Critical Features of Instructional Materials Design

Webinar

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Welcome and Introduction

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Why Materials Matter

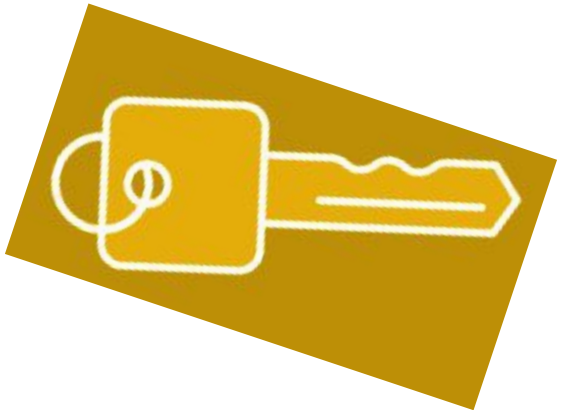
Through our work, we know that **INSTRUCTIONAL MATERIALS MAKE A DIFFERENCE FOR KIDS. WHAT IS CHOSEN MATTERS.** Research indicates that students learn primarily through their interactions with teachers and content (the instructional core).

THIS INSTRUCTIONAL CORE IS THE FOUNDATION for ensuring all students are college-and career-ready and have the skills and knowledge they need to thrive in school and beyond.

Reference: Elizabeth A. City, Richard F. Elmore, Sarah E. Fiarman, and Lee Teitel, foreword by Andrew Lachman. *Instructional Rounds in Education*
A Network Approach to Improving Teaching and Learning. (2009).

Direct Effects on Learning Outcomes

When **TEACHERS** use high-quality instructional materials



IT CAN SIGNIFICANTLY INCREASE STUDENT LEARNING OUTCOMES

A 2017 study shows that the effect on learning is the same as moving from an average performing teacher to one at the 80th percentile.

Reference: Jackson, K., Makarin, A. (2016-2017). Can Online On-the-Shelf Lessons Improve Student Outcomes? Evidence from a Field Experiment. American Economic Journal: Economic Policy, Vol 10 (3), pages 226-254. Retrieved from: https://www.nber.org/papers/w22398

IMPROVING THE QUALITY OF CURRICULUM IS

40 X MORE

COST EFFECTIVE

THAN CLASS-SIZE REDUCTION

Reference: Boser, U., Chingos, M., Straus, C. (2015). The Hidden Value of Curriculum Reform: Do States and Districts Receive the Most Bang for Their Curriculum Buck? Washington, DC: Center for American Progress. Retrieved from: https://cdn.americanprogress.org/wp-content/uploads/2015/10/06111518/CurriculumMatters-report.pdf

Teachers' Challenge

TEACHERS SPEND 7–12 HOURS PER WEEK

searching for and creating instructional resources (free and paid), drawing from a variety of sources, many of them unvetted.

A 2017 RAND analysis found that

96%

OF TEACHERS

use Google to find lessons and materials.

Nearly 75%

OF TEACHERS

Use Pinterest to find lessons and materials.

Reference: Goldberg, M. (2016). Classroom Trends: Teachers as Buyers of Instructional Materials and Users of Technology. K-12 Market Advisors. Retrieved from: https://mdreducation.com/reports/classroom-trends-teachersbuyers-instructional-materials-users-technology/

Opfer, V., Kaufman, J., Thompson, L. (2016). Implementation of K-12 State Standards for Mathematics and English Language Arts and Literacy. Santa Monica, CA: RAND Corporation. Retrieved from: https://www.rand.org/pubs/research_reports/RR1529-1.html

This leads to inconsistent quality that **AFFECTS LOW-INCOME STUDENTS AND STUDENTS OF COLOR THE MOST.**

Impact on Equity

INCONSISTENT ACCESS TO HIGH-QUALITY CONTENT AFFECTS STUDENT LEARNING IN SCHOOLS ACROSS THE COUNTRY.

In a single school year, the average student spends **581 of 720** available hours on assignments that are **NOT high-quality**.

