

The Three Dimensions of The Next Generation Science Standards

Conceptual Shifts in NGSS

K-12 Science Education Should Reflect the Interconnected Nature of Science as it is Practiced and Experienced in the Real World.

The Next Generation Science Standards are student performance expectations – NOT curriculum.

The science concepts in the NGSS build coherently from K-12.

The NGSS Focus on Deeper Understanding of Content as well as Application of Content.

Science and Engineering are Integrated in the NGSS from K–12.

The NGSS are designed to prepare students for college, career, and citizenship.

The NGSS and Common Core State Standards (Mathematics and English Language Arts) are Aligned.

Quiz Time

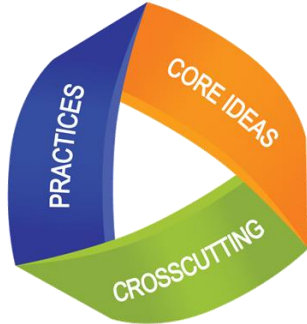
What are the three dimensions of NGSS?

Three Dimensions



Science & Engineering Practices

1. Ask questions (for science) and define problems (for engineering)
2. Develop and use models
3. Plan and carry out investigations
4. Analyze and interpret data
5. Use mathematics and computational thinking
6. Construct explanations (for science) and design solutions (for engineering)
7. Engage in argument from evidence
8. Obtain, evaluate, and communicate information



Crosscutting Concepts

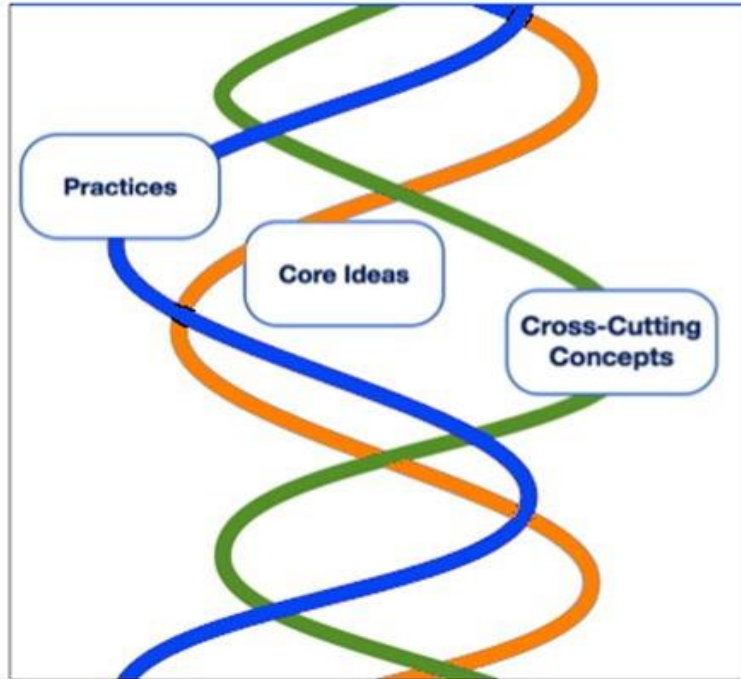
1. Patterns
2. Cause and effect
3. Scale, proportion and quantity
4. Systems and system models
5. Energy and matter
6. Structure and function
7. Stability and change



Core Ideas

1. Physical Sciences
2. Life Sciences
3. Earth and Space Sciences
4. Engineering, Technology and Applications of Science

Three Dimension Learning



- Performance Expectations
- The Framework requires contextual application of the three dimensions by students.
- Focus is on how and why as well as what

What does this diagram look like to you?



Quiz Time

What are performance expectations?

What Are Performance Expectations?

Performance Expectations state what students should be able to do in order to demonstrate that they have met the standard, thus providing clear and specific targets for curriculum, instruction, and classroom assessment.



Performance Expectations Build Across Years

9-12

HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

6-8

MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

3-5

5-PS1-3. Make observations and measurements to identify materials based on their properties.

