Framework for K-12 Science
&
Next Generation Science Standards:
An Overview

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Slides from Helen Quinn
(Stanford U. and NRC/NAS)

Background: K-12 Standards

+ US K-12 education: State and local control

+ "Common Core" Math and Language Arts:
  47+ states

Foundation for Standards
(from US National Academy of Sciences)

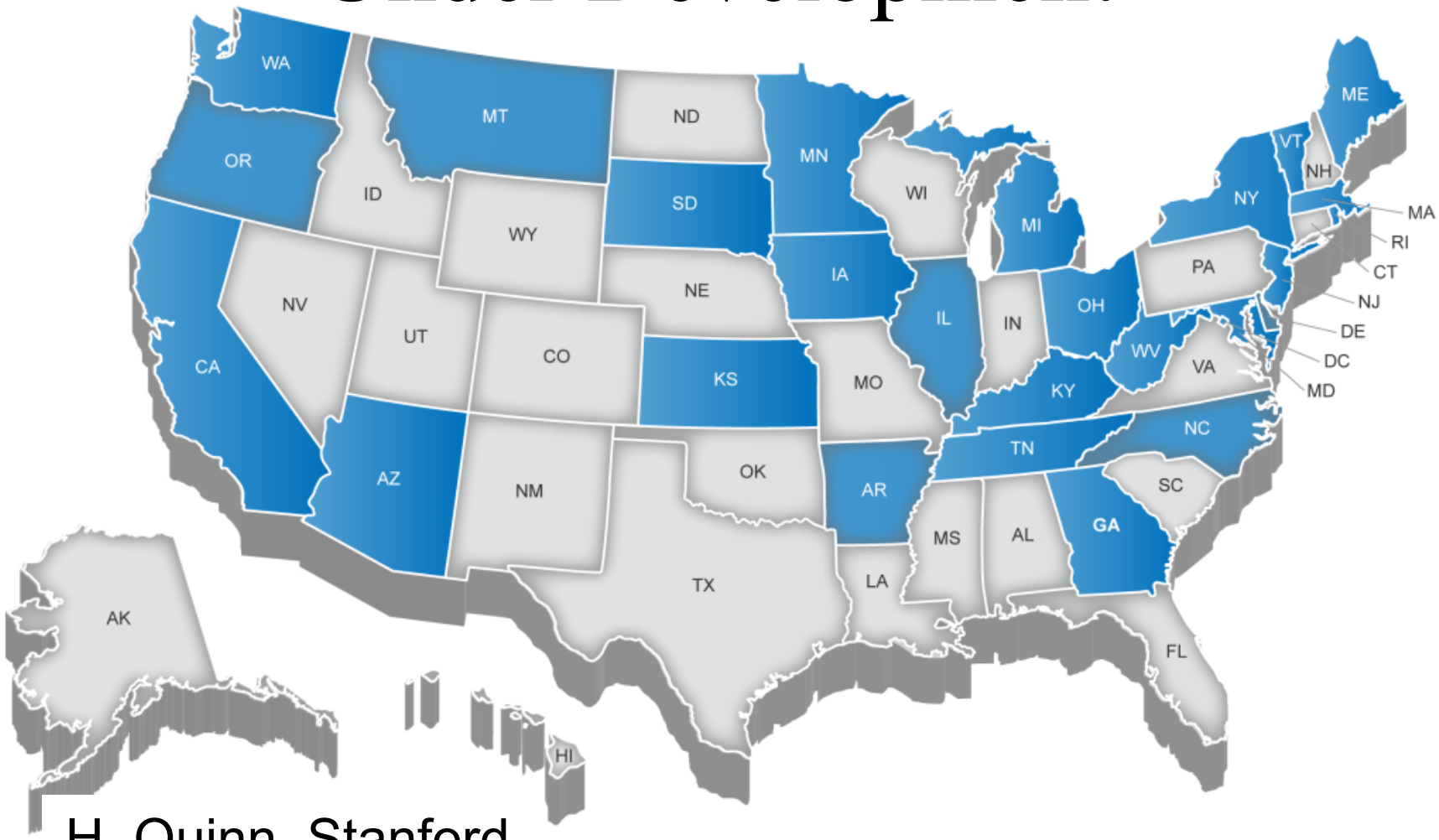
A FRAMEWORK FOR K-12 SCIENCE EDUCATION

Practices, Crosscutting Concepts, and Core Ideas

2012

NRC Board on
Science Education

U.S National Science Standards (Pre-college) Under Development



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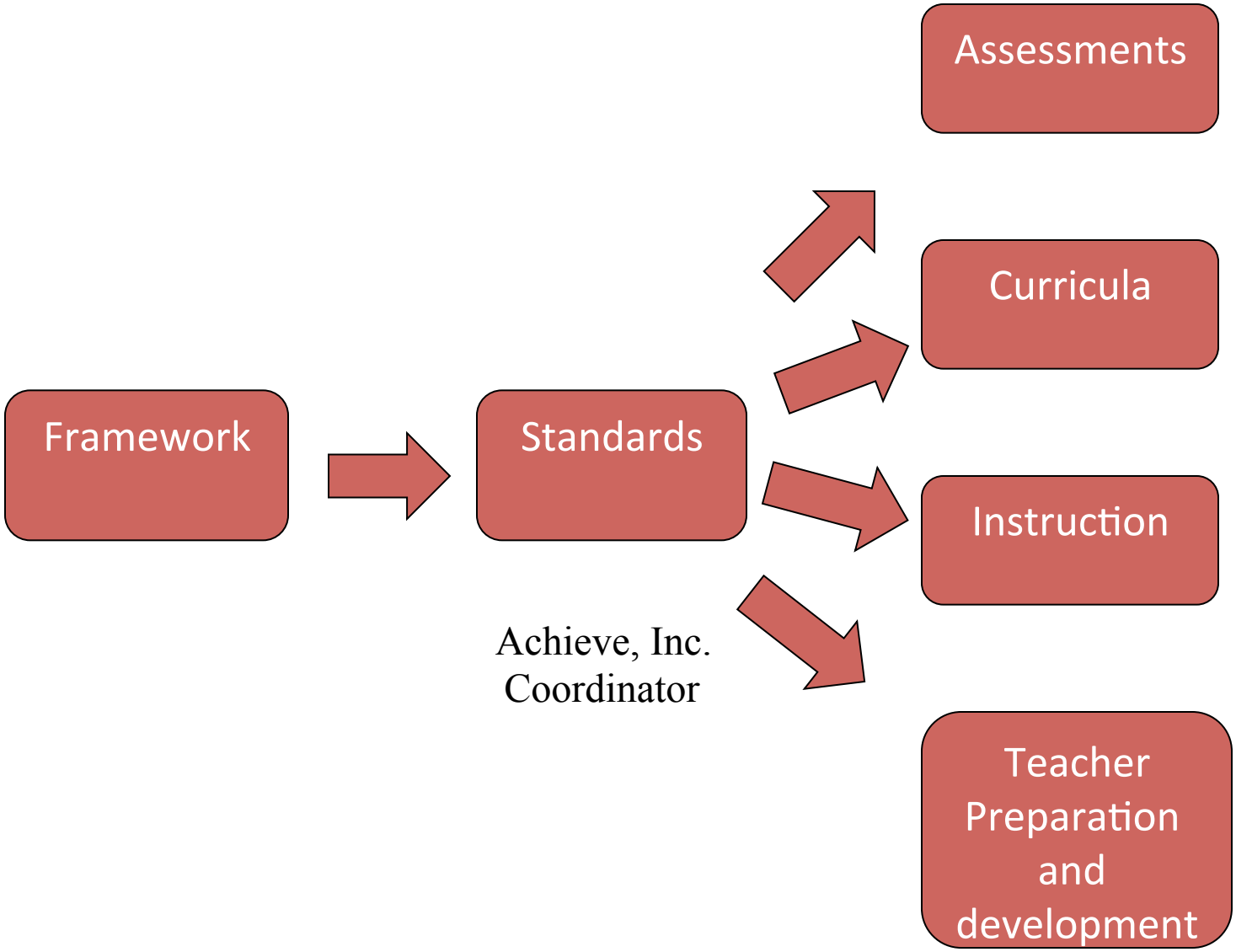

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Three Dimensions of Modern Science Education

+ Disciplinary core ideas

+ Crosscutting concepts

+ Scientific and engineering practices

Disciplinary Core Ideas: Physical Sciences

- PS1 Matter and its interactions
- PS2 Motion and stability: Forces and interactions
- PS3 Energy
- PS4 Waves and their applications in technologies for information transfer

AP Science Reform

+ Reduce Coverage (Emphasize core ideas)
+ Teach students to think like scientists (Inquiry)

Crosscutting Concepts

1. Patterns
2. Cause and effect: mechanism and explanation
3. Scale, proportion and quantity
4. Systems and system models
5. Energy and matter: flows, cycles and conservation
6. Structure and function
7. Stability and change

