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Math method gets Tucson attention

SUNNYSIDE, LOCAL INVESTOR LIKE MEXICO TEACHING INNOVATION

GABRIELA RICO / ARIZONA DAILY STAR

Humberto Tovar, 15, left, and Martha Castro, 14, center, work on their geometry lesson at a middle school in Guaymas, Sonora.

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One-dimensional drawings on chalkboards and the drone of mathematical theories did not appear to be doing the job.

News reports of Mexico's dismal math and science scores were troubling.

"What if?" Mexican engineer Nahum Correa wondered. "What if we could transform classrooms into laboratories? And students into scientists?"

The former Ford Motor Co. engineer recalls putting down the newspaper and heading to his lab.

"Right then," he says. "That's when I decided to create a math curriculum that - simply put - a child would not hate."

The system, known as MetroMatemáticas, uses metrology and manufacturing tools to teach algebra, geometry and calculus.

The teaching method has generated such interest that a Tucson company is now an investment partner and the Sunnyside school district is looking to incorporate the program in two Tucson middle schools.

Potentially, students receiving this training could fill jobs in the quickly growing aerospace industries in Southern Arizona and Sonora.

Thumbing through a traditional math book, Correa scoffs at the drawings of triangles and spheres.

He then picks up a triangular piece of hard plastic and a measuring instrument.

"Let's bring this book to life," the inventor says.

Calculating Minds

The paint is peeling on the walls of a middle school in central Guaymas, Sonora.

A stray dog loiters in overgrown weeds near the chain-link fence surrounding the campus. Concrete is cracked and rooftops sag.

It is here that one of five MetroMatemáticas labs was built earlier this year.

To walk into that lab is to walk into another world.

"They live in the Third World; we don't want them working in the Third World," Correa says. "Here we're taking them to the First World with labs that would make the Japanese and the French envious."

Dressed in crisp, white lab coats, students file in orderly fashion to their stations.

The room buzzes with mathematical debate.

"Not like that."

"You're calculating it wrong."

"Watch. I'll show you."

Correa beams with pride as he observes.

"Do you see that?" he asks. "Not only do they know their stuff, they have the tools to prove it. They don't have to accept someone's answer."

Students say this method of learning math has made it relevant.

"I always liked math, but I didn't understand how it related to real life," says Marla Acuña Muñoz, 14. "Now I feel curious. … I want to know more."

Mario Fernandez, 15, agrees.

"I finally understand math," he says. "I like that I can touch it."

Other students say that, beyond understanding it, they now envision a career involving math.

"I know you're going to think I'm exaggerating when I say this, but it's changed my life," says Karen Santos, 16. "When we measure things, we have to be exact. I have to be perfect, and I've applied that to my personal life."

Santos participated in the inaugural MetroMatemáticas tournament in 2009 and is one of 16 participants who received a scholarship to Colegio Americano de San Carlos, a private school, where she is learning English and studying advanced science.

Coming to America

When he first heard about MetroMatemáticas, Sunnyside Unified School District Superintendent Manuel L. Isquierdo decided to visit Guaymas.

"It, on so many levels, intrigues us," he says. "We are considering making one or two of our middle schools MetroMatemáticas labs."

The district has bond money available to pay for the labs and technology. The hurdle is the cost of training teachers - in Guaymas, the teachers volunteered.

"In Mexico, the teacher is held in high regard and rewarded through great esteem," Isquierdo says. "That's where they got a lot of their volunteerism.

"I don't think, for a lot of reasons, we could expect our teachers to do that," he says. "There are hundreds of hours involved in the training, and we have to compensate our teachers for their time."

Isquierdo estimates it would cost the district about $50,000 to train the teachers.

The superintendent wants his students to envision themselves in the burgeoning aerospace industry in Southern Arizona and Sonora or in other engineering jobs.

There are about 500,000 high-skill manufacturing jobs in the United States that can't be filled due to a lack of talent, says a report by The Manufacturing Institute.

"We see it through the window and we're very excited about it," Isquierdo says of MetroMatemáticas. "We believe in the concept. It has such potential."

Tucson partner
Based in Hermosillo, Sonora, Correa first approached automotive and medical manufacturers in northern Mexico about sponsoring his program.

"They all thought it was 'cool' " he says. "But no one was interested in providing funding."

Correa then turned his attention to Guaymas, which is making a name for itself in the aerospace industry.

His methodology involves labs that are a miniature version of the ones inside manufacturing plants where turbines and engine parts are assembled for clients such as Rolls-Royce, Boeing and the Department of Defense.

Owners of industrial park Maquilas Teta Kawi, which houses aerospace manufacturing tenants, were eager to hear more, says Armando Lee Quiroga, general manager of the park, which is owned by Tucson-based The Offshore Group.

"Math taught by books and blackboards is boring and intimidating," Lee says. "He uses technology to teach math as it applies to real life."

Because Offshore provides labor to its tenants, having a pool of skilled students coming up the pipeline makes the region more attractive to the industry, Lee says.

Offshore built a training center at the Guaymas industrial park and provided transportation and funding to train teachers and students.

Lee says precision manufacturing requires exact measurements down to 1/1000th of an inch.

"A company will see 18 man-hours put into a part," he says. "If one measurement is off, that part becomes scrap metal."

Building a team
Once funding was secured, Correa was in search of the MVPs - the teachers.

In 2009, he asked for volunteer middle school math and science teachers in Guaymas and neighboring Empalme to learn the program. Today there are 120 certified teachers in the region.

"I heard about the program and that they were looking for volunteers, so I went out of curiosity," says math teacher Gabriela Felix-Ruiz. "The experience awoke my inner scientist."

She says the students' excitement is the reward for the time she invested.

"There are a lot more questions from the students," says Felix-Ruiz, who has been teaching for four years. "They're pushing themselves to higher lesson plans because they're curious about what's next."

A math teacher for 28 years, Radame Sanchez recalls how his classes used to begin.

"OK, students … on what page did we leave off?"

Questions used to frustrate him, Sanchez admits.

"What do you mean, 'Why do you need to know a square root?'" he says. "Because you need to know it."

Teachers say the biggest change is in how engaged the students are in their lessons.

"I remember looking at a classroom full of blank stares as I tried to explain mathematical theories," says Francisco Hernandez Moreno, who has been a math teacher for 15 years. "Now they can see, touch and feel the theory.

"Now, when I tell my students something is so, they don't just accept it," Hernandez says. "They pick up their instruments and measure it themselves."

Creating momentum

To introduce the program to students, a tournament was organized in 2009 and an invitation sent to middle school students to participate.

More than 600 students tried out - 20 were selected. Correa picked the top scorers and the low scorers for the first tournament.

"I needed to be sure that the program worked for everyone," he says.

The 14-, 15- and 16-year-old students got 80 hours of training to prepare for the competition.

Elected officials and business leaders were invited to the inaugural event where students squared off in timed events to solve complex equations.

Organizers held a parade through downtown Guaymas to congratulate and thank the teachers leading the way. Banners with photographs of the teachers were carried through the streets by students and parents.

State education officials begin to take note.

"We thought it was a novel idea, but we didn't support it at first," says Alonso Martinez Castillo, a liaison for the State of Sonora's Secretary of the Economy.

"Then we saw what was happening," he says. "We saw the projects he was creating, the effect it had on students, the excitement on the part of the teachers and parents."

Earlier this year, laboratories in five middle schools were inaugurated by the state. Two educators have been appointed to evaluate the program, Martinez says.

"It's anecdotal, but already we've seen improvements in students' attitudes, motivation and attendance," he says.

The state views the program as an economic development tool, Martinez says, because of the growing need for skilled labor in aerospace manufacturing.

He points out that in 2008 there were 28 aerospace manufacturers in Guaymas. Today, that has grown to 45.

Martinez says the teaching method was adopted because it does not stray from the state-mandated curriculum.

"The math is the same, they're just changing the way it is taught," he says. "They've taken students out of a classroom and put them in a lab."

The gambler
In just three years, Correa - an engineering Six Sigma Black Belt - has seen his invention spread to middle schools, and he is now developing a high school component.

The third phase of MetroMatemáticas will involve elementary school curriculum.

Correa calls his patent-pending program primal.

"A child's tendency is to take things apart and put them back together. We need to build on that," he says. "The way we teach math now kills creativity."

So far, $1.7 million has been invested.

Correa, through his engineering company Centro Metrologico de Mexico, has invested $600,000; The Offshore Group another $600,000; and $500,000 has come from state and federal grants.

"I've placed my bet," Correa says. "It's on the future."

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