

VAI EDUCATION SPOTLIGHT

Behind the Numbers: Infusing Creativity into Math and Science



When you think about math and science, what descriptors come to mind? Typically, we think about logic and reasoning, and it is rare for us to associate these subject areas with creativity. But, why not? Both math and science hold great potential for creative work, and there are simple, practical ways to make this happen in your classroom.

Here are some strategies, tips, and takeaways that can help you and your students.

Attitude Matters

A recent Stanford study found that “if you have a strong interest and self-perceived ability in math, it results in enhanced memory and more efficient engagement of the brain’s problem-solving capacities.” So, finding ways to ignite interest in our students is instrumental.

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Imagine if we taught art the way we teach math and science. We give our students a color-by-number. They don’t get to choose their colors, they have to stay within the lines, and they are very limited to how they can color the picture. Boring, right?!

In many ways, this is how traditional math and science curriculum has been taught. We teach students how to figure out the equation or how to lead an investigation step-by-step, give them a bunch of practice problems on a worksheet, and check to see if they followed within the lines as instructed.

Real-World Application Matters

While we know it is important to give students time and practice through worksheets, we also recognize that this shouldn't be the core of their learning. In today's ever-changing world, the job skills that our students will need have creativity at the core. The World Economic Forum (October 2020) listed these skills as essential in today's workforce:

- Analytical thinking and innovation
- Complex problem-solving
- Creativity, originality, and initiative
- Technology design and programming
- Reasoning, problem-solving, and ideation

These skills are waiting to be unleashed by students sitting in all our classrooms. We hear stories everyday about young humans doing amazing things, like 18 year-old Amber Lang who developed an artificial neural network to locate space junk. And 13 year-old Hannah Edge, who created a device to help her deal with her asthma by informing her of her oxygen levels in real-time. Also, 13 year-old Shubham Banerjee, who developed a Braille printer using Legos®. These students are OUR students and when given a creative problem, chose to unleash their potential and do something to solve it.

We can unleash their creativity in math and science in so many ways, but here are four practical ways to make this happen in your classroom:

1. Prioritize and Promote Play
2. Incorporate Opportunities for Creative Problem-Solving
3. Cultivate Collaboration
4. Foster Weirdness

Let's look a bit closer at how we take each one of these big ideas and apply strategies that are sure to ignite the creative genius in every one of our students.

Prioritize and Promote Play

Messing About: Play is essential to growth and development as it gives our students a sense of how our world works. While we give our students opportunities to play in the early grades, we often have to push this aside as they progress through their schooling. Partly because of our curriculum demands, but also because we may lose sight of the important role it plays beyond early childhood.

By giving our students opportunities to grapple with the materials and/or the content before the intended learning happens, we open up opportunities to make connections before they learn the planned content.

So, put those tools out there and let students explore! In elementary, this could be unifix cubes, counting bears, measuring cups, etc. If you are a middle or high school teacher wondering what this may look like at your grade level, it's also quite simple. Any tool that students will be using like a compass, scale, ruler, calculator, or even data sets should be investigated prior to being used with intention.

Why?

In science, curiosity and creativity have powerful potential to drive learning. By allowing students opportunities to use the tools to figure out how things work, we equip them with knowledge and know-how that is foundational for future learning.

In math, those foundational skills are developed very similarly. The concrete pictorial abstract (CPA) progression is a great example of this. When students are given hands-on opportunities to work with objects to show their understanding of a concept, then draw a pictorial representation of that concept, they are better equipped to think about and solve that concept in an abstract way.

Be Intentional

We all know that when we write something down, we are more likely to follow through with it. By simply making space for messing about within our lesson plans, we ensure that we think about a way to make it happen when teaching that lesson.

Incorporate Opportunities for Creative Problem-Solving

Open-Ended Questions: One of the best (and easiest!) ways to get students to think differently and creatively is to pose a question that is open-ended. For example, in math, if you are teaching students how to round to the nearest tenth, instead of saying "round 37.67 to the nearest tenth", ask students to generate three different numbers that when rounded to the nearest tenth give you 37.7.

