

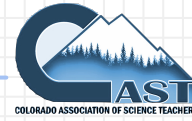


STEM-ifying Your Lessons

By [Kristina Stem](#)



HELLO!

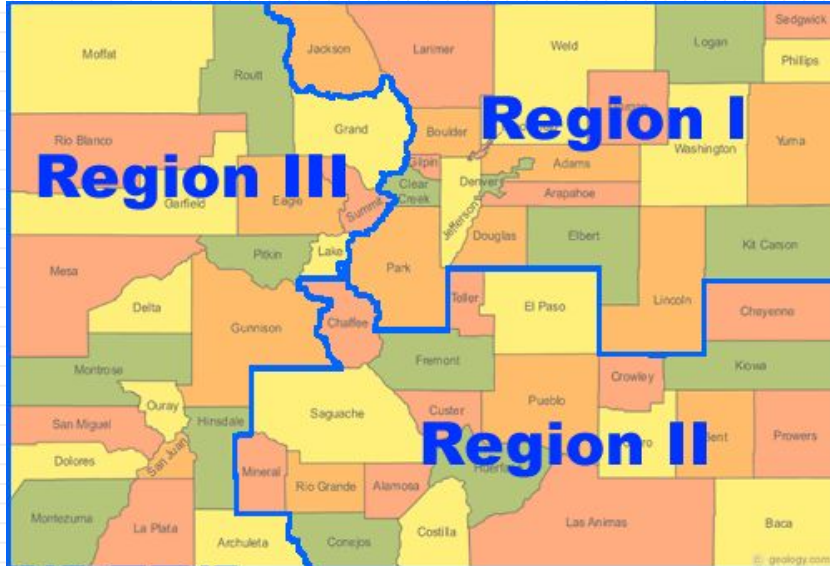



I am Kristina Stem.

stem_kristina@svvsd.org

 [@ErieSTEM](https://twitter.com/ErieSTEM)

CAST Region 1 Elementary Rep



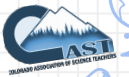


STEM for All!

Culture of STEM

STEM is Everywhere

With lots of examples and linked resources.



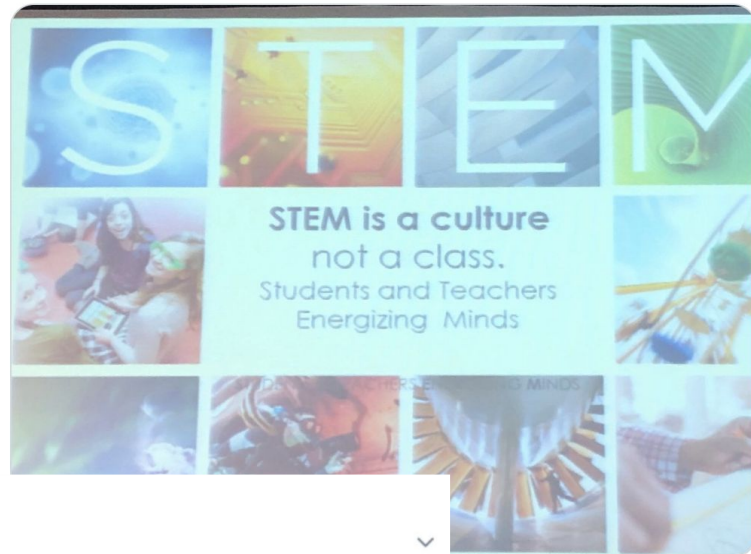
STEM for ALL!

- ✓ Every Class.
- ✓ Every Kid.
- ✓ No exceptions.



STEM is a culture of helping learners solve problems.
@stemboss #springvirtcon You can't buy it in a box. :)

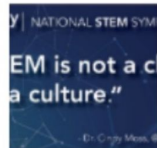
STEM is not something that happens in just one class it's a culture 🙌 @stemboss #DESTEM #UCPSstem



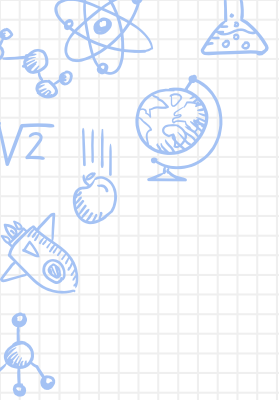
 **Mrs. Stem**
@ErieStem

STEM is a way to think... a way to process information.... a way to create... a mindset. YES!