This is particularly significant for **students of color** and **students living in poverty** who have less access to high-quality, standards-aligned materials than their peers.

Reference: TNTP. (2018). The Opportunity Myth. Retrieved from: https://opportunitymyth.tntp.org/

Agenda

- Introduce resource
- Discuss trends from review findings:
  - Bright Spots
  - Common Challenges ⇨ Critical Features
- Q&A

Poll - Materials Selection and Design

Which of these areas has been the biggest challenge when designing or selecting materials?

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EdReports and NextGenScience

Similarities:

- Staff hold expertise in both development and implementation of NGSS
- Expert educator-led review
- Criteria based on Innovations for NGSS
- Identified few materials deemed “NGSS Designed”
- Both support states and districts in utilizing reviews to adopt aligned materials that can work best for their students

Differences:

- **EdReports** provides reviews of comprehensive core instructional materials programs and publishes all programs reviewed on its website.
- **NextGenScience** provides extensive formative feedback on instructional units through confidential, iterative review cycles. Only top-rated instructional units in this process are made public.

Process: Critical Features of Instructional Materials Design for Today's Science Standards

1. Initial Analysis
2. Collaborative Understanding
3. Draft Product Development
4. Stakeholder Review
5. Revision and Finalization

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Structure: Critical Features of Instructional Materials Design for Today's Science Standards

1. Three ***Sections***: Learning Goals, Student Supports, and Student Assessments
   a. Each Section includes ***Critical Features.***

      Each Critical Feature Includes:

      i. ***Detailed Descriptions***

      ii. ***Less Like/More Like Charts***

      iii. ***Illustrations*** (not prescriptive nor restrictive)

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Focus: Critical Features of Instructional Materials Design for Today's Science Standards

Resource is:

- Built to support and illustrate high-quality design for those selecting, designing, and/or implementing materials for today's science standards

Resource is not:

- A process used to design curriculum
- A process for review of instructional materials
- A replacement for review tools
- A list of all important features of quality instructional materials

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Intended Use: Critical Features of Instructional Materials Design for Today's Science Standards

- To support district and state conversations about features in current or future instructional materials, including:
  - Conversations about quality with educators,
  - Conversations with developers to drive change towards NGSS alignment, and
  - Local adaptation work
- To support curriculum developers in the design and revision of NGSS instructional materials

Seven Current Bright Spots

- Most learning is now at least 2D
- Most programs develop almost all the DCIs
- Learning goals and phenomenon / problem are more often aligned
- Most phenomena / problems are engaging and relatable
- Formal assessment tasks often require sense-making or problem solving
- Multi-dimensional assessment items are used regularly
- Most assessments are accessible

10 Common Challenges

#1–3: Learning Goals

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Challenge 1. Mismatched Claims and Evidence

Partial progression for Constructing Explanations from NGSS Appendix F			
By the end of Grade 2	By the end of Grade 5	By the end of Grade 8	By the end of Grade 12
Use information from observations (firsthand and from media) to construct an evidence-based account for natural phenomena.	Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.	Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer reviews) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

Student prompt (below grade level)

Learning goal claimed

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Student prompt (below grade level)

Learning goal claimed

Addressing the challenge:

Critical Feature 1.1: Materials clearly describe three-dimensional, grade-appropriate learning goals that match what students learn during instruction.

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Challenge 2. Missing Learning Progressions for SEPs and CCCs

One possible illustration of high-quality materials

Lesson #	Progression building toward this CCC element: *Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.*
2	Applying prior CCC knowledge: *Events that occur together with regularity might or might not be a cause-and-effect relationship.*
3	Introduction to part of the CCC: *Correlation does not necessarily imply causation.*
6	Group practice applying part of the CCC: *Correlation does not necessarily imply causation.*
8	Student independent use of part of the CCC: *Correlation does not necessarily imply causation.*

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Addressing the challenge:

Critical Feature 1.2: Learning goals are presented in a coherent sequence and describe for teachers the way instruction will help students reach these goals (i.e., the learning progression).

