Leslie Rubio: Lessons Learned: Creating a STEM Classroom of Excellence

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I love STEM, and I want my students to love it as well. I worried, however, that I wasn't doing enough in my daily lessons to inspire them to pursue these fields in college or careers.

As a fourth grade math and science teacher, I work very hard to follow our district's pacing guide requirements and cover all of the standards in order to prepare students for state testing in the spring. I wanted to show students the fun side of STEM but had difficulty finding activities that directly related to our standards, which meant we didn't have time for the fun stuff.

I also worried about the scope of my STEM lessons. How could I effectively integrate science, mathematics, engineering, and technology? How could I incorporate student autonomy, constructivism, and 21st-century skill building? How could I implement problem-based learning and help students make authentic real-world connections? How could I find the time to use technology to improve students' understanding of key concepts? And how could I do all of this in one lesson?!

I founded our school's STEM Club to provide an afterschool opportunity for students to get excited about STEM. The kids loved it, but still, I wanted to do more in my classroom, and I wanted to get other teachers excited about STEM, too. For this reason, I decided to pursue a National Certificate for STEM Teaching through the National Institute for STEM Education.

Going through the online certification process, I explored the 15 fundamental teacher actions that are essential to STEM learning. As I developed and demonstrated proficiency in each area, I gained new strategies that I could immediately incorporate in my classroom — and I eliminated the worries I had before.

Here are a few of the lessons I learned that have transformed my teaching:

1. **STEM education isn't just about STEM.**

STEM isn't just about each subject or the interrelationship of these subjects. It's about creating an environment for learning that not only builds students' understanding but actively engages them in STEM practices. While there are many actions we can take, the key is to focus on high-impact strategies such as establishing cooperative learning, implementing inquiry, implementing project-based learning, implementing problem-based learning, or facilitating the Claim, Evidence, and Reasoning framework, among others.

1. **Give students opportunities to fail and try again.**

STEM is also about questioning, hypothesizing, investigating, measuring, analyzing, designing, creating, testing, and learning from the results. An individual doesn't get to be an engineer or inventor or research scientist without experiencing failure and learning from it. Students, too, need to understand that it's okay if their project or experiment doesn't result in the outcome they expected. That "failure" is simply another piece of information they can use to refine their design or investigation and try again.

Further, by trying, failing, and trying again, students can develop 21st century skills — such as collaboration and teamwork, creativity and imagination, critical thinking, and problem solving — that are necessary for success in STEM or any field.

1. **Integrating technology can actually save time.**

Our school has a 1:1 laptop initiative, and I often use technology to provide differentiated instruction for my students. Even so, I rarely incorporated technology into my math or science lessons because it seemed like it would take too much time. I was wrong.

Here's one example that illustrates why. Over the years, I have found that "length times width equals area" is a difficult concept for nine-year-olds to grasp. So this year, instead of asking students to draw squares within rectangles and then calculate the area, I gave them the choice of working in pairs or groups of three on an online, interactive math simulation. In the simulation, students designed different collections of chocolate bars that were all the same area. One collection

might be 1 square by 12 squares of chocolate, while another could be 2 squares by 6 squares or 3 squares by 4 squares. Building these collections, all of my students grasped the concept of area in less than an hour! In previous years, I would've had to allocate additional days for differentiated small group instruction.

The use of technology not only made the lesson more fun, it helped students grasp the concept more quickly, which saved me hours of instructional time.

Creating a STEM classroom of excellence

By participating in a STEM certification program, I dispelled many of my own misconceptions about how much time and effort it takes to create inquiry-based, student-centered lessons. I'm now able to create and deliver lessons that two years ago I would have considered too time-consuming or challenging to even attempt. Now, in addition to helping students master our state standards, I'm supporting their development of STEM and 21st century learning skills. Even better, my students are falling in love with STEM because it's more engaging.

Thanks to my experiences, I'm also working to help other teachers become more comfortable with and excited about implementing STEM in their classrooms. Like me, they're discovering that a STEM classroom of excellence is about so much more than just STEM!

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