K-2

2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose

Quiz Time

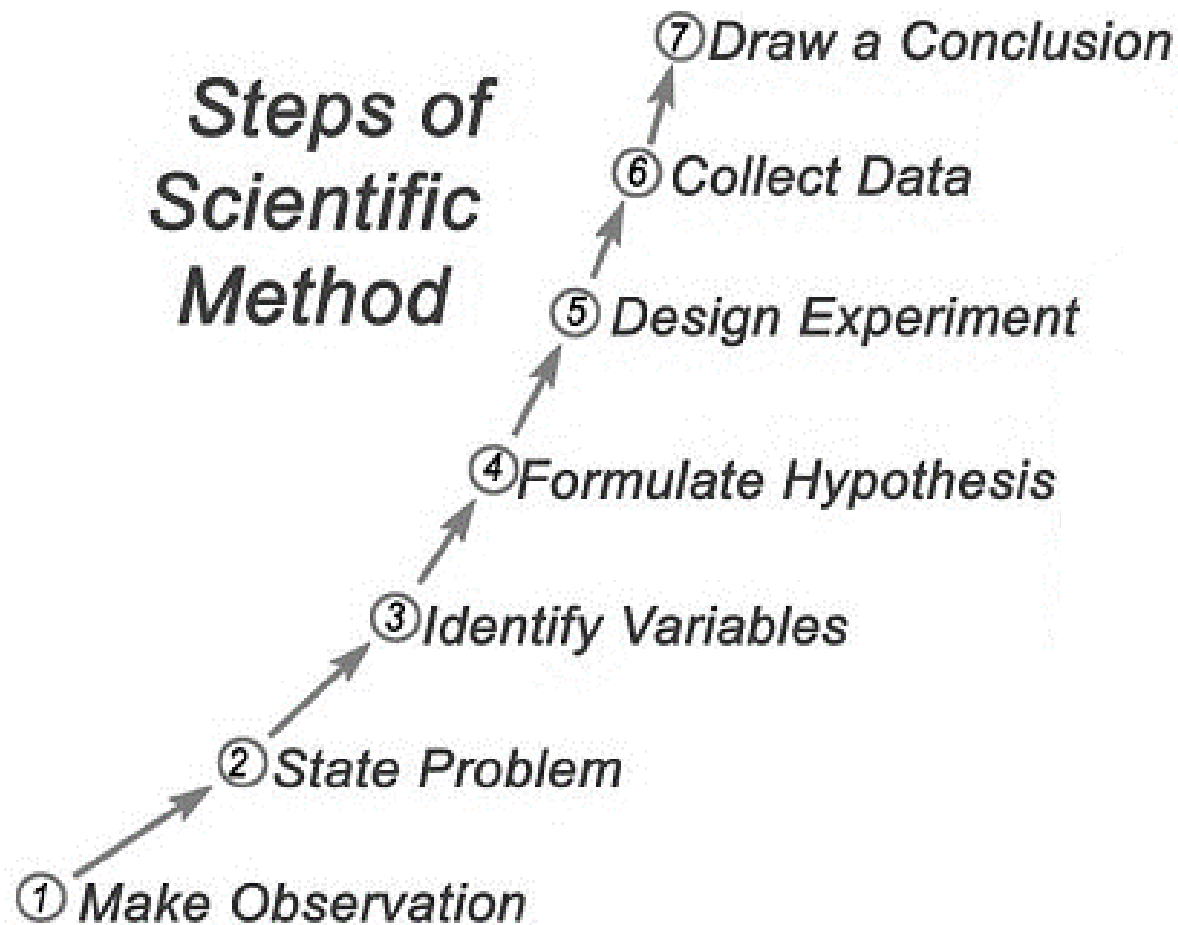
Explain the Science and Engineering Practices?



Science and Engineering Practices

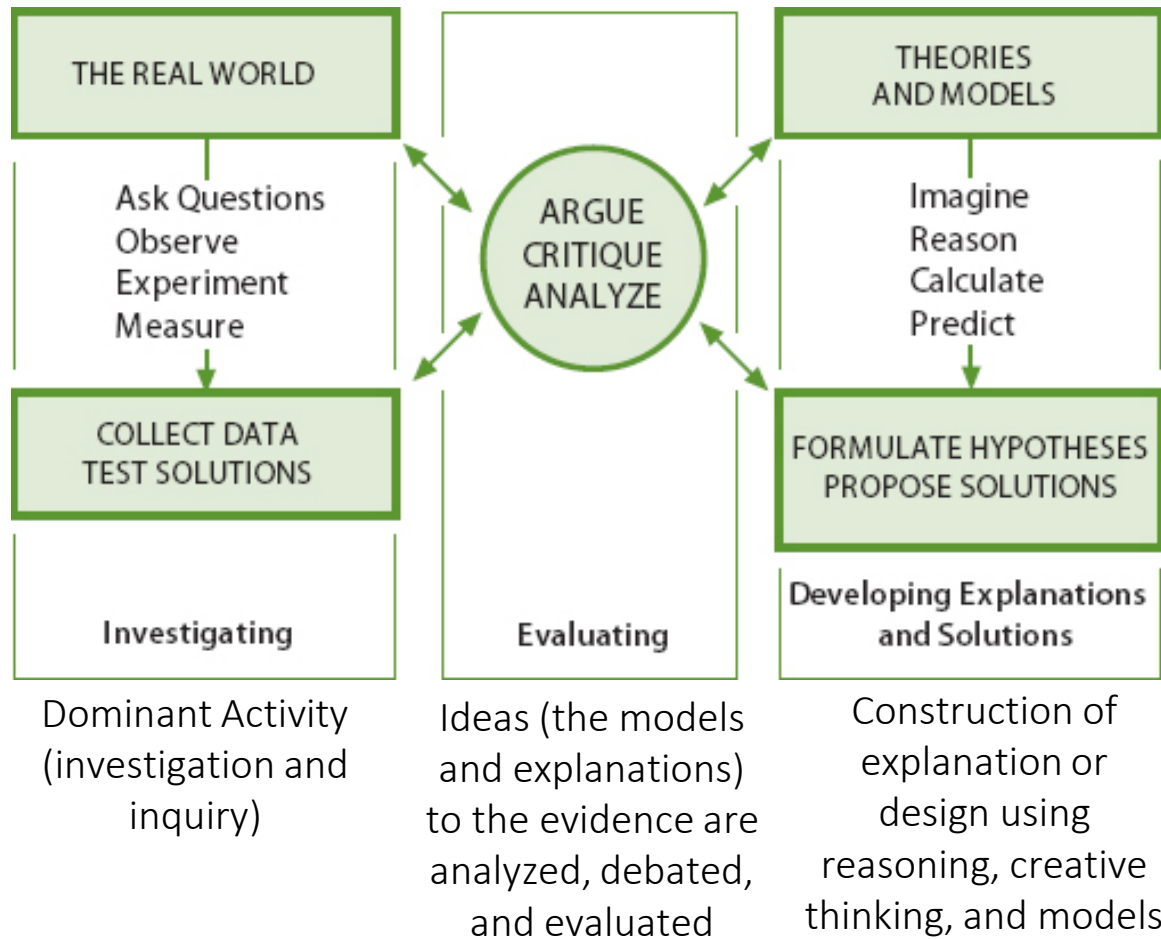
Science and Engineering Practices **describes** what **scientists** do to **investigate the natural world** and what **engineers** do to **design and build systems**.

