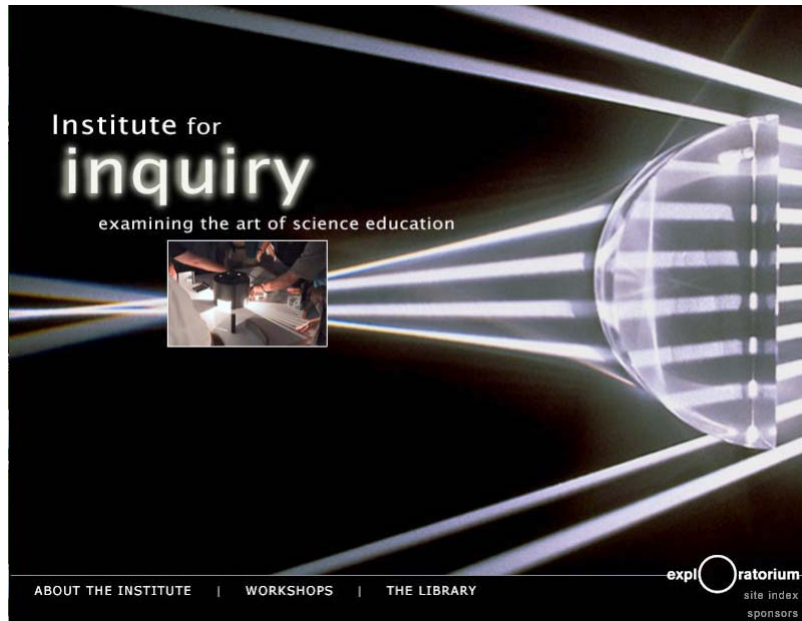
- Children make meaning particularly well when they can express themselves in ways that acknowledge their cultural lives and value their cultural practices (Rogoff & Gutierrez 2003; Lee 2007; Rosebery & Ballenger 2008; Warren & Rosebery 2008).



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).

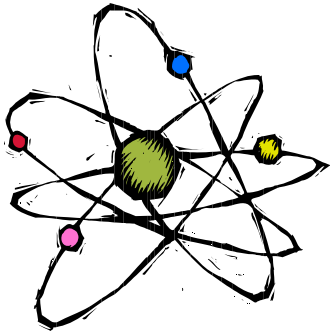


# Essential Elements for Professional Development in Inquiry

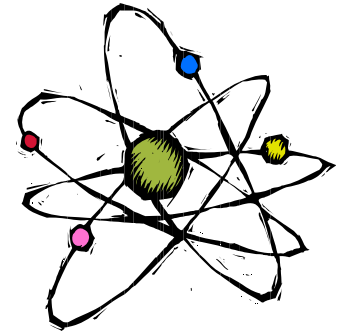
**Transformative** experiences (vision & motivation)  
change in thinking about the nature of science  
change in thinking about the nature of teaching & learning