Credit to @stemboss!



Discovery Education @DiscoveryEd
"STEM is not a class, it's a culture." @stemboss #DESTEM
#MondayMotivation #STEMchat





STEM is more than the content, more than the hype.

STEM is a MINDSET!

STEM is a Culture.

STEM is a purposeful and intentional way to DO.

Regardless what, where, or who you teach,
you are already a person who does STEM!!

You already think, question, practice, play, and work
like a STEMist...



How people who do STEM Do STEM

What people who do STEM Do STEM

MEGA-SKILLS FOR STEM

- PROBLEM SOLVE
- REASON
- MODEL
- ADAPT
- COMMUNICATE

THINKING STRATEGIES FOR STEM

- USE BACKGROUND KNOWLEDGE (SCHEMA)
- QUESTION
- INFER
- DETERMINE IMPORTANCE
- VISUALIZE
- SYNTHESIZE
- MONITOR FOR MEANING

PLUS... THEY SHARE THEIR THINKING!

As a teacher - YOU DO ALL OF THIS! YOU STEM!



STEM Concepts, Skills, Practices, and Standards

Collected by Kathy Stern

NGSS - CrossCutting Concepts

- Patterns
- Cause and Effect
- Scale, Proportion, Quantity
- Systems and System Models
- Energy and Matter
- Structure and Function
- Stability and Change
- Interdependence of STEM
- Influence of STEM on society and natural world

Essential Skills / 21st Century Skills

- Creativity and Imagination
- Critical Thinking and Problem Solving
- Communication
- Collaboration and Teamwork
- Inquiry and Analysis
- Self-Awareness and Responsibility
- Initiative
- Flexibility and Adaptability
- Persistence and Resilience
- Global and Cultural Awareness
- Character
- Information and Media Literacy
- Productivity and Accountability

NGSS - Practices

- Asking Questions and Defining Problems
- Developing and Using Models
- Planning and Carrying out Investigations
- Analyzing and Interpreting Data
- Using Math and Computational Thinking
- Constructing Explanations and Designing Solutions
- Engaging in Argument from Evidence
- Obtaining, Evaluating and Communicating Information

CCSS Math Practices

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

ISTE Standards for Students

- **Empowered Learner:** Leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.
- **Digital Citizen:** Recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world, and they act and model in ways that are safe, legal and ethical.
- **Knowledge Constructor:** Critically curates a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.
- **Innovative Designer:** Implement a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.
- **Computational Thinker:** Develops and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.
- **Creative Communicator:** Communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, files, formats and digital media appropriate to their goals.
- **Global Collaborator:** Use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally.

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What people who do STEM Study and Know:

As a SCIENCE teacher -
YOU KNOW ALL OF THIS!
YOU KNOW STEM!

SUMMARY OF STEM BIG IDEAS

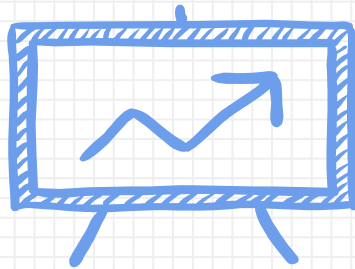
- DETAILS ARE USED TO IDENTIFY, COMPARE, AND CONTRAST
 - RIGHT TOOL FOR THE RIGHT JOB
 - EVIDENCE IS USED TO SUPPORT
- CHANGE IS A PROCESS
 - SOME CHANGES ARE CYCLIC
 - SOME CHANGES ARE CUMULATIVE
- PATTERNS, INTERACTIONS/RELATIONSHIPS, AND TRANSFORMATIONS
 - ARE OBSERVABLE
 - CAN BE USED TO PREDICT OUTCOMES AND DRAW CONCLUSIONS
- EVERYTHING IS CONNECTED

Cool models of the interconnectedness of things by Dominic Walliman:
<https://dominicwalliman.com/>








Yes. You do STEM.
Yes. You know STEM.

But do you have a STEM Culture
in your teaching space?
How you can *up* your STEM game?

