# **AURORA UNIVERSITY**

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**REBECCA L. SHERRICK** PRESIDENT

**A SIMPLE HYPOTHESIS DROVE** THE PROBLEM SOLVING AGENDA: THE BELIEF THAT IMPROVING **TEACHER CONTENT MASTERY** WOULD HAVE A POSITIVE IMPACT ON STUDENT LEARNING.

In this special edition of the new Aurora University magazine, we share with our readers an update on our pioneering Science, Technology, Engineering and Mathematics initiative. For me, the story begins with two seemingly unrelated events on either side of the state line - the establishment of the Institute for Collaboration in Aurora and the successful effort on the part of Aurora University and community leaders to block the planned sale of historic Yerkes Observatory in Williams Bay, Wisconsin. Through these twin efforts, AU committed itself to community engagement. I recall clearly the shift in my own

As we were about to learn, often our

thinking that occurred then. I began to understand our university as having two great potentials, to transform students' lives through learning and to contribute in meaningful ways to the solution of complicated civic, social, economic and educational problems. We began to understand our surroundings as laboratories for change and to identify business, civic, nonprofit and educational partners. emphasis on community engagement opened exciting new doors for AU students and faculty.

At approximately the same time, New York Times columnist Thomas Friedman published one of the most important books of the early-21st century, The World is Flat. Almost overnight, Americans became aware that significant numbers of the nation's students lag behind international peers in crucial science and mathematics disciplines. Over the next decade, AU faculty and administrators joined forces with public school colleagues, state legislators, local officials, a community foundation and a wide range of corporate partners to craft

possible solutions to this problem.

A simple hypothesis drove the problemsolving agenda: the belief that improving teacher content mastery would have a positive impact on student learning. And so the university and its many collaborators set out on the grand adventure that resulted in a series of triumphs, including new graduate programs, new legislation, a long list of grants, and the development of the John C. Dunham STEM Partnership School on the AU campus. The pages that follow provide an insight into the current status of our work. As you read, know that we are hard at work on the next phase of the STEM initiative.

Teams of faculty are designing expanded summer STEM programming and exploring the possibility of collaboration with colleagues at Yerkes Observatory in Wisconsin. On our drawing board is an exciting new undergraduate curriculum in innovation engineering. Meanwhile our presence in McHenry County continues to grow through the acquisition of the Challenger Learning Center, a successful nonprofit educational organization that relies upon simulated space missions to engage students in mathematics and science learning.

The roster of leaders who have dedicated themselves to our STEM initiative is long and impressive. In the pages that follow, you will learn more about some of these colleagues and their contributions. Each day, I am profoundly grateful for their gifts of time, talent and energy. I know that I write in behalf of all involved in our Great STEM Adventure to thank those who have advanced our agenda, believed in our vision and invested in our cause.

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FEATURE

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#### IN 2008, TWELVE PARTNERS FROM THE INSTITUTE FOR COLLABORATION OF AURORA

**UNIVERSITY** worked together over several months to prepare a proposal to present to the Dunham Fund. Their concept would eventually become the John C. Dunham STEM Partnership School. When they stood before the Dunham Fund advisors and were asked who among them would act as spokesperson, they were initially stumped. In a dramatic moment, the founding partners realized that any one of them could take on this role. The realization that they each "owned" the project and that collectively they offered more than each did individually, not only helped win their first financial grant, but it also set the stage for unparalleled collaboration.

