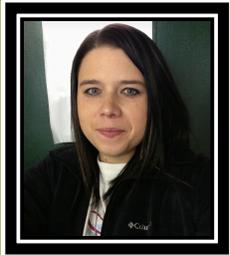


# Introduction to STEM

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*By Kristen Deitz Broken Arrow Schools*

My name is Kristen Deitz and I am currently the gifted education teacher at Aspen Creek Elementary in Broken Arrow, Oklahoma. I received my bachelors in Elementary Education from Northeastern State University in 2008 and I am currently working on my Master's in Science and STEM certification through NSU and NASA's Endeavor Program. I am a huge advocate for STEM education.



## What is STEM?

STEM education is an acronym for science, technology, engineering and mathematics. However, that is not what it represents in the classroom. STEM education is an interdisciplinary approach to learning where rigorous academic concepts are coupled with real-world lessons as students apply science, technology, engineering, and mathematics in contexts that make connections between school, community, work, and the global enterprise enabling the development of STEM literacy and with it the ability to compete in the new economy. (1)

(1) Suggested Reading – For the whole study on the need for STEM integration in the classroom read: STEM Education in Southwestern Pennsylvania: Report of a project to identify the missing components by Nancy Tsupros  
<http://www.cmu.edu/gelfand/documents/stem-survey-report-cmu-iu1.pdf>

### Reading Reflection Questions

- ✓ Do you feel we are adequately preparing our students for the future workforce or is there something missing?
- ✓ Will the United States be able to meet the demand for STEM rich jobs that are available without looking for applicants out of the country?
- ✓ What can we do to change the current perspective of teachers when it comes to integrating STEM in the classroom?

In other words, STEM takes technology and engineering and adds it to the science and mathematics we already teach. You aren't changing what you teach; you are changing how you teach it.

## The ABC's of STEM

The current trend in STEM education seems to be how many more letters we can integrate into the STEM acronym. What does it mean? Why does it have to be so confusing?

STEAM – Science, Technology, Engineering, Art, Mathematics (Integration of arts)

STREAM – Science, Technology, Reading, Engineering, Art, Mathematics (integration of reading and arts)

Does it matter which one you choose?

### STEM, STEAM, STREAM.... SCREAM?!

Is it STEM or STEAM? Why not STREAM? This battle of acronyms makes me want to SCREAM!

I am not sure how long the acronym STEM (Science, Technology, Engineering & Math) has been around, but the new buzzword is STEAM (sprinkle in the Arts), and it seems



to be gaining steam in popularity. Why not call it STREAM, add a dash of reading in the mix, and replace the popular “pipeline” metaphor with an “estuary” metaphor! Do our acronyms and metaphors matter?

There seems to be a battle of value between the liberal arts and the sciences, and this is evident in the conversation to be STEAM not STEM. This begs the question: Was STEM created to idolize these fields, and diminish the arts? I cannot know for certain, but I highly doubt that was the intention. (2)

(2) Suggested Reading – For the whole article please visit Meagan Pollock’s website at <http://meaganpollock.com/stem-steam/> . She has some great resources on equality in engineering.

#### Reading Reflection Questions

- ✓ Should the arts, reading and liberal arts, be included in the STEM instruction?
- ✓ How do we separate the arts from STEM instruction?

## Where do I start?

The first place is by reviewing the 5E lesson plan. KEEP READING!! I am not saying you have to write a long lesson for every STEM activity you do. All you need to look for are the 5E's. These will help you develop a lesson that incorporates all aspects of STEM integration. See NASA's link for a good 5E resource

<http://www.nasa.gov/audience/foreducators/nasaclips/5eteachingmodels/index.html>

The 5E's are things you probably do every day; however, when placed into a STEM classroom can provide more meaningful instruction.

- ✓ Engage – The purpose for the ENGAGE stage is to pique student interest and get them personally involved in the lesson, while pre-assessing prior understanding.
- ✓ Explore -The purpose for the EXPLORE stage is to get students involved in the topic and providing them with a chance to build their own understanding.
- ✓ Explain - The purpose for the EXPLAIN stage is to provide students with an opportunity to communicate what they have learned so far and figure out what it means.
- ✓ Extend - The purpose for the EXTEND stage is to allow students to use their new knowledge and continue to explore its implications.
- ✓ Evaluate - The purpose for the EVALUATION stage is for both students and teachers to determine how much learning and understanding has taken place.

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## But what does this have to do with math?

**The easiest, most straightforward answer is everything!**

**If you are trying to calculate force, speed, distance, etc what are you using to get your answers? If you need to measure items for an investigation what are you using? Science requires mathematics even for the most basic problems.**

## Learning Prompt

Students have been given the task of comparing different types of roller coasters and using the different variables to make estimations on height, length, speed and duration.

The lesson plan and activity sheet can be located at  
<http://illuminations.nctm.org/Lesson.aspx?id=924>

### **What makes this a STEM activity?**

After working through the estimation part of the activity which uses mathematics and technology, I incorporate the engineering aspect by asking students to work in groups and design their own roller coasters using K'nex building materials. After they engineer and build their roller coaster the different groups will then test their roller coasters and make observations based upon the original task.

- S – Speed, researching roller coasters
- T – Use of joyrides.com to complete estimation assignment
- E – Design and build a model roller coaster
- M – Line graphs and estimation

### **Questions for Students**

1. Did your ability to estimate the height of roller coasters improve as you looked at more coaster pictures and data? How can you tell?
2. Can an Estimation Score be greater than 100? How?
3. Can an Estimation Score be greater than 100 if the estimate is lower than the actual amount? Explain.
4. Did you notice a relationship between the speed of the coasters you chose and their height? For example, does a taller coaster go faster? Explain what relationship, if any, exists with the coaster data you gathered on speed and height.
5. Do you notice a relationship between speed and the duration of the ride for the roller coasters you chose? If so, explain the relationship. If not, tell why you think a relationship does not exist.
6. Would the length of a roller coaster track affect its speed? Why or why not?
7. What other factors could be affected by the length of the coaster track?

### **Teacher Reflection**

1. Did students achieve the objectives for this lesson? What evidence supports this claim? What changes should I make to create a more effective lesson?
2. What additional experiences do students need to be successful with this activity?
3. Were students able to explain their reasoning in a clear and logical manner?
4. Have students gone beyond simply stating procedures by justifying and defending their reasoning?
5. What are the indicators that students were able to work together and share responsibilities?
6. What is the evidence that students have assumed individual responsibility for understanding the mathematics content shared in their group?

7. Have individual students asked questions to clarify and extend their understanding of the mathematics content?
8. Were students able to quantify, organize, and/or record information?
9. What new vocabulary did students use that might need to be reinforced in the next lesson?
10. Were directions in the lessons clear and usable by students? If not what adjustments would be appropriate for me to make?
11. What additional extensions/experiences would be appropriate?

### Teacher Community

These are some great starting places for those interested in connecting with other teachers passionate about STEM, STEAM and integrating math and science in general.

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**Facebook Group started by Oklahoma Teachers**    **#okSTEAM**

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**Twitter**    **#STEMchat**

**STEMseeds.org**

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