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Challenge 3. Developing too little SEP and CCC content

End of Grade 2 learning goals	End of Grade 5 learning goals	End of Grade 8 learning goals	End of Grade 12 learning goals
36 SEP elements	**41** SEP elements	**51** SEP elements	**47 SEP elements**
11 CCC elements	**16** CCC elements	**25** CCC elements	**29 CCC elements**

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Addressing the challenge:

Critical Feature 1.3: Materials include an appropriate number of learning goals such that students will have enough time to meet or exceed all standards by the end of the grade or grade band.

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Poll - Learning Goals

Which “Learning Goals” critical feature has been the most difficult for you to find (when selecting materials) or apply (when designing materials)?

10 Common Challenges

#4–7: Student Supports

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Challenge 4. Only some learning is driven by phenomena or problems

One possible illustration of high-quality materials

Sample Unit: *Each lesson focuses on helping students solve a problem.*

Lesson 1: Students see pictures of a steep road and see a video of a woman talking about a car crash where her car brakes failed on that road. Students ask questions about why that road is particularly dangerous.

Lesson 2: Students investigate how toy cars move on different kinds of ramps to test ideas about what kind of road makes it hard for cars to stop.

Lesson 3: Students communicate their findings about what kinds of ramps make cars go the fastest and plan investigations for how to make the cars go slower.

Lesson 4: Students conduct their investigations about ways to make cars go slower.

Lesson 5: Students discuss their conclusions and brainstorm road designs to solve the problem of car crashes when brakes fail.

Lesson 6: Students build and test their design with ramps and toy cars.

Lesson 7: Students present their test data and compare designs to determine which best solves the problem.

many materials only do this step

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Lesson 7: Students present their test data and compare designs to determine which best solves the problem.

Addressing the challenge:

Critical Feature 2.1: Materials feature sense-making and problem solving —with true phenomena or problems— as the focus of instruction.

Challenge 5. Grade appropriate three dimensions not required for sense-making or problem solving

One possible illustration of high-quality materials

"Students have been working toward explaining *the phenomenon of a tree gaining mass*. They are prompted to think about the different CCCs they have used before and consider which one they want to use to help them start figuring out the phenomenon. When students talk about systems, *they are facilitated* to use the CCC element "systems may interact with other systems; they may have sub-systems and be a part of larger complex systems" to consider whether a tree interacts with a larger system, and if so, what the components of that system are."

Challenge 5. Grade appropriate three dimensions not required for sense-making or problem solving

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When students talk about systems, *they are facilitated* to use the CCC element "systems may interact with other systems; they may have sub-systems and be a part of larger complex systems" to consider whether a tree interacts with a larger system, and if so, what the components of that system are."

Addressing the challenge:

Critical Feature 2.4: Supporting students to use all three dimensions in an integrated way to sense-make or problem solve.

Challenge 6. Students don't feel that they are driving learning

One possible illustration of high-quality materials

1. Students generate questions about a phenomenon, and the class groups similar questions together on a driving question board. The teacher asks guiding questions that prompt students to choose groupings that *correspond with sense-making steps the teacher knows need to happen.*
2. The teacher then facilitates a class discussion, asking guiding questions that help the class *realize which question groupings need to be answered first* before other investigations could be fully planned.
3. The teacher *paraphrases and connects student ideas* for how to begin answering the first group of questions.
4. The next lesson begins by *reminding the class what they decided* to investigate first, and then proceeding with that investigation.

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3. The teacher *paraphrases and connects student ideas* for how to begin answering the first group of questions.
4. The next lesson begins by *reminding the class what they decided* to investigate first, and then proceeding with that investigation.

Addressing the challenge:

Critical Feature 2.5: Materials include facilitation support so students see that their curiosity, questions, and ideas related to prior experiences direct the learning sequence.

Challenge 7. Student funds of knowledge are not engaged

Two possible illustrations of high-quality materials

Illustration 1

Materials support teachers in eliciting and praising the unique thinking and contributions from all students to aid in group problem solving.