Robert Vaughan, executive director of the Dunham Fund, says the partnership's initial proposal answered the Fund's Challenge for Change, a competition aimed at inspiring organizations to look at the needs of the

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IN AUGUST 2014, AU HELD A CELEBRATORY OPEN HOUSE EVENT TO MARK THE OFFICIAL OPENING OF THE STEM PARTNERSHIP SCHOOL. HERE AURORA MAYOR TOM WEISNER AND DR. SHERRY EAGLE, EXECUTIVE DIRECTOR OF THE INSTITUTE FOR COLLABORATION, READ FROM THE "STORY OF THE JOHN C. DUNHAM STEM PARTNERSHIP SCHOOL," WHILE REPRESENTATIVES SHOW DIFFERENT COLORED CARDS TO DEMONSTRATE THE WIDE VARIETY OF CONSTITUENCIES INVOLVED IN THE FORMATION OF THIS UNIQUE PARTNERSHIP.

community and the obstacles to meeting those needs. "This was done at a time when we were entering the economic downturn and we wanted to offer an opportunity to move the needle on a community issue," Vaughan says. "Aurora University's submission was truly collaborative and offered an opportunity to engage young people in the area of STEM education, while giving educators experiences not currently available in their home school districts." The Dunham Fund also felt the rotation of teachers through the STEM School was extremely innovative and offered the chance to share best practices in STEM education with thousands of elementary and middle school students.

After winning their first grant, the dialogue deepened, more grants were written and new

partners joined the effort. Despite a difficult economy, they forged ahead.

#### **OVERCOMING OBSTACLES**

As the concept of the school developed further, it became clear it required enabling legislation. Illinois State Senator Linda Holmes joined the effort in 2010, taking over sponsorship of the bill in the spring of 2011. State Representative Linda Chapa LaVia, State Representative Stephanie Kifowit and then House Minority Leader Tom Cross were also actively involved in this effort. While an initial charter school concept failed in Springfield, partners experienced a breakthrough that spring. "I asked them to break down the concept to the most basic level," Senator Holmes says. "That was when the light bulb went on. We were simply



IT WAS NOT A CHARTER OR MAGNET SCHOOL; IT WAS AN ENTIRELY NEW CONCEPT.

TOP LEFT: ILLINOIS STATE REPRESENTATIVE STEPHANIE KIFOWIT. TOP RIGHT: ILLINOIS STATE SENATOR LINDA HOLMES. BOTTOM: ILLINOIS STATE REPRESENTATIVE LINDA CHAPA LAVIA.

trying to create a partnership. It was not a charter or magnet school; it was an entirely new concept." This new concept would not be the responsibility of a strapped state government. Instead, it put the spotlight on collaboration and incentivized business involvement with hands-on development of future, well-educated employees from their own communities.

Senator Holmes and Representatives Chapa LaVia and Kifowit gained support from the Illinois State Board of Education and gathered input from teachers, partners, the Illinois Education Association and the Illinois Federation of Teachers to determine student eligibility, teacher compensation and cost responsibilities in order to complete a final draft of the legislation. After passing both the Senate and the House of

4



Representatives, Governor Pat Quinn signed the bill into law on July 13, 2011, on the campus of Aurora University.

#### **BECOMING VESTED**

With the support of Aurora University President Dr. Rebecca L. Sherrick and legislation underway, the group began reaching out to key partners with particular interest in STEM education, such as Exelon. "We immediately saw this as a strong idea with an even stronger commitment," says Steve Solomon, vice president of corporate relations for the Exelon Corporation and president of the Exelon Foundation. "You don't hear of many opportunities in the grant making business with such strong buy-in and high goals. Because of the collaboration, the plans for measuring success and the potential



(LEFT) AND U.S. CONGRESSMAN BILL FOSTER IN APRIL 2013 AS PART OF AN OVERALL EFFORT TO SHOWCASE THE UNIQUE ASPECTS OF THE COLLABORATION RELATED TO STEM LEARNING AND TEACHING





EVERYTHING WAS BRAND NEW AND RADICALLY DIFFERENT THAN WHA TEACHERS ARE USED

> LOWER LEFT: STEM SCHOOL STUDENTS WORK TOGETHER ON A LABORATORY ACTIVITY TO INVESTIGATE THE DIFFERENT PROPERTIES OF MATTER.

