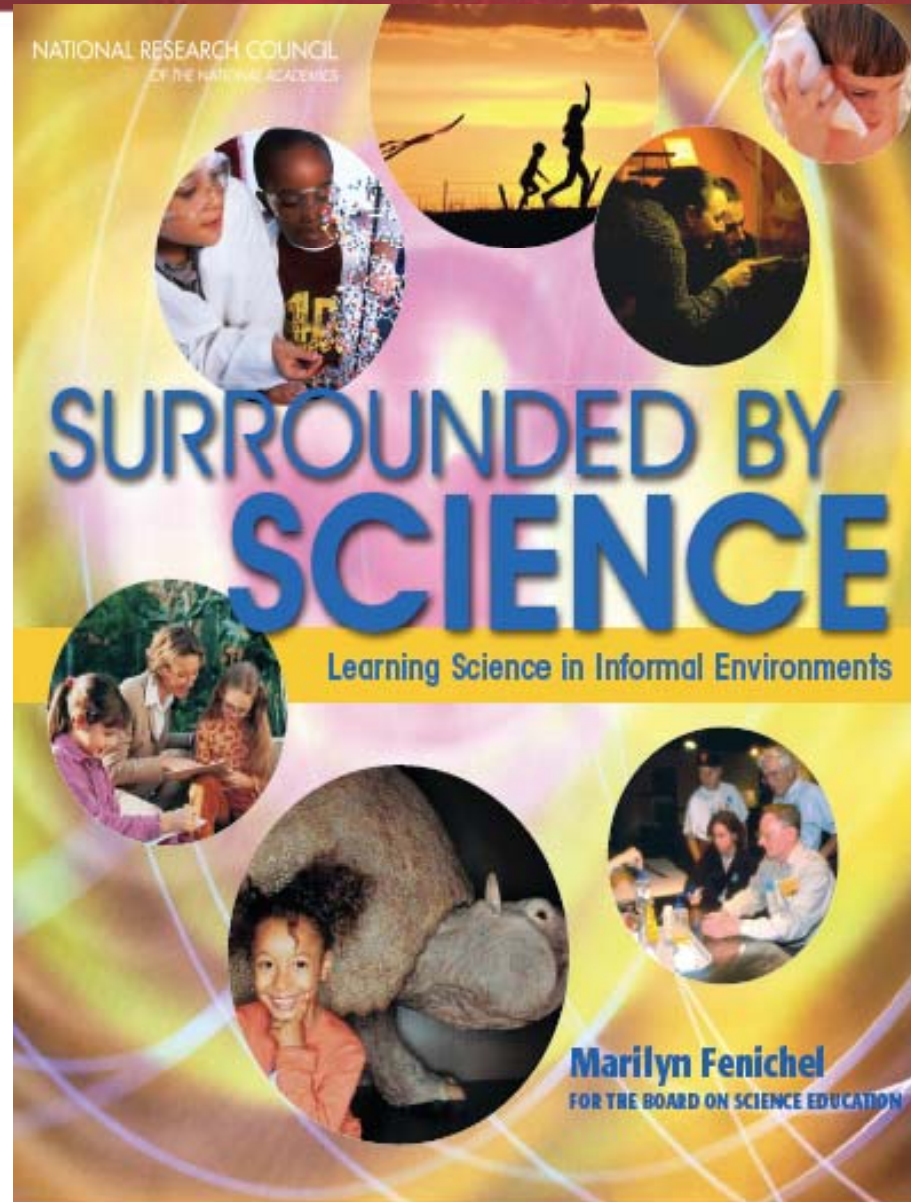


What's the Evidence Base?

Andrew Shouse,
University of Washington

Cecilia Garibay,
Garibay Group

Marsha Semmel, Institute for
Museum and Library Services



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**Learning Science
in Informal
Environments**

**People, Places,
and Pursuits**

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**SURROUNDED BY
SCIENCE**

Learning Science in Informal Environments

Marilyn Fenichel
FOR THE BOARD ON SCIENCE EDUCATION

LSIE Study Process by Numbers

- 3.5 years; \$1.7 million & preceded by small planning grant (NSF Thank you!)
- 14 Committee members
- 22 Invited testimonials (panels, white papers)
- 2000+ Publications
- Adjudicated review; 14 reviewers
- 340 pages . . .

