OpenSciEd Research Agenda Kickoff

March 31, 2021

Digital Promise

Science Strategy

Education Program

Leadership and Teaching to Advance Learning

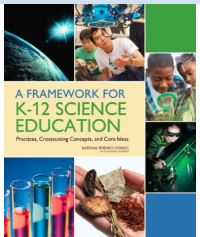
March 2021

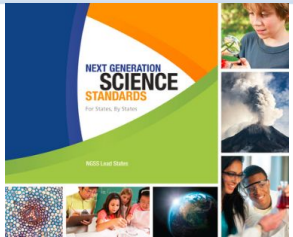
Standards & Curriculum Reform

Carnegie Corporation of New York

Purpose	Policies	Programs	Practices
• Reforming goals and priorities by publishing a report	• Adopting new standards and frameworks through legislation	• Developing instructional materials; selecting and using new programs	• Changing teaching strategies; adapting materials to the needs of students and schools
• 1-2 years (national)	• 3-4 years (states)	• 3-6 years (districts/schools)	• 7-10 years (classrooms)

Leadership → Leadership → Leadership

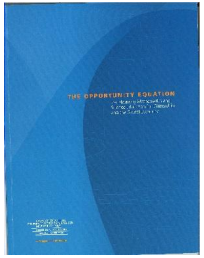




National Reports on Science Education

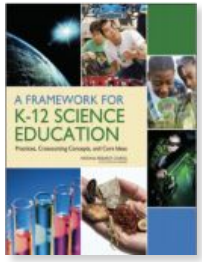
Carnegie Corporation of New York

The National Academies of SCIENCES ENGINEERING MEDICINE



INSTITUTE FOR ADVANCED STUDY

2007-2009



THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

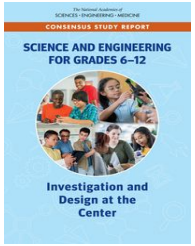
2009-2011

NEXT GENERATION SCIENCE STANDARDS
For States, By States

Achieve

2010-2017

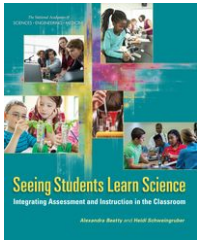
2014



2019

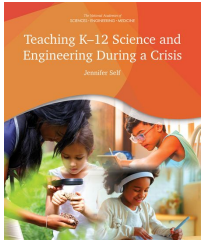
Science and Engineering for Grades PreK-5

2021



2017

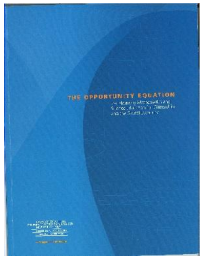
2018



2020

Investments in Science Education

Carnegie Corporation of New York



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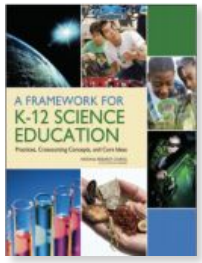

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For States, By States

Achieve

2010-2017

Curriculum-Based Professional Learning

OpenSciEd

K-12 Instructional Materials

edreports.org

Interim Assessments

THE LAWRENCE HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY

2018-present

Leadership Development

Council of State Science Supervisors

OpenSciEd50+

NEXUS Academy for Science Curriculum Leadership
A Project of WestEd and BSCS Science Learning

BSCS SCIENCE LEARNING

Research Agenda

Digital Promise
Accelerating Innovation in Education

2020 - present

OpenSciEd

A nonprofit organization that aims to improve science education through the development and implementation of **high-quality, freely available K-12 science instructional materials**.

