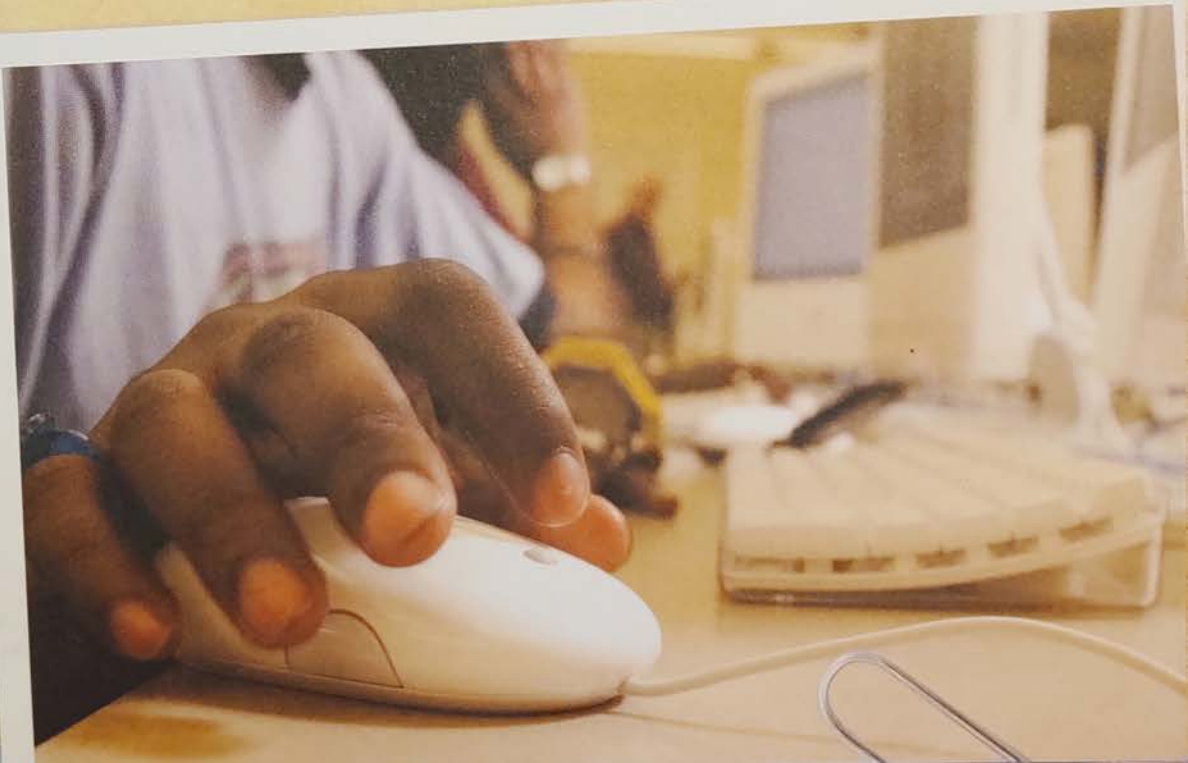


Welcome to a quick tour of some of the most successful schools in America. Once you've stepped inside, you'll see why they work.



# THE CHALLENGE

Maintaining America's scientific and technological leadership is essential to our economic growth, national security and a productive future for our children. We are facing a critical talent gap in science, technology, engineering, and mathematics, the international "language" of innovation. Other nations are demonstrating a stronger commitment to building their "brain power" than we are.

Ohio's future prosperity depends on how well we educate our children and youth. Yet, it's becoming increasingly clear that too many of our elementary school students lose interest in science and mathematics by the time they reach the middle grades, and too many of our high school graduates are unprepared for college and the workforce. To be sure, our challenge spans the entire P-16 education continuum.

Ohio's competitive position – and its opportunities for thriving in this ever-flattening world – will be won or lost based on the quality of our human capital and their collective capacity for innovation leadership. Now, more than ever, we need skilled, knowledgeable and ethical citizens, ready to succeed in life. Ohio's challenge is sharp: we must educate the "whole" child and cultivate more STEM-literate graduates.

# ONE SOLUTION

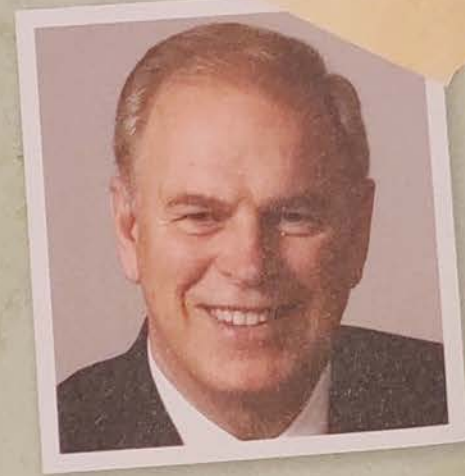
**A revolutionary movement in American education is arising to address this problem and it's called STEM.**

STEM is an acronym for Science, Technology, Engineering, and Mathematics, but what it teaches is far greater than the sum of its parts. Critical thinking learned through STEM education is applied across all disciplines, from the humanities through everyday problem solving and, of course, higher-level science.

STEM education can occur in any school district or learning environment, as long as important STEM design elements are embedded throughout the learning process. These key elements, common to best-in-class STEM schools, are described in this quick tour.

**"True STEM educates the whole child – because if we open their hearts, we can open their minds."**

- The Honorable Ted Strickland  
Governor, State of Ohio



STEM IS NOT...a movement to educate only the best and the brightest. STEM schools don't just cater to the economically well off or the geographically providential.

STEM schools are most often public schools. They draw kids from diverse socio-economic backgrounds, basing their admission on little more than the child's will to achieve.

The goal of a STEM focused curriculum is to drive STEM-literacy for all students as they prepare for college and work. After entering a STEM school, many students have already made the decision to move on to careers in the rapidly evolving technology and science sectors, two areas where American industry struggles to keep in step with foreign competition.

From San Diego to Washington, D.C., this booklet is a first-hand tour of a few of the STEM schools throughout the U.S. that are working hard to educate the future leaders and innovators of America. Inside, you will meet some of the students. You will find out how STEM programs are designed for success and what STEM schools across America are providing for our country's talented young minds.

Please take a moment and step inside STEM.

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## ANYONE CAN APPLY

STEM schools are most often public schools. They're generally controlled by the same governing bodies that provide oversight for traditional public schools. As for the student body...they're not creamed from the top. STEM kids are diverse. STEM kids are determined. Each student walks through the door unwaveringly determined to soak up every opportunity offered by the STEM school. They know what is at stake.



“STEM is for all children and, like Metro or programs we have in Toledo, can thrive in a traditional public education setting.”

- The Honorable Teresa Fedor  
Minority Leader, Ohio Senate

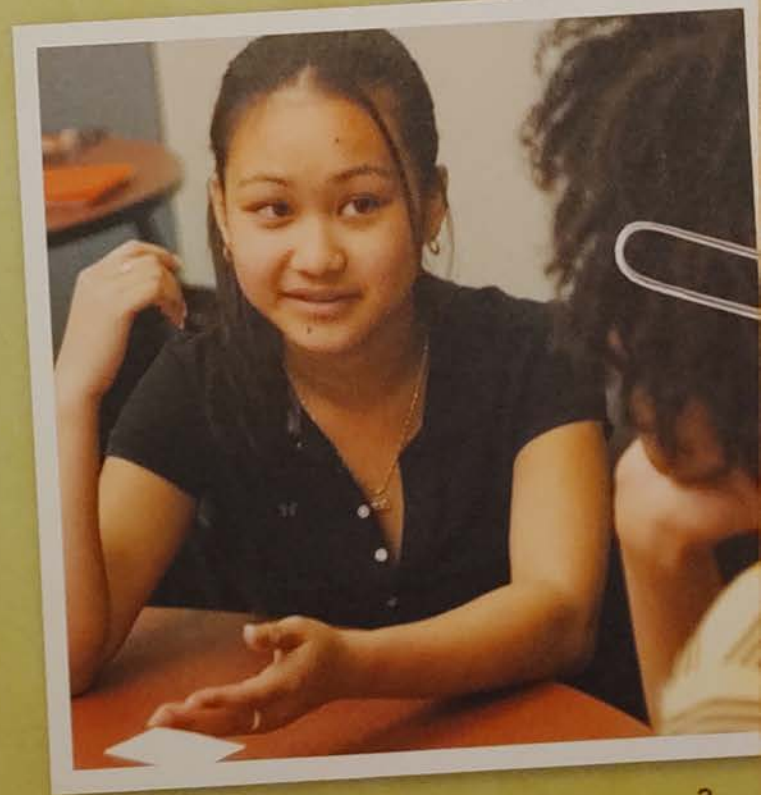
## MALI

Malivan Xaiyakosy likes to be called Mali. The Taiwanese native is thoughtful. She considers questions carefully before she speaks, as if her mind is pulling information from a vast storehouse inside her head.

A freshman at Columbus' Metro High School, Mali takes the COTA bus to and from school every day. She freely acknowledges that she has to work harder than many of her friends to succeed. “I’m good at Spanish and Language Arts. I’m not so good at math, so I make sure to go to the after-school tutoring,” she says with a smile, as if she’s considering the direction her future is taking, and knowing she will get there. That’s the first indication that Mali is nurturing a growing self-confidence and path to STEM-literacy.

To read the rest of Mali’s story please visit [www.ohiostem.org](http://www.ohiostem.org).

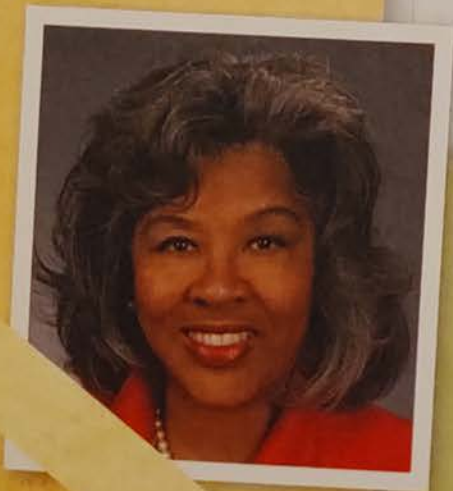
“I’m not so good at math, so I make sure to go to the after-school tutoring.”



## RIGOROUS & DIVERSE CURRICULUM

STEM students typically complete four credits of advanced math and science with relevant work-based contextual learning. Internship participation is not only stressed, it is regularly required. Many co-curricular pursuits center on STEM. Multi-year/senior-year capstone projects require students to defend their work and rise to an exemplary level.

Students, regardless of their background in math and science, begin their STEM experience with immersion in Algebra II and Physics. They continue their higher-level track with courses in Chemistry, Biology, Calculus, and Trigonometry. The arts and humanities remain key components of the student's "whole" education. Personal mastery in these subjects translates into the critical thinking and problem-solving skills increasingly required by 21st century science and technology employers.



# Derrick

Derrick is 18 and this summer he's working for the FBI. As if that's not impressive enough, he's so excited to learn that he is all smiles as he voluntarily spends the first Monday of his spring break at school.

A contagiously friendly senior at McKinley Technical High School in northeast Washington, D.C., Derrick is one of 200 students enrolled in the school's Information Technology program, one section of McKinley's STEM curriculum.

Four years ago Derrick's mother closed her small restaurant in Pennsylvania. She moved herself and Derrick to the District of Columbia in the hopes of having her son enrolled in one of McKinley's core STEM disciplines of Broadcast Technology, Engineering Technology or Biotechnology. She knows he's in good hands at McKinley.

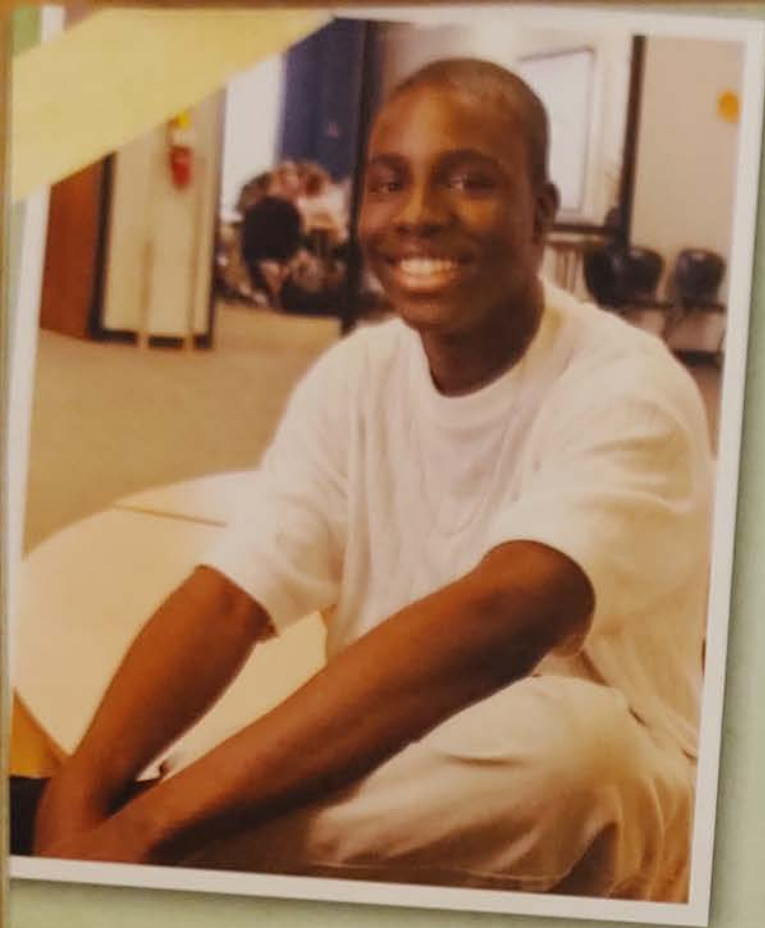
To read the rest of Derrick's story please visit [www.ohiostem.org](http://www.ohiostem.org).

"McKinley's public school STEM program demonstrates how teachers and students working together can overcome disadvantages and challenges to create a world of possibilities."

- The Honorable Joyce Beatty  
Minority Leader, Ohio House of Representatives

"When I got here it was like... WOW! I was in a place where I could mature," says Derrick, a former "middle-of-the-road" student. "Besides all of the technology available, the grading is harder. They ask a lot of you. They want you to succeed." And succeed he has.





“I’d change every school to a STEM school.”

- Ronny Oppong, Freshman  
Metro, H.S. - Columbus

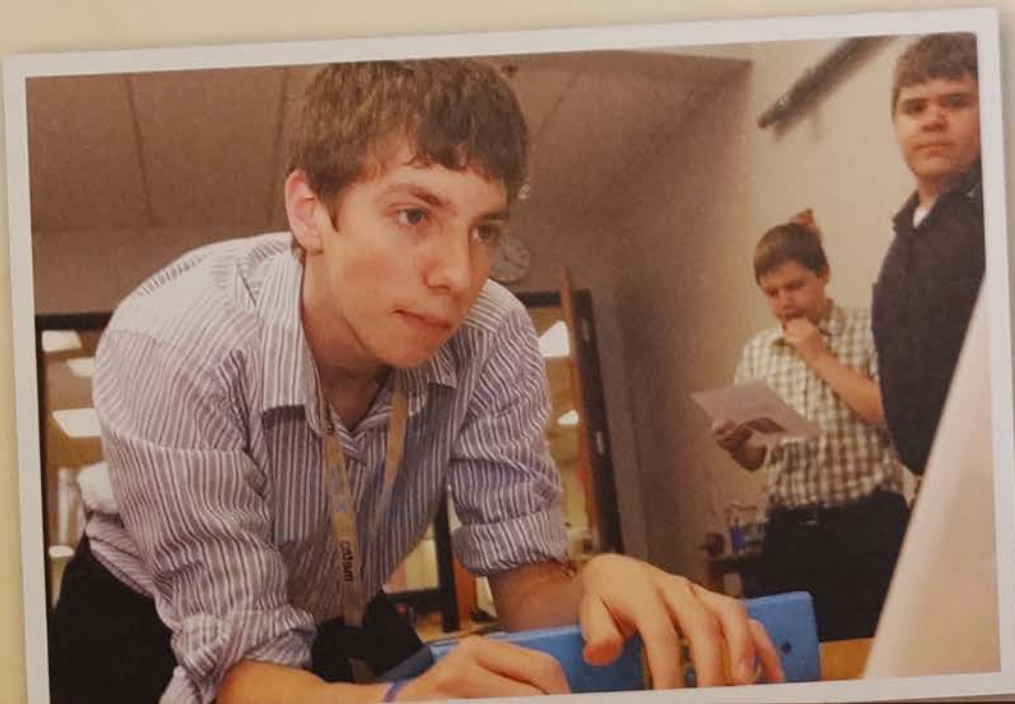
“When these kids graduate, half of them will go directly into a professional work situation and the other half will go on to college. That is a 100% success rate.”

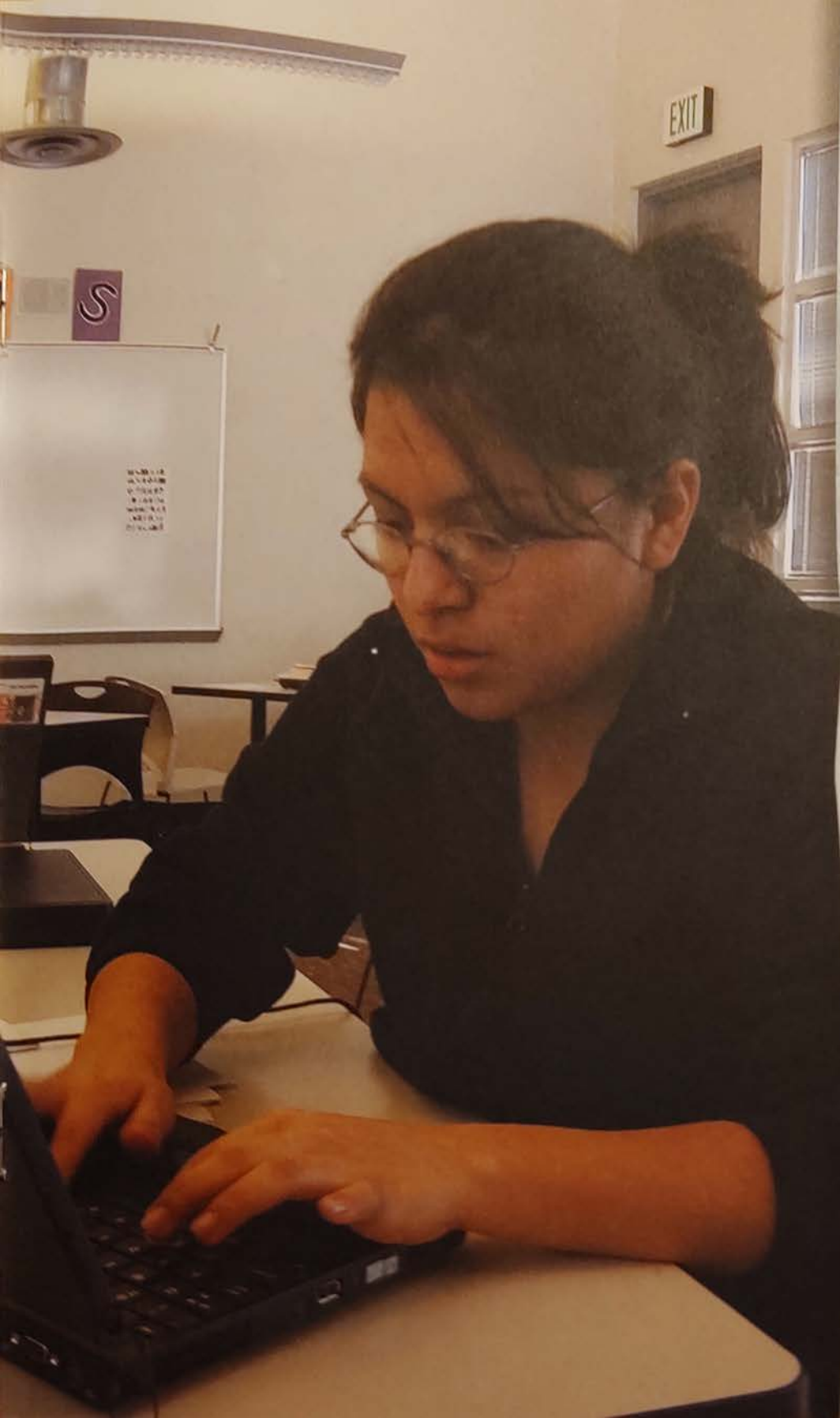
- Dr. Cornelius Diya, Head of Biotechnology  
McKinley H.S. - Washington, D.C.

## COLLEGE-READY & WORK-READY CULTURE

Waiting to progress serves little purpose within the STEM paradigm. That’s why students can often earn high school credit and college credit simultaneously, and participate in internships with growth sector employers. Mentors reinforce high expectations and expose students to college and career opportunities in STEM fields.

The focus on getting students to demonstrate their STEM knowledge outside the classroom is paramount to their success. Corporate and government operations offering careers in STEM fields open their doors to STEM students, allowing them to gain “real world” experience, incorporating work as part of their school day or during the summer. Before they ever leave high school, STEM students are building a portfolio of credible experience.





# ANA

Ana Mendoza, a junior, says the Denver School of Science and Technology has helped her set her goals higher than she ever has before.

“When I came here and I started doing digital portfolios and researching colleges, I started to look at other college options... I can go out of state to college or study in Mexico if I want. I’m looking into CU, DU, MIT, and the University of Guadalajara.” Ana is currently enrolled in Pre-Calculus, Genetics, Biology, Spanish for Native Speakers, American Literature, and American History. Last year she took Neurobiology as an elective. “I want to be a doctor – an orthopedic doctor. I want to learn more about skeletal deformation. My little cousin limps because of the way his bones grow. It’s very interesting to me to see how people can get a malformation while developing in the womb.” Ana’s aspirations to become a doctor are rooted in her desire to give back and her understanding of a STEM world.

Ana feels comfortable being a DSST student. She enjoys the small class sizes, the feel of a close-knit community and the college focus of her school curriculum.

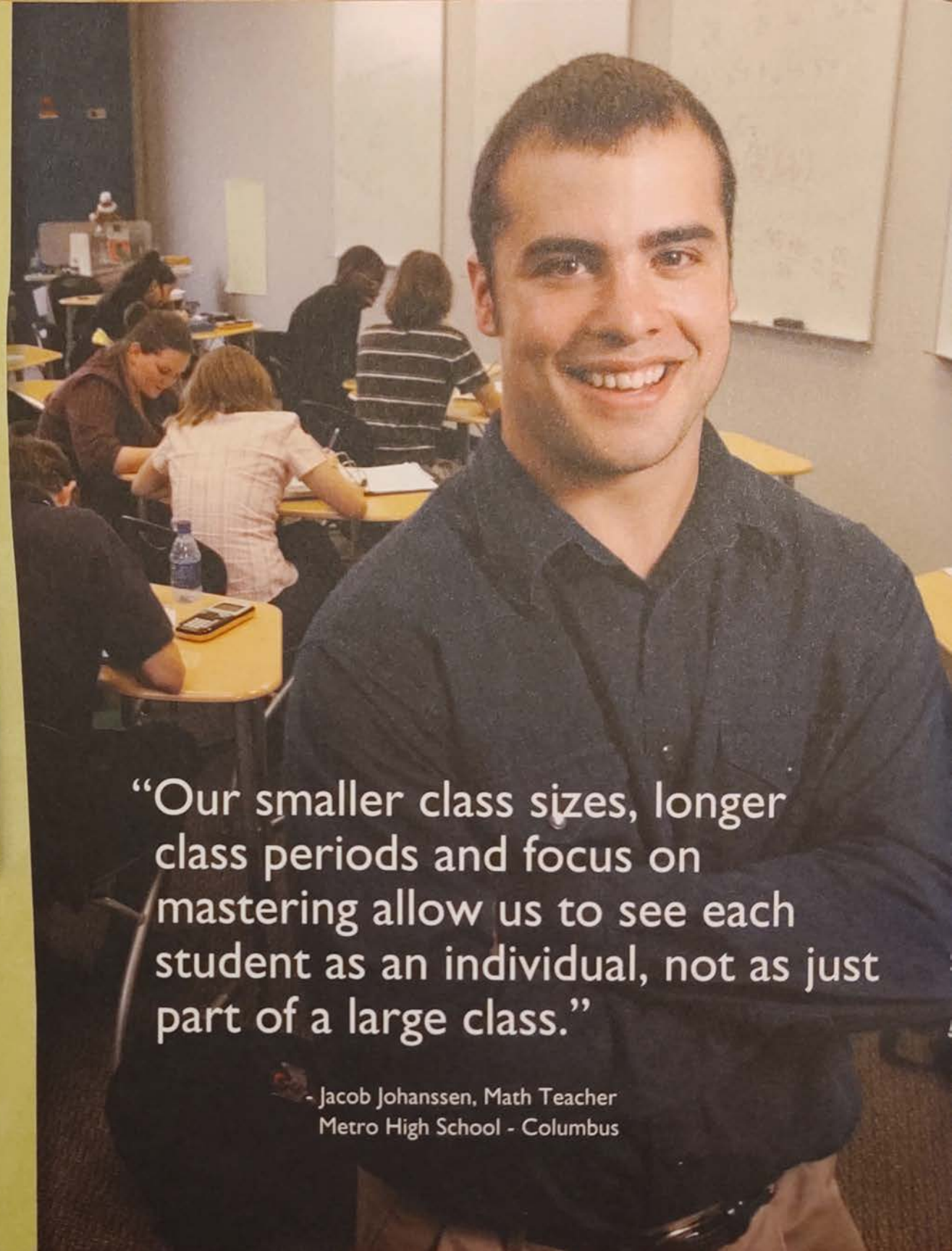
## EMPHASIS ON PERSONALIZED LEARNING

STEM education stresses the need for a small learning community, emphasizing individual student and faculty interaction. Each student's progress is individually assessed and addressed and personalized graduation plans are unique to the student's strengths. STEM faculty focuses on developing meaningful relationships with every student and their families.



“Kids have to have a reason to come to school and ‘hands-on’ is what keeps ‘em coming back.”

- Sohn Butts, Head of Broadcast Technology  
McKinley H.S. - Washington, D.C.



“Our smaller class sizes, longer class periods and focus on mastering allow us to see each student as an individual, not as just part of a large class.”

- Jacob Johanssen, Math Teacher  
Metro High School - Columbus

## JACOB JOHANSSSEN & ANDREA McALLISTER

### METRO HIGH SCHOOL

There's a passion in their voices when they talk about their students. It's a characteristic indicative of educators dedicated to change.

"It's too easy for kids to slip through the cracks," says Mr. Johanssen, a mathematics teacher at Metro High School in Columbus. His hands flail about and his eyes grow wide with excitement as he elaborates. "Our smaller class sizes, longer class periods and focus on mastering allow us to see each student as an individual, not as just part of a large class."

According to Ms. McAllister, a Language Arts teacher at Metro, it is imperative that they teach critical comprehension skills. "At Metro we focus on bringing the student up to meet the standards and the skills that the state says the student needs rather than on a particular text. We make sure they're able to read and comprehend any text across any genre."

Language Arts is a key part of the strong academic foundation that transcends the school focus on science, technology, engineering, and mathematics. It allows students to employ scientific methodology, design-engineering and mathematical reasoning in any discipline, both in school and out in the "real world."





## VISIONARY LEADERSHIP

The principal of each school serves as the instructional leader for the campus, believing in and supporting the mission and its approach to student success. They're innovative, responsive and flexible. They construct lasting stakeholder coalitions and strong community partnerships.

School officials readily admit that hiring the principal before the launch of a new STEM school is critical. This way the principal has a hand in guiding the design and development of the school. It also enables the leader to come to the fore fully engaged in the school's economic and technological mission. They must prepare their staff to make the student body better STEM informed citizens once they move on from their post-secondary training.

“STEM education is fully integrated, it's cross curricular, it's holistic. More importantly, we don't leave the people out of the equation. We don't focus so hard on the math and science that we forget the humanities.”

- Annalies Corbin  
The Past Foundation - Columbus



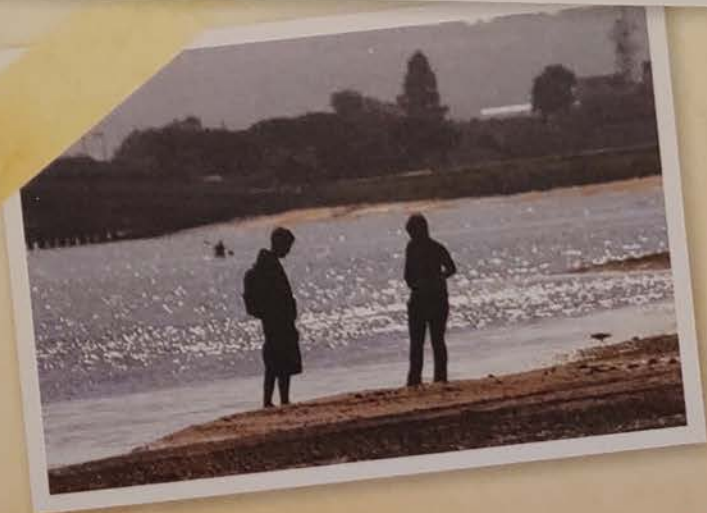
## HANDS ON, REAL WORLD LEARNING

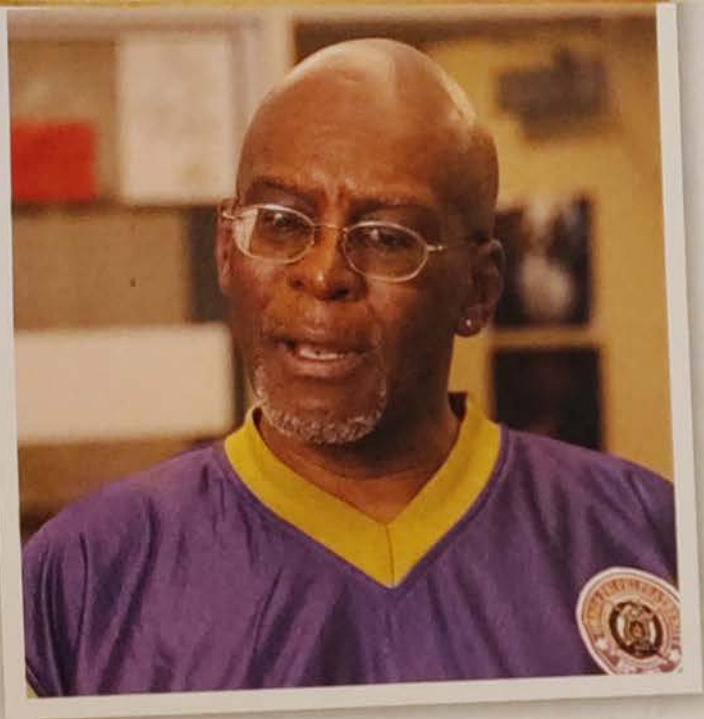
56 students at San Diego's High Tech High have made the most of their small learning community to leave a lasting impression. In place of studying for finals like students in other, more traditional high schools, this band of eleventh-graders demonstrated their science, math and humanities knowledge through a demanding investigative project, requiring subject understanding inside and out.

For weeks they visited the San Diego Bay at low tide to observe and document the multitude of species that make the Bay their home. Like explorers of the past, students kept explorers' logs and compiled renderings of what they observed. Now, their findings are open to the public in the form of a 240-page book entitled "Perspectives of the San Diego Bay." Standing on its own as a naturalist's guidebook to the Bay, each student found a way to contribute to its final form.

"Every kid has that question, 'Where am I going to use this in the real world?'" says Evan Morikawa, one of the guide's chief student editors.

**"Well, you can't get more attached to the real world than this."**





## JOSEPH PRICE

### McKINLEY TECHNICAL HIGH SCHOOL

It's an understatement when Joseph Price, a Biotechnology teacher at McKinley High School in northeast Washington, D.C., says that he's taught a lot of places. His passion for teaching has taken him to countless schools, in his effort to connect with thousands of kids. He's landed in D.C., Maryland, Virginia, St. Louis, Georgia, even Africa... he's taught everything from middle school through college and still has a passion for what he does. However, it wasn't always that way.

"I left the system. I was disenchanted with a number of things. Inner city problems like drugs, gangs and teen pregnancy. I just felt like nothing was being done. A year after I left, some of my old students began e-mailing me telling me that I needed to come to McKinley." After investigating the school and its educational mission, Mr. Price made the leap.

At McKinley, Mr. Price has found that he can push his kids further and further and they still come back for more and more. They know what failure means, and know that they must commit to the work. As Mr. Price knows, it's not about making sure his students meet the state minimum, but about coaching and guiding his students as they work to achieve.

"What we're teaching here are the careers of the future. And if you get them early, before they become jaded, the kids will do the work," says Mr. Price. He then turns his attention back to his students. His students respond in turn.

## WORLD-CLASS TEACHER PROFESSIONAL DEVELOPMENT

Teachers participate in STEM content training and research-based teaching methods proven effective in STEM subjects. They network with other STEM educators, higher education faculty and STEM sector employers. Exemplary practices are developed and disseminated, and teachers collaborate through common planning time.

Community partnerships are essential for teacher professional development and STEM success. They bring corporate and technological culture into the school and the kids into the culture. Lesson plans are designed in close association with partners to blend real life with the backbone of a rigorous STEM education.

# WHAT MAKES A STEM-LITERATE GRADUATE?

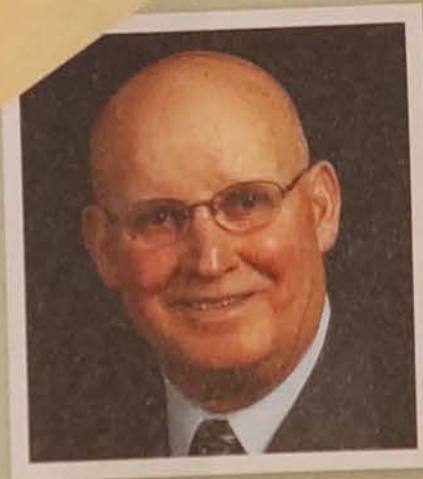
A STEM-literate graduate is able to enter a college-level course of study in Science, Technology, Engineering, and Math without the need for remediation.

The STEM curriculum provides a strong academic foundation rooted in the knowledge used to solve complex problems. STEM-literate graduates have the ability to import this knowledge across all disciplines both inside and out of the scientific and technological realms.

STEM-literate graduates will be able to immediately take advantage of opportunities made available to them through post-secondary institutions and businesses.

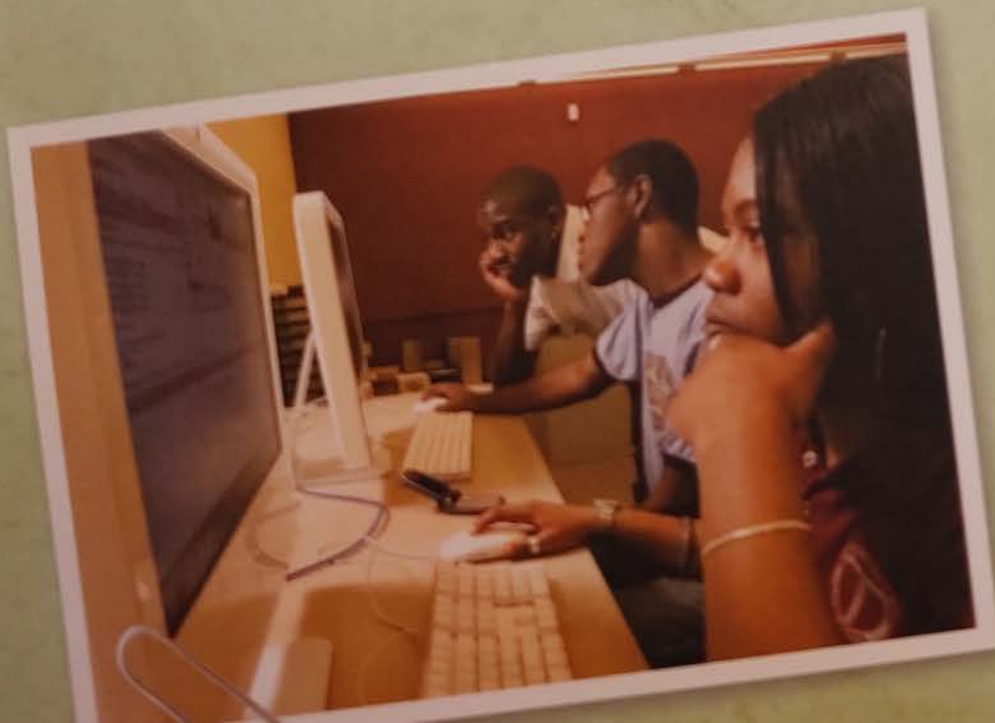
**Metro High School, McKinley Technical High School, Denver School of Science and Technology, and High Tech High** are addressing the challenge posed upfront. We must cultivate more STEM-literate graduates. These best-in-class models help us get there.

To learn more about the attributes of a STEM-literate graduate and their impact on the future success of science and technology in America, please log onto [www.ohiostem.org](http://www.ohiostem.org).



“Hands-on STEM learning through the P-16 pipeline enhances what our children need to know in an increasingly flattened world.”

-The Honorable Bill Harris  
President, Ohio Senate



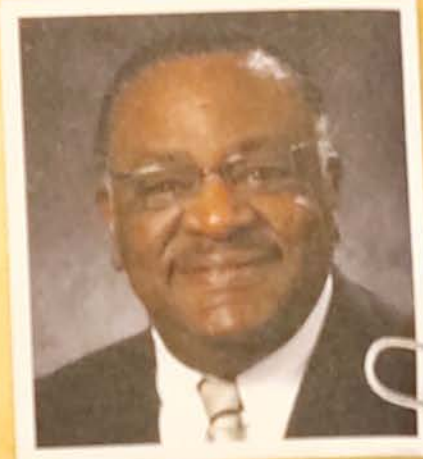
“STEM is exactly what we should be doing to inspire our kids and grow our economy at the same time; anybody who doesn't think so should go visit Metro.”

-The Honorable Jon Husted,  
Speaker, Ohio House of  
Representatives





"We believe in the right, power, responsibility and opportunity of every citizen of this great state to maximize their full potential to improve their lives – and education is the key."



-Phillip R. Cox  
Chairman, Cincinnati Bell  
Executive Committee Member, Ohio Business Roundtable  
Co-chair, Business Alliance for Higher Education and the Economy

### A SPECIAL THANKS TO:

#### Students

Derrick Davis  
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Dionte McFadden

Ana Mendoza  
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Daniel Gohl  
Denise DesMoineaux Hudson  
Jacob L. Johannsen  
Rick Kaisey  
Grace Lee  
Andrea McAllister  
Joseph W. Price  
Marcy Raymond



## The Business Alliance for Higher Education and the Economy

For more information, please contact Shaun Yoder, Director, at 614.228.8084. Or visit [www.ohiostem.org](http://www.ohiostem.org).

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**Tapping Ohio's Potential**  
All high school graduates ready for college, work and citizenship  
Double the number of STEW graduates with Bachelor's degrees by 2015