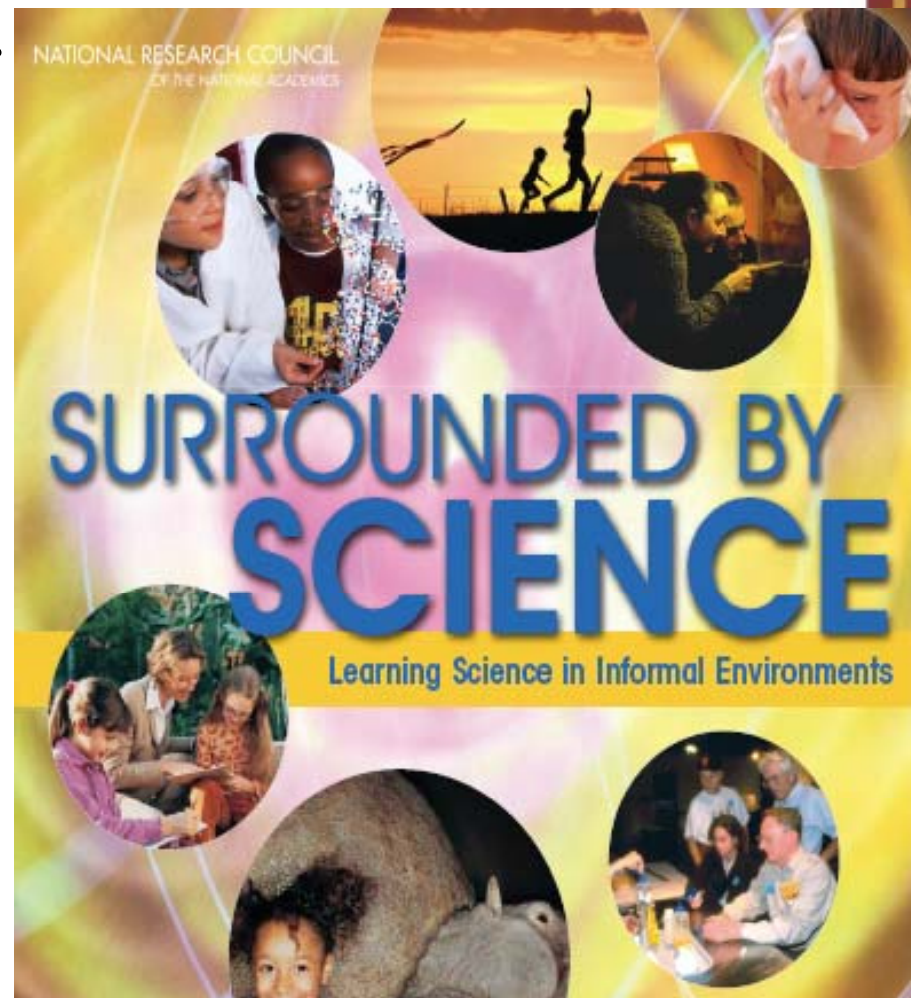
Major Themes (A sprint-sorry!)

- Learning happens (!) and in multiple ways; it can be described, measured, probed, supported
- Virtually all people have science-relevant skills
- We can design for learning that harnesses skills
- As a field we know a lot and we have much more to learn!
 - Deep community partnerships
 - Cultural diversity and equity
 - Learning over longer periods of time; across settings