Carnegie Corporation of New York

Bill & Melinda Gates foundation

As our parents planted for us, so will we plant for our children

Charles and Lynn Schusterman Family Foundation

William + Flora Hewlett Foundation

Jim Ryan
Executive Director

Matt Krehbiel
Professional Learning Director

Sarah Delaney
Curriculum Director

3 OpenSciEd Staff Members

OpenSciEd

5

Organizations in the Middle School Developers Consortium

BSCS SCIENCE LEARNING

NextGen Science Storylines
Northwestern University

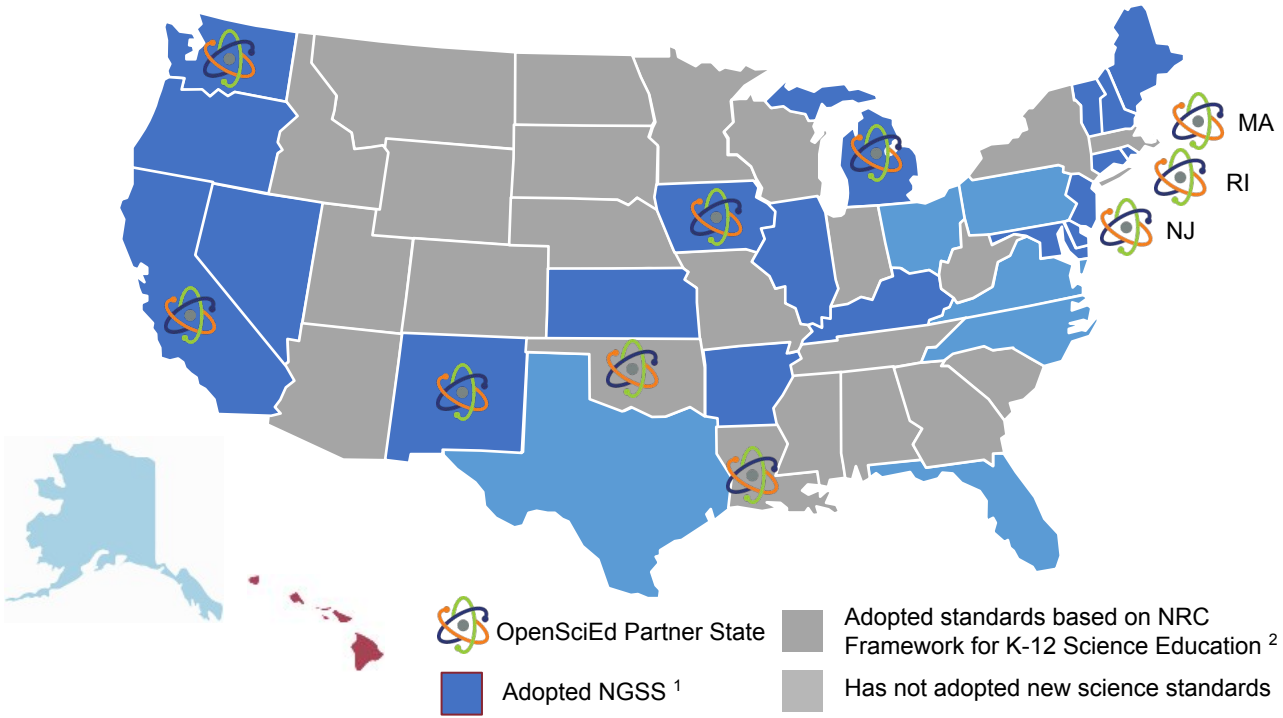
BOSTON COLLEGE
Lynch School of Education and Human Development

The University of Texas at Austin
Charles A. Dana Center

University of Colorado Boulder

OpenSciEd

20 states and D.C. have adopted the NGSS
24 states have adopted standards based on the NRC Framework



1) States that adopted NGSS made no or minimal changes to NGSS standards
2) States that adopted standards based on NRC framework made minimal to moderate changes to NGSS standards
Source: NGSS NSTA

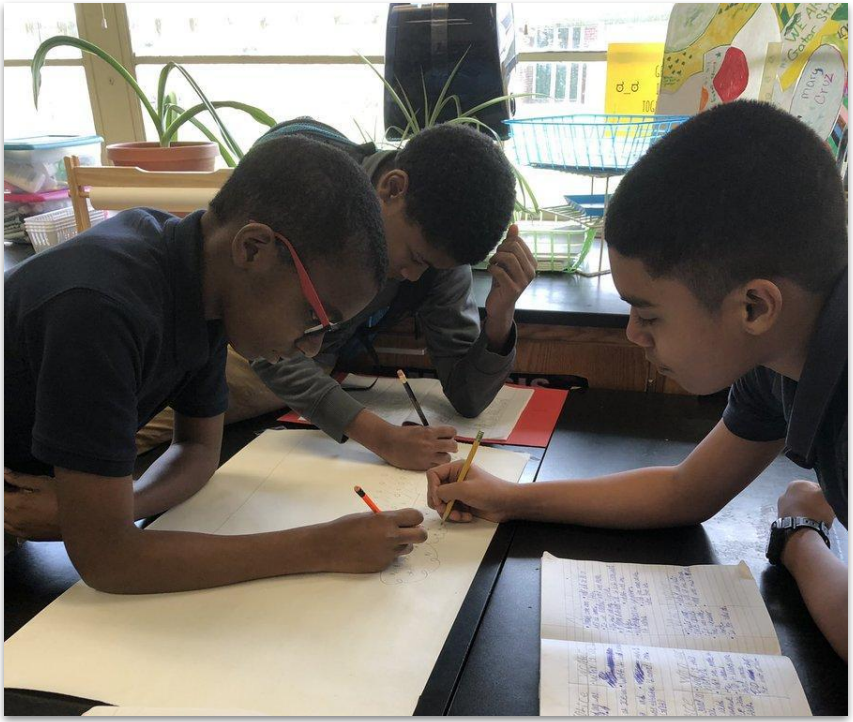
65 Facilitators

OpenSciEd

228

Field Test Middle School Teachers

OpenSciEd



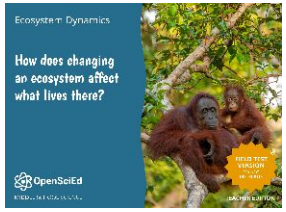
Students contributing to field test results

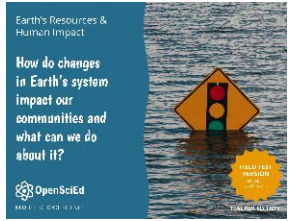
5,800

OpenSciEd

High-quality middle school science classroom and professional learning materials that prioritize equity

OpenSciEd





Remote Learning Adaptations

REMOTE LEARNING ADAPTATIONS NOW AVAILABLE

Visit OpenSciEd.org for more information.