LOWER RIGHT: FRANK CLARK (LEFT), FORMER PRESIDENT AND CEO OF COMED, AND STEVE SOLOMON, VICE PRESIDENT OF CORPORATE **RELATIONS FOR THE EXELON CORPORATION AND** PRESIDENT OF THE EXELON FOUNDATION, ATTEND A CEREMONY IN FEBRUARY 2012 IN SUPPORT OF THE STEM PARTNERSHIP SCHOOL.



community impact, we saw this as a win-win-win." The Exelon name proved to be critical in opening doors with other corporate and nonprofit partners.

From the beginning, it was clear that the Exelon Foundation would get involved and stay involved. Contributing to the energy curriculum, hosting field trips to the company's nuclear site and providing an energy workshop for teachers are just some of the ways Exelon showed support. Solomon is especially fond of their efforts to provide community-wide STEM teacher professional development. "That's one of the things I love. This initiative wasn't just to create this new school. The teachers who go through the program then take what they've learned back into their school district to share best practices and lessons learned," he says. "There's a lift for students and the educators that's very unique. It's a special project."

Caterpillar, another corporate partner, had already identified the need to share STEM education with students much earlier in life. When Dr. Sherry Eagle, executive director of AU's Institute for Collaboration, and Christine Crouch, assistant director of the Institute, approached Caterpillar in 2012, they responded with both financial and human capital contributions. Pete Wright, Caterpillar's supply chain manager, began facilitating weekly meetings of business partners, teachers, faculty and nonprofit representatives at Caterpillar in Montgomery. Participants stretched their thinking as they considered the perspectives of all stakeholders resulting in innovative ideas to prepare students for future careers.

According to Pete Wright, Caterpillar has about 10,000 engineers on staff and exports a tremendous amount of product. "Being on the leading edge of product development requires a strong pipeline of potential employees," Wright says. "When you think about it, we're competing on a global stage from the heart of Illinois. From our Aurora facility, we're building the best products in the world and need the best talent in the world to do it."

Together, early partners built the curriculum's framework in those Caterpillar-facilitated meetings.

They took the core education requirements and added a deeper understanding of the STEM fields, teamwork critical thinking and problem solving.

#### EDUCATOR AND **STUDENT EXPERIENCES**

Dr. Ed Howerton, an Aurora University faculty member who served as the school's interim director during its inaugural year, was first exposed to the partnership school concept while working for West Aurora District 129. He describes the initial teacher experience as freeing but scary. "Everything was brand new and radically different than what teachers are used to," Howerton says. "I compare it to making a cake from scratch versus making one from a box." While it was challenging for teachers to wrap their heads around new ways of doing things within the partnership, they clicked quickly.

"It was really a matter of breaking an old paradigm," says Howerton, who describes the faculty-teacher-business partner relationship as professional development on-demand. "Most teachers describe it as the hardest, but most rewarding work they've ever done."

The student experience spoke volumes as well. Howerton says the biggest motivator was to send kids home excited, sharing what they learned every day, and seeing them succeed. "The kids were very aware of the fact that they were doing something different," he says.

#### **MOVING FORWARD**

After the remarkable inaugural year, the partners remain committed and are increasing their involvement. The Exelon Foundation will continue to share STEM experiences, their alliance-building assistance and financial contributions as they ramp up volunteer involvement. In addition to ongoing fundraising assistance, Caterpillar's offerings include school field trips to their Montgomery site and dedicated engineers who are deeply involved with day-to-day efforts. The Dunham Fund continues to support what it calls its marguee project because of the replication potential of the truly collaborative and innovated model.

As the school enters its second year, all partners agree that the STEM Partnership School continues to be a truly rewarding experience for the partners and the teachers, faculty and students. Perhaps Senator Holmes articulates this best. "I am so proud to have played a small part in the creation of an idea that I believe will impact the education and job opportunities of future generations," she says. "It is humbling to be a part of something that has such an impact on so many lives."