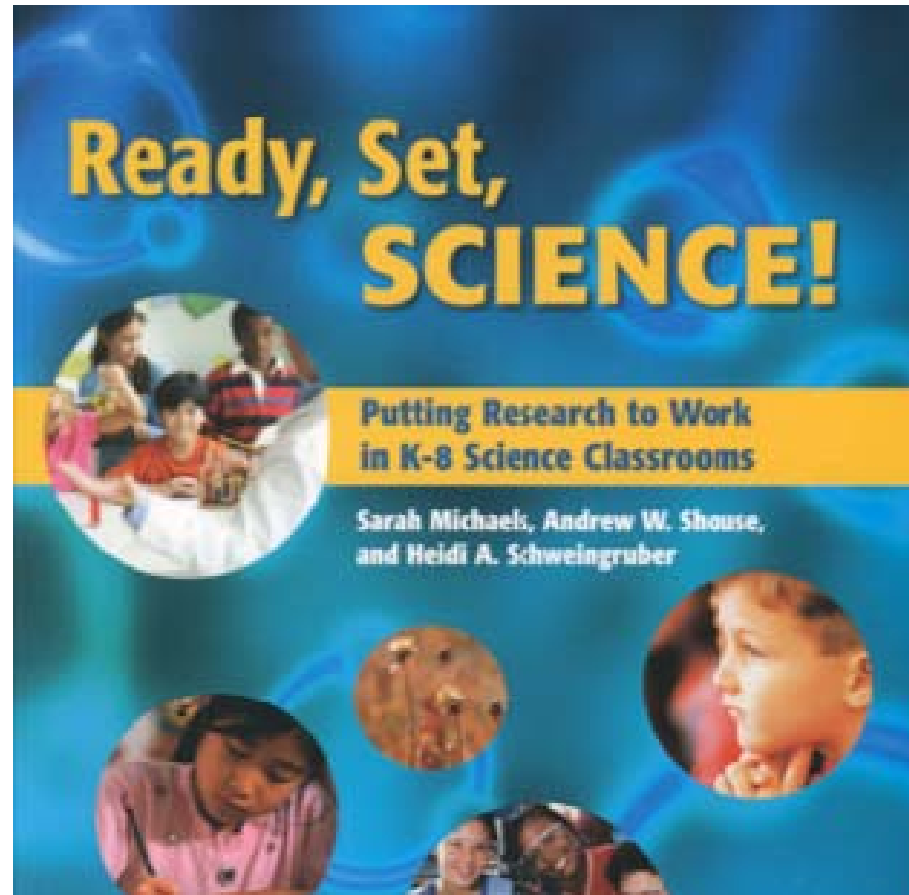
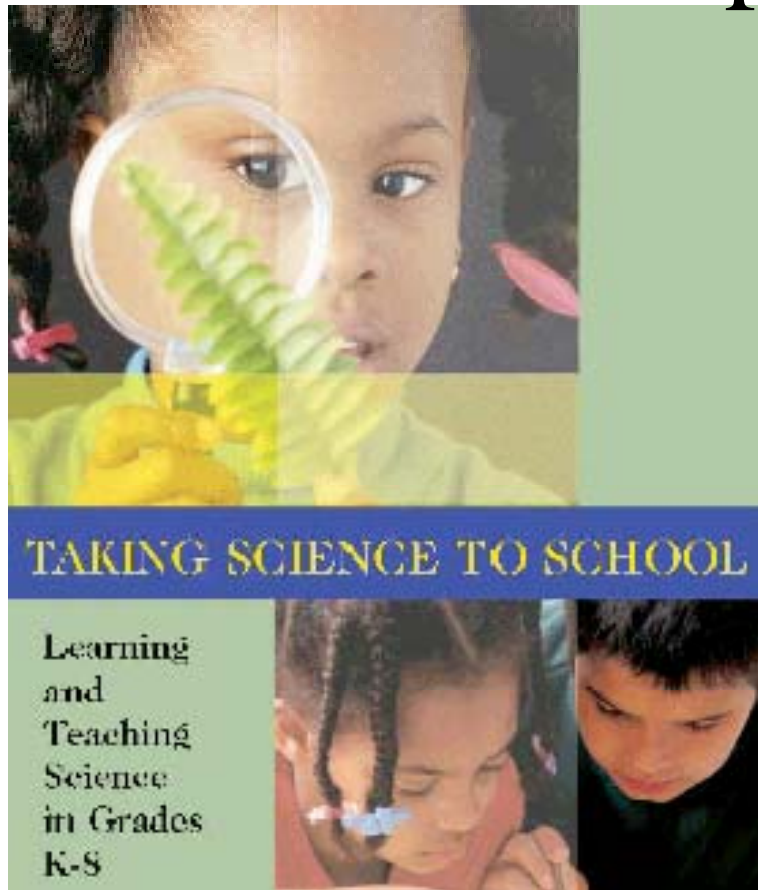
Did you say 340 Pages?! Yes, I did. But relax. . .