OpenSciEd

COVID-19 & HEALTH EQUITY SCIENCE UNITS

GRADES K-2

GRADES 3-5

MIDDLE SCHOOL

HIGH SCHOOL

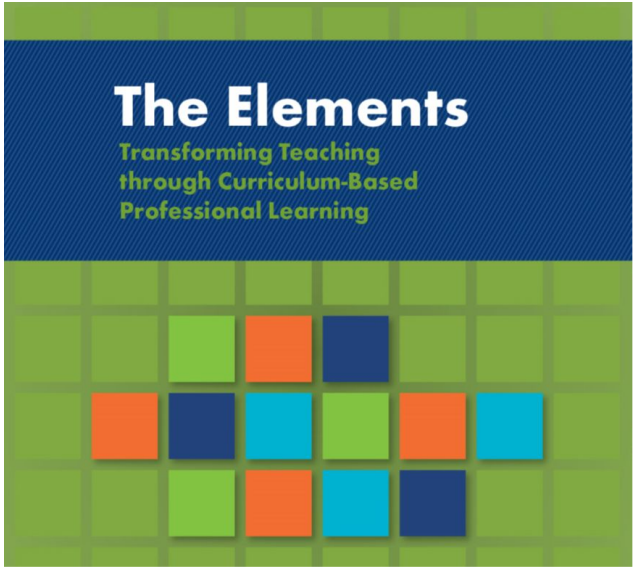
Who's Using this Stuff?

20,961 Registered users on website

203,655 Downloaded items from the website

422,197 Views on our YouTube Channel

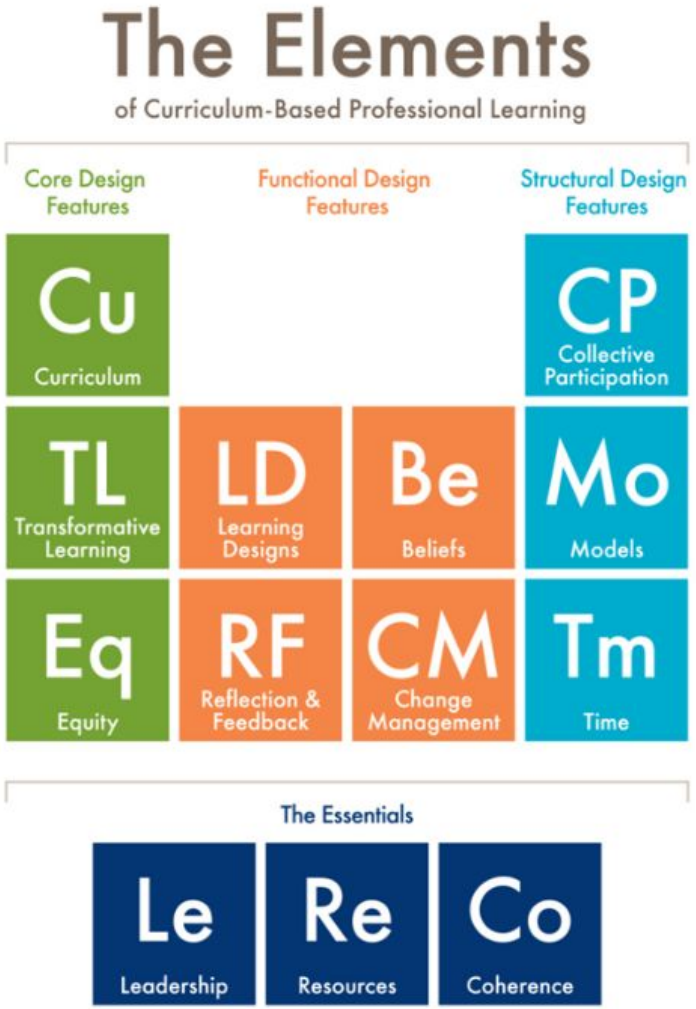
OpenSciEd



A Challenge Paper From

Carnegie
CORPORATION
OF NEW YORK

www.Carnegie.org/Elements



Toward an OpenSciEd Research Community

Jeremy Roschelle

Digital Promise

Learning Sciences Research

Presented by Digital Promise

Digital Promise

Accelerating Innovation in Education

The Research Opportunities We Envision

- **OpenSciEd-enabled** research
  Research questions in service of science education broadly

- **OpenSciEd-inspired** research
  Research questions that drive innovations based on distinctive features

- **OpenSciEd-partnership** research
  Research and evaluation questions of mutual interest to you and OpenSciEd developers

The vision: an extended community investigating how to improve science education, centered on an open, modern, high quality curriculum.

Types of Research Studies

- **Core research**
  Building scientific knowledge about learning and teaching
- **Design research**
  Exploring improvements, adaptations and extensions
- **Implementation research**
  Building capacity and supporting use
- **Efficacy research**
  For whom and under what conditions does OpenSciEd work?
- **Scale up research**
  Spread, depth, shift of ownership, sustainability, evolution

What OpenSciEd makes possible

Anchoring in one curriculum can help a community achieving greater impact

- A researcher-practitioner district partnership adapts materials to tackle science equity
- A partnership with a state agency reorganizes the built-in teacher supports to be able to scale up teacher professional development statewide
- A rural STEM consortium develops a toolkit and guidelines for adapting OpenSciEd for differing rural communities nationwide

Why we're excited

OpenSciEd opens up powerful, new research opportunities

Digital Promise's Beliefs

1. Important research requires bringing researchers, practitioners, developers, funders, and other voices together
2. Individual research projects achieve stronger rigor and relevance when they are part of a community
3. Equity is a pressing challenge that we need to tackle together

Call to Action: Join a working group to define what this community should become and what research it should seek to do.

buildbackbetter.gov

IMEDITATE PRIORITIES:

COVID-19
CLIMATE
HEALTH CARE

RACIAL EQUITY
IMMIGRATION

ECONOMY
RESTORING AMERICA'S
GLOBAL STANDING

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IMEDITATE PRIORITIES:

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RESTORING AMERICA'S
GLOBAL STANDING

All Standards, All Students

Traditional

Scientists & Teachers

Knowledge of Science Disciplines

Some Students

Contemporary

Students as Scientists and Engineers

Making Sense of Phenomena and Designing Solutions to Problems

All Students

Future

Students as ??

All Students

A Case for an Equity Research Agenda

Equality: Students are all treated the same and have access to the same resources

Equity: Students all receive the resources they need so they can achieve the same rigorous outcomes

Shifts from Deficits to Assets

Deficit-Oriented Pedagogy

- Linguistically marginalizing
- Linguistic inequity

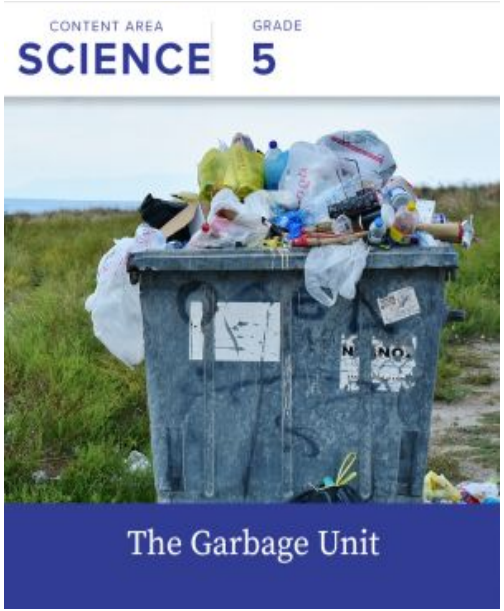
Asset-Oriented Pedagogy

- Linguistically sustaining
- Linguistic equity

Terms Indicating Shifts from Deficits to Assets

- Limited English proficient students (LEPs) in the No Child Left Behind Act of 2001
- Students from non-English language backgrounds
- Culturally and linguistically diverse students
- English language learners
- English learners (ELs) in the Every Student Succeeds Act of 2015
- Emergent (or emerging) bilinguals
- Multilingual learners
- Term in future federal legislation?

“Doing” Science



What happens to our garbage?

Cluster 1	Cluster 2	Cluster 3	Cluster 4
What do we want to know about our garbage?	What happens to the garbage materials?	How do we smell garbage materials?	What causes changes in garbage materials?
• Phenomenon and driving question of the unit	• 5-PS1-3 Properties of matter	• 5-PS1-1 Particle nature of matter	• 5-PS1-4 Chemical reactions • 5-PS1-2 Conservation of matter • 5-LS2-1 Decomposers

Doing Science, Using Language

What is That Smell?

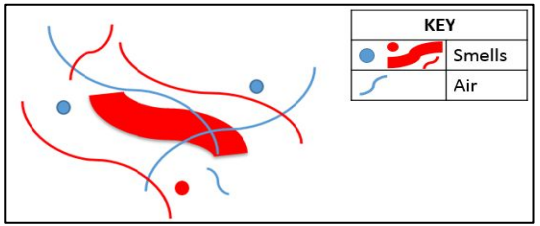
Modalities

Students use multiple modalities in increasingly strategic ways over time.

1

Smell

2



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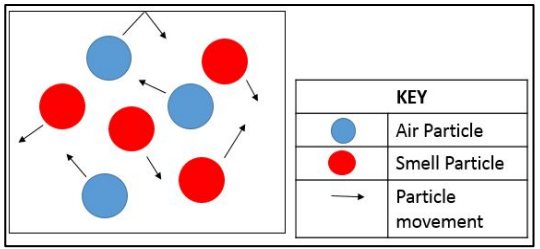

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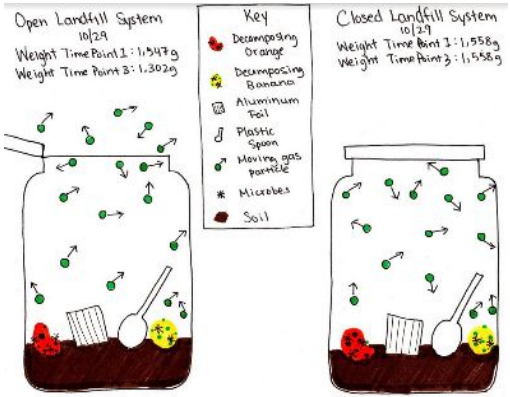
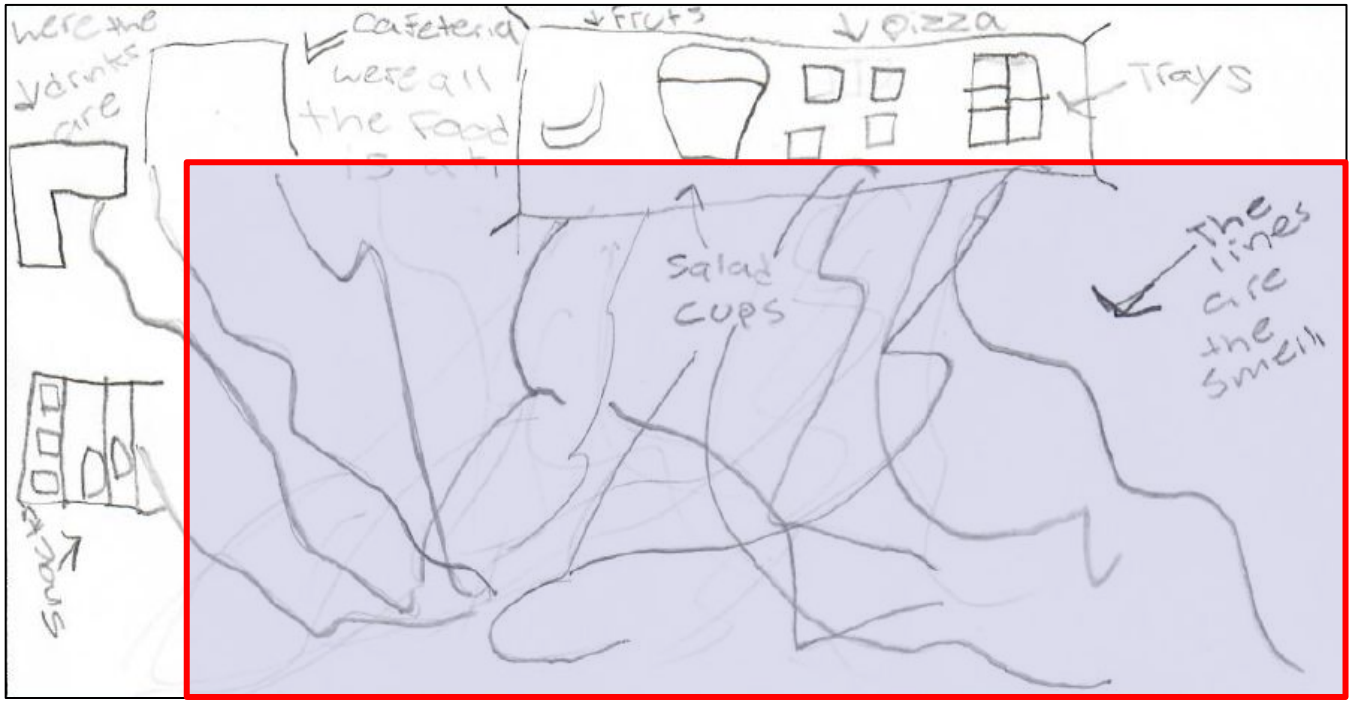


Talk, text, diagrams, symbols, tables, graphs, etc.

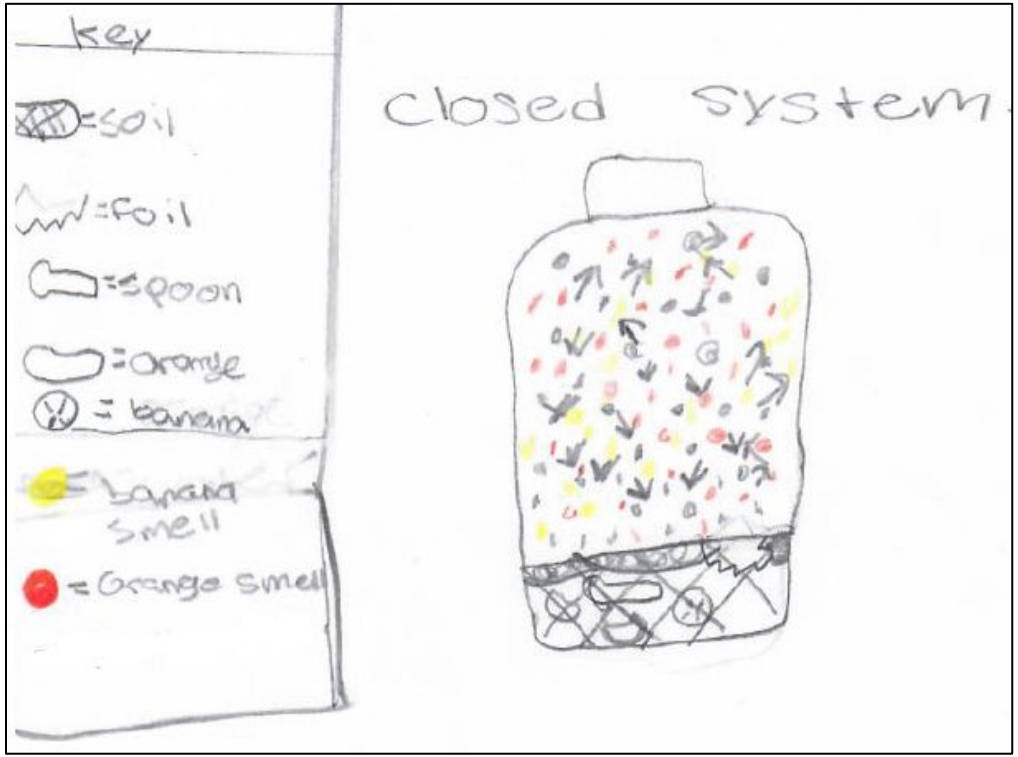
Modalities

Beginning of a lesson cluster



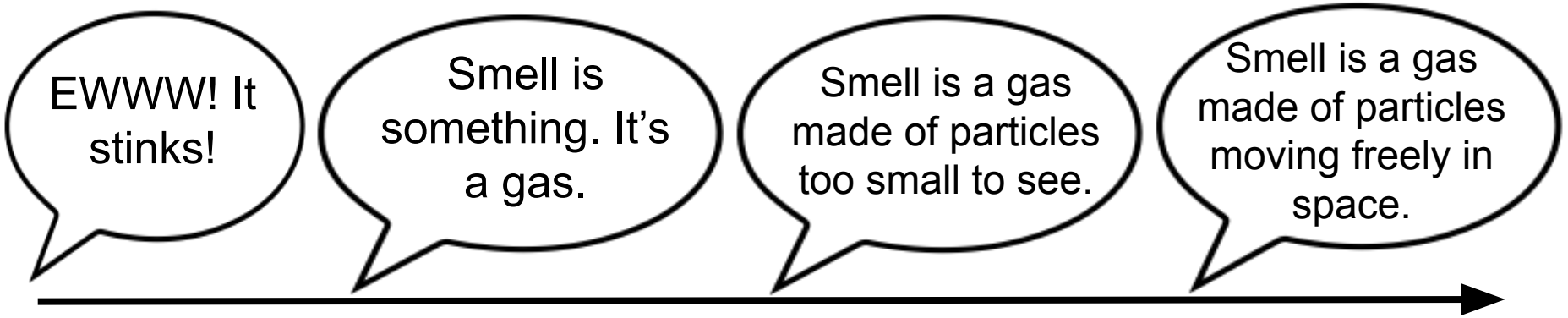
Modalities

End of a lesson cluster



Registers

Students progress from everyday language to specialized language over time

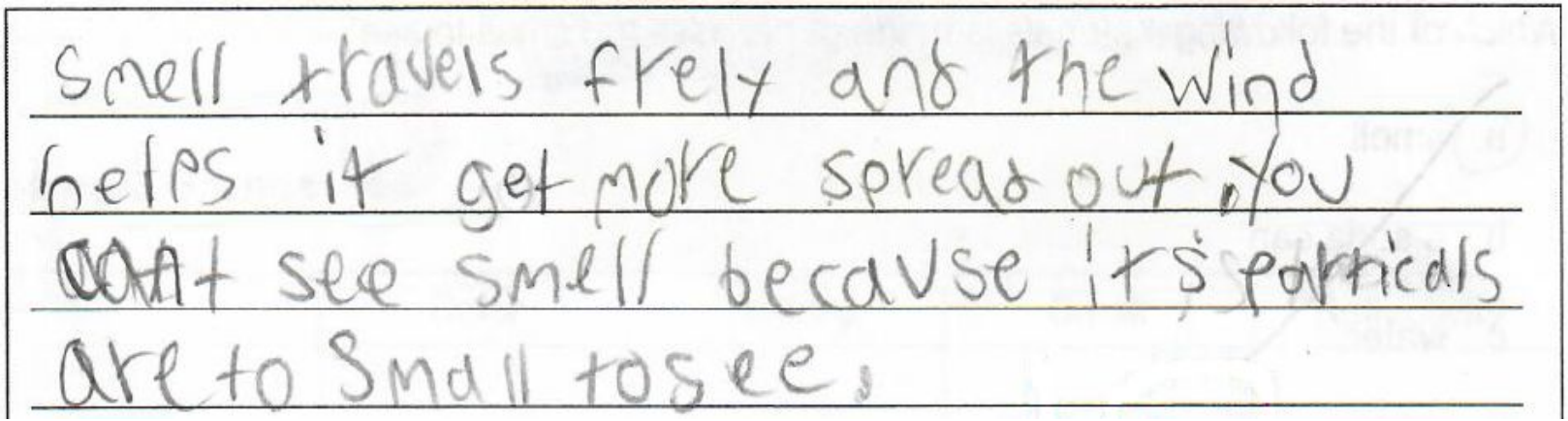


From everyday to specialized registers

Registers

Beginning of a lesson cluster

Midpoint of a lesson cluster



End of a lesson cluster

Student Assets

EVERYDAY LANGUAGE

MULTIMODALITY

HOME LANGUAGE

SPECIALIZED LANGUAGE

Student Assets

FAMILY

EVERYDAY LANGUAGE

MULTIMODALITY

RELIGION

HOME LANGUAGE

PASSIONS

FRIENDS

SPECIALIZED LANGUAGE

RACE

COMMUNITY ISSUES

EXPERIENCES

DREAMS

VALUES

GOALS

SKILLS

CULTURES

MENTORS

NATIONALITY

ABILITIES

All Standards, All Students

Traditional

Scientists & Teachers

Knowledge of Science Disciplines

Some Students

Contemporary

Students as Scientists and Engineers

Making Sense of Phenomena and Designing Solutions to Problems

All Students

Future

Students as ??

All Students

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IMEDITATE PRIORITIES:

- COVID-19
- Climate
- Health Care
- Racial Equity
- Immigration
- Economy
- Restoring America's Global Standing


March 24 2021

BSCS SCIENCE LEARNING

Transforming Science Education Through Research-Driven Innovation

It's all a matter of perspective: Starting points for research on OpenSciEd

OpenSciEd Research Agenda Plenary

March 31, 2021

Danny Edelson, BSCS Science Learning

OpenSciEd is an innovation

- What does it take to get people to adopt it?
  - Who adopts it?
  - Why do they adopt it?
  - Who doesn't? Why not?
- What does it take to implement it successfully?
  - How do people react to the changes that it requires?
  - How do you get people to buy in to the changes?
  - Who buys in? Who doesn't?
- Does it persist?
  - Is it implemented as designed?
  - How does its use change over time?

OpenSciEd is a Solution to a Challenge

- How do you characterize the challenge?
    - How do you measure “solution”?
- How well does it solve the challenge?
    - Is it better at solving than alternatives?
- Under what conditions does it solve the challenge?
    - For whom?
- At what cost does it solve the challenge?
    - Is it affordable?
    - Is it cost-effective in comparison to alternatives?

OpenSciEd is the translation of a theory of change into an intervention

- Are the assumptions about the system being intervened on valid in the ”real world”?
- Is the intervention a faithful translation of the theory of change?
- Is there evidence that the individual conjectures in the theory of change are valid?
- Is there evidence that the conjectures are valid when combined in a complex intervention?

OpenSciEd is a drosophila (model organism) for educational research

- What research should we do on OpenSciEd (v 1.0) to provide a baseline for future research?
- Under what different conditions should we study OpenSciEd?
- How can we use OpenSciEd to study changes in the system over time?
- What variations on OpenSciEd should we study?
    - What conjectures can be explored by studying variations on OpenSciEd?

Things to remember about the OpenSciEd Middle School Program

- It belongs to the world.
- It is a first draft of a program that is meant to grow and branch.
- It is a challenge to do better
    - in some cases by improving it,
    - in some cases by doing something different.
- It will fail
    - if it never gets a fair chance,
    - if people ask too much of it,
    - if it never gets a chance to get better.

BSCS SCIENCE LEARNING

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Email: dedelson@bscs.org
Twitter: DCEdelson

An Initial Logic Model to Guide OpenSciEd Research

Kevin McElhaney

Digital Promise

Learning Sciences Research

Presented by Digital Promise

Digital Promise

Accelerating Innovation in Education

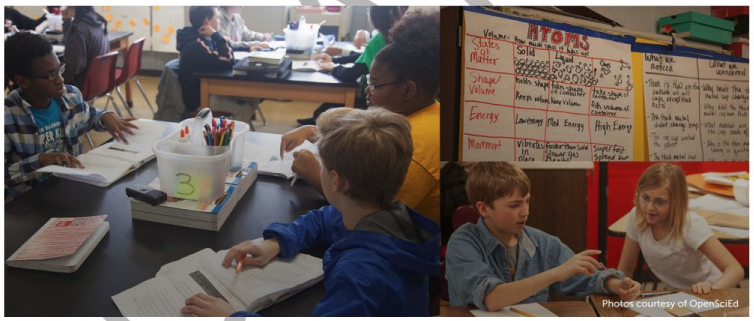
OpenSciEd logic model features

- **It's a draft**—we will refine it together.
- **It's not exhaustive**—it highlights what is most distinctive about OpenSciEd.
- **It's high-level**—a starting point for more detailed models.

An Initial Logic Model to Guide OpenSciEd Research

Kevin McElhaney, Anthony Baker, Carly Chillmon, Zareen Kasad, Babe Liberman, and Jeremy Roschelle

March 31, 2021



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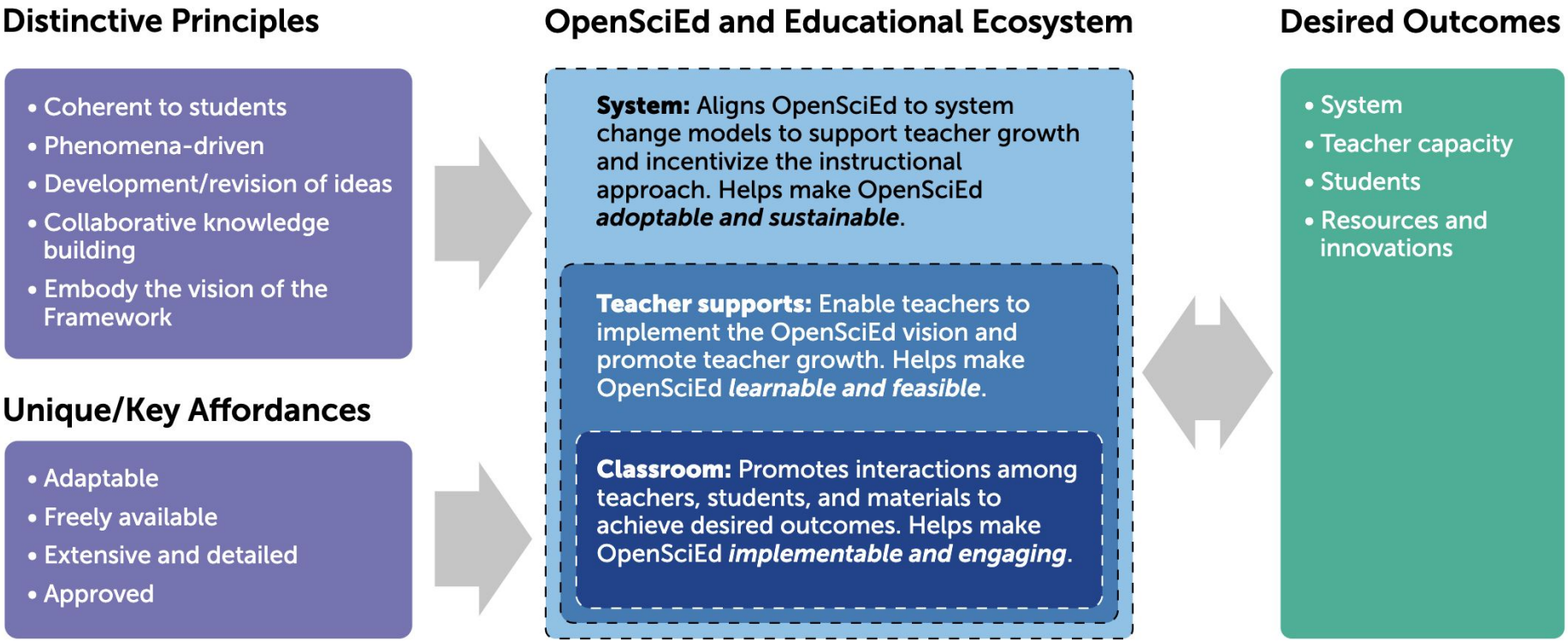
OpenSciEd

Initial Logic Model to Guide OpenSciEd Research



Classroom: Promotes interactions among teachers, students, and materials to achieve desired outcomes

Components

- Teacher as facilitator
- Driven by student questions
- Lesson-to-lesson enactment
- Consensus building among students
- Problematization
- Opportunities for assessment

Research opportunities

- Characterize and improve classroom feasibility
- Technologies that support implementation
- Equitable and inclusive instructional practices
- Assessment systems
- Improvements over time
- Practical barriers

Teacher supports: Enable teachers to implement the OpenSciEd vision and promote teacher growth

Themes

- Content understanding
- Unit storyline
- Goals for specific lessons, discussions, and activities
- Logistical and materials strategies

Professional learning activities

- Engage in analysis of and reflection on problems of practice
- Highlight navigation and lesson-to-lesson enactment
- Immerse teachers in content from the student perspective
- Provide opportunities to collaborate and reflect with peers

Research opportunities

- Adapting teacher supports to meet local needs
- Professional learning communities, coaching, and teacher-to-teacher support
- Supporting equity across classrooms
- How much professional development is needed, and can teachers get it
- Supporting professional development leaders from non-science disciplines

System: Aligns OpenSciEd to system change models to support teacher growth and incentivize the instructional approach

Components

- Collaborations with state officers who can help align to existing systems and effect change in states
- System of OpenSciEd professional development service providers with trained and certified facilitators
- Support for districts to prepare for implementing OpenSciEd

Research opportunities

- Variation across states
- Redirecting resources from curriculum to professional learning
- Engaging families
- Accountability systems
- Strategic partnerships
- Building district capacity

Desired Outcomes

Student

- NGSS-based learning outcomes
- Science engagement
  - Phenomena and problems
  - Classroom
  - Coursetaking
  - Community
- Autonomy
  - Science practices
  - Knowledge building practices
- Outcomes are equitable within and across classrooms

System

- Deeply committed district adoption
- Broad adoption and infrastructure
- Teacher collaborations
- Shifts in accountability practices
- Teacher professionalism
- Increased resources to teacher professional learning
- Strategic partnerships

Increased teacher capacity to:

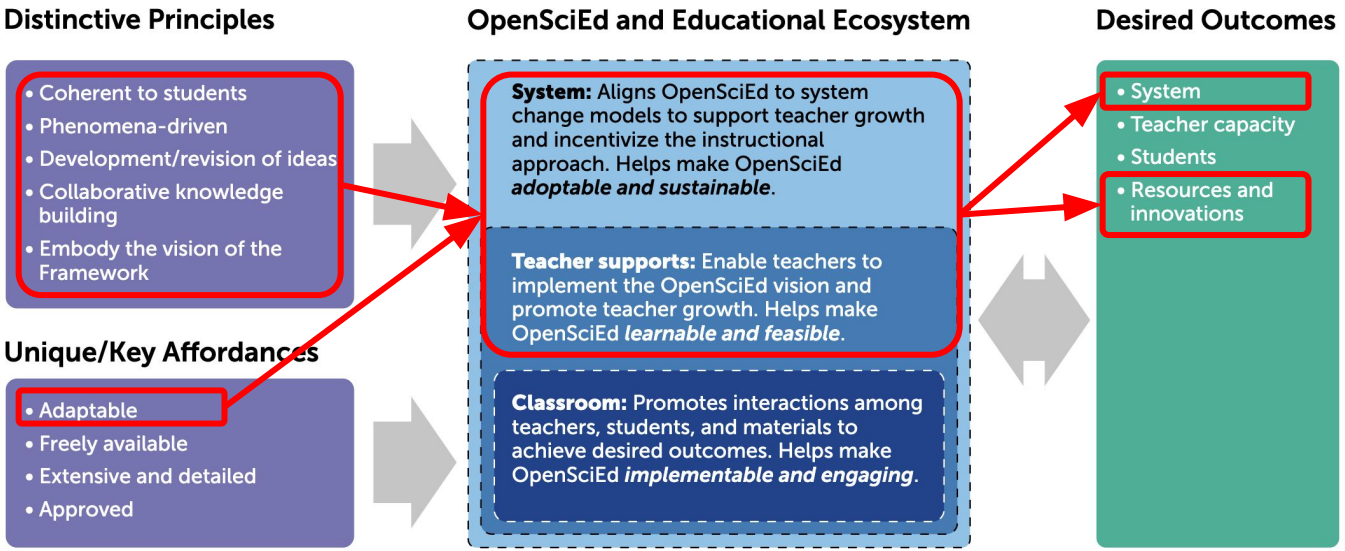
- Implement OpenSciEd successfully and sustainably
- Engage all students equitably
- Sustain a classroom culture of "figuring out"
- Achieve self-efficacy

Resources and innovations:

- Refined and customized materials
- Technologies
- Assessment systems
- Adoption and implementation models

Research opportunity: District adoption

- How are PD materials adapted? Are they adapted with integrity?
- What teacher-to-teacher supports are successful?
- What shifts occur in district policies / accountability practices?



Stay Connected

- Download the logic model: http://bit.ly/OpenSciEdResearch
- Join the conversation on Twitter: #OpenSciEdResearch @DigitalPromise @OpenSciEd
- Email us with questions or ideas: babe@digitalpromise.org kmcelhaney@digitalpromise.org

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Okhee Lee

Ann Rivet

Tina Vo

Thank you!

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