The practices better explain and extend what is meant by “inquiry” in science and the range of cognitive, social, and physical practices that it requires. Students engage in practices to build, deepen, and apply their knowledge of core ideas and crosscutting concepts.



How the Practices Are Integrated into Both Inquiry and Design

The three spheres of activity for scientists and engineers.



Quiz Time

What is an example of Phenomena?

A **phenomenon** is an extraordinary occurrence or circumstance. In the 1950s, rock-n-roll was considered a new cultural **phenomenon**, while today we think of crop circles as a mysterious **phenomenon**. Like many words with Greek roots, **phenomenon** started out as a **science** term.

Phenomena are an essential part of implementing the NGSS.
But what is a phenomena, and how can they be used?



Phenomenon

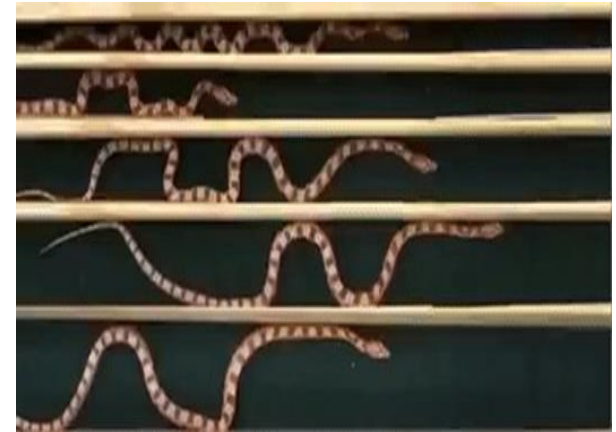


Project



Solution to the Problem

What are other types of Phenomena?



