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Three Quick Tips To Connect STEM And The Next Generation Science Standards



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By Jasper Fox Sr.

The Next Generation Science Standards (NGSS) represent a shift towards solving problems using scientific thought and design thinking which is a perfect fit with the Science Technology Engineering and Math (STEM) movement. Focusing on my recent eighth grade science lesson *The Helicopter Challenge* in which I introduced the principle of *lean manufacturing* I'll share my insights on how to connect engineering principals found in the NGSS with your STEM curriculum. Keeping the following ideas from the NGSS in mind, your classroom will yield impressive solutions to issues your students find important and engaging.

1. **Optimization:** Have students formulate solutions towards a common goal like, making as many paper helicopters as possible in one class period. Using an inquiry-based environment in which students control the process, higher order thinking skills such as synthesis are continually taking place. While the mission was clear in our helicopter challenge, it was up to the students to come up with a plan to optimize, or improve, the process. Once each student created a helicopter from start to finish and we established a baseline completion time, then class then developed strategies to improve both the rate and quality of product creation. With little teacher intervention, the work became focused and intense. One child said, "At first each person cut out one. When we cut out more than one the production increased."
2. **Draw Schematics:** Have students summarize the challenge by connecting abstract graphic symbols such as circles and squares with arrows to represent the entire process. Viewing the workflow from an overall scale helps to mathematically quantify the relationship between aspects of systems. For example, as one student stated, "If 20 people cut 4 sheets at once, you get 80 helicopters" after drawing their version of the process.
3. **Argumentation:** Through discourse, pupils learn to supplement ideas and defend their perspectives. During this stage of our helicopter challenge, students elaborated on their experiences: "people cut more than one piece at a time. But because of that there needs to be two times the amount of folders" and "having separate jobs is a good way to optimize. One group gets a certain job and the other one gets a different job." Using data gathered during the different production runs, students discussed the best and most effective ideas developed during the challenge.

3 QUICK TIPS TO CONNECT STEM & THE NEXT GENERATION SCIENCE STANDARDS



Collaborative experiences based on NGSS principals help students see what careers in engineering look like while building engagement and interest. The main ideas from the NGSS and STEM education represent a tremendous opportunity to incorporate current manufacturing procedure into our curriculums. The outcome of this connection is that students will not only be prepared to work with these processes, they will be able to design the operations of the future.

Postscript: Much of my thought process on this would not have been possible without help of ASCD Emerging Leader Fred Ende, who is also assistant director of curriculum and instruction for Putnam/Northern Westchester BOCES, and comoderator of the [Next Generation Science Standards chat](#) on Twitter. Connect with Ende on [@FredEnde](#).

Jasper Fox Sr. teaches science at Copper Beech Middle School in the Lakeland Central School District in Shrub Oak, New York, where he is currently

in his twelfth year of teaching. He was recently named the Educators Voice Honoree for Middle School Teacher of the Year at the 2014 Bammy Awards and was a semifinalist in the 2015 New York State Teacher of the Year program. An avid writer and connected educator, Fox maintains an active Twitter presence as @jsprfox and writes for a variety of sites and publications.

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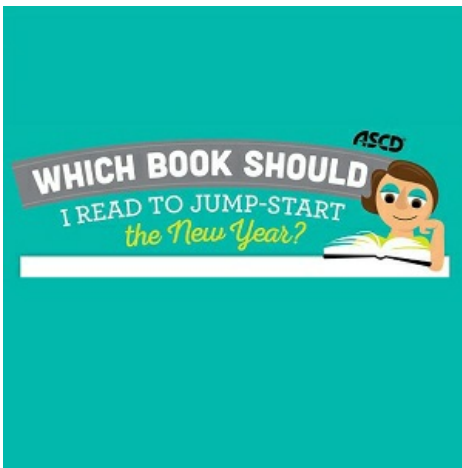
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