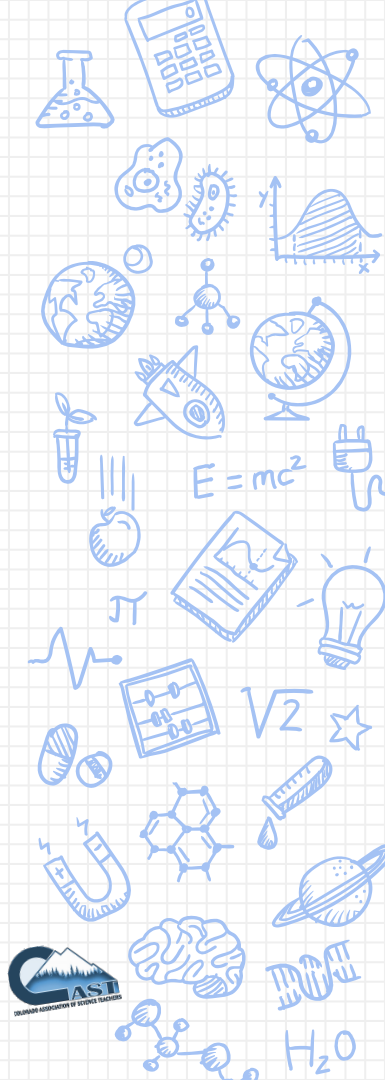


I STEM. I've got the mindset, just not the time!

How do I make STEM part of my day?

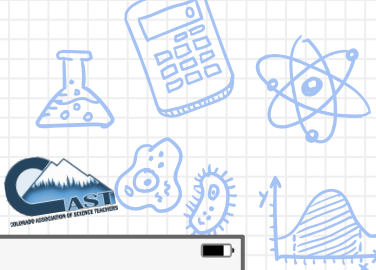
-  Speak with Language that models STEM Culture.
-  Make STEM Moments and Routines
-  Allow for Structured Play
-  Practice PBL & Design Thinking
-  Leverage your STEM mindset to *really* celebrate the practices, thinking strategies, and character traits that develop great thinkers.

Let's explore a little of each of these...



Language that Models STEM Culture

Yay!
STEM!



●●●●● STEMIst

< Messages **Growth Promoting** Details

You must be worn out from all that hard work. Let's switch gears to something easier.

I see you working hard, showing lots of effort and persistence. Way to grow

My, you are quick! Look how smart you are! Wow! The solutions are coming easily to you! You're really good at this!

What great effort you are putting into this work! I love your stamina - the way you are sticking with it! I'm impressed to see you've tried different strategies to solve this! What great thinking!

Text Message Send

●●●●● STEMIst

< Messages **Curiosity** Details

Great question. Keep asking good questions.

That's a great mathematician (or scientist, or engineer) question. Being curious makes you powerful.

I don't know. How about you look it up and when you find out, teach me what you learned.

What questions do you have about this?

What is interesting to you about this?

What else do you wonder?

Text Message Send

●●●●● STEMIst

< Messages **All of us STEM** Details

Today, class, we are going to...

Today, scientists, we are going to explore...

I like how I see everyone working on solving this problem.

I like how I see every mathematician using strategies to solve this problem.

I really like how you are working together as a team.

Scientists collaborate. I really like how you are acting like scientists and working together to learn.

Text Message Send

●●●●● STEMIst

< Messages **STEM is Every...** Details

Get out your magic fingers to help get the projector working.

There must be some technical reason why the projector isn't working. Do any of my problem solvers have any ideas.

What connections can you find?

STEM is everywhere. What STEM connections can you find?

Text Message Send

Making STEM Moments

Tell a personal story about STEM in your world.

"You probably noticed I dripped mustard on my white shirt yesterday... and I'm proud to tell you that this morning, I used my super-chemistry skills to successfully remove any evidence of my clumsiness! Physics (and mustard) won yesterday but Chemistry won today!"

Model how you are a problem-solver.

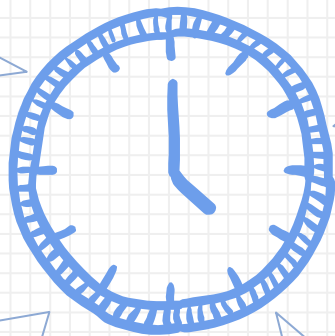
"You remember how my projector has been glitchy for a while... Well, I finally figured it out! I thought it was cord - it usually is - so I jiggled it and checked the connections, but that didn't help. I even swapped it out for a new one but that didn't do anything either. And as I went to investigate more, I noticed that bulb didn't look right. I was able to request a new one and it's here and the projector seems good as new!"

Share how you are a lifelong learner.

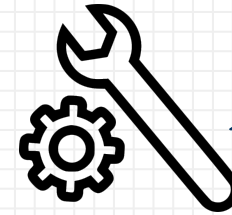
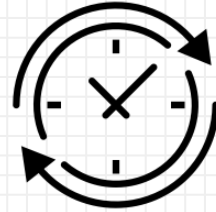
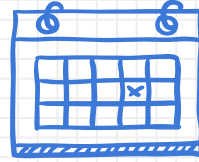
"This past weekend, I was at the Colorado Science Conference with a bunch of fabulous science teachers all across Colorado, and I got to hear the Colorado Teacher of the Year, Autumn Rivera, give a talk and it was SO cool how through her presentation she wove in the States of Matter - the same States of Matter you're learning about right now - into her lesson. She talked about how sometimes we are like rigid solids and other times more fluid like liquids and even times when we get more energy and behave like gases. I was thinking of you the whole time!"

Ask thoughtful, deep, answerable questions.

"Ok, we have a little time before we need to go. I'm going to give you a minute to think about it and gather your thoughts and then you're going to tell your tables:
- From original source to your mouth, what do you think was the journey of the last food you consumed."



Making STEM Routines



Have an easily accessible collection of "stuff" (TP rolls, tape, pipe cleaners, clean recyclables) to build with.

- Curiosity Researcher
- Tech Squad
- Builder/Fixer/Problem-Solver
- Statistician/Data Visualizer

- Math and Science Vocab All Around
- Line Games
- Math Games as Reward Time
- Element/Invention/Scientist of the Week/Month
- STEM Current Events or Ethical Dilemma

- STEM Center/Station
 - Structured Builds
 - Creative Builds
- Builds/Models for Understanding
 - Reviews
 - Assessment
 - Intro

Physical
Artistic
Digital

Structured Play

Play is the
highest form
of research

Albert Einstein



Give:

Limited Time.

Any Kind of Stuff.

A Topic.

High Expectations.

AND GO!!!!

"Play is often talked about as if it were a relief from serious learning. But for children, play is serious learning."

—Mr. Rogers

Playground > Playpen

PHET
INTERACTIVE SIMULATIONS

"Hard fun."

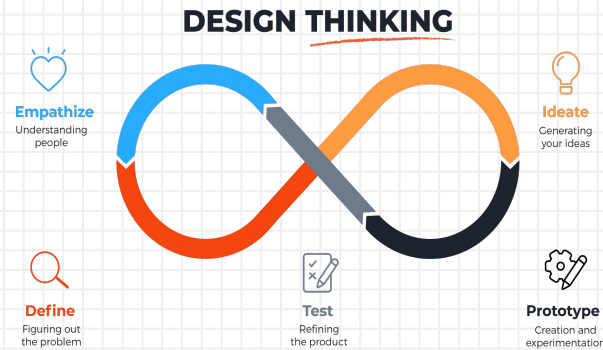
Practice

PBL & Design Thinking

Although we are naturally curious,
STEM takes explicit instruction, practice, and experience.

Big PBLs and Big Design Thinking Challenges are AWESOME.

Little bits of them are, too!





Celebrate

the practices, thinking strategies, and character traits that develop great thinkers and learners.

Iterate! Try Again! Draft! Improve!
Respawn! Rehearse! Repeat! Redo! Revise!

Mistakes and Struggles



Clear evidence from neuroscience & education

- The best times for our brains are when we are struggling & making mistakes

Maya Lin
Finding Balance Award



Examples

Ideas to Integrate CS with Content

Concrete curricular content lesson examples infused with computer science skills and strategies to elucidate and inspire on how CS can be included in any teaching space.



Made with love by Kristin Dorn
www.kristindorn.com

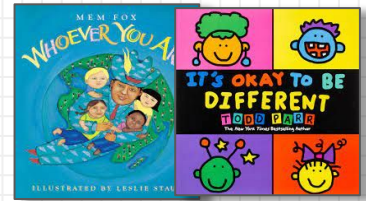
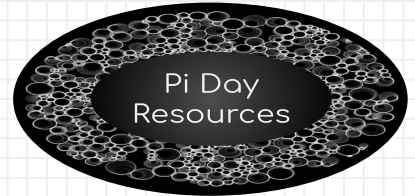
Seed Dispersal Challenge Card
 - Shaker -
 Modify your seed to fall out when shaken.

I've had, the time of my lines...

Task: Arrange a set of cards on the meter stick from oldest to youngest.



NEAL.FUN
 a tiny website on the internet



NATURE SCAVENGER HUNT

HINT: Have someone hold the clue card in focus in the picture so we can make a digital book of the treasures you found.

Bring a clipboard, pencil, with checklist, clue cards and camera!
 Let's GO!

SAVING WINSLOW

Agenda

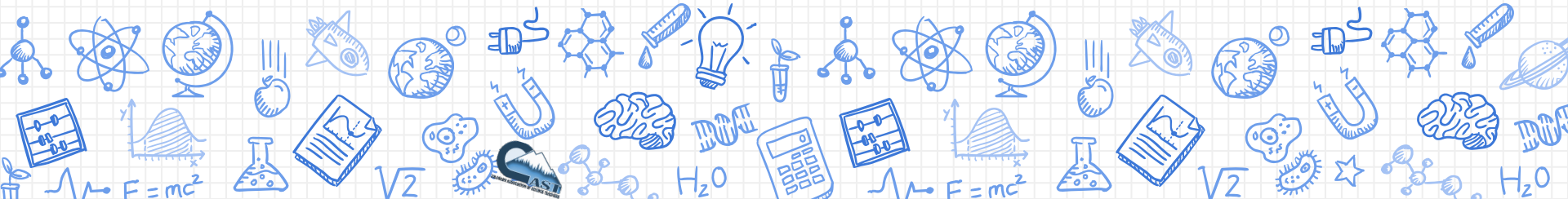
- Vocab work
- Questions
- Discussion Questions
- Diapers & Oranges

SAVING WINSLOW

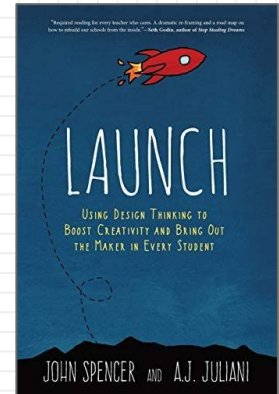
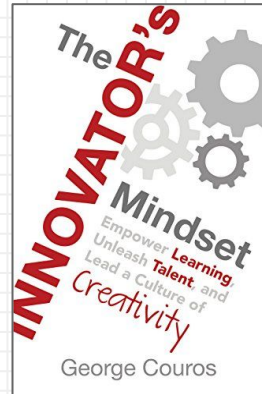
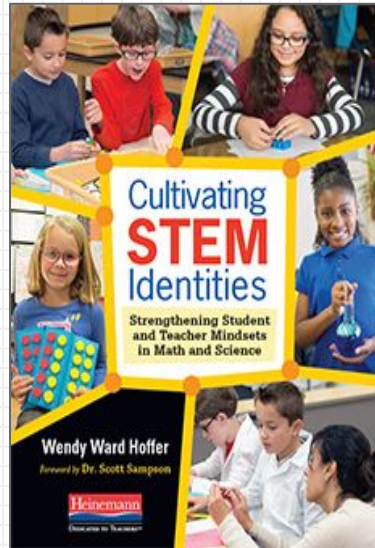
Day 6 - Diapers & Oranges

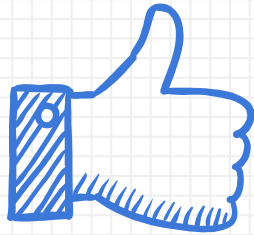
Spiders are Engineers

Empathy Lesson



Good Books






THANKS!

Curious about more? Wanna collaborate?!

You can find me at

- ✘ [@ErieSTEM](https://twitter.com/ErieSTEM) 
- ✘ stem_kristina@svvsd.org