

Veering from the learning cliff: the unpopularity of STEM

For two years, an OSU team has tracked the STEM interests and activities of 16 Parkrose fifth-graders

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Nobody's quite sure why, but toward the end of middle school students lose interest in science and math. Researchers at one Portland school want to learn why. By solving the mystery, they hope to reverse the trend.

Northeast Portland's culturally diverse, working-class Parkrose Middle School is the subject of an investigation by Oregon State University researchers hoping to discover why science, technology, engineering, and math, or STEM, no longer appeals to many kids once they reach the eighth grade.

STEM has become a watchword for educators wanting a trained workforce capable of flourishing in an increasingly science-and-technology-driven global economy. Others say STEM is essential to create an informed citizenry able to weigh in on issues from climate change to bioengineering.

However, whereas much of STEM education is currently dominated by in-school curriculum changes, the OSU Parkrose project is traveling a different path.

"The data says if they [students] have interests and are engaged, good things will happen," says OSU professor John Falk.

Falk heads OSU's Center for Research on Lifelong STEM Learning. He's organizing the Parkrose project and its small team with his wife, OSU professor Lynn Dierking.

For decades Falk and Dierking have trail-blazed an iconoclastic education theory. Called free-choice learning, the theory says individuals, whether young or old, are more likely to learn when it's self-directed, that is when they're interested and personally invested in a subject. It seems obvious, yet it can be a hard sell.

Because self-directed learning often happens in "informal" settings — think museums, clubs, and after-school programs — Falk says policymakers and foundations are often reluctant to fund these efforts.

"People think that if somehow it's self-directed and fun, then there's something suspect about it in terms of learning," says Dierking. Contrary to this, her research has shown how important self-directed childhood play is for STEM learning.

Falk says research has also shown self-directed learning can powerfully augment classroom learning. As an example, he points to a nine-year study he performed that traced more than a doubling of Los Angeles residents' understanding of homeostasis — a common tenth grade biology lesson — to an exhibit at the California Science Center.

This is one goal of the Parkrose Middle School project and it's being employed to figure out why students go over what the researchers call the "STEM cliff."

"Nationally," says Falk, "and our data supports

this, 10-year-olds — fifth-graders — say they like science. Even what little science they get in school they think is cool. Then by eighth grade that nose-dives to where maybe a quarter say they're interested in science."

For two years, the OSU team has tracked the STEM interests and activities of 16 Parkrose fifth graders and their families, recently adding a 17th student. The researchers performed in-depth interviews with these case study students and families. The team also spread its net wide, setting a baseline by administering surveys to non-case-study students in the same grade.

The first of these surveys showed the Parkrose students were on a STEM trajectory typical for their age: students showed an interest in science, but hadn't yet displayed a dislike for it. In their sixth grade, the survey was administered again. This time the children diverged from the norm: exhibiting an increased interest in STEM.

Team member Nancy Staus, who has been compiling the project's data, says this apparent gain could result from how this study's questions differed from others. Unlike past studies that asked more general questions, such as, "Do you like science?" the OSU team asked more specific questions about the students' interests, such as, "Are you curious about what it is like on other planets?" and, "Are you curious about how computers and cell phones work?"

The researchers are now graphing the students' learning behavior by examining how factors like peers, adult support, and out-of-school programs affect their learning. However, the Parkrose project isn't just research; with the students now in seventh grade, and the STEM cliff near, the team is looking for community support.

"It's really a balance of bringing in partners that want to be doing this for the long haul," says Tricia Harding, Parkrose community coordinator for OSU.

Since late May, Harding has been reaching out to potential out-of-school educators that can partner with the project and, hopefully, walk the kids back from the edge. Many are interested, including the Oregon Zoo and the Oregon Museum of Science and Industry.

At a recent meeting, the OSU team met with representatives from these and other Portland-area educational nonprofits. Also present were representatives from Parkrose and the Oregon Education Investment Board's Director of STEM, Mark Lewis. All told, about 30 people met to discuss how to use the researchers' observations to change the students' expected trajectory.

Harding says several potential partners are now looking into creating out-of-school courses—or creating greater access to existing courses—for the Parkrose students. She says partnering in

this way is unconventional in research. Equally unconventional is the project's relationship with the school district. Harding says because the project's goal isn't to create a pre-designed program for Parkrose, but to more generally facilitate and observe change, the school district needs to be an active partner. Parkrose Superintendent Karen Gray says the district is onboard.

"I was fascinated by their [Falk and Dierking's] hypothesis and the tenants of the research around what it is that motivates kids to stay interested in STEM," says Gray about choosing to sign on. She had another reason as well.

Gray points out that although research shows eighth-graders everywhere lose interest in STEM, she wanted OSU's input because her students face their own unique challenges.

About 70 percent of Parkrose district's 3,430 students qualify for free and reduced meals. At Parkrose Middle School, 75 percent of students qualify. Many students are also first-generation Americans with parents from roughly 70 different countries as varied as Somalia, Nepal, and Mexico. English is a second language for about 16 percent of the district's students.

"I think when you have 75 percent poverty on average," says Gray, "and almost 50 languages, and you have a high mobility rate of people moving to take jobs that can pay their rent, we need all the help we can get to motivate our kids to be successful."

To help make that happen, Gray will be submitting a proposal to the upcoming Portland Children's Levy to turn Parkrose Middle School into a Schools Uniting Neighborhoods school, or SUN school. This would give the middle school a full-time organizer who could coordinate in-school activities with out-of-school ones.

According to Gray, the district has also received a state grant to fund a mentorship program and is already partnering with two educational nonprofits.

On OSU's end, the team is seeking more funds to implement the research's final intervention stage. Falk says a larger outcome of the research is a computer model that could be used by educators across the nation to troubleshoot STEM programs before implementing them. In the meantime, the OSU team is identifying partners that can do as much as possible right now. Dierking warns that without intervention the seventh-graders are expected to drop STEM, and soon. "We sort of feel like we are at this hub where the building is starting to crumble."

DIRECTOR'S DESK, from page 2

uncomfortable and being embarrassed that your friends might see you with your father and a homeless man. You feel guilty for being mean to your father after the dinner. You wish someone with his kindness would appear before you now.

Am I going crazy?

The constant dampness makes you feel like you are carrying a hundred pounds of extra weight. You imagine a nice hot bubble bath with candles and watching meaningless sitcoms for hours on a couch with a big furry blanket.

Then the rain turns into a downpour and you are forced to huddle under a downtown bus stop. Your socks and shoes are soaked. You feel your feet beginning to wilt. You start to get a chill and feel a sickness coming on.

What does someone do if they get sick? I can't

handle this, I just can't.

You let it all go and begin to cry. An affluent businessman with an umbrella walks past. Young students looking at their phones pass you by. You are invisible to them.

It feels like the only person you've talked to in days are the voices in your head. The loneliness you feel is unbearable.

You see a police officer and ask him for help. He gives you the address of the shelter where you've already been.

"They don't have anything available right now. Where should I go?"

The officer shrugs and walks away. "Have a nice day."

You take a deep breath and sigh. A mother walks past you with her child. She pulls her close, shielding you from her as you both make eye contact. Your dignity is stripped away, little by little, with every passing person.

Your feet begin to swell, but you continuing

walking.

You learn from talking to a newfound friend on the streets that you could actually go to jail for being homeless, or sitting down on the sidewalk. He lists off so many different laws that the police could use against you that you can't even comprehend what he is saying, or remember what they all are or what they mean.

For a moment you think to yourself, jail might be better than this. At least you could get dry. The thought scares you.

Another man on the streets offers you a place back at his camp, but you decline, not knowing if you can trust this person. He came on a little too strong.

Realizing that there are hundreds of people just like you wondering the streets, you do everything in your power to hold onto any last shred of hope you have. You have to keep your head straight. Hopefully, things will turn

around tomorrow. They must.

It's overwhelming just to think about.

Homelessness in many ways has become a new normal in urban America. It is anything but normal, my friends. It's a crime that thousands of our friends and neighbors, mothers and fathers, sisters and brothers, sleep on the streets of Portland every night.

Street Roots challenges you to do something for your community. Give a donation, find out what items local nonprofits need to support individuals and families, look people on the streets in the eyes and acknowledge they exist. Get your peers and family members to support Street Roots vendors. Follow Street Roots and others on Twitter this winter and find out ways you can help. Now is not the time to give up.