- Practitioner/Researcher collaboration
- Practice friendly
- Brief, accessible prose
- Case-based
- Professional development design

Thank you: IMLS, NSF, Burroughs Wellcome Fund



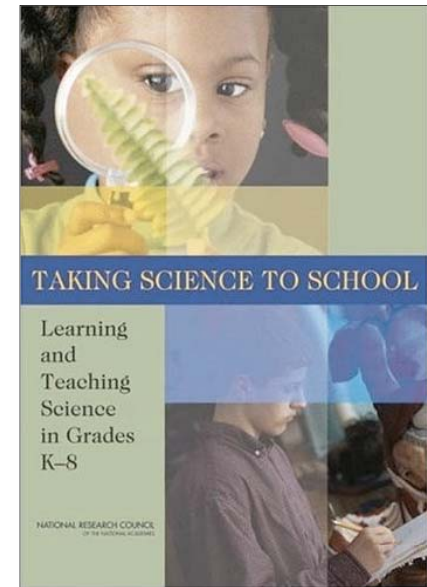
There are powerful resonances
with the school-based literatures
and practices!



What Is Science?

Definition of Science — The use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process.

- ✓ Doing science involves:
 - Building theories and models
 - Collecting and analyzing data from observations or experiments
 - Constructing arguments
 - Using specialized ways of talking, writing and representing phenomena

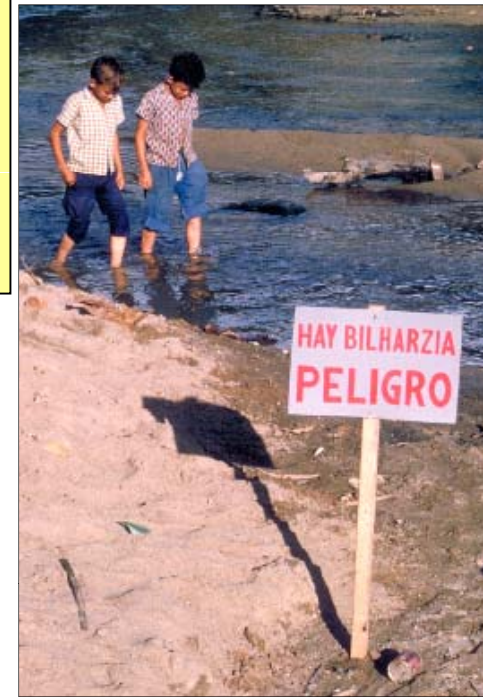


Attending to science . . . science is a social enterprise with specialized goals, tools, ways of speaking.



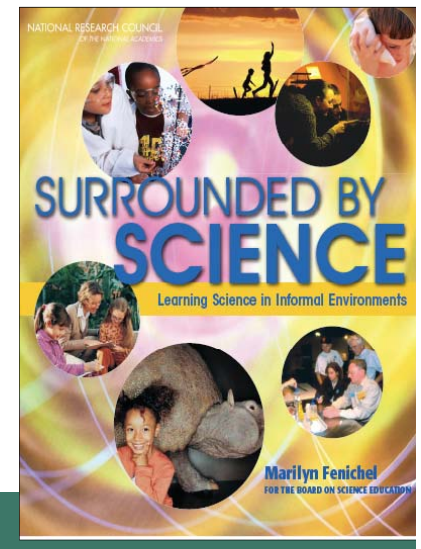
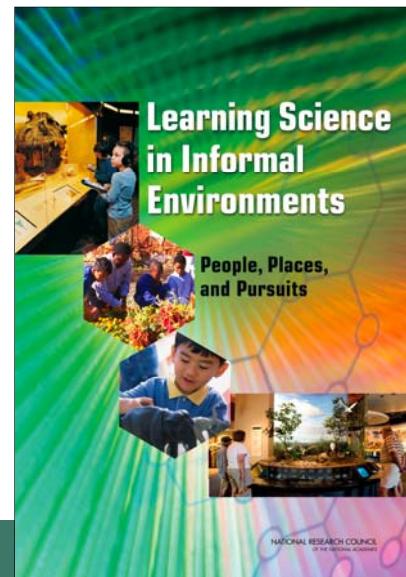
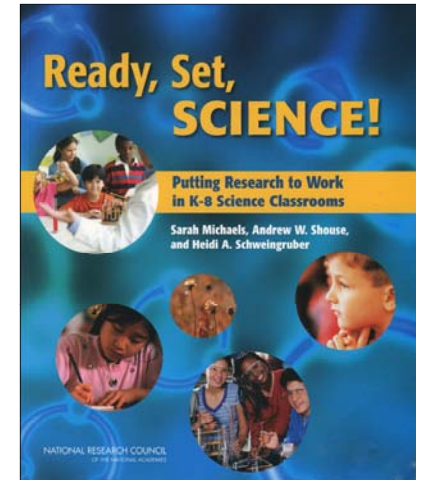
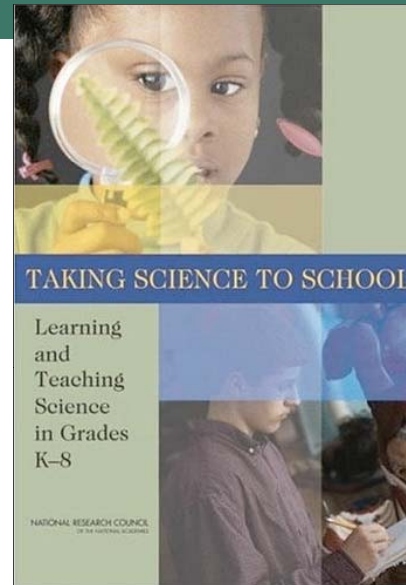
Attending to learners and communities . . .

Science education should deeply orient to the practices, needs and interests of youth and communities.



What is Science Learning? Consensus: Six Strands of Scientific Proficiency

- 1) Developing Interest in Science
- 2) Understanding Science Knowledge
- 3) Engaging in Scientific Explanation and Argument
- 4) Understanding the Scientific Enterprise
- 5) Engaging in Scientific Practices
- 6) Identifying with the Scientific Enterprise



Strands: Explore and Apply

Conspire with your neighbor:

- Each choose 3 of the strands
- Read (5 minutes)
- Watch video & apply
- Discuss:

Where do you see evidence of the strands?

(Thank you Exploratorium and Sue Allen for the video!)

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Diversity and Equity in Informal Environments

Conclusions Related to Diversity

Conclusion 4

Members of cultural groups develop systematic knowledge of the natural world through participation in informal learning experiences and forms of exploration that are shaped by their cultural-historical backgrounds and the demands of particular environments and settings. Such knowledge and ways of approaching nature reflect a diversity of perspectives that should be recognized in designing science learning experiences.



*Plant Knowledge
among Zapotec
Children,
(Hunn, 2002)*

Conclusion 8

Designers and educators can make science more accessible to learners when they portray science as a social, lived experience, in contexts that are relevant to learners and when they are mindful of diverse learners' existing relationships with science and institutions of science learning.



Conclusion 9

Informal environments can have a significant impact for individuals from non-dominant groups who are historically underrepresented in science.



Conclusion 10

Partnerships between science-rich institutions and local communities show great promise for fostering inclusive science learning. Developing productive partnerships requires considerable time and energy.



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Recommendations

Exhibit and Program Designers

Recommendation 2

From their inception, informal environments for science learning should be developed through community-educator partnerships and whenever possible should be rooted in scientific problems and ideas that are consequential for community members.

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Models Exhibition Museum of Science, Boston



Front-Line Educators

Recommendation 4:

. . . should actively integrate into science learning experiences, questions, everyday language, ideas, concerns, world views, and histories, both their own and those of diverse learners.

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Hopa Mountain Native Science Field Programs



Biodiversity Taxa Checklist

Code	Species – Blackfeet Name	Present
Mammals		
M1	Badger – mi's-in-ski (striped face)	
M2	Buffalo – in-i'wa (dead living)	
M3	Coyote - api'si (white just showing)	
M4	Mole – stuksi-kainas-kina (under mouse)	
M5	Mule Deer - i'sik-o-toyi (black tail)	
M6	Porcupine – kai-ska'hp (quilled nose)	
M7	Rabbit - a'a-tsis-ta (jumper)	
M8	Skunk - a'pi-kai-l (white striped back)	
M9	White-tailed Deer – a'wa-toyi (wags his tail)	
Birds		
B1	Bald Eagle – ksikkihkini (white head)	
B2	Magpie - mamai'tsikimi	
B3	Owl – sipisttoo (night announcer)	

Park Voyagers Museums in the Park



Now the museums have an in-house person who's lived it—there's no substitute for being at a community center, seeing the problems... seeing the successes and seeing what their world is like.