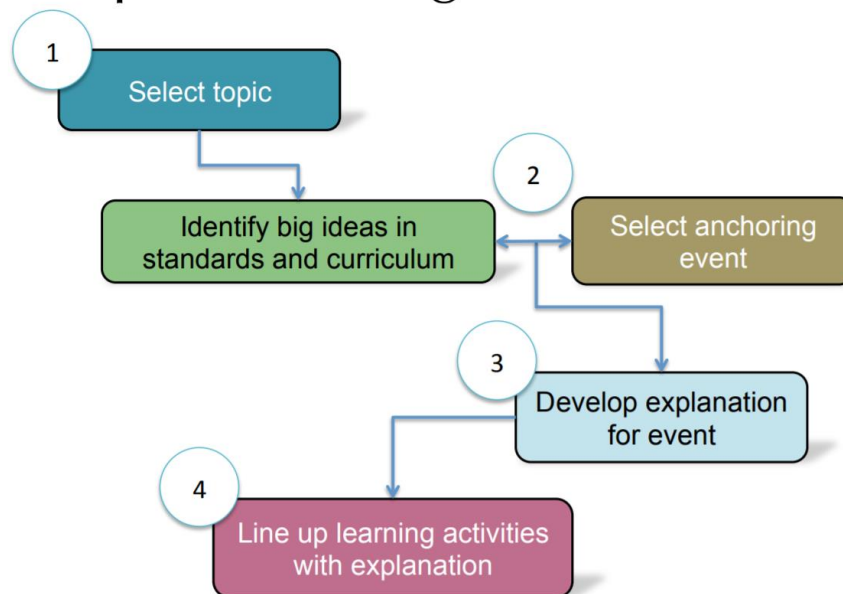
Quiz Time

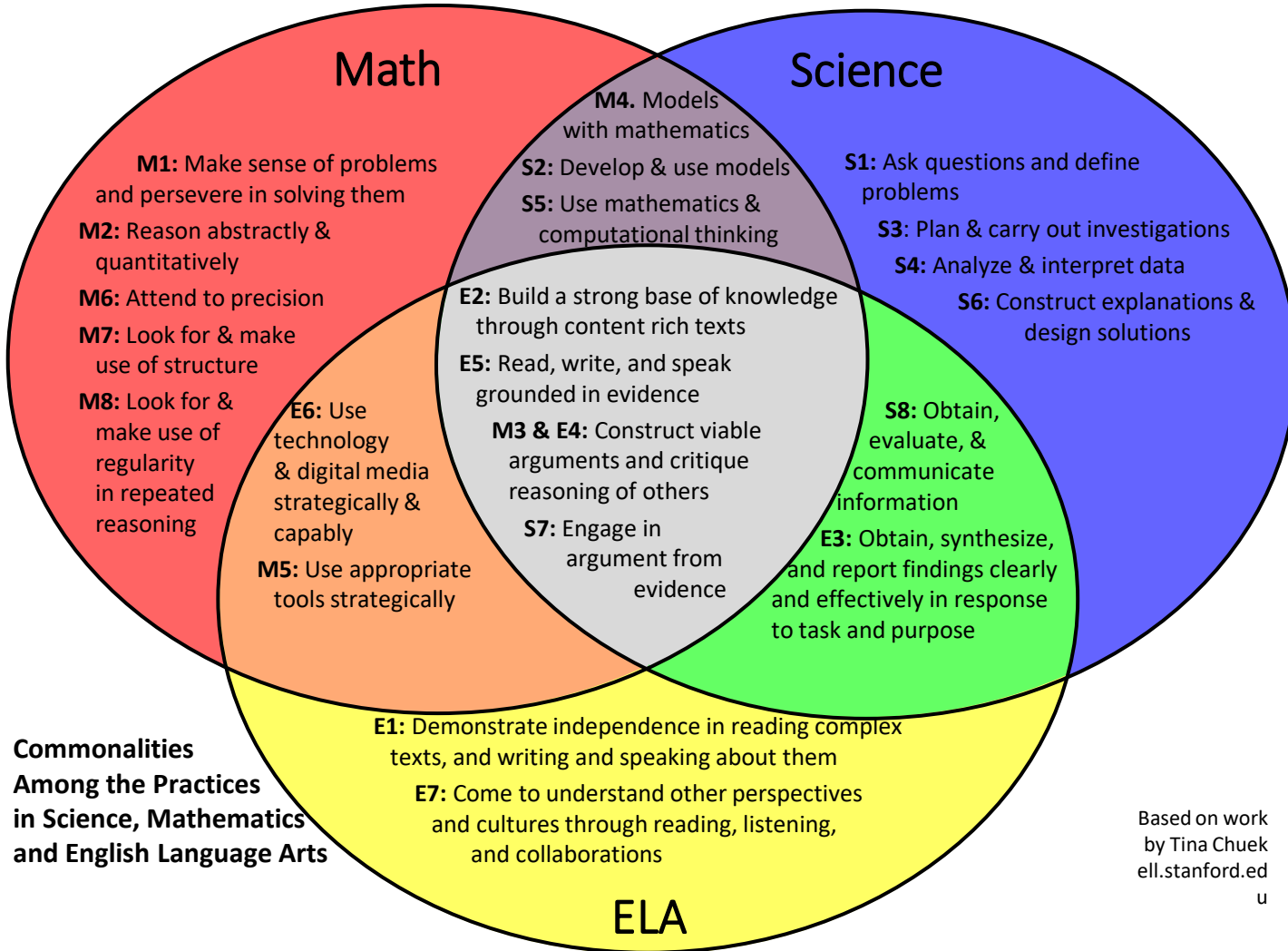
What is an anchoring question?

Checklist for Good Anchoring Events and Essential Question

- ☒ It is a phenomenon, something that unfolds over time (it's not a theme)
- ☒ It is contextualized situation, takes place at a particular time, under unique circumstances
- ☒ Explanation requires many core science ideas to be integrated with one another
- ☒ Students can pull together core ideas in different ways to explain