In science, when students are following a step-by-step investigation, ask students these questions throughout that process:

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- What patterns do you notice?
- What materials will work best?
- How are they alike? How are they different?
- What makes that happen?
- How do you make sense of this?
- How can we find a new way to do it?

By posing open-ended questions, it sends students the message that there is more than one way to solve any problem and gives them permission to find a way that is meaningful to them.

Creative Storytelling: We've heard the saying "a picture is worth a thousand words", and that holds true in any academic context. Take advantage of this concept by showing students any image that has various things in varying amounts. For math, have students tell a mathematical story based on what they see. In science, ask students to prove or disprove a scientific theory. Chances are, you will be amazed by the creativity and academic thinking that occurs by simply giving them this prompt!

Prove It!: This strategy takes the idea of storytelling to a different level. Find an object that has a story to tell. Then, tell students a story about it. Ask them to prove or disprove your story. One example of this is from a middle school teacher who placed a rock on a shelf at the beginning of the year. Students asked questions in which he simply responded, "When the time is right, I'll tell you about it." As his class started learning about geology, he told his students a story about this particular rock, saying it dated back to prehistoric times - dinosaurs likely walked on this rock. He then told students to prove or disprove his story. A great way to build engagement while also getting them to think deeply about a topic

Cultivate Collaboration



objective to accomplish. In math, you can have your students build a mascot that represents your understanding of mixed

numbers. Or, in science you may have your students build a mascot that represents your understanding of Newton's Three Laws of Motion. In both situations, students must work within the established constraints while also meeting the criteria. This activity gets students thinking deeply about how to use the materials available to convey an idea in a nonsensical way. Beyond that, it teaches students the power of teamwork and how creative and critical thinking tasks are better when ideas can be discussed, shared, and problem-solved together.

Draw It Out: Not only is learning how to work together important, but it is also equally important to learn how to communicate ideas effectively. Not all students are gifted with the ability to regurgitate learned information in a way that makes sense, right!? So, give students the opportunity to sketch their ideas out and use this as a prompt when they are conveying their ideas to others.

Foster Weirdness

Find Another Way: Oftentimes, students uphold ideas around problem-solving that lead them to believe there is only one solution or one "right" way. When we provide students with the opportunity to show their understanding in a variety of ways, actually inviting them to do so, they begin to see that every problem has multiple solutions. So, when students find one way to solve a problem, have them find another way, and another way, and another way...you get the idea here. To be even more intentional, suggest a set number of ways to solve a problem. As they get closer to that designated number and the more obvious solutions are already out there, students begin to think more creatively about how they may work to solve it.

Change the Conversation: Students have a wonderful knack for taking what they hear us saying and internalizing the meaning to construct their own ideas around a topic. In fact, we all do it. So, if we can construct the message we are sending to our students that weird is, in fact, cool, we can get our students to take pride in thinking and being - different. By stating things like "Wow! That's such a wonderfully weird idea!" or "I'm impressed how you thought about that in a creative and weird way." or "Now, how can you think about that in a weirdly different way?" The message we send is that being weird means being able to think differently, and this is exactly what our complex and ever-changing world needs.

Infusing Math and Science with Project-Based Learning

If you'd like to try a project-based learning (PBL) unit that gets students thinking in creatively different ways, take a look at the Blue Apple project, [The Dirty Truth](#).

This project gets students thinking critically and creatively as they ponder the question, "Can Earth be saved, or is Mars our only hope?" Through research and science, students determine whether they are Team Earth or Team Mars and craft a convincing PSA to raise money for an organization that supports their cause.



If you'd like to try this project, check out these resources:

- This [Project Overview](#) provides a lesson by lesson summary of this project.
- Check out [K-8 content standard connections](#) for this project.
- Check out the rich and diverse [Recommended Book List](#).
- To see this project in action, check out the [project video](#).

Conclusion

By infusing learning with strategies that foster creative thought, we make learning an attainable task for our students. The very best classrooms have a carefully constructed balance of critical and creative thinking tasks in all subject areas. Our world needs all kinds of problem-solvers and thinkers, so what else can you do to support the development of both critical and creative thinkers in your classroom?

[Click here](#) if you would like to see a **FREE 30-minute webinar** of this content:
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