Investigating Science in Kindergarten

Sheron Lemley and Sean Timmons

About Us

Sean Timmons

- Educator for 12 years in K-6 Schools
- Data Consultant for School Districts in Northern California
- Educational Technology Developer for Pearson
- Serve on the California Science Subcommittee for CA
- Coordinator of Science and Science Professional Development at San Joaquin County Office of Education

Sheron Lemley

- Kindergarten Teacher in Merced County
- In Education for 12 Years
- Graduated from California State University Fresno with a BS in Agriculture Education/Animal Science
- CLAD Multiple Subject Credential and Educational Specialist Credentials Held

K-2 Science STARTS

What did we do?

Why was this project important?

K-2 Science STARTS

- Team: University of the Pacific, New Hope Elementary School District, San Joaquin County Office of Education, WestEd
- Consortium of 11 rural and small districts/15 schools located in a four-county region of the Central Valley and Sierra Nevada Foothills

"Teaching science in this way is making me more comfortable with letting kids do things on their own, investigate, and explore. It brings some joy back into learning."

Project Goals

Increase teachers' science content knowledge and knowledge of pedagogy

Enhance teachers' ability to access information and resources.

Network with grade level teachers to improve their science teaching

Project Goals

Increase teachers' ability and confidence to employ research-based strategies

Learn to integrate math and reading skills

Improve writing skills by using science notebooks

Project Goals

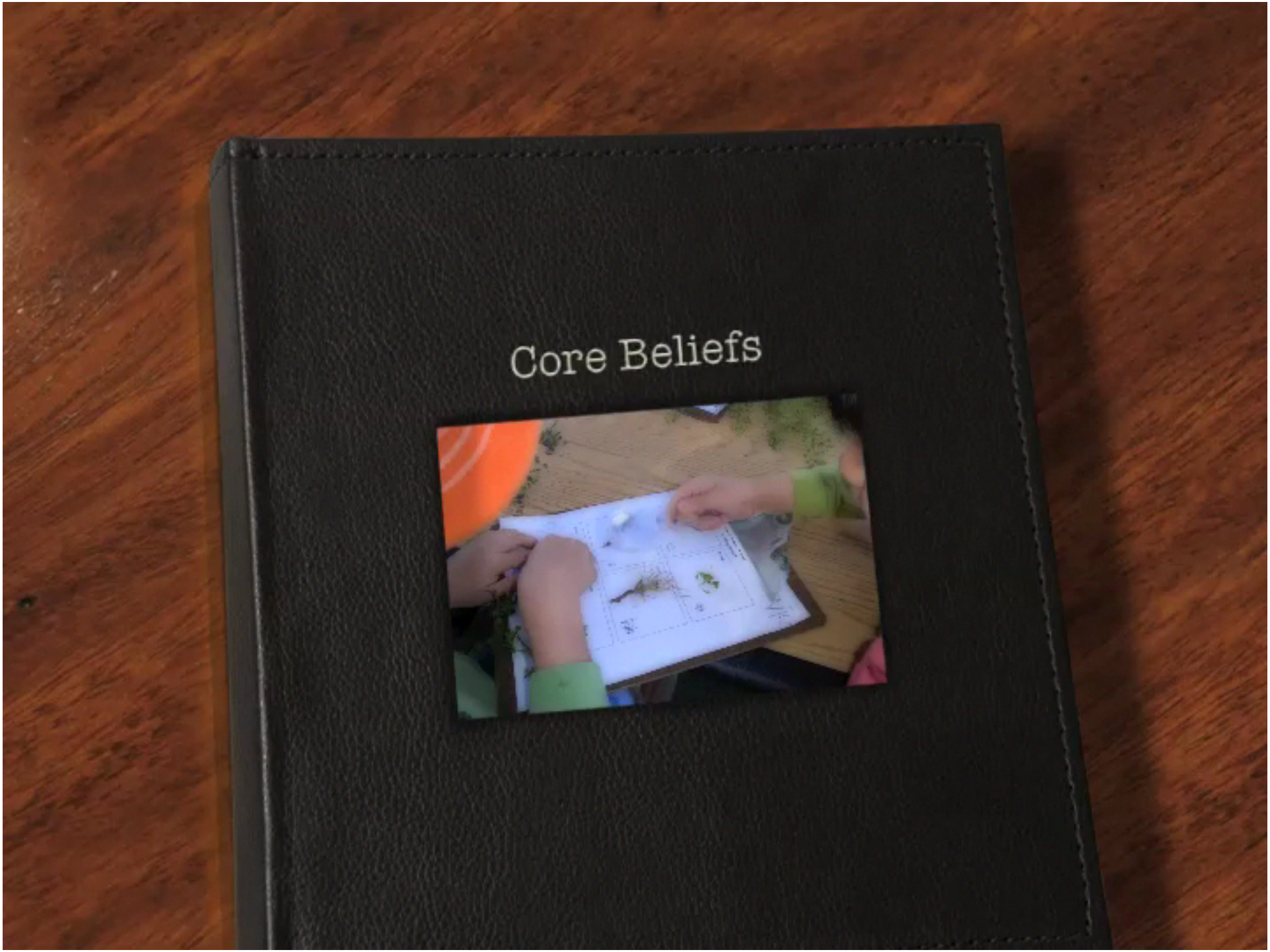
Increase time devoted to science instruction

Student achievement in science

What is Science Inquiry?

Inquiry is defined as “a seeking for truth, information, or

knowledge by questioning."


Core Beliefs

Instruments

- Classroom Observations and Surveys
  - Adaptation of Horizon Local Systemic Change Observation Tool
  - Various Surveys
  - Content Assessments Developed by WestEd
  - Enoch and Riggs (1990) Science Teaching Efficacy Belief Instrument

Instruments

- Teacher Interviews
  - Data on teacher background, time spent teaching science, school-level support, curricular and instructional choices, and other related topics
  - Conducted yearly with a strategic sample of teachers (n = 12)
    - subset of Teacher Leaders who were also randomly selected to be observed
    - remaining teachers selected at random

Instruments

- Student Notebooks
  - 5 notebooks per teacher per year randomly selected using table of random numbers
  - Will be evaluated with a rubric measuring the extent to which they reflect teaching that integrates math and English/Language Arts; appropriate K-2 standards; and inquiry-based learning outcomes

Instruments

- Student science achievement tests
  - McMillan-McGraw Hill tests tied to California science standards
  - Tests have appropriate level of internal reliability and appropriate level of difficulty
  - Test will be administered to students of project teachers, and in comparison schools drawn from the same or neighboring districts
  - Analysis will include 2nd grade standardized reading scores and demographic variables as covariates

Some Preliminary Findings

- Positive impact on teacher subject matter knowledge and retention of content over time
  - Paired t-tests indicate statistically significant gain on science assessments (35 items):
  - Pre-test mean = 16.8
  - Post-test mean = 26.7 ($p = .000$)
  - Post-post mean = 23.4 ($p = .000$ compared to pre-test)

Changes in Instructional Strategies

Survey data comparing baseline data with data collected in spring 2010 indicate statistically significant changes in teachers' instructional strategies when teaching science.

Changes in Instructional Strategies

Percentage of teachers reporting they NEVER or RARELY:	Baseline	2009	2010
Demonstrated science-related principle or phenomenon	40%	10%	8%
Required students to supply evidence	51%	13%	8%
Had students engage in hands-on activities	31%	0%	3%
Had students involved in investigations or projects	73%	41%	28%

Student Interest in Science

"A little boy said, 'This is really interesting,' when doing an experiment on matter. . . I could give you countless examples. . . Science was their favorite subject. They would play science at recess. They were almost obsessed. I heard one kid say, when leaving for recess, 'Do you want to be a paleontologist today?'"

Welcome!