Purposeful design of units

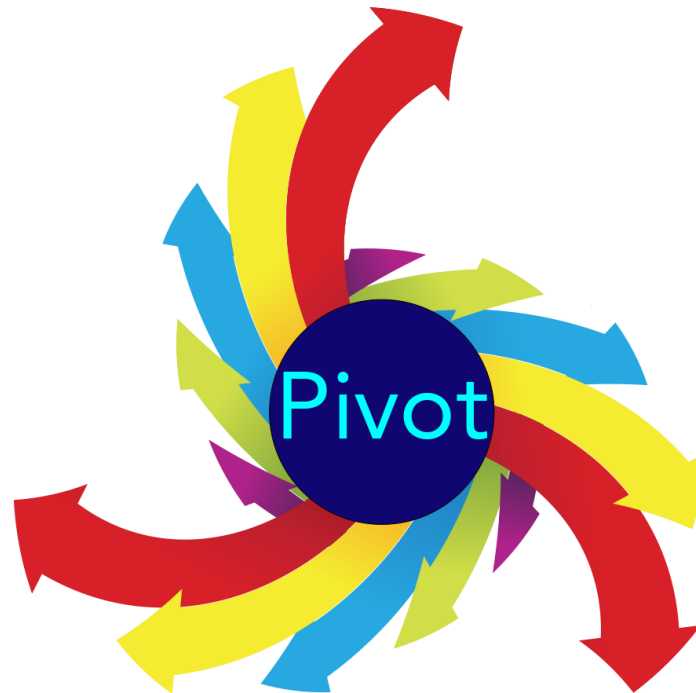




Based on work
by Tina Chuek
ell.stanford.ed
u



Let's Pivot and Talk about Leadership



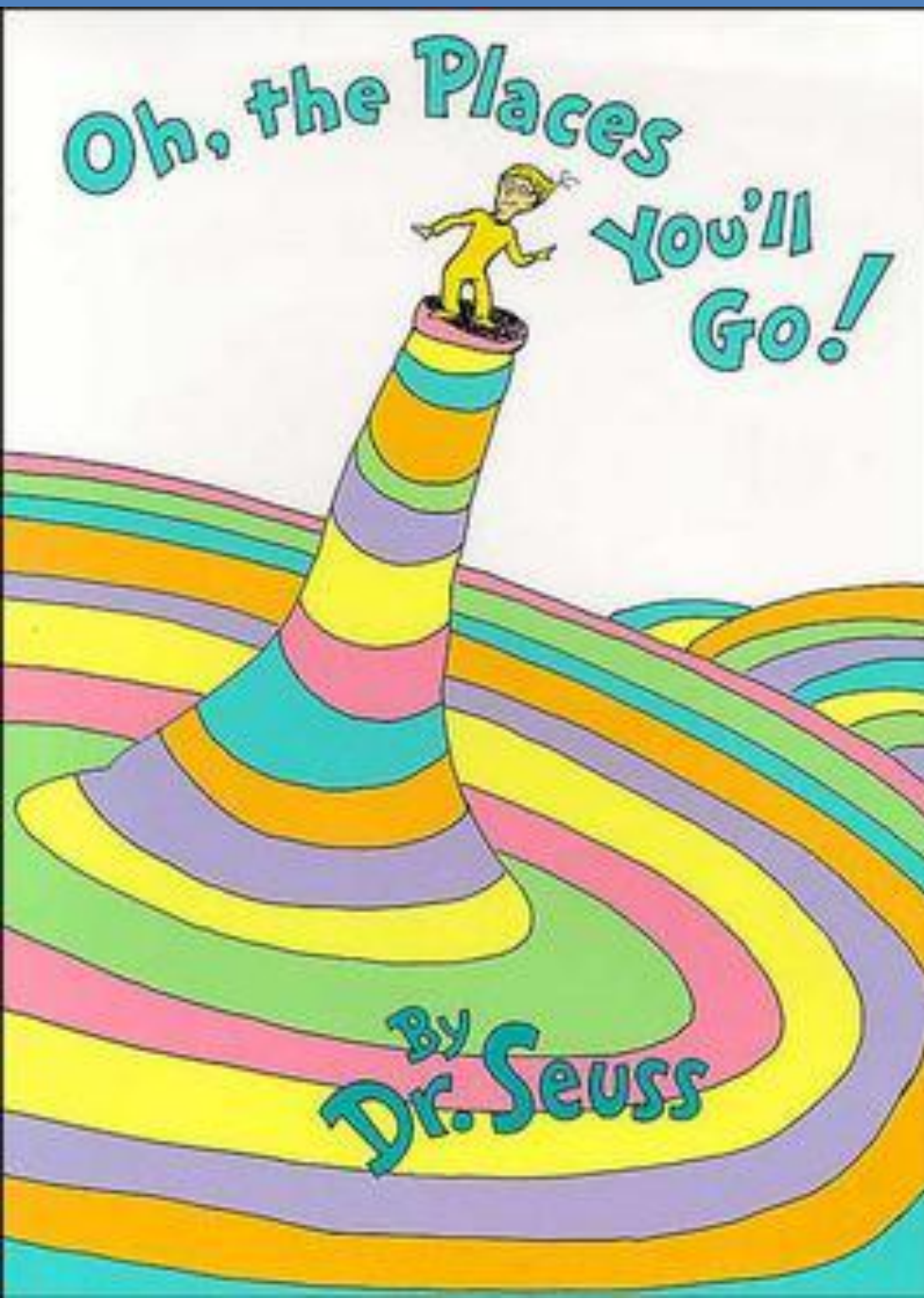
SCHOOL HAPPENS!

A Practitioner's Guide for Increasing School Achievement in a Hybrid Learning Environment

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AGENDA

- What Makes a Great School
- 3 Pillars for School Achievement
 - Effective Leadership
 - Collaborative Teachers
 - Rigorous Instruction
- Reaching Our Goal
- Summary
- What's Next



Congratulations!
Today is your day!
You're off to Great Places!
You're off and away!

You have brains in your
head.
You have feet in your
shoes.
You can steer yourself
Any direction you choose.

You're on your own. And
you know what you know.
And YOU are the guy
who'll decide where to go!

*We have brains in our heads,
We know what we know,
And WE are the educators, so let's go.....*



Collectively, we as educators....

- all want to build great schools.
- have many of the tools & resources we need to succeed.
- must determine how to best utilize our resources (persevere through remote learning) and determine the direction in which to steer our schools to greatness.

What Makes a Great School?

Teachers, administrators, students, parents, assessments, instructional materials, school environment...?

- Many factors involved in building great schools; some over which we have control, others we don't.
- Educators face many harsh realities and challenges, but none should distract from the roles we are there to fulfill.
- Acknowledging that we all come to this work at different levels of education, experience and background, accepting where we are, and problem-solve to move forward allows us to move from good schools to great schools.

Moving from Good to Great

- Jim Collins, author of *Good to Great and the Social Sectors*, maintains that business thinking is not the answer. Rather we must consider the values of “greatness” – the elements that distinguish good organizations from great ones.
- What are your thoughts of great schools?
(Share ideas in the chat room)

3 Pillars for School Achievement

Effective Leadership

Collaborative Teachers

Rigorous Instruction

EFFECTIVE LEADERS

- Develop a strong **school culture** and **supportive environment** based on trust
- Develop a **shared vision**
- Offer **continuous support** and ongoing **professional development** opportunities for **ALL** teachers
- Ensure a **viable curriculum** for **ALL** students
- Build strong **family and community** ties