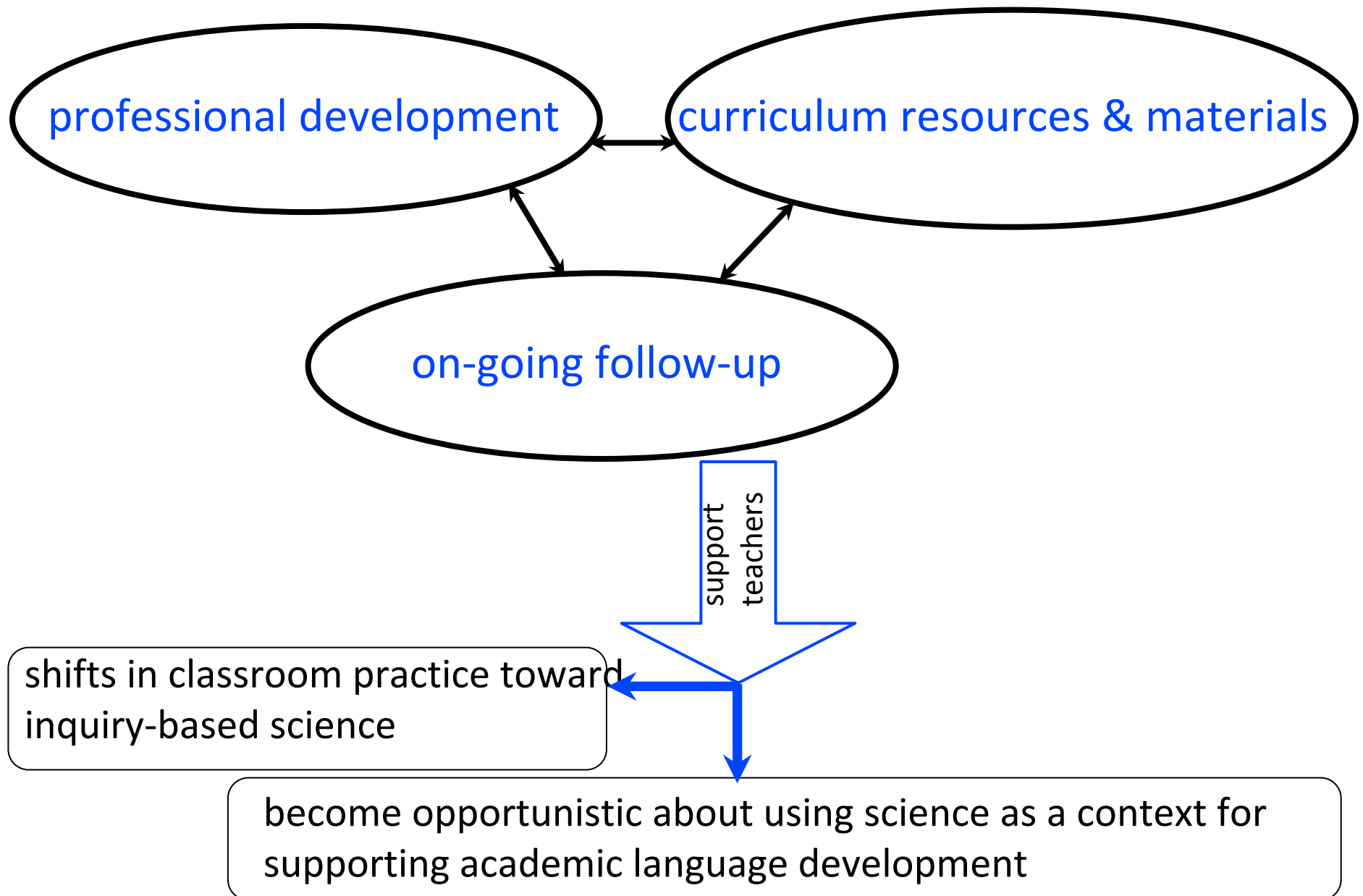
— *necessary but not sufficient* —

**Translatable** experiences (practical application)  
develop usable knowledge (pedagogical principles)  
develop classroom strategies

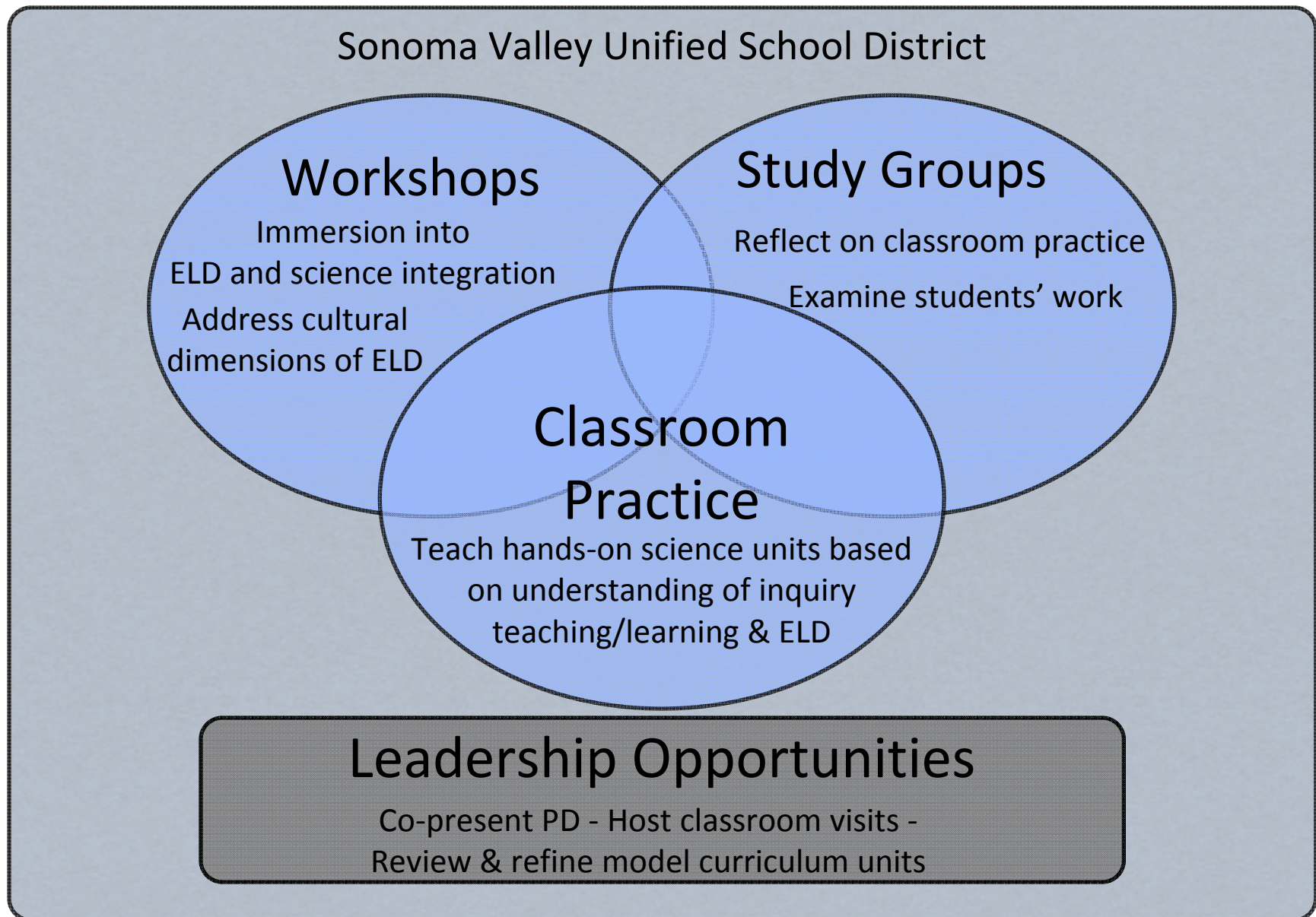


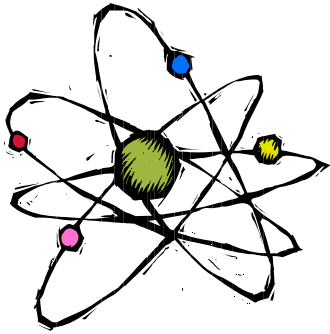
QUESTIONS?



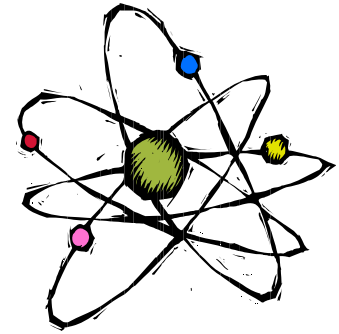








QUESTIONS?



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?



*I notice ....*

*I wonder ....*



## 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?





## 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 big antennae
- Snails look like snakes without a shell
- Snails are brown
- Snails look like a stick when they stand still.

### What they do

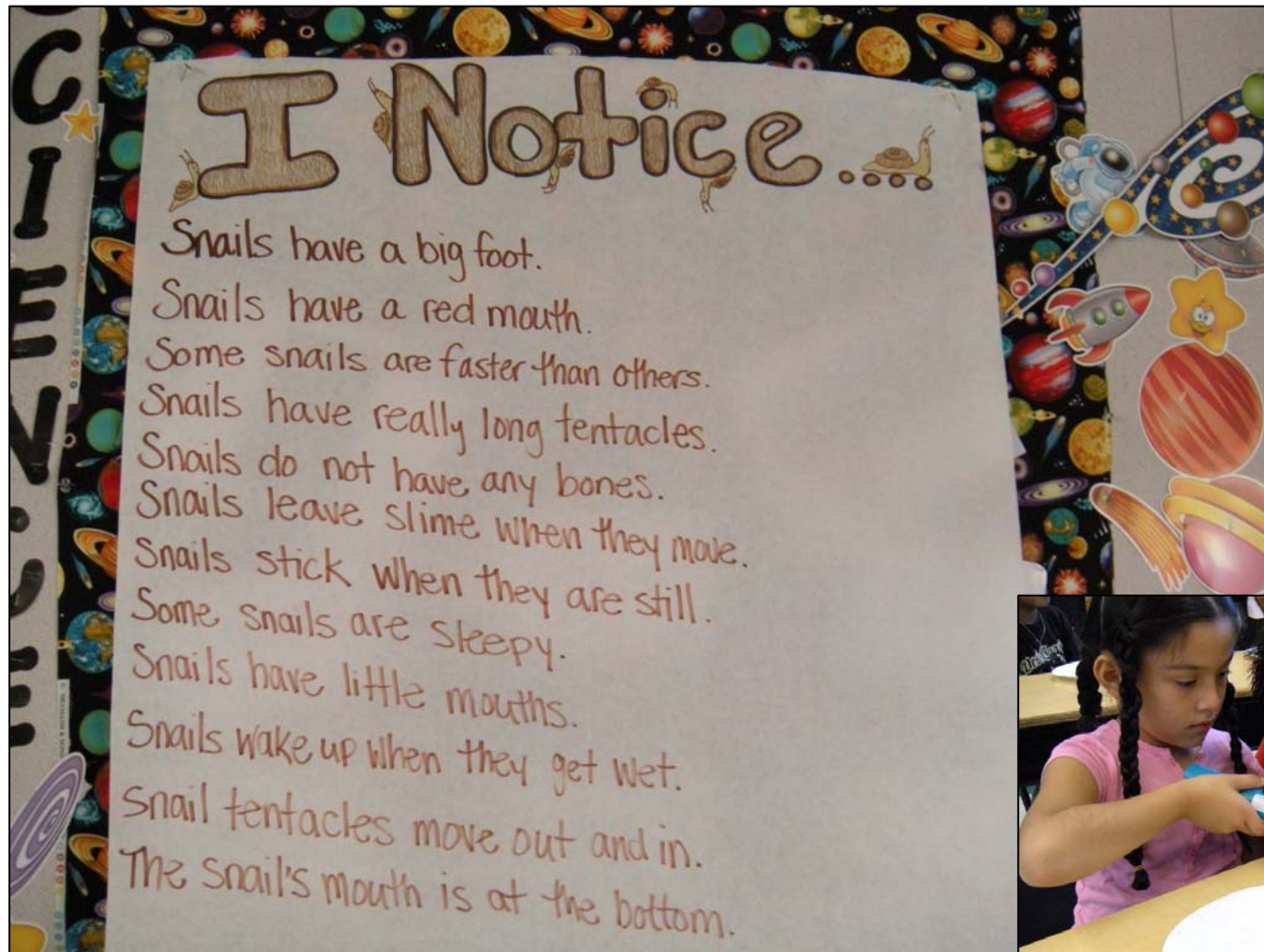
- Snails move slowly
- Snails can hide in their shells
- Snails' antennae go in when they are touched
- Snails' shells can fall off
- Snails' shells can break easily
- Snails can be poisonous
- Snails leave slime
- Snails can eat leaves
- Snails can live anywhere
- Snails like wet things
- Snails can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

### ADJECTIVES

slimy soft Wet Skinny Pretty gross  
nasty Sticky rough brown  
tooth fat fancy sharp Stinky  
squishy hideous dull  
ucky hard disgusting  
ugly

How do I Look?







# Investigate

# I Wonder...

- Can snails live in the sun?
- Can snails eat paper?
- Can snails eat pizza?
- Do snails sleep?
- Can snails move on water?
- Do snails eat plants?
- Do snails eat eggs?
- Do snails eat flowers?
- Can snails live in/under water?
- Do snails eat fruit?
- Do snails eat vegetables?
- Can snails move on rocks?
- Do snails eat candy?
- Do snails bite (you)?
- Do snails like pepper?
- Can snails move on sand?
- Do snails eat Hot Cheetos?
- Do snails eat dirt?
- Can snails stick to metal?
- Do 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?