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Scientific and Engineering Practices

1. Asking questions and ***defining problems***
2. ***Developing and using models***
3. Planning and carrying out investigations
4. ***Analyzing and interpreting data***
5. Using mathematics and ***computational thinking***
6. Developing explanations and ***designing solutions***
7. ***Engaging in argument from evidence***
8. Obtaining, ***evaluating***, and communicating information

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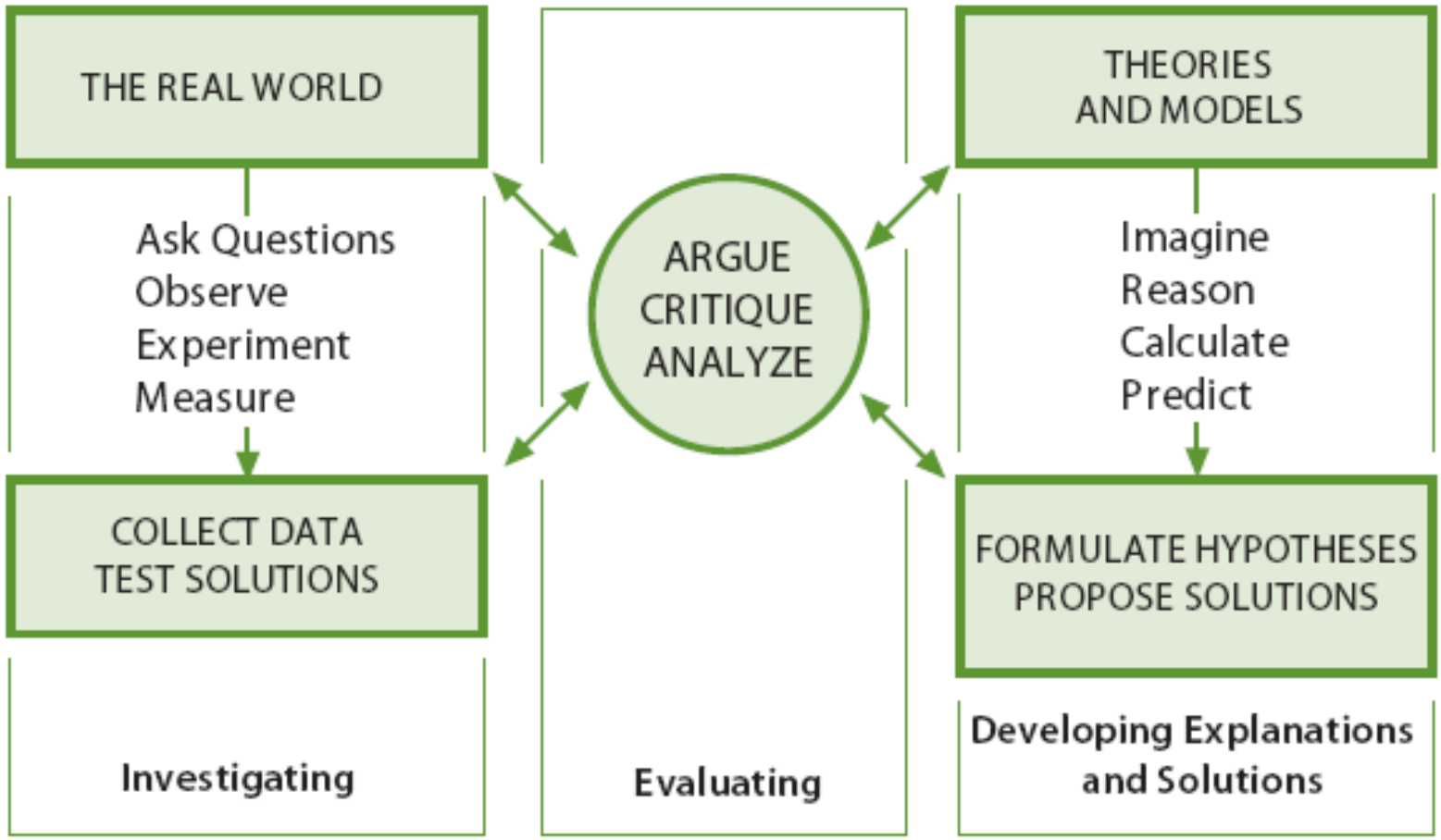
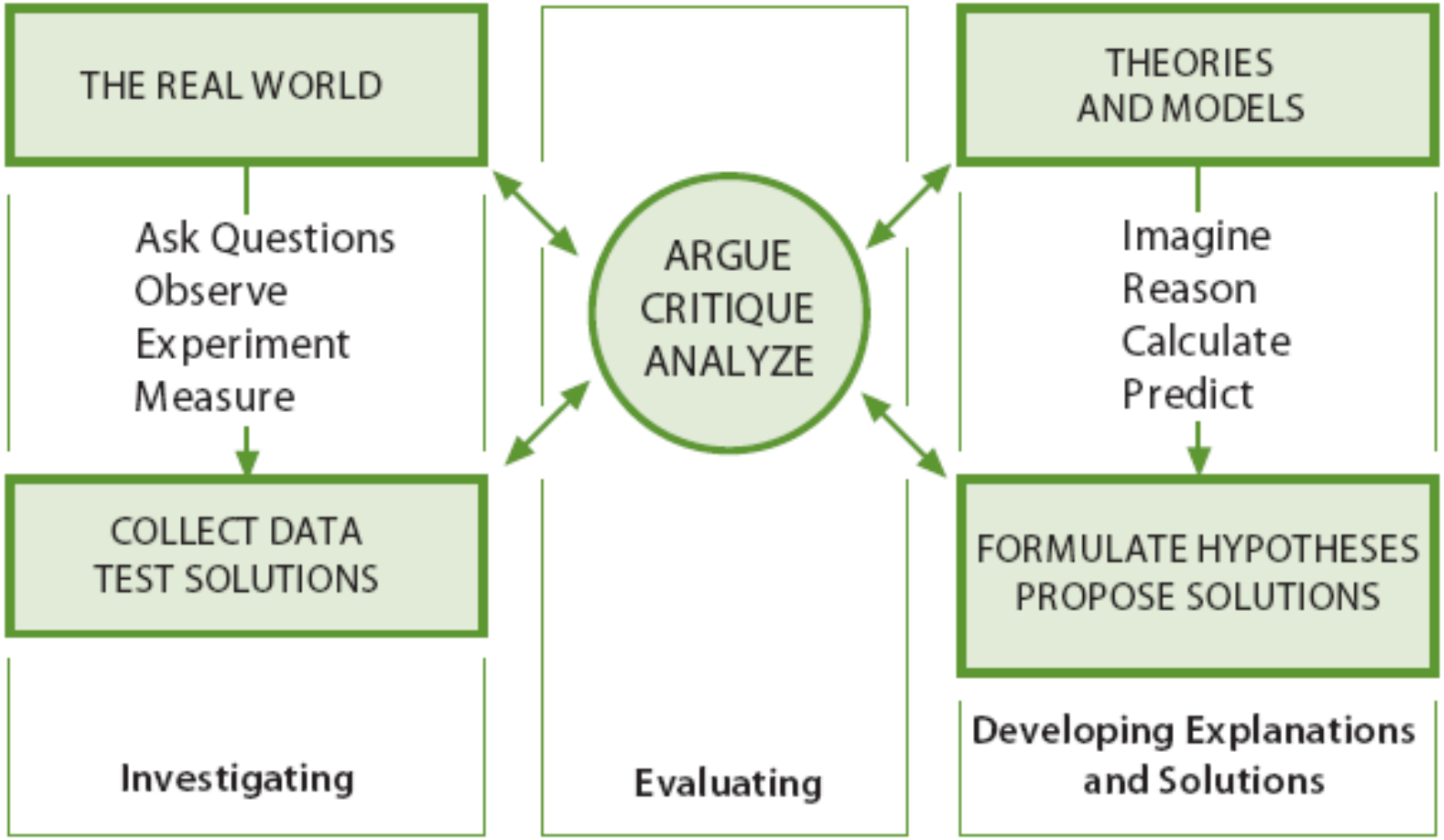
Integrating Practices



NRC Framework for K-12 Science Education

A Framework for ~~K-12~~ Undergraduate Science Education?

Why don't GT Intro. Physics labs look like this?



Example: Mechanics (Motion Prediction)

PS2.A: Forces and Motion

+ Cognitive Principles (Reif)

+ Modeling Instruction (Hestenes)

+ Computational Thinking

(Chabay & Sherwood)

References

* Framework: K-12 Science Standards:
http://www.nap.edu/catalog.php?record_id=13165

* Webinar by Helen Quinn on framework
http://www.aps.org/careers/guidance/webinars/nextgen.cfm

* K-12 Standards Development
http://www.nextgenscience.org/