COLLABORATIVE TEACHERS

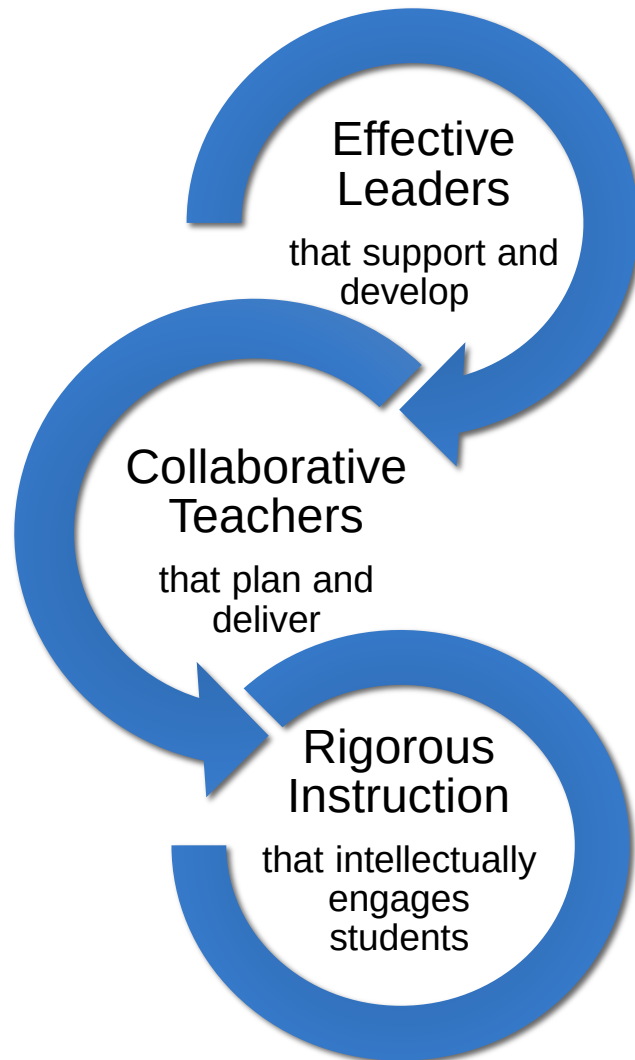
- Share **best practices** with colleagues
- Engage in thoughtful, **collaborative planning**
- Engage in ongoing **professional learning** with colleagues
- Foster **communication and positive dialogue** with outside stakeholders
- Establish **reflective stakeholders**

RIGOROUS INSTRUCTION

- Demands clear **expectations and outcomes**
- Demands **knowledge of students**
- Demands **knowledge of content and pedagogy**
- Embeds **assessment** opportunities with **data-driven and goal oriented** planning
- Creates opportunities for **intellectual engagement** and **critical thinking** by students, both collaboratively and independently

This Does Not Change With Remote Learning

In short, we need...



We will achieve our GOAL...

*To support school leaders in
building and maintaining a
successful school for their
students*

Let's Discuss the Three Pillars

- **Effective Leadership**
 - **Collaborative Teachers**
 - **Rigorous Instruction**
-
- **What resonated about Effective Leadership?**
 - **Why is it important to have Collaborative Teachers?**
 - **What does Rigorous Instruction mean to you?**
 - **Has any of this changed with Remote Learning?**

Effective Leadership

“To lead requires those who willingly follow. It requires those who believe in something bigger than a single issue. To inspire starts with the clarity of WHY”

-Simon Sinek

Remember the Administration?

- All administrators are not created equal – varying levels of knowledge, experience, and expertise.
- Administrators observe teaching practices, provide feedback, coordinate professional development, and, like it or not, evaluate teaching. If teachers do not respect their supervisors, they will likely not respect their feedback.
- Need to build mutual respect and solid professional relationships between teachers and administrators.

When “School Happens”

- Building great schools requires paying attention to all school staff members. More and more, schools are being required to do more with less.
- If we want everyone to give more and do more, we must ask ourselves, “What else would help them to perform their best every day? How can we better bridge the work/life balance for school staff members that will encourage their best work, avoid burnout and job dissatisfaction, and meet their needs?”
- School leaders must reach out to their staff and discover what else they truly need to be great.

Write in the chat box your thoughts

What Do We Believe and Why?

- Establish the purpose of the school's work
 - *Why are we doing this work?*
- Define success for your school
 - *What does success look and sound like to you?*



- Align school goals to beliefs
 - *Have we developed clear goals and action plans aligned to these goals?*
- Implement an action plan
 - *How will we do this work?*

Where Do You Want To Go?

Effective Teachers + Supportive Leaders = Great Schools

- Varying strengths & needs dictate that the roadmaps for getting to our respective *great school* will vary, but there is one constant across all:
 - Prior experience does not equal effectiveness; schools must plan to develop anyone who comes through their doors.
- How do we motivate, develop and retain effective teachers and supportive leaders?
 - STEP 1: Establish Well-Defined, Shared Values
 - STEP 2: Develop Tools Aligned to Values
 - STEP 3: Design a System to Assess Upon Implementation of Values
 - STEP 4: Design a System to Reflect Upon Implementation of Values

Always use the lens of school improvement and make revisions along the way.

STEP 1: Establish Well-Defined, Shared Values

OVERVIEW

- Determine the elements that are most important to building a great school – this is the foundation.
- Consider:
 - What are we trying to accomplish?
 - What aspects of great teaching and leadership will be the focus of our learning efforts?
 - How will we assess our progress as learners?

GREAT EXAMPLE

- Framework for Teaching Rubric:
 - Provides foundation of the work;
 - Creates a coherent vision about what constitutes great instruction
 - Guides us in thinking about ways to improve our practice

Framework for Teaching



STEP 2: Develop Tools Aligned to Values

- Schools must create and align tools to their core values that work for the school building and for remote learning.
- Tools, then, will maintain framework of assessment, reflection & support to ensure all staff members are engaged in the journey and working toward greatness.
- Each component - the assessment, reflection, and support – is equally important. Without one, we miss out on a critical element of what makes a school great.

STEP 3: Design a System to Assess Implementation of Values

Assessment:

- The current system of formal observations is flawed and does not work well in a remote environment.
- Using a system of ongoing classroom observations, instead, better reveals a teacher's strengths, pinpoints areas for improvement, and allows for more specific, ongoing support. In a remote learning environment reviewing class assignments, completion of meaningful work, student engagement and ownership.
- Schools can, but rarely do, employ two layers to classroom observations:
 - 1) Supervisor-to-Teacher – Do not need to be evaluative.
 - 2) Teacher-to-Teacher – Should not be evaluative.