7	



IN SPRING 2015. FORMER SUPERINTENDENTS FROM THE ORIGINAL THREE SCHOOL DISTRICTS CONNECTED TO THE STEM PARTNERSHIP SCHOOL WERE HONORED. FROM LEFT, AU PRESIDENT **DR. REBECCA L. SHERRICK, JEROME ROBERTS** (AURORA EAST), KATHY BIRKETT (INDIAN PRAIRIE), NEAL ORMOND (WEST AURORA SCHOOL BOARD PRESIDENT REPRESENTING JIM RYDLAND AT AURORA WEST), DR. SHERRY EAGLE, EXECUTIVE DIRECTOR OF THE INSTITUTE FOR COLLABORATION, AND CHRISTINE CROUCH, ASSISTANT DIRECTOR, INSTITUTE FOR COLLABORATION.

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When discussing his early involvement helping the John C. Dunham STEM Partnership School create partnerships, raise funds and pass legislation, former Republican Leader Tom Cross' enthusiasm is palpable. "I think this is the most exciting project I've ever participated in. I've never seen anything like it," Cross says. "As I traveled around the state over the years, CEOs told me of their struggles with the STEM-void in hiring pools. This is exactly what people have been talking about for years and Aurora University did it." When the call came to join Aurora University as a Distinguished Fellow in the spring of 2015, it was a natural move for Cross, a 22-year veteran of the Illinois

8

### FORMER ILLINOIS REPUBLICAN LEADER TOM CROSS JOINS AU AS DISTINGUISHED FELLOW TO PROMOTE STEM EDUCATION

General Assembly. In his new role, Cross builds strategic partnerships between AU and the corporate and nonprofit worlds. And while growing the school and expanding its education model will surely be challenging, Cross says that with a lead partner like Aurora University, it becomes possible.

"Having a thoughtful president like Dr. Sherrick behind this is critical," Cross says. "She believes AU must be a good community partner and that its reach must extend well beyond the physical structure of the university." That community spirit and the project's unique collaboration keeps motivation and expectations high.

"There's nothing complicated about collaboration if you commit and stick to it," Cross says. "All the partners realize there's something magical here. Everybody is involved. Everyone is committed to making sure the collaboration continues."

Cross, whose position is financially supported by the Dunham Fund, will share the school's story throughout the state and the country. Focusing on adding new partners from fields such as agriculture, finance, and technology are the linchpins of his role, but he'll also help develop new programs such as corporate internships and preschool programs.

"I enjoyed my time in the General Assembly, but I couldn't be happier now," Cross says. "I can't wait to come to campus every day; it's an exciting place to be."

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THE DESIGN AND FUNCTIONALITY of the John C. Dunham STEM (Science/Technology/Engineering/Math) Partnership School offers students the rare opportunity to view up-close the often concealed physical inner workings of a school. In some ways it's comparable to pulling back the curtain to expose the Wizard of Oz. Throughout the building, glass walls reveal various components, such as heating and air-conditioning ductwork, plumbing and electrical conduit, all accompanied by explanatory legends understandable to students at all grade levels. Across the ceiling, pipes and wires are illuminated with LED and accent lighting.

"The function of the building is completely on display," said Jeff Cali, assistant vice president for administration for the university. Cali served as AU's project manager for the state-of-the-art edifice. "Everywhere they look, students see the inner workings of the building." Welcoming its first students in August 2014, the STEM Partnership School building was designed to be extremely energy efficient and easy to maintain. The planners also wanted the physical attributes of the school to mirror the hands-on approach to learning in the classroom. Each classroom can be customized, as there is no designated front or back. Desks are on wheels and seat a minimum of two students. Wall surfaces have large expanses of idea paint which allows them to function as dry erase boards so students and teachers can actually write on the classroom walls. Having this flexibility "is absolutely conducive to learning," Cali stated. "A teacher can use multiple walls for multiple perspectives, based on where the students are facing." The STEM Partnership School concept originated in the Institute for Collaboration of Aurora University. According to Executive Director Dr. Sherry Eagle, "the idea was to create a learning environment that would draw on the building as a resource for the curriculum." This multi-generational space ignites interest in the fields of mathematics and science by allowing students to "see into" what is happening, "so there is no mystique," Eagle said. "You can tell what is going on in all of the laboratories," whether it be material science, environmental science or the biological sciences.