Illustration 2

Materials encourage students to gather their own data from their family, community members, and local environment and then bring that data back to the class, emphasizing that the class data will be richer with all the families or areas involved.

Challenge 7. Student funds of knowledge are not engaged

Illustration 1
Materials support teachers in eliciting and praising the unique thinking and contributions from all students to aid in group problem solving.

Illustration 2
Materials encourage students to gather their own data from their family, community members, and local environment and then bring that data back to the class, emphasizing that the class data will be richer with all the families or areas involved.

Addressing the challenge:

Critical Feature 2.8: Supporting teachers to connect student assets and culture to instruction.

Poll - Student Supports

Which “Student Supports” critical feature has been the most difficult for you to find (when selecting materials) or apply (when designing materials)?

10 Common Challenges

#8–10: Student Assessment

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Challenge 8. Assessments don't require more than one grade-appropriate dimension

One possible illustration of high-quality materials

"Formative assessments ask students to construct and present an oral or written argument supported by empirical evidence and scientific reasoning to support the claim that being male doesn't cause color blindness, but there is a probabilistic cause-and-effect relationship."

K-2	3-5	6-8	9-12
Events have causes that generate observable patterns.	Events that occur together with regularity might or might not be a cause and effect relationship.	Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.	Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Challenge 8. Assessments don't require more than one grade-appropriate dimension

"Formative assessments ask students to construct and present an oral or written argument supported by empirical evidence and scientific reasoning to support the claim that being male doesn't cause color blindness, but there is a probabilistic cause-and-effect relationship."

Addressing the challenge:

Critical Feature 3.1: Materials include opportunities for students to engage in meaningful assessment tasks, many of which require the use of all three dimensions together to make sense of phenomena or design solutions to problems.

Challenge 9. Missing guidance to interpret student performance in all three dimensions

One possible illustration of high-quality materials

An entry level student response may include one or more of the following descriptors in place of the corresponding proficient-level descriptors:	A student response approaching proficiency may include one or more of the following descriptors in place of the corresponding proficient-level descriptor:	A proficient student response describes:
• a mention of what was seen when classroom lights are on [SEP & DCI], • a description of which stage of light made it easiest to see the objects (but no mention of observations) [SEP & DCI], and • listing initial ideas but not connecting them to observations [DCI].	• the appearance of all three objects when classroom lights are on [SEP & DCI], • that their observations under all three investigation conditions help them determine which stage of light made it easiest to see the objects [SEP, CCC, & DCI], • a comparison of their observations to their initial ideas about the causes of seeing things well [SEP, CCC, & DCI].	• ability to observe all three objects when classroom lights are on because of the amount of light reaching all surfaces [SEP & DCI], • that their observations under all three investigation conditions provide them with evidence to be able to determine why they couldn't see the objects with the lights off [SEP, CCC, & DCI], • a statement about whether their observations supported their initial ideas about the causes of seeing things well [SEP, CCC, & DCI].

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Addressing the challenge:

Critical Feature 3.3: Including scoring guidance and supporting teachers to provide feedback related to student use of the three dimensions.

Challenge 10. Mismatch between learning goals and assessment targets

Learning Goals

MS-ESS2-2: Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future.

ESS2.A. The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future.
ESS2.C. Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.

Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

One of many small formative assessment targets

MS-level element: Analyze and interpret data to provide evidence for phenomena.

MS-level assessment target: ESS2.C. Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.

3-5 level element: Observable phenomena exist from very short to very long time periods.

One possible illustration of high-quality materials

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Sample Formative Assessment Targets

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3-5 level element: Observable phenomena exist from very short to very long time periods.

Addressing the challenge:

Critical Feature 3.4: Includes alignment between goals of assessments and learning and an understanding of how students progress towards the grade or grade-band performance expectations.

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Poll - Student Assessments

Which “Student Assessments” critical feature has been the most difficult for you to find (when selecting materials) or apply (when designing materials)?

Questions?

Type in the Q&A window

Thank you!

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