Sample Informal Observation Process

- **Layer 1: Supervisor-to-Teacher**

- Conduct frequent cycles of informal observations
- Meet with teachers to discuss findings
- Create a shared understanding of teacher needs
- Prioritize areas of development

Sample Interclass Visitation Process

- **Layer 2: Teacher-to-Teacher:**

- Short cycles of interclass visitations establishes a streamlined approach for teachers to collaborate with colleagues.

Which allows teachers....

- to focus on best instructional practices & student learning.
- learn from other teachers.
- monitor their professional growth through observations and continuous feedback.

STEP 4: Design a System to Reflect Implementation of Values

- **Reflection:**

- Self-reflection is absolutely necessary - All professionals should know how they're performing at any given time.
- How can we expect educators to improve and become great if they are not asked to think about their own performance or become an active participant in their own professional growth?
- Teachers AND administrators must engage in self-assessment and reflection so that they can play key roles in deciding the direction and nature of their professional improvement.

Yearlong Plan Sample Worksheet:

Complete the following charts that will help you develop a framework for your school vision and the goals you wish to achieve for instruction.

VISION:	What is your long-term desired future state? Where do you want to be? What do you want to become?
MISSION:	What is your purpose? What do you do, for whom do you do it and how do you do it? What value do you provide?
INSTRUCTIONAL FOCUS:	What is your school's priority area for classroom instruction?
RATIONALE:	How did you determine your instructional focus and why? What data supports it as a priority area for your school?

What goals will you set to support you in achieving your school's mission and vision, and staying aligned to your instructional focus?

	GOAL #1 School Culture	GOAL #2 Effective Leadership	GOAL #3 Professional Learning and Support	GOAL #4 Curriculum and Instruction Collaboration	GOAL #5 Family/ Community Connection
ACTION PLAN					
TIMELINE/ CHECKPOINTS					
FACILITATOR(S)					

Weekly Check-In

Reflection	(General reflection on the week)
Priority Areas	(What did I work on this week? What am I trying to achieve?)
Progress	(Describe the progress made/lessons learned)
Areas of Concern/ Questions	(What challenges are ahead? What broader issues need to be considered if this action is to be successful? What questions do I have?)
Next Steps	(How will I continue the work? What specifically will I do in the next week and over the next month?)

Collaborative Teachers

“John Hattie (2015) has added further confirmation to our conclusions in his report *What Works Best in Education: The Politics of Collaborative Expertise*. His conclusion represents a powerful endorsement of our findings: “the greatest influence on student progression in learning is having highly expert, inspired and passionate teachers and school leaders working together to maximize the effect of their teaching on all students in their care” (p. 2).”

— **Michael Fullan,**
Coherence: The Right Drivers in Action for Schools, Districts, and Systems

Phases of a Professional Learning Plan:

Phase I – Understanding school-wide expectations and outcomes.

Phase II – Developing instructional practices; Focusing on key areas of our school-wide rubrics.

Phase III – Offering opportunities for Teacher Leadership; Learning the theory of, and engaging in action research on, instructional practices.

Designed to run under three phases. All teachers participate in Phases I & II, with selected teachers participating in Phase III. The lengths of each phase may be modified for new teachers or those who require additional assistance along the various topics.

Setting the Stage for PLC's

- **Purpose**

- *Why is collaboration important?*

- **Time**

- *PLC's programmed into teacher schedules*

- **Training and Support**

- *People need to be taught how to work together effectively and efficiently*

- **Accept Responsibility**

- *Recognize an opportunity to change the way a school operates*

- **Interclass Visits (Even Remotely)**

- *Low-interference observation of teacher colleagues*

- **Collaborative Planning**

- *Small teacher groups collaborate, deliver and reflect on group lesson plans*



PLC Planning Document

Plan the Lesson	Participants spend the bulk of their time in this step of the process.
Deliver the Lesson	One teacher in the group will implement the lesson while the other participants will watch and take low inference observation notes.
Looking at Student Work	Together, participants assess student work produced as a result of the lesson.
Reflection and Lesson Debrief	Participants reflect on the lesson design and implementation and discuss the process and outcomes of this lesson.
Next Steps	Participants determine clear and concise next steps for future planning and delivery of instruction.

Rigorous Instruction

Effective practices are designed to achieve desired results. As educators expand their expectations for student learning to focus more on conceptual understandings and problem-solving skills, the instructional strategies used must correspondingly change.

-Charlotte Danielson

Students as Leaders Own Their Learning



Viable Curriculum

Complex content and concepts aligned to grade level standards

Bringing Curriculum to Life

Learning objectives, action plans & assessment

Data Analysis

Utilizing student data for future planning

Rigorous Instruction

- Great Schools are not only built from strong, internal organizational structures.
- Students can only perform to the assignments they are given; therefore, thinking about how effective our curriculum is, alongside our school-wide framework, is essential to building a Great School.
- We must think about both curriculum and pedagogy together; the equation, then, changes.
- ***Effective Teachers + Supportive Leaders + A Viable Curriculum = Great Schools***

Thoughts on Rigorous Instruction



What is a Viable Curriculum?

- Curriculum is not the end all, it is the **delivery of instruction via in-person or remote.**
- Curriculum must be adapted to meet the needs of the learners and continues to be challenging.
- A solid curriculum is both tight and loose, meaning there are non-negotiable items, but room for flexibility.
- Consider:
 - What do we want to achieve?
 - How do we plan to achieve our goal?
 - How will we know we have achieved our goal?

What is a Viable Curriculum?



What do We Want to Achieve?