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#### **COMBINING THE PAST AND FUTURE**

The 31,000-square-foot, single-story building houses 200 third to eighth graders and teachers as well as high-tech, multi-generational laboratory space that the STEM Partnership School students share with Aurora University students.

One of the challenges in designing the building was merging the traditional AU ambience of redbrick buildings with an overt technology presence. "We tried to create a composition that both respected the historic nature of the campus and a tech feel to the structure," said John Cordogan, a partner at Cordogan Clark & Associates Inc., the Aurora firm that served as the architects and engineers for the STEM building.

The past was honored by using many similar materials found in older campus buildings, including red brick and stone. "But the actual configuration of the building has a more dynamic, modern vocabulary that reflects the technology going on inside," Cordogan conveyed. For instance, instead of traditional gabled entrances, the STEM building sports modern geometric forms. Upon entering, there is exposed precast concrete and, in the ceiling area, exposed mechanical systems. "Windows have also been placed in many walls, so people can view the pipes and wires passing through the interior portions of the wall," Cordogan said.



The roof is also equipped with roughly 5,000-square feet of photovoltaic cells (solar cells) that absorb sunlight and convert it into electricity. "The harvesting of solar energy is an excellent teaching tool, and is evocative of the forwardthinking design of the building itself," Cordogan said.

To reinforce curriculum in biology and plant life, a section of the roof has a garden to keep the roof system cooler by not allowing direct sunlight to heat it. "The green roof also absorbs carbon dioxide through the plant life growing on it," Cordogan notes. The roof is directly adjacent to a greenhouse, which is situated in a "penthouse" area for science experiments by both STEM Partnership School students and university students.

#### **RENEWABLE ENERGY**

Several industry partners have donated interactive displays to the STEM Partnership School. A cabinet on wheels from Waste Management Inc., in nearby Lombard, highlights the company's renewable energy program. Under glass, there is a threedimensional model of a landfill and an energyrecovery facility. Several small placards, each with a button that describes a specific component within the model, are posted around the edges of the model.

In addition, underneath the cabinet, there is a vacuum source that is visually aligned with the model for an exploded view of the company's gas-recovery system. This allows students to reach into the cabinet, turn on a switch and watch a simulation of the gas-recovery system. A pipe manifold mounted in front of the cabinet features valves and different measuring devices associated with the system. "Students can experiment with how gas is extracted from a landfill," said Bill Schubert, senior director of disposal operations for Waste Management, which owns and operates over 60 gas-to-electricity facilities. These plants pull methane gas from a landfill and then transport the gas to an energy-recovery facility, where internal combustion engines connected to electrical

12

By the numbers: building **highlights** 

31,000 SQ. FEET OF SPACE

5,000 SQ. FEET OF SOLAR CELLS

100% LIT BY LEDS

38%

MORE ENERGY EFFICIENT THAN A NEW BUILDING





EVERYWHERE THEY LOOK, STUDENTS SEE THE INNER WORKINGS OF THE BUILDING.

66

generators produce electricity and sell power to an electrical utility.

Our display is used as a format for teaching the basic principles of fluid mechanics to the gradeschool children," said Schubert. The company has aligned their display to Next Generation Science Standards and provided a series of lesson plans. "Overall, there is great synergy from having both the university and the school districts collaborating on the use of the building's space. I believe this layout represents a model for university and school partnerships in the future."

#### **TURBINE POWER**

The wind turbine in front of the building and the solar cells on the roof feed part of the power

demand of the school. "So many of these things can be incorporated directly into the curriculum, without needing to go to another location or company," said Bill Spitzig, global operations manager for Cabot Microelectronics. "Students can learn by simply living in that environment." In addition to their professionals' support of the curriculum, Aurora-based Cabot Microelectronics also helped to fund the materials science laboratