Bringing Learning to Life

Case-based learning project in Cincinnati connects kids with STEM careers

Editor's Note

The stories in this publication show the result of the hard work of Milford and Cincinnati educators and students in trying something new in education. It also shows the ingenuity of non-profit partners who helped them explore how to engage with studies in science, technology, engineering and math (STEM.)

But it would not have been possible without the extraordinary opportunity presented by the State of Ohio through its Straight A Fund and a grant of $1.1 million for this project. For two years, the state provided $250 million for schools and districts to pursue innovative projects that would promise to increase academic achievement, reduce costs, and send more dollars to classrooms. States are not usually in the business of funding innovation to this degree. For this, Ohio stands out.

This project, one of 24 funded in the inaugural year of the Straight A Fund, was successful in increasing academic achievement in STEM subjects without raising costs to the participating schools and districts. An independent evaluation from the University of Cincinnati found that students met learning objectives, were more engaged, and that teachers found that they could teach hard-to-teach subjects differently and more effectively.

As you read these stories of how teachers, students, and business partners excelled in this case-based learning project, please know that there are many, many others in Milford and Cincinnati who tried this new approach to do a better job teaching STEM subjects and found success as well.

At right is a table showing all of the schools and organizations who agreed to try something new to help students learn subject matter that can be very important to them pursuing lucrative and rewarding careers in the STEM fields.

I hope you find these stories as inspiring as they were for us to bring them to you.

- Andrew Benson
Executive Director
Smarter Schools

School	Partner
Cincinnati Public Schools	
Academy of Multilingual Immersion Studies (AMIS)	Affordable Language Services
Aiken New Tech High School	Taft Museum of Art
Clark Montessori High School	Gorman Heritage Farm
Gamble Montessori High School	TriHealth
Hughes STEM High School	Macy's
Hyde Park School/ Cincinnati Gifted Academy	The BonBonerie
Kilgour School	Madisono's Gelato
Pleasant Ridge Montessori	Greater Cincinnati World Affairs Council
Rockdale Academy	Cincinnati Children's Hospital Medical Center
Rothenberg Preparatory Academy	Cincinnati Symphony Orchestra
Sands Montessori	Cincinnati Art Museum
School of the Creative and Performing Arts (SCPA)	Hamilton County Jobs and Family Services
Milford Exempted Village Schools	
Boyd E. Smith Elementary	3M
McCormick Elementary	3M
Meadowview Elementary	3M
Mulberry Elementary	3M
Pattison Elementary	3M
Seipelt Elementary	3M

Bringing Learning to Life

Straight A Grant Funds Case-Based Learning for 18 Greater Cincinnati Schools

Create a new gelato flavor. Evaluate a city's readiness to host the Olympic Games. Find a better moisture-absorbing fabric for athletic braces.

When businesses, students and teachers come together to solve real-life challenges, the possibilities for learning are unlimited.

That's the thinking that brought together businesses and non-profit organizations with Cincinnati Public Schools and Milford Exempted Village Schools for case-based learning projects in 2014.

Eighteen classes between the two districts were paired with a company or non-profit organization and given a case-based learning problem to solve. For Kilgour Elementary School, the delicious challenge was working with Madisono's Gelato to create a new gelato flavor. Other schools compared organic with non-organic produce, sought ways to effectively pair mentors with young adults just out of foster care, or explored illusions and perspectives of art.

Aiken New Tech Student Kyree Boyd created a 3D model of a house from a 2D image as she learned about perspective in a STEM case she worked on with the Taft Museum of Art.

At the conclusion of each project, the Northern Kentucky University Center for Applied Informatics collaborated with students to create a software app game closely linked to the subject matter of their case study. (See sidebar on page 5.)

All projects were funded by a $1.1 million grant from Ohio Gov. John Kasich's Straight A Fund, established to boost student achievement, reduce spending or maximize use of existing resources. Cincinnati-based Smarter Schools and the Partnership for Innovation in Education (PIE) partnered on the grant to increase student awareness and interest in science, technology,

Milford teacher Cassie Dorl guided 6th-grade students in her science class at Meadowview Elementary, which tested fabrics for 3M.

engineering and math (STEM) fields through case-based learning.

Typically, the case method places students in an active, decision-making role. The case presents facts and context but relies on the student to actively pursue a solution, with the teacher serving as facilitator and guide.

"The active engagement of students helps them to see the sciences as interesting and something they can master," says Andrew Benson, Founder and Executive Director of Smarter Schools, a Cincinnati non-profit that partnered on the Straight A Fund grant. "By the 8th grade, nearly half of American students have decided they are not interested in pursuing studies in science."

Mary Welsh Schlueter, CEO of the Partnership for Innovation in Education, said she believes that teachers who gain experience in case-based learning will do a better job preparing students for the workplace.

"Educators are preparing kids for workplace readiness, and STEM occupations are projected to grow 27 percent over the next 10 years, according to Cincinnati's 2020 Jobs Outlook Report," she says.

Schlueter notes that this is the first time case-based learning has been introduced into the curriculum of public elementary and middle schools. A graduate of Harvard Business School (a case-based learning Mecca), Schlueter facilitated a pilot program at Kilgour Elementary in 2012 that offered promising academic achievement and spurred interest in continuing the project.

Teachers for the 2014 program had considerable input on the case studies. Each school received funds for an iPad or similar tablet for students participating in

"The active engagement of students helps them to see the sciences as interesting and something they can master."

the project. In addition, the schools will sell apps based on their case, with revenue going back to each school.

Project goals are to make the case studies reproducible and available for purchase so other school districts can implement their own case-based learning projects.

Dr. Robert Farrell, superintendent of Milford schools, enthusiastically endorses the case-based learning process. “Our students have learned general concepts, and here’s the real-life problem they get to work on with a real company. The students gather data and figure things out. We’re moving toward inquiry learning, and this is a great way to bring the community into the classroom and engage students.”

He plans to bring case-based learning to other grades in his school district.

Participating business people, teachers and students wholeheartedly agree that the case-based learning approach in this grant project help students analyze a problem and think through a solution – an important skill that will help them in school and careers.

Students at Cincinnati's Kilgour Elementary used their iPads to analyze survey data from the school and conduct research to create a new gelato flavor for Madisono's Gelato.

Three Stories of Real-Life Applications

■ For Matt Madison, owner of Madisono's Gelato, working with 6th grade students at Kilgour Elementary was more than just a good deed. His partnership with students unleashed a powerful marketing effort as students brainstormed, surveyed fellow students and analyzed costs to bring a new gelato flavor to the Cincinnati market. They felt all of the real-world pressures of meeting deadlines, being accountable for budgets and presenting a totally new product to the world. **Page 7.**

■ A shy teenager gained confidence and a growing interest in science as she took on the role of group leader for a case-based project with Cincinnati's Taft Museum of Art. Through a 10-week process, Kyree Boyd and the 8th grade students at Aiken New Tech School applied problem-solving and time management as they collaborated to create a three-dimensional model of one of the museum's large landscape murals. The students gained exposure to a variety of skills that could point them in the direction of careers in architecture, engineering, computer science, art and other related fields. **Page 19.**

■ Milford teachers Charles Smith and Cassie Dorl rolled up their sleeves and collaboratively created a unique learning experience in their 6th-grade classes in Meadowview Elementary. Their new case-based partnership with 3M had students testing properties of fabrics to keep skin dry, but the project also tested these teachers as they adopted an approach that let students unleash their creativity and ingenuity under their guidance. "Every week was a new adventure for us with this project," recalls Cassie. **Page 32.**

Game Time

Apps Blend Fun and Learning

Start talking about game apps, and you can capture a classroom's undivided attention. That was the experience of Northern Kentucky University's Chris Rider, director of the Center for Applied Informatics, as he traveled from classroom to classroom to brainstorm app ideas as part of the students' case-based learning project.

Chris Rider, director of the Northern Kentucky University Center for Applied Informatics, gets ideas from students to develop an app.

"For each class of 30 students, we were getting about 100 game ideas. I gave students papers that looked like a blank iPad screen, and they sketched out what they thought the app page should look like. Some that are especially good might be incorporated into the final game," Rider says.

Teachers narrowed down the selections and students took a final vote. Each app idea follows the theme of a case study:

Hyde Park Elementary, which helped create a new kids' cake for BonBonerie Bakery, will have a tower defense game, where the game player will try to prevent ants from getting to sweet treats.

Rothenberg Preparatory Academy worked with the Cincinnati Symphony Orchestra and proposed a take off of Mario Kart using animals, musical instruments and CSO's "Carnival of Animals" symphony as background music.

Milford Exempted Village Schools, who worked with the 3M Company, will have a game with water droplets falling from the top of the screen, and the player has to use different types of 3M fabrics to collect the drops.

Rider has staff members, student programmers and student graphic designers creating 18 apps. Development takes about three to four weeks per app. The Straight A Fund grant pays for the students' time.

NKU benefits from the community outreach, Rider says. "We're meeting a lot of kids who might come here for college. Plus, working with K through 12 is beneficial to the region as a whole. It's a win all around."

Final products will be sold on the Google Play Market and Apple's iTunes, and revenue will go back to the individual schools.

"App development is a fun way to introduce computer science to young students. We briefly touched on business informatics to sell apps. It introduces a different side of STEM concepts," Rider says.

"App development is a fun way to introduce computer science to young students."

NKU's Chris Rider gives students an overview of software applications during the case-based learning project.

He notes his own students were excited by the project, as well. "Our students usually work on business apps, like a customer relations handbook. They're having just as much fun with these games as the kids working on them. They're getting experiential learning and an opportunity to apply what they've learned in the classroom. This will be great for their resume, and a great story to tell."

Sweet Taste of Success

6th grade math students at Kilgour create new gelato flavor and gain valuable STEM skills

The children's eyes widen in delight as the sweet, refreshing gelato hits their tongues. A steady tapping ensues as spoons hit the bottoms of tiny, plastic taste cups. Lips smack with every last drop. Tongues linger on empty spoons. Dreamy-eyed students are content with this new gelato flavor.

So goes another day in Ms. Bisher's 6th-grade math class.

But it's the moment of truth for these students at Kilgour Elementary, located in Cincinnati's Mt. Lookout neighborhood and serving grades K through 6. They spent the previous five weeks of their Wednesday math class assisting Matt Madison, the owner of his family's Madisono's Gelato, in developing a new gelato flavor for the summer.
It's the end of April, and the Kilgour school carnival – where the new flavor will debut – is just a few weeks away. Will people want to buy it?

"We like it, but what if Ohio doesn't like the flavor?" questions James, a highly social student who assists his four-member group as production manager for this real-life business case.

"What if we're wrong?"

Students at Kilgour Elementary delighted in sampling their gelato choices as they came up with a new flavor for Madisono's Gelato.

Matt is familiar with these concerns. He has pondered similar thoughts in the seven years he has operated Madisono's Gelato. Giving these students an opportunity to see a difficult challenge, address it on their own and ultimately triumph was appealing to him. He had done career days in schools before with his own three children, aged 14, 11 and 9. But nothing ever quite like this.

"I've always felt a responsibility to give back even without getting something in return," he notes. "It's better than just writing a check."

Learning by doing

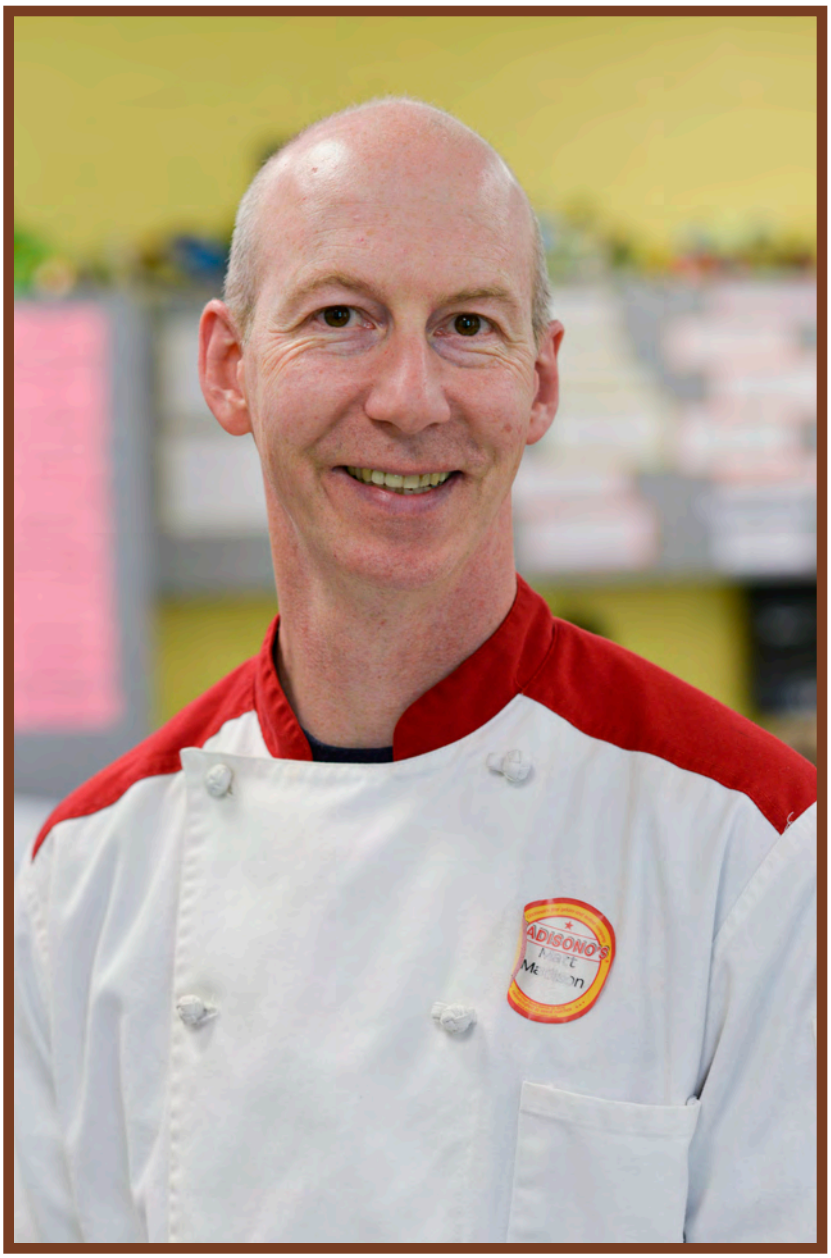
It all began in March, when Matt, a thin, 6-foot-tall, 40-something local business owner, entered this Cincinnati Public Schools elementary classroom wearing a red and white chef's jacket.

"I wear the jacket to reinforce with them how this is real," he asserts. "I'm a real business. I want to sell more gelato."

It's this partnering of local business with classrooms that provides the often-absent relatability in learning. Kilgour was one of 18 Greater Cincinnati schools in 2014 given this unique case-based learning opportunity through a $1.1 million grant from the Ohio Straight A Fund.

The grant promotes a Harvard-influenced learning model that aims to increase student awareness and interest in science, technology, engineering and math (STEM) fields.

It appears Matt has landed in the right place for giving back. Science and teaching are in his blood. His father was a product research chemist; his mother, a teacher.



Matt Madison, owner of Madisono's Gelato: "I wear the jacket to reinforce with them how this is real. I'm a real business. I want to sell more gelato."

From the beginning, Matt did not have to worry about gaining the interest of students. They were more than eager to help. Perhaps it was the lure of gelato. How can kids not get excited about the cool stuff?

During his first class visit, Matt made sure his new product development team understood his product by explaining the differences between ice cream and gelato. Gelato has lower butterfat and calories. It's also slow churned, which means it has less air whipped into it, yielding a creamier, denser texture that often results in more intense flavors.

Matt grew up in College Hill and has fond memories of riding his bike with his brother to the local ice cream store. "Ice cream offers a bit of nostalgia to people," he contends. "I would hope Madisono's would have that same effect."

Since 2007, Matt has worked to make Madisono's Gelato a Cincinnati tradition. The small-batch gelato business in Glendale's historic Village Square is a spin-off of Madison's at Findlay Market, a fresh produce business his parents started in 1996.

In the classroom, the group's marketing manager, Kilgour 6th-grader Sophie, enthusiastically confesses, "Wednesdays are my favorite days! I really like how we're working with someone who works in the real world."

Her classmate, Edgar, the group's data analyst, shares a more academic view.

Sophie, a 6th-grader at Kilgour, served as marketing manager for her group. "I really like how we're working with someone who works in the real world."

Matt Madison challenged the students to use data and be creative. "This wasn't something where I could sit back passively."

> "We're learning all these new skills to prepare us for real-world problems. What we're doing here is real."

"We're learning all these new skills to prepare us for real-world problems. What we're doing here is real."

During the first few sessions of the case, students submitted applications for management positions and began research for a consumer survey. Sophie even called another local gelato business. "I've gained confidence in talking to people," she shares.

Kilgour Elementary Teacher Stephanie Bisher

The business titles serve to give the students another taste of the real world. As for Matt's title, well, you won't hear him answer to president or CEO. But he will release a humble smile when his merchant customers refer to him as the Gelato Guy.

Kicking off such an endeavor has been a bit overwhelming, admits the students' teacher, Stephanie Bisher. "The challenge for teachers is that we're not business people," she explains. "So having a community partner is key. Matt gave me an outline of what his company would do when developing a new flavor, and we put it into the level and language 6th graders could understand."

Vanilla or Chocolate?

Matt has attended all seven Wednesday sessions of the case. "This wasn't something where I could sit back passively." It's worked.

Each Wednesday, students eagerly await the moment of the class where Matt walks to the front of the classroom in a slow, easy gait and shares how what they're doing is what he and his staff do when developing a new flavor.

It's the second session and Matt guides the students, telling them, "What kinds of things do we need to know from customers to develop a new flavor?" After lively classroom participation, research managers from each four-member group get to work, compiling survey questions for the entire elementary school – their target market for the new flavor. They even work through lunch to get it done.

Ava, the group's research manager, feels pressure with the challenge before her.

"I've felt pressure and fun at the same time," she says. "You know, finding a flavor someone likes."

During the next class, the groups go out and survey the school. Each group covers a grade level. Edgar recalls his interaction with a 4th grader.

"He sat there scratching his head like it was the most serious thing in the world." A week later, they compile their findings into Survey Monkey, pulling out their iPads and reviewing data ranging from students' favorite toppings to their preference for vanilla or chocolate. It's math. It's statistics. And it's data interpretation all rolled into one. The iPads were paid for with the Ohio Straight A Fund grant.

It's time to make sense of the research. Their teacher, Stephanie, instructs, "I'm going to let you guys go through the data and figure it out. You're smart enough."

She relates , "I believe in the constructivist theory. Children will build their own knowledge. This is the way I like to teach."

Data analysts from each group stand up at their tables and report on their grade's findings. "What trends are you starting to see emerge?" Stephanie asks. Answers include, "They like sweet more than sour," and "I heard brownies mentioned a lot."

James locked on to Matt's guidance during one of his classroom visits.

Getting real

Matt continues to encourage these young entrepreneurs. “Those were great questions. The type we’d ask ourselves.” Now, the students can brainstorm flavor ideas.

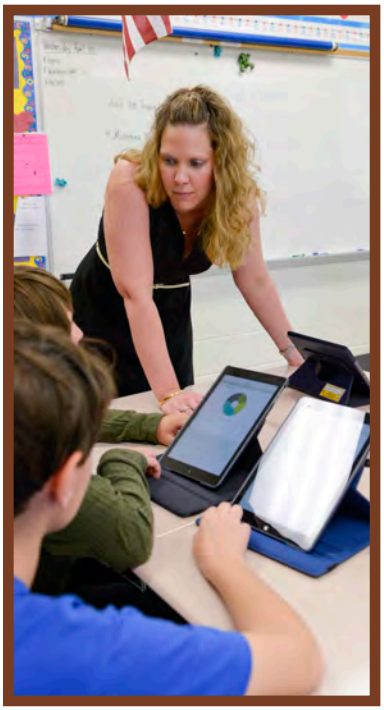
“The sky is the limit,” Matt says. “Nothing is too goofy or too crazy. Now you have information to guide you toward a flavor combination.” The energy in the room changes as some students lean forward, sensing how real this business case is becoming.

“Companies work very hard to get information and data to help them decide things. You guys are doing that. This is the real thing.” Matt then reads from an industry magazine called *The Dipper*, his voice authoritative yet soothing. The magazine article featured a survey for the most popular ice cream flavor for summer 2013 – vanilla chocolate/caramel crunch.

The students go to work to brainstorm flavor combinations. A constant chatter consumes the classroom. Words like “what if” and “we could” bounce from every table like silver balls in a pinball machine. One student gets so excited that she jumps from her chair, blurting out her idea.

The following week, students shift gears and engage in a challenging cost analysis for their top seven flavor ideas and accompanying ingredients. Stephanie discusses terms like variable cost, unit cost and gross profit margin.

Matt continues to give context to what the students are doing. “It’s like if you were starting a lawn business. You’d need to



Kilgour Elementary teacher Stephanie Bisher felt comfortable with the case-based learning project. “This is the way I like to teach.”

“Companies work very hard to get information and data to help them decide things. You guys are doing that. This is the real thing.”

know the cost of gas, how many lawns per gallon and what to charge." It's a flurry of activity as students begin creating spreadsheets with their iPads. To some, the work is familiar since they had studied unit rates earlier in the school year.

The students appreciate Matt's help as he walks around the classroom answering questions.

viewing the spreadsheet, he says, "I'm really impressed. You guys have done a good job with that."

It's a different story at another table attempting to calculate the cost for 25 pounds of marshmallows instead of the correct 2.5 pounds. Matt smiles and says, "Well, does that sound logical? That would be a lot of marshmallows!"

Matt discussed the project with marketing manager Sophie.

Often, he stoops to table level to better connect with his inquisitive students. With a smooth, calming voice he asks one table, "What were your Oreo and cheesecake prices?" Nodding in approval upon

His approach is much like the one he takes with his own children. "I'm always looking for teachable moments," he says, noting how he often reminds his own kids to apply logic when evaluating problems.

"This is giving us real experience."

"What excites me is that the students are able to process these concepts. It's great observing them and seeing some "ah-ha" moments, especially when they're interpreting data."

For Sophie, today's task has challenged her. "This part has been hard, but Mr. Madison is helping us." Ava agrees the work has been challenging, but offers, "It's knowing we can adapt. We know more and how to face challenges."

Meanwhile, Edgar enjoys working the numbers and learning which flavors will yield the highest and lowest profit margins. "This is giving us real experience and to know what's it like to be an entrepreneur. It feels good because we are helping Madisono's be successful."

And the winner is …

The gelato case gains momentum during the next class as the students turn to brainstorming a name for the winning flavor – chocolate base with chocolate pieces and brownie bits. Potential names fly across the room and onto the chalkboard. Matt stands in the back of the room, chin in hand, nodding in approval.

The class narrows the names through another survey. At the next class, they're ready for a winner. As some students hear their suggestion being discussed at another table, they pump their fists in excitement.

Matt enjoys the creative energy. "This is really genuine. I can feel their energy."

The winning name – Triple Chocolate Dare – won by one vote and beat out contenders such as Mustang Blitz and Lots of Choco.

Sophie comments, "I've liked seeing it go from like a hundred names to one and how we each got to come up with something on the list." Ava is starting to see it all come together. "We're helping a real business, and it's not play money with a fake business where if anything goes wrong, it's not real."

The moment of truth: tasting.

"This project is probably pushing these students further than the state standards," Matt notes. "It's accelerating basic ideas of learning but pushing them into deeper water, swifter current. … They're guiding themselves through it."

With a name chosen, Matt moves his attention to marketing as he makes his last presentation to the class. "People in grocery stores make a buying decision in a very small period of time. Statistics say 1.5 seconds. So what will catch their attention? The name? Packaging? Color?"

As Matt wraps up, he looks around this room of newfound friends and wide-eyed entrepreneurs. His words become more deliberate.

"Coming here on a weekly basis has been the high point of my week," he says. "You guys are doing real work. The concepts, the surveys, the analysis – you understand the whole part. I am wildly impressed. What you've done is pretty incredible."

Matt then walks around the room, observing students as they discuss how to market their gelato at the upcoming school carnival. He wears a look of fatherly pride. The students, seemingly unaware of their impact on this gelato genius, excitedly share their marketing ideas.

Students got to taste the flavors they chose.

"It's definitely been rewarding watching them get behind this and stay behind it and seeing the gears turn in their heads," he shares.

Business owner Matt Madison offered parting words during his final class visit: "Coming here on a weekly basis has been the high point of my week."

Kilgour students worked on posters to promote their new gelato flavor, Triple Chocolate Dare.

"Each week, I've been eager to see what they've come up with."

The following week, students create posters, Power Point promos, T-shirts, videos and blurbs for the carnival DJ to announce. James, Edgar, Sophie and Ava create T-shirts while simultaneously discussing ideas for their video promo. They shake Sharpie markers while pondering script for the video.

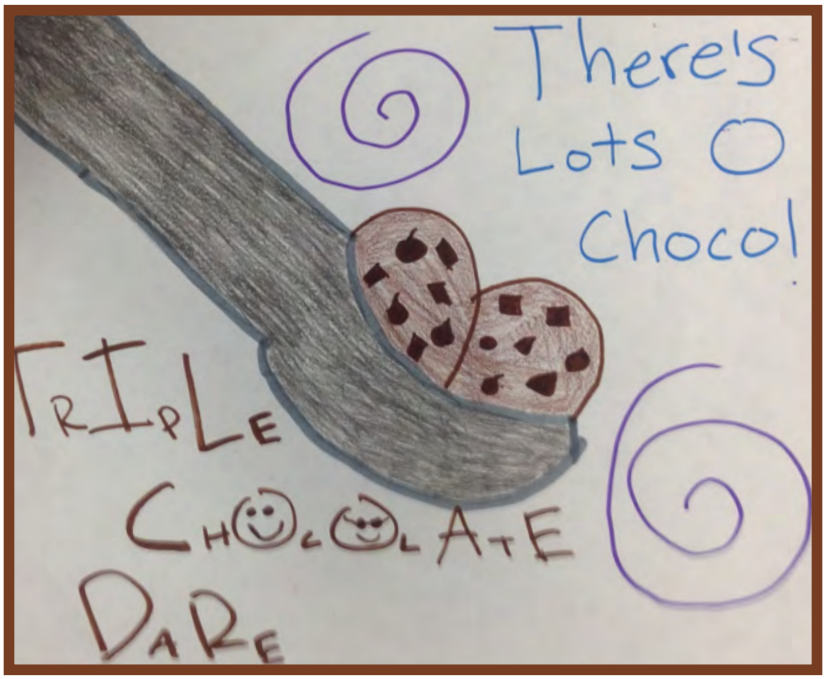
James confesses, "I can't think of anything … I don't know," feeling the pressure of time running out. Then Ava says, "I think it ought to be about a race to the gelato." James's bright blue eyes widen, his body leans back, and with a drawn-out gasp he says … "Yeah!"

Coming full circle

Carnival day has arrived. It is a very chilly Saturday in May – not exactly an ideal day to sell gelato.

James, Edgar, Sophie and Ava work the first shift,

Posters were made by students for the Kilgour carnival using slogans they developed.



Students got ready to sell their new gelato flavor for the first time at the Kilgour Carnival.

from 11 to 11:30 a.m., for their gelato booth. Proceeds from sales of the 4-ounce containers of their prized Triple Chocolate Dare will go to Kilgour. Pints of the new flavor will be sold in local grocery stores in summer, with partial proceeds benefitting Kilgour. The booth is ready. Colorful, hand-made posters are hung. Excitement is building. And so are the nerves. A mom and her two children approach the booth. She purchases the gelato. Four pairs of eyes are glued to the mom as she takes her first bite.

"This is great!" she exclaims. "I'd like more!" Sweet success. She likes it. Smiles fill the booth.

The new flavor is a hit among carnival guests. Matt is excited to share in the students' success but gives them all the credit."They did it," he declares. "They did the work. I just gave them direction and helped boost their confidence."

Students sold nearly 500 containers of their new gelato flavor at the carnival.

Triple Chocolate Dare was so popular at the carnival that the students ran out of gelato before the carnival was over.

With each shift of students, the supply dwindles. The booth ran out of Triple Chocolate Dare at 4 p.m. with an hour left of carnival, selling nearly 500 containers. Seven weeks of dedication to the job, including working through some lunches, had paid off.

Edgar reflects, "It makes me feel like I'm the one who made this all happen. I kinda am. When I walk through stores and see Triple Chocolate Dare, I'll think to myself, 'Hey, I made that!' "

Matt relates well to this entrepreneurial pride and believes these 6th graders understand that the case assignment was bigger than just coming up with a new gelato flavor and name.

"People wanted what they had done," he explains. "They respected and valued what they'd done and paid money for it. The students saw the gelato being sold and saw a piece of themselves in that."

EDITOR'S NOTE: Triple Chocolate Dare arrived on grocery shelves in late June. Over the summer, the flavor was tracking in the top eight flavors Madisono's sells.

"It makes me feel like I'm the one who made this all happen. I kinda am. When I walk through stores and see Triple Chocolate Dare, I'll think to myself, 'Hey, I made that!' "

Story by Cindy Dodson

Getting the Big Picture

Case-Based Learning Teaches Life Lessons in Cincinnati's Aiken New Tech School

Excited and a bit nervous, 8th-grade students from Aiken New Tech School emerge into the bright sunlight from the yellow school bus parked in front of Cincinnati's historical Taft Museum of Art. The dozen or so young African-Americans are dressed for a special occasion: young men in shirts and ties, and several young women in skirts or dresses.

One young girl of medium height and build wears a cream-colored, ruffled blouse, casual hooded jacket and leggings. Her name is Kyree Boyd, and she doesn't initially stand out amidst her colorfully garbed classmates in red dresses and purple shirts. Yet, she will soon be taking center stage to introduce her class's 10-week partnership with the Taft Museum.

Kyree and her fellow students follow science teacher Brandi Foster into a light-filled, cheerful room set up with round tables and a side buffet with fruits and mini muffins. The young people pause for refreshments and then seat themselves, some talking quietly but most focused on notes for their presentation, which they have worked toward for the last 10 weeks.

8th-grade Aiken student Kyree Boyd presents her class's STEM project to a gathering at the Taft Museum of Art.

Debe Terhar, president of the State Board of Education met Kyree, right, and her fellow students at Aiken's presentation of their STEM case with partner Taft Museum of Art.

A wide smile brings out the beauty in Kyree's face as she chats with president of the State Board of Education, Debe Terhar, about the project she is about to present. What she can't sum up in casual conversation, however, is how much this project has fueled her interest in science and given her a greater appreciation of her own abilities.

Quiet in a crowd, Kyree is more likely to observe than to seek attention. Her tendency to blend in is perhaps not surprising of a child who falls somewhere in the middle of 10 siblings and half-siblings.

Yet, given the chance to speak, Kyree exhibits a keen mind eager to embrace new ideas and concepts.
Her teacher has seen a transformation in Kyree during this case-based learning partnership with the Taft Museum and has asked her to introduce the project to Taft Museum staff and a handful of adults invested in improving the learning process at Cincinnati Public Schools.

Conversation dwindles as students and a few small clusters of adults focus their attention on Lisa Morrisette, manager of school and docent programs at the Taft Museum. Morrisette describes her enjoyment in working with the Aiken students.

She made several trips to be with students in the Cincinnati Public Schools classroom as they grappled with transforming the subject matter of a two-dimensional landscape mural from the museum's collection into a three-dimensional, free-standing work of art.

Lisa Morrisette of the Taft Museum of Art made several trips to be with students at Aiken New Tech as they did hands-on exploration of illusion and perspective based on a Robert Duncanson mural displayed at the museum.

"We're going to explore how the arts intersect with math and science."

Aiken's student presentation follows Morrisette's introduction. A dynamic iMovie video blares dramatic music worthy of a "Raiders of the Lost Ark" movie trailer. The students' quest, however, has been for knowledge and skills: 1) research on African-American artist Robert Duncanson, whose stunning landscapes teach valuable lessons on perspective and illusion, 2) understanding of size and proportion to make models of geometric shapes, 3) building and then painting – with proper light and shading – a three-dimensional representation of a mural, and 4) constructing structures and understanding concepts such as aerial, atmospheric and linear perspective.

Kyree steps to the front of the meeting room, her straight, black hair neatly parted to one side and large brown eyes scanning her audience. Following the enthusiastic applause for the iMovie she helped create, Kyree faces her most daunting challenge of the 10-week process: having all eyes focused on her as she puts into words the unique learning opportunity she and her classmates have experienced.

Merging Art with Science and Math

Three short months ago, Kyree and most of her classmates hadn't even heard of the Taft Museum of Art, much less visited there. During their first trip to the museum, they had been a little overwhelmed by the description Morrisette had given them of their case-based learning assignment. "Using one of our murals, we're going to explore how the arts intersect with math and science," she told them.

Morrisette had brought the class to the second-floor hallways of the house-museum to see the 6 ½ feet by 9 feet landscape murals on the walls. She and co-workers at the Taft thought Duncanson's works powerfully demonstrated how the arts intersect with math and science by projecting pictorial space onto a flat surface.

"We are bombarded by 2D imagery that creates the illusion of 3D." Morrisette pointed to a particular mural, noting how Duncanson had painted an ornate frame around a majestic woodland scene. The painted frame gives the illusion of dimension but is actually flat.

Morrisette, together with a mathematically minded co-worker and an art history intern, formulated the case study for Aiken students to create a three-dimensional model of the picture frame and landscape and then to photograph the model to make it a flat, two-dimensional work again. The case-based learning assignment challenged students to explore dimension, perspective and the creative merging of art with math and science.

Kyree and her fellow classmates initially reacted to the project with skepticism. "How are we going to do this?" they wondered.

Aiken New Tech students examined a mural by Robert Duncanson at the Taft Museum of Art.

The frame Robert Duncanson painted around his landscape mural gives the illusion of 3D.

Hands-on Learning

Back at Aiken New Tech School, Foster and students began to tackle their project. The New Tech School is perfect training ground for case-based learning, with its teaching philosophy focused on hands-on application of new knowledge.

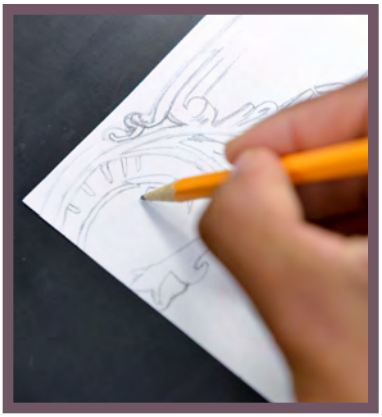
Tucked into a long-established residential street laced with grand old estates interspersed with modest homes, Aiken New Tech School embraces the modern world. Inside, its tall ceilings, wide hallways and shiny tile floors offer a sense of newness, space and light.

Foster's science classroom is dominated by long, black, rectangular tables serving as desks for taking notes but, more importantly, providing ample space for the sometimes messy business of creating and experimenting.

Foster discussed objectives of the Duncanson mural case with her students and gave them a chance to apply for one of four groups she created to achieve their learning goals:

■ **The Models Group** worked with a math teacher to understand proportion and how to scale work to larger and smaller sizes. They built a three-dimensional model with five planes on a flat base and learned skills used by architects, graphic designers and engineers.

■ **The Artist Group** worked with an art teacher to learn about lighting and shading techniques, which they applied as they painted the model their classmates had created. Skills learned could help prepare them for careers in fine art, interior design or fashion design.



A student sketched a portion of the Duncanson mural as his part of the case project.

■ **A Perspectives Group** created a website and experimented with making structures to experience perspective. Skills they learned could point them in the direction of careers in web design, engineering, industrial design, computer technology, architecture and landscape design.

■ **The Research Group** investigated artist Robert Duncanson, interviewed various project participants and created a video that chronicled the project. They focused on skills applicable to video design, journalism, broadcasting and social sciences.

"This assignment was the perfect way to get them thinking."

Lisa Morrisette of the Taft Museum of Art discussed with a student how to approach the case project. She helped formulate the case study for students to create a three-dimensional model of the picture frame and landscape and then photograph the model to make it a flat, two-dimensional work again.

Over the next several weeks, students worked one or more days each week on the project. Foster acted primarily as facilitator, guiding the students without telling them what to do. "I gave them ideas, but they did it themselves. That's where they learned. This assignment was the perfect way to get them thinking." Foster crafted the lessons so students were absorbing Ohio's New Learning Standards without even realizing it.

During one session, a student approached to ask, "Ms. Foster, how are we going to make the pieces of our model stand up?" She replied, "How do you make anything stand up?"

Another asked, "What will we build this out of?" And she countered with an encouraging tone, "What do you think you should build it out of?"

When another student asked her to send him some pictures for the web site he was building, she recommended in a kind but firm voice, "Jameel, why don't you go to the Taft Musuem website on your iPad?" Jameel willingly used the iPad he and science students had available for use from the Straight A Fund project.

"...the creative merging of art with math and science."

Gaining Perspective

Early in the project, Kyree, whom Foster appointed leader of the Perspectives group, selected a stack of wide Popsicle sticks and some glue from the science lab across the hall. She and other students also worked with paints, poster board, foam core and other materials for their various assignments.

Kyree looked at a photo of a cabin and considered how best to construct a 10” x 10” model of it. Her goal was to learn about linear, atmospheric and aerial perspective and post this information on the project web site being created by fellow group member Jameel.

Kyree and classmate Andrea worked together to build up the walls, patiently applying glue and stacking the sticks one at a time. They made steady progress, until they realized they had forgotten to create a door. So, they consulted with Foster and decided to remove some bottom pieces and reconfigure the structure.

Being a group leader was something new for Kyree. Undeniably a hard worker, she hadn’t always been the one selected to motivate other students. Plus, she hadn’t always been that excited by science.

Foster had watched Kyree blossom as the school year unfolded and culminated with the case-based project. “She was very quiet when I first met her,” Foster says of Kyree. “It was like pulling teeth to get her to do group work. She hated it.”

Kyree had gained new confidence working on a model-car-building project earlier in the year with a student who has learning disabilities. “All of a sudden, I noticed her talking in a gentle, calming voice with the other girl, showing her how to make wheels for a car. When her group’s car finished as one of the better cars on race day, Kyree gave me a look of pride like ‘I did it,’” Foster shares.

As leader of her Perspectives Group, Kyree exhibited a gentle respect for her group members. One can’t help but think she must be a kind nurturer to her younger siblings at home. She asked questions and made suggestions about what they could do or how they could stay on task. “I’ve learned a lot about time management,” she comments.

Kyree Boyd and her teacher, Brandi Foster.

Developing Confidence

At age 13, Kyree lives in Evanston, a residential, largely African-American neighborhood that has been part of Cincinnati since 1903. She lives with her parents and five siblings, who range in age from 6 to 17. Four other half-siblings live elsewhere. Her mom is a nurse and one of the most important people in her life. "I want to make my mom proud" is one of her chief goals in life.

Her dad, older sister, uncle and grandmother are others who have a big impact on her.

Kyree and Annia learned about perspective as they created a three-dimensional house using a two-dimensional picture for reference.

Kyree's parents show support and ask her about her school work. Although reading and math are Kyree's favorite subjects, science is growing on her. The Straight A Fund project with the Taft Museum is a big reason for this, and she speaks about it with enthusiasm. She is grateful to be part of this case-based learning project.

"They're really leading us on the right path. Most of us can't afford iPads or things they've given us. It's a blessing.

"I was just telling one of my friends from another school that it's more than just electronics or just art or just math or just science," Kyree continues. "It's one step further. This project has taught me about working as a team and about what I can accomplish.

"I've seen how much I've grown as a person from this project. This is creative for our brains. It gives us more ways to see things in life. It's making me love science."

"... this project ... it's making me love science."

Productive Partnership

According to the National Center for STEM Elementary Education, a third of students lose interest in science by the fourth grade. By eighth grade, almost 50 percent have lost interest.

To have organizations like the Taft Museum encourage STEM learning, blend it with art and capture the imagination of students like Kyree is precisely what the Straight A Fund project aims to achieve.

Aiken New Tech students worked in teams to complete the case project.

Morrisette, who firmly believes in the concept, routinely made the trip from the Taft Museum in downtown Cincinnati to College Hill to visit the classroom and engage the students about what they were learning and why they were doing the project.

"Art encourages creativity, and teaching creative arts makes us better mathematicians and scientists," Morrisette says.

Annia, a pretty, thin girl from Kyree's Perspectives group, approaches Morrisette to show her the tunnel she has created using crisscrossing Popsicle sticks. She is painting her work and consults with Morrisette about which colors to use to maximize the illusion of depth.

"Do you know about warm and cool colors?" Morrisette asks Annia. As Annia nods her assent, Morrisette continues to explain, "Warm colors appear closer to the viewer and cool colors appear farther away." She presses her index fingers and thumbs together to make a

"Art encourages creativity, and teaching creative arts makes us better mathematicians and scientists."

The presentation of the project at the Taft Museum was the culmination of 10 weeks of work.

"I'm learning that I can accomplish more than I think. I feel like someone's listening to me and knows what I'm reaching for."

triangle and then realizes she has a much better tool at her disposal.

"I can show you on your iPad," she tells Annia. They look up visuals that depict color theory. After a brief conversation, Annia returns to her seat with a plan in mind about painting the inside of her tunnel.

"I've been dubious about the role of technology in art, but here we were able to look up warm and cool colors. I can have students look up Duncanson or the Taft Museum," Morrisette says.

As she moved around the room, Morrisette stopped at Kyree's desk to admire the cabin she was building. Kyree savored the praise and gave Morrisette a small smile. What Morrisette didn't realize is just how much her encouraging words meant.

As Kyree says, "I'm learning that I can accomplish more than I think. I feel like someone's listening to me and knows what I'm reaching for. Everyone in this class is really going at it and showing pride in their work."

Foster affirms the importance of Morrisette's interaction with the students: "Having someone from the Taft Museum saying 'you're on the right track' motivates students more. They hear the word 'can't' so often; it's good for them to hear the word 'can.'"

The Aiken High School New Tech team tied in science, math, art, English and social studies lessons as they completed the case-based learning project.

Conquering Real-World Challenges

From the moment she heard about the case-based learning opportunity in a teachers' meeting, Foster realized the case study's potential to engage students' interest in a memorable way. She implemented ideas to not only bring in math and art, but to tie in English and social studies lessons, as well.

Foster, once inspired by a dynamic science teacher, now provides her own inspiration for others. As Kyree comments, "If I was a teacher, I'd want to be like her. She pushes you, and she's always there when you need someone to talk to. I can't wait to come to class."

The project itself has been an amalgamation of skills and subjects experienced by students in an entirely non-linear way. Both teachers and the Taft Museum staff are delighted with the students' ability to apply concepts they learned. For, Kyree, the project has been an inspiration. "I thought I couldn't do this," she says. I didn't believe in myself. This makes me believe what I can

do and shows me what I can do. I like bringing something new to the world and thinking outside the box."

Foster applauds Kyree's attitude. It reinforces why she agreed to do the project: "The scientific method is about inquiry. We're collecting and organizing data. I tell the students science is everywhere. They don't believe me. This is my way of showing them."

As they complete their final presentation at the Taft Museum, the students talk one by one about lessons learned and accomplishments achieved. They present their three-dimensional model and show the two-dimensional photo of that model on the movie screen at the front of the room. Their mission has been accomplished.

Morrisette comments, "It was exciting to visit the classroom and see your energy. You've given me a new way to view the Duncanson murals."

Staff members and students make a final trip up to the second floor to view paintings and the mural that has occupied their minds and hands for the past 10 weeks.

Kyree studies the now-familiar artwork that has been the focus of her hands-on learning experience.

The mural looks just the same as it did a few months ago. It's Kyree and her classmates who have changed, with broader perspectives on science, art and life.

"I tell the students science is everywhere. They don't believe me. This is my way of showing them."

Story by Sandy Weiskittel

The Joy of Discovery

Students - and teachers - in Milford learn lessons beyond science

6th graders at Meadowview Elementary in Milford took on a case that had them testing the absorption rate of fabrics manufactured by 3M.

They watched and waited. A single drop of water on a piece of fabric held their attention. Never before had a drop of water been so interesting to these young 3M scientists. They stared. They chatted. They waited. Eyes fixed and frozen in curiosity on the fabric before them.

The pressure was on. They had to pay close attention while executing this water droplet experiment, which would yield data on the fabric's absorption rate. After all, they were expected to present their findings to management within a few weeks.

But this is not any ordinary group of scientists. They are 6th graders at Meadowview Elementary, one of six elementary schools within

the Milford Exempted Village Schools that participated in a unique case-based learning opportunity this spring.

The project was funded through a $1.1 million grant from the Ohio Straight A Fund. The grant promoted a Harvard-influenced learning model that aims to increase student awareness and interest in science, technology, engineering and math (STEM) fields.

Meadowview Elementary's charge was to test, identify and rank optimal moisture-wicking fabrics for joint and muscle support wraps manufactured by 3M, a Minnesota-based manufacturer with a facility in Milford. Their results would help 3M determine the best fabrics at the lowest possible cost.

Their "supervisors" were Meadowview teachers Charles Smith and Cassie Dorl, who have collaborated for four years in a team-teaching approach, often joining their classrooms together for special projects. Researching the ability of fabrics to keep the skin dry was not on their radar earlier this spring. They had planned to study rocks and minerals and eventually the characteristics of life and cells.

But their plans had to change to take advantage of the opportunity with 3M. And staring them square in

Meadowview teachers Charles Smith and Cassie Dorl used a team-teaching approach for the case-based learning project. Because of their collaborative approach, they took comfort in relying on each other to create a successful experience for their students. Four years of shared teaching philosophies fueled their success.

the face was a case outline that provided limited guidance to teachers, letting them shape the project to the meet their learning objectives and classroom dynamics. The two teachers felt uncertainty initially since the project was so open ended.

Cassie recalls, "We really decided … that we needed to just jump in and make this project work. We weren't okay with doing it half way."

Charles adds, "We liked the concept. We just weren't clear on expectations. So we decided we would make this our own."

What kept them motivated and moving forward was their shared passion for doing what's best for their students. "Once we sat down and really decided what we envisioned and then figured out what we thought would help the kids, we were able to start creating a plan," he says.

Little did they know … this business case would unleash a type of learning that knew no boundaries. Little did they know … their shared passion would play out so meaningfully, for the students, and for them.

"We liked the concept. We just weren't clear on expectations. So we decided we would make this our own."

Team teaching

Because of their collaborative approach, these Cincinnati natives took comfort in relying on each other to create a successful experience for their students. Four years of shared teaching philosophies fueled their success.

"I expect a great deal from my students," Cassie notes. "Charles and I have very similar philosophies here. I do not reward students for doing the bare minimum."

Charles tells students from day one that, in the end, it's not the grade that matters. "They are rewarded for their effort, and doing the bare minimum is not 'A' quality work. Tests do not reflect ability or aptitude. Effort does."

This tough-love approach was nurtured early in both Charles and Cassie. Charles says his kindergarten teacher was his biggest role model. He recalls her mantra of "High expectations equal high achievement."

Cassie says her best teachers were always the toughest teachers. "They were the ones who expected the most from you and made you do more than you ever thought possible of yourself."

You would think their well-seasoned teaching philosophies took many decades to blossom. But Meadowview is Cassie's first teaching position after graduating from the University of Cincinnati in 2010 with a degree in

Middle Childhood Education. With no children of her own, Cassie's experience with children has been all on the job.

Charles came to Meadowview five years ago after teaching seven years at Loveland Baptist School. He received his degree in Elementary Education in 2000 from Miami University in Oxford. He is married with two boys, ages 6 and 9.

A different type of assignment

The students received their assignment in a non-traditional way – from a 3M engineer and Human Resources Manager Don Barnes.

"3M is focused on innovation," Don notes. "We need more engineers and scientists. This partnership is all tied into STEM. It's awesome."

Data from the research at Meadowview was analyzed using Chromebooks purchased through the Straight A Fund grant.

The students quickly grasped that this was a very different type of assignment. Many important-looking people attended the kick-off with 3M. They felt special. Simultaneously, they felt uncomfortable when they heard they were expected to present their findings to 3M in 10 weeks. Yes, a presentation!

"You could see it in their faces," Charles recalls. "When they were told they'd be creating presentations, the kids thought, 'With what?' "

When they returned to the classroom, Charles and Cassie eased their concerns. "We presented this project to students as a privilege and challenge," Charles explains. Both graduate students at Miami University, they also created tools to complement the case, such as a graphic organizer, which they shared with the five other participating Milford elementary schools.

"Overall, they really jumped right into it and took the challenge. They enjoyed the idea that a company was asking them for help with a real problem that needed a solution."

One student recalls, “It made me feel pretty cool that 3M picked us for this.” Another notes, “I gained a better appreciation of what real professionals do and the importance of working together as a team to get things done.”

Cassie Dorl guided students through the experiments as they tested the fabrics from 3M.

Go find that out

Students felt new stress the following Tuesday when Charles and Cassie asked them to research 3M using their graphic organizer tool. After one student approached Charles to ask about the purpose of 3M, he responded, “I don’t know. That’s a good question. Go find that out.”

The students began to realize this was not their typical classroom experience where they received an assignment, completed it and received a grade. This experience was different and would occupy their science class throughout the end of the school year. But they trusted their teachers. They began to relax within this awkward yet refreshing environment of independence and self-directed discovery.

Students had to carefully measure the distance of water absorption.

Charles explains, “This was to help them understand this real-life customer rather than spelling it out for them. If they have to discover it on their own, they will better remember it.” He adds, “We always talk about how this generation has more access to knowledge, yet they possess less knowledge.”

Milford Schools Superintendent Robert Farrell has been a fan of the

case-based learning model from the start. “Our students learn theories and concepts, but the relevance is missing. Here’s a real-life problem they get to work on with a real-life company. It’s fun for them, and they’re beginning to see how learning is relevant and they ‘get it’ and how it can help them in the future.”

The dynamic teaching duo stood firm in their “go find that out” game plan. However, according to Cassie, it was not without growing pains.

“It was hard for me to watch the students become frustrated. As a teacher, I wanted to help them. It took a lot for me to realize that in allowing them to be frustrated, I was helping them. Ultimately, I *was* helping them more, because they were figuring it out for themselves, growing in confidence and realizing they have ways to find the answers.”

Charles refers to the proverb of teaching a man to fish. “Dependence is nurtured if we are not careful,” he contends. “It takes a mindset that it’s okay to not always help your students by giving them answers. They need to become learners, not just students.”

For the students, there was freedom in knowing there were no right or wrong answers. Dr. Farrell refers to this as inquiry learning and would like to see education move more rapidly toward this environment. “It’s not one solution to something, no one right answer. It’s about gathering data and figuring it out. We’re moving more toward inquiry learning. Something like this is a great way to help us move in this direction.”

“Our students learn theories and concepts, but the relevance is missing. Here’s a real-life problem they get to work on with a real-life company. It’s fun for them, and they’re beginning to see how learning is relevant and they ‘get it’ and how it can help them in the future.”

Teacher Charles Smith: "This whole process made some students step up. As they'd look at a table next to them, they were like, 'I want to be doing what they're doing.'"

The three-member groups of students dug into their research and began filling out their graphic organizers.

"I bet they make lots of money because they give the products to a lot of stores," one student revealed. "What do they sell?" chimed in another. "They sell in the manufacturing industry," blurted a teammate. "I'm going to look up the definition of wicking," announced a student at a near-by table.

Transformative freedom

Part of the research included observing fabrics they soon would be testing – a critical part of the Scientific Method they had studied earlier in the year and would be applying in this case as well.

Whispers of discussion ramped up at each table. Ponytails flipped side to side as students looked back and forth from fabric to pen and paper, feverishly capturing their observations. The room was alive with the sights and sounds of discovery.

Hands rested on heads as if to aid the brain. Pencils flew across notebooks. Mouths turned sideways in deep thought. Eagle eyes landed on fabric swatches to eke out every possible observation. Some students even put their noses to the fabric, utilizing yet another sense.

Charles and Cassie guided their young scientists in discovering varied Google tools available at the tips of their fingers through their own personal Chromebooks, which were funded by the state grant. From Google Docs to Google Presentations, students discovered a whole new world of resources available to them.

The teachers strolled around the room, observing and providing guidance. “Did you share a folder yet?” Charles asked one group. He had previously recommended Google Drive to the students so that all team members would receive instant, fluid communication on the group’s progress each week.

Charles and Cassie became more like coaches – a role they both connect to, attributing coaching as one of their reasons for going into teaching. Charles coached junior high basketball and volleyball during college. Cassie has been coaching a multi-age swim team at the Blue Ash YMCA for about five years.

They encouraged students yet also expected them to sweat out the unknowns and dig a little deeper into their abilities. They were not teaching to a test. The case already had been matched up to Ohio’s New Learning Standards. They were facilitating learning, which pleased them since it’s one of their preferred approaches to teaching.

Cassie notes, “Though this is a more and more common part of our classrooms, this case was the most extreme example yet to take place.”

Then a strange thing happened. The project began to take on a life of its own, filled with the energy of enthusiastic students thriving in an environment of inquiry and gentle guidance. Their classroom environment was transforming.

Charles shares, “This whole process made some students step up. As they’d look at a table next to them, they were like, ‘I want to be doing what they’re doing.’ “

Students soon became accustomed to relying on one another rather than going straight to their teachers. “As students saw problems, they first came to us, but quickly realized we didn’t run the experiment and could not tell them what happened,” Cassie explains. “By the end of the case, students were much better at asking peers before they came to us for help.”

Students soon became accustomed to relying on one another rather than going straight to their teachers.

Putting a name to it

Charles and Cassie knew they could make this classroom experience even more authentic if they assigned job titles. So they wrote job descriptions for three roles – Team Leader, Communications Officer and Data Analyst. They shared this document with the other Milford 6th grade classes as well.

Cassie says, "Students were able to relate personal experiences – jobs their parents have – to this project. Many were able to relate to the idea of a project that would be reported to a boss."

She told the students, "Every person has been assigned a role for the group they're in. Responsibilities are not limited to what's listed on the page. Use each person's strengths to create the best outcome for your group."

Charles notes how they put into leadership roles students who might not normally be leaders. "It gave kids the opportunity to do well in a place they could do well."

It gave them a chance to shine, to discover their leadership potential.

"It gave kids the opportunity to do well in a place they could do well."

It gave them a chance to shine, to discover their leadership potential.

And that leadership opportunity became a learning opportunity. The teachers dedicated a few classes a week to the case. Cassie notes, "We stressed to the students how important it was to be there for their team on these days and how you can't just not come to school because you don't feel like it. … Just like in the real world, you can't just decide to not show up one day."

Charles adds, "We set high standards in our class each and every day, and our students know this."

The students took it seriously.

"I'm the Team Leader," professed a student in one group. "I have to make sure you guys are ready." The same group's data analyst announced, "I'm the one who creates the forms."

"Is your email William or Will," asked the group's Communications Officer, who was setting up Google Drive emails. "Do you know how to do Power Point?" asked the Team Leader of the Communications Officer. Tensions still were running high regarding the group's looming presentation to 3M.

Testing hypotheses

Eventually, hypotheses were made. Questions were asked. What effect would each fabric have on the skin? Does a thicker fabric absorb better? Students discussed the materials they would need for the experiment.

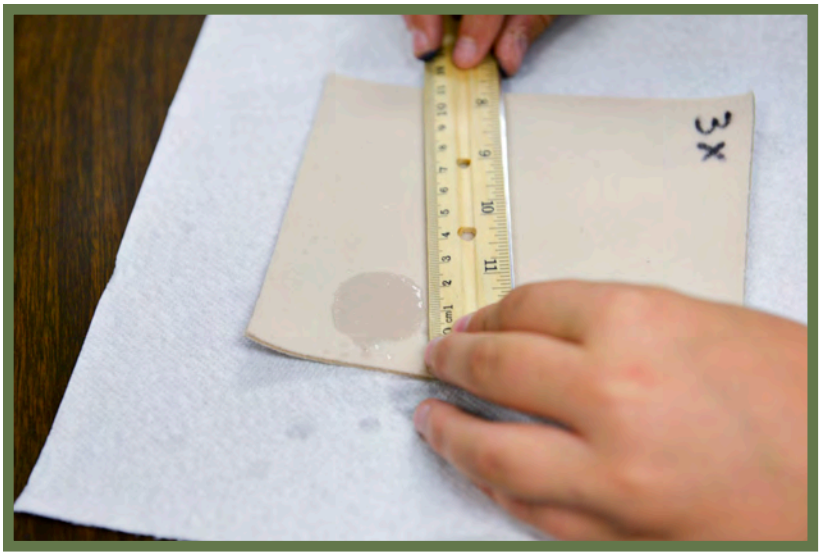
The day of the experiment came, and students were anxious to test their hypotheses. They tested absorption (wicking), water spread and water migration (transfer of water from one side of fabric to the other.) They created dot plot diagrams and calculated means and medians.

Students' expectations shattered with some of the fabrics. They believed a thicker fabric would absorb more. They were not expecting it to spread so much. Charles referenced how with project-based learning, he always knew the outcome of an experiment and would hold back on the knowledge until the students could arrive at the answer.

"I had no idea what they would see with this experiment," he recalls.

Don from 3M notes, "We test materials three to five times. The students provided more test measurements for us, making our data and results more reliable."

The experiments on the 3M fabric involved observing and measuring water spread across the fabric and water migration through the fabric.



After they analyzed and documented their experiments, the students turned their energies toward their presentations to 3M management. Oddly enough, some of the trepidation they previously felt had faded.

Cassie explains, "Every week was a new adventure

The Meadowview teachers saw that students gained confidence through the case project and took the initiative without asking for help on each step.

for us with this project. By the end of each stage, we felt pretty good with the products from our kids." And the students gained confidence too.

During their experiments, students were told they needed to take photos, but they were not instructed how to incorporate the photos into their presentation. Some made flipagrams using an iPhone app that creates short videos from photos.

"That may have been my favorite moment," Cassie declares. "I was taken back because we hadn't told them to do it. They just did it!" That independence would pay off for students.

Soon it was May 28 and time for the presentation. Don from 3M visited Meadowview, as he'd done with the five other participating Milford schools, to learn what the students had discovered.

"What they did in the short amount of time was impressive. We walked away from the presentations with a double thumbs up." Don notes how 3M would easily partner with the schools again.

"We were all in for this. It helps kids learn. It helps the school district. Eighty-five to 90 percent of the driving force for us is helping the learning process expand for these kids."

"We were all in for this. It helps kids learn. It helps the school district. Eighty-five to 90 percent of the driving force for us is helping the learning process expand for these kids."

Growth through struggle

Charles and Cassie adapted to the challenges of the 3M case and triumphed in the end. Passion for their students made everything else work.

In stepping outside their planned curriculum, they entered a world where their strengths as teachers were honed -- where they could mentor students in a real-world case. And where students adapted as well, supported by the expert guidance of their dedicated teachers who worked in collaboration. It was more than science.

Charles observed that the case supported their teaching philosophy of collaborating to do what's best for the students.

"We are more powerful when we collaborate," he asserts. "If we're always doing what's right for the kids, then we're always doing what's right."

Cassie agreed, revealing her own journey of discovery. "I'm glad the kids experienced this," she professes. "They even taught us along the way. They're capable of more than we thought, and they can be very creative."

"I'm glad the kids experienced this. They even taught us along the way. They're capable of more than we thought, and they can be very creative."

Story by Cindy Dodson

About the Storytellers

Sandy Weiskittel is a veteran free-lance writer and editor with keen interests in education and health care. She views writing as a lifelong learning opportunity and appreciates the inspirational people she meets along the way. Sandy is a native Cincinnatian who lives in the White Oak area and can be reached at weiskittelwriter.com

Cindy Dodson has been writing about people, places and things for nearly three decades. She serves clients in the health care, education and financial industries, recently focusing her efforts in small businesses branding and marketing. She believes the world is full of stories waiting to be told. Cindy resides in Mason and can be reached at cdodson@cinci.rr.com.

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Smarter Schools
P.O. Box 43401
Cincinnati, Ohio 45243
Telephone: (513) 313-5109
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