Sheron Lemley

Step 1: The Planning Process

- Step 1: Display Big Idea & Standard Addressed
  - Time: Day 1, approx. 5 min.
  - The big idea is simply the standard being addressed throughout the unit written in student friendly terms.

Step 2: The Kit Inventory

- Step 2: Kit Inventory
  - Day 1, approx. 15-20 min. depending on grade level
  - Gather all materials needed to conduct the inquiry before doing the inventory. Showcase each item to the class asking probing questions about the items.

Step 3: The Engaging Scenario

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  - Time: Day 1, approx. 5 min.
  - Read and discuss the engaging scenario being used to capture student interest for the inquiry. An engaging scenario is how you present the problem to be addressed through a story format. You will need to guide students to identify the problem faced in the engaging scenario. The identified problem will lead to a focus question.

Step 4: Focus Question

- Step 4: Focus Question
  - Time: Day 2, approx. 5 - 10 min.
  - Using guiding questions, lead the students to identify the problem in the engaging scenario. You may need to provide the question to the students. Write the focus question on the board for the students to copy into their notebooks. The focus question usually is a "how can we find out or how do we....?" type of question.

Step 5: Prediction

- Step 5: Prediction
  - Time: Day 2, approx. 15 min.
  - Review the focus question from the previous day. Have students offer suggestions on how to solve the problem. This is an important time for a class discussion. After most of the class has shared their ideas, provide time for students to write their predictions answering the focus question in their journals.

Step 6: Procedure and Data Collection

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  - Time: Day 3, approx. 30 - 60 min. depending on your experiment.
  - Plan and discuss how you will record the information students are going to observe in the experiment. Depending on the age of the students, you may need to provide charts or concept maps for students to fill in as the inquiry takes place.
  - Student drawings, graph, diagrams, and charts are all examples of appropriate data collection materials

Step 7: Claims and Evidence

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  - Time: Day 4 approx. 15 - 30 min.
  - Discuss what happened in yesterday's experiment and use any textbooks or materials to further understand. Provide guiding questions to your students that they will answer in declarative sentences to make claims based on information gathered during the investigation and textbook reading.

Step 8: Conclusion

- Day 8: Conclusion
  - Time: Day 5
  - Review the focus question. Have students reread their predictions. Were they able to solve the problem? Students write a sentence explaining if the evidence supported or did not support their predictions.

Step 9: Reflection

- Step 9: Reflection
  - Time: Day 5
  - Read the big idea to the class. Ask students what evidence they have that supports the big idea. Students write ideas on what they learned about throughout the investigation. Ask students to write something else they want to know about the topic.

Sink and Float

The Kit Inventory

1. Chart paper
2. Student handout worksheet
3. Items that float or sink:
    a. empty plastic bottle
    b. popsicle sticks
    c. large metal paper clips
    d. coins
4. Markers
5. Tub for water
6. Student pencils
7. Tape

The Engaging Scenario

The three little pigs were on a walk in the forest one day. They came upon a wishing well. Since they didn't have any coins to throw into the wishing well they decided to throw things into the well that they had in their pockets or things that they could find nearby. The first little piggy threw a rock into the well and watched it sink to the bottom. The second little piggy had a popsicle stick and threw it in. The popsicle stick floated on the top of the water. The third little piggy's pockets were empty so he looked around and found a big tree leaf and threw it in. The leaf floated along the top of the water like the second little piggy's popsicle stick. Realizing that some objects float and others sink, the three little pigs decided to go home and find new objects to test out.

The Focus Question

Which objects sink and which float?

Prediction

We predict that the _____ will (sink/float).

Procedure and Data Collection

Claims and Evidence

Conclusion

We wanted to know if certain objects that were provided would sink or float.

We discovered which objects floated and which sank.

Reflection

I wonder what other items sink and float?

Students will bring 3 items from home in a plastic bag.

Students will investigate which of their items sink and float.

In Closing

Questions or Comments

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