## Types of Food

Meat	Dairy	Fruit	Vegetable	Grains	Other
<ul style="list-style-type: none"> <li>Chicken</li> <li>Bacon</li> <li>Pork</li> <li>Ribs</li> <li>Hot Dog</li> <li>Fish</li> <li>Turkey</li> <li>Beef</li> <li>Shrimp</li> <li>Clams</li> <li>Crab</li> <li>Ham</li> <li>Tuna</li> <li>Salami</li> </ul>	<ul style="list-style-type: none"> <li>ice cream</li> <li>yogurt</li> <li>milk</li> <li>Cheese</li> <li>Sour Cream</li> <li>Cottage Cheese</li> <li>eggs</li> </ul>	<ul style="list-style-type: none"> <li>apple</li> <li>orange</li> <li>avocado</li> <li>banana</li> <li>Pineapple</li> <li>strawberry</li> <li>pear</li> <li>tomato</li> <li>melon</li> <li>peaches</li> <li>grapes</li> <li>cherries</li> <li>lemon</li> <li>berries</li> <li>Tropical fruits</li> <li>plum</li> <li>raisins</li> </ul>	<ul style="list-style-type: none"> <li>Carrot</li> <li>broccoli</li> <li>lettuce</li> <li>pumpkin</li> <li>potato</li> <li>mushroom</li> <li>Pickle/Cucumber</li> <li>celery</li> <li>corn</li> <li>beet</li> <li>squash</li> <li>Spinach</li> <li>green beans</li> <li>peas</li> <li>onion</li> <li>bell pepper</li> </ul>	<ul style="list-style-type: none"> <li>White bread</li> <li>wheat bread</li> <li>Sweet bread</li> <li>rice</li> <li>spaghetti</li> <li>pasta</li> <li>lasagna</li> <li>sourdough bread</li> <li>crackers</li> </ul>	<ul style="list-style-type: none"> <li>Pizza</li> <li>Hot Cheetos</li> <li>cookie dough</li> <li>chips</li> <li>gum</li> <li>tacos</li> <li>Chocolate burrito</li> <li>tic-tacs</li> <li>tamales</li> <li>quesadillas</li> <li>lollipop</li> <li>licorice</li> <li>Skittles</li> <li>m&amp;m's</li> <li>mints</li> <li>gummi bears</li> <li>peanut butter</li> </ul>

## Investigation Plan

<p>example</p> <p>Student 1</p> <hr/> <p>Student 2</p> <hr/>	<p>Our Plan</p> <p>What kinds of foods do snails eat?</p>	<p>Materials:</p> <ul style="list-style-type: none"><li>• Snails (x 4)</li><li>• Pieces of 4 different foods</li><li>• A tray</li><li>• Hand lense</li><li>• flashlight</li><li>• pencil</li><li>• paper</li></ul>	<p>First we will gather all our materials.</p>
<p>Next we will arrange food on they tray.</p>	<p>Then we will place the snails in the middle of the tray or near each food.</p>	<p>Finally we will watch the activity of each snail.</p>	<p>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.</p>