- Create a year-long plan - the foundation for the coursework.
- Not specific enough to include daily lesson plans or even weekly calendars, but rather establishes:
 - the standards that will be addressed over the course of the year;
 - the number of units that will be addressed within the year;
 - the length of each unit;
 - the standards that will be addressed within each unit;
 - the texts, topics, or concepts that will be addressed within each unit;
 - the products or processes that will demonstrate the knowledge gained as a result of engaging with the identified text, topic, or concept, as well as mastery of the standards addressed; and
 - **the integrations across the content areas of each unit.**

How Do We Plan to Achieve Our Goal?

- Break down instruction into manageable chunks.
- Consider:
 - What are the essential questions with which students will grapple throughout the unit?
 - What are the guiding questions that will allow students to explore and better grapple with the essential questions?
 - How can the guiding questions shape our daily lesson plans, ensuring a clear focus and aligned activities?

Reaching Our Goal



**"Think left and think right
and think low and think high.
Oh, the thinks you can think up
if only you try!"**

- Dr. Seuss

TwistedSifter.com

How Will We Know We Have Achieved Our Goal?

- Establish learning metrics and track student progress:
 - This ensures we do not reach the end of the unit and learn then that our students have not mastered the standards addressed.
- Helps us determine:
 - Were we clear about our expectations?
 - Did we explicitly impart to students the knowledge and skills necessary for them to complete the task?
 - Did we design interim checkpoints to ensure that students were understanding and able to apply their learning?
 - Did students didn't learn or accomplish what we wanted them to learn or accomplish?

Month-By-Month Guide

Month	Focus Area (s)	Description	Products/ Outcomes	Follow Up/ Next Steps
July	Assessment	Assessment: Teachers engage in the second round of data discussions, revisiting their student learning goals and assessing progress in order to revise/set new goals. Teacher will provide leaders with sample student work and an analysis of assessment data.	• Student Data Analysis- Goals and Action Plans • Data Discussion Notes • Meeting Agenda and Minutes • Revised Professional Learning Plan	• Classroom Instruction- Observations, Feedback and Next Steps • Aligning Observation Feedback to PD Offerings

Revising the Framework Over Time

- Needs will change over time.
- Engage in assessing and reflecting on the framework itself to ensure that it continues to support work and lead us to even greater schools.
- Consider:
 - What are our needs?
 - What is our capacity to move things forward?
 - How can we move from theory to practice?
 - What does this concept look like in practice?
 - How do we know when we see it
 - How is it defined at our school, across levels?
 - How can it be improved upon over time?

Summary

- Developing a framework of assessment, reflection, and support is an ongoing process.
- It requires reflection, discussion, collaboration, and goal-directed thinking.
- Working together, we can all improve our practice and ultimately move closer to our common goal: building great schools.



And will you succeed?
Yes! You will, indeed!
(98 and $\frac{3}{4}$ percent guaranteed.)

~ Dr. Seuss, *Oh the Places You'll Go!*

THANK YOU!

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Your Categories

DCI's

Phenomenon

Design
Challenge

You are going to play along at home but the resources will be available to you to engage teachers or students in this activity.

Card Sort Activity AMNH – 5 Tools

Review the set of cards with your table group.

Decide if the question is about:

“Phenomena”

“Disciplinary Core Ideas” (DCI’s)

“Design Challenge”.

After you are done, write a list of criteria - a definition - for each category.

In your notebook or on a piece of paper, write down your answer to each card. For today's activity the cards will be numbered- in a workshop or activity the teachers or students would get the physical cards to sort.

1

How will climate change affect the distribution of Himalayan rabbits with less and more color in their fur?

2

How do the properties and movements of water shape Earth's surface and affect its systems?

3

What mix of surfaces should cover the schoolyard in order to keep the largest area coolest in the summertime, and why will that surface keep the yard coolest?

4

What species of tree can we plant that will maximize the biodiversity of the tree canopy in Denver and bring the most benefits to humans and other organisms?

DCI ?

Phenomena ?

Design Challenge ?

DCI ?

Phenomena ?

Design Challenge ?

5

Why does your kitchen warm up when you leave the oven door open after you've been cooking something in it?

6

How did the beautiful arches found in the "Four Corners" area of the U.S. form? (in the southwest, where AZ, CO, NM, and UT meet)

7

What is biodiversity, how do humans affect it, and how does it affect humans?

8

What happens when energy is transferred to a substance?



DCI ?

Phenomena ?

Design Challenge ?

9

How does the environment
affect the variation and
distribution of expressed
traits in a population?

Can sand catch fire and burn?

10

11

Why does a breeze form
along the coast after a warm
day?



The Answers

The resource section on the website will have a document with the complete explanation of the answers.

- 1) How will climate change affect the distribution of Himalayan rabbits with less and more color in their fur? *Phenomenon*
- 2) How do the properties and movements of water shape Earth's surface and affect its systems? *DCI*
- 3) What mix of surfaces should cover the schoolyard, in order to keep the largest area coolest in the summertime, and why will that surface keep the yard coolest? *Design Challenge*
- 4) What species of tree can we plant that will maximize the biodiversity of the tree canopy in Denver and bring the most benefits to humans and other organisms? *Design Challenge*
- 5) Why does your kitchen warm up when you leave the oven door open after you've been cooking something in it? *Phenomenon*
- 6) How did the beautiful arches found in the Four Corners area of the United States form? *Phenomenon*
- 7) What is biodiversity, how do humans affect it, and how does it affect humans? *DCI*
- 8) What happens when energy is transferred to a substance? *DCI*
- 9) How does the environment affect the variation and distribution of expressed traits in a population? *DCI*
- 10) Can sand catch fire and burn? *Phenomenon*
- 11) Why does a breeze form along the coast after a warm day? *Phenomenon*