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STEM Connects
Past and Present 6

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Reports

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Helping Students Develop Perseverance

While some people use the terms “perseverance” and “grit” interchangeably, David Upegui, science teacher at Central Falls High School in Central Falls, Rhode Island, has a different view: “I am extremely fortunate to work in Central Falls (the most economically disadvantaged city in Rhode Island), where I teach some of the best students in our country. I have several strategies that I have [used] in the past, and also some potential warnings about the use of the ‘grit’ concept (perseverance is much better).”

With “100% of students [at my school] receiving free or reduced-price lunch,” 80% Latino, and many the children of immigrants, Upegui maintains, “all the students are already ‘gritty.’ They’re survivors. That these students show up [at school] at all is amazing.”

Perseverance, however, “is having the faculty to look at academic challenges as a way to grow personally and gain power over the world,” says Upegui. In his classes, “students feel science is our language and knowledge...and a tool for empowerment. They understand that science can teach you how to question the world, and you can apply it to all aspects of your life. My students realize it’s not about one assignment or one test: It’s about tools to help them change the world.” Science, he emphasizes to students, “has built into it the ability of changing. Science isn’t static.”

Helping students persevere is “not training [them] to be managed by others, but to manage others, to be



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Tom Meagher, district STEM education coordinator for Owatonna Public Schools in Owatonna, Minnesota, shows students how to hold a monarch butterfly before releasing it. “Finding, collecting, feeding, cleaning, and releasing live monarch butterflies teaches students about scientific observation, collecting samples, recording changes over time, life cycles, and stewardship. Each step requires practice in perseverance,” he says.

leaders,” Upegui asserts. Because many of his students “don’t see themselves in college, [they] need to be trained to be problem solvers and better citizens,” he says.

Upegui shares stories about the successes of former students, many of whom accomplished goals they once thought unimaginable including attending “Harvard, MIT, the Naval Academy.” He talks about scientists who overcame obstacles, such as Lynn Margulis, who was honored for her seminal work in endosymbiosis. “She was rejected 18 times until her research was published,” Upegui relates. “[I emphasize that] perseverance is something we all can develop: Work hard and work smart.”

Because some of his students are skeptical about their potential for suc-

cess, Upegui says he carefully scaffolds challenging tasks “to help students have small successes first. I make them challenging enough so it’s interesting, but simple enough to be doable...”

“When students work with [one another], they learn to rely on [one another] in a learning community. The students feel, ‘The responsibility to succeed is on all of us.’ Purposeful grouping and peer-editing assignments” can bolster that feeling, Upegui explains.

Dave Carlgren, physical science teacher at Renert School in Calgary, Canada, and his colleagues are taking perseverance through collaboration a step further. “Our science department is looking at a new evaluation strategy

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that involves students' individual assessments also counting toward a 'pod' mark involving the individual marks of others. In this way, subcommunities of individuals may form that 'look out for...one another. They can help other students in their pod study and prepare to do well," he explains.

This idea came about because "we see a disconnect between what's done in school and the way the world is," says Carlgren. Often in the workforce, people "collaborate in support and aren't competitive. We wanted to reflect this in classroom assessment and evaluation."

Beginning this year in fourth- and fifth-grade physical science classes, students have been grouped into pods of four to five students for collaboration. This pod size is "large enough that there's a significant impact of [grade] averaging, but not too large so that students can easily help one another," Carlgren points out.

Grouping is based on teachers' knowledge of students' strengths and weaknesses. "We teach students over multiple years," he notes, so teachers have had sufficient time to familiarize

themselves with their students' habits. Other factors in grouping are student communication modes, parental support, past success in science, students' friends, homerooms, and "how often students will see one another during the school day, the more, the better," Carlgren relates. Pods can change during the year, if needed, he adds.

"The pod effect" occurs "before the test or quiz," says Carlgren. High achievers benefit from teaching the material to their peers, while struggling students "will have several students in their pod who can help them and provide different perspectives," he reports.

Carlgren and his colleagues hope the pod arrangement also will discourage bullying. "We're pushing the idea that all students have strengths. The pods allow students to focus on the academic side; we encourage them to help the bully and the bullied," he explains.

So far, students have been "extremely supportive" of the pod concept and of their pod members, says Carlgren. By the end of the school year, the science department hopes to have this strategy incorporated in science classes in grades 4–9. "We hope students will become accustomed to helping others," he observes.

The Power of 'Yet'

Tom Meagher, district STEM (science, technology, engineering, and math) education coordinator for Owatonna Public Schools in Owatonna, Minnesota, works closely with more than 120 teachers to design and implement STEM lessons "grounded in [a] growth mindset [and] perseverance... When you approach learning through problem solving, teamwork, and challenges, there's a whole different mindset: 'We're going to solve this together.'"

When describing strategies for encouraging perseverance, Meagher points to Stanford University psychologist Carol Dweck's work on growth mindset and her TED Talk, *The Power of Yet*. "When a student says, 'I don't get it,' the teacher responds, 'You don't get it yet. What's our next step?'," he explains. "This provides a path to grow and expand their knowledge. I find it helps with our teachers, too...to help them grow out of their own comfort zones."

To help students develop perseverance, Meagher discourages teachers from "labeling students according to how they perform on tests. Life's not a race." Developing student perseverance begins with teachers recognizing,

for example, that for a kindergartener to successfully do leaf rubbings and find and sort leaves, "fine motor skills are needed. Some students aren't experienced in this, so we need to teach them the fine motor skills, plus [things like] sorting and identification," he maintains.

Often students who are used to getting things right the first time need help developing perseverance, Meagher observes. "They had to learn to change the way they think. [The less-gifted] students were more diligent, more strategic problem solvers." He found pairing the two types helped the advanced students learn perseverance and allowed the less-gifted students to get help with reading.

Meagher also advises, "Don't give students specific roles in groups, like notetaker. Just give them the assignment and say, 'It's up to you to figure it out.' They will determine their roles [naturally]." Educators need only step in "when strong personalities are involved," he suggests.

Rather than presenting challenges to students as things to work on, Meagher suggests teachers present challenges as opportunities for practice. "Students see this as building skill," he explains. ●



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