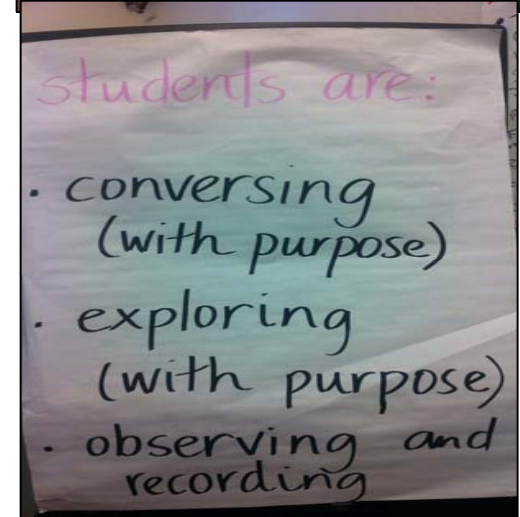


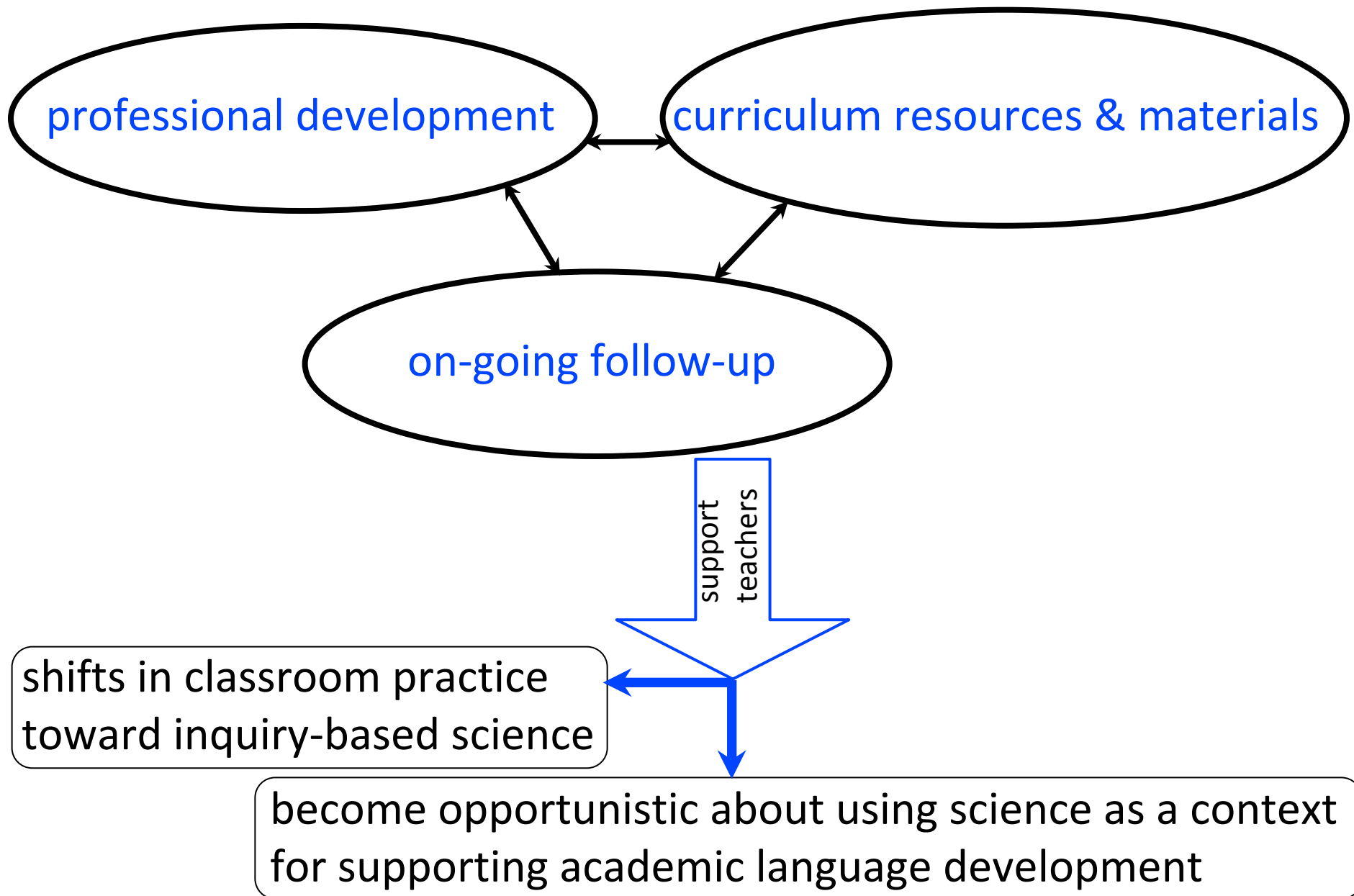


Students **talk**, **listen**, **read**, **write** and use **process skills** in the context of science investigations.

# 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.





# Next steps: The best answer is a question ... ??

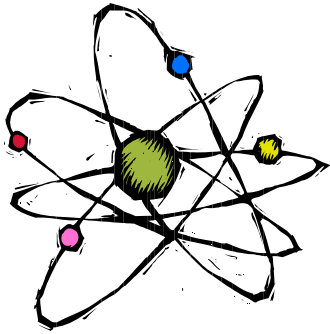
How do **teachers** who progress through the workshops, study groups and teaching of curriculum units begin to:

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

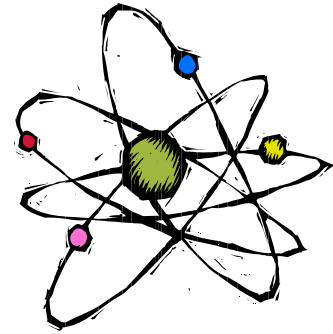
How do **students** progress in understanding science ideas and academic language proficiency?

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QUESTIONS?



**Thank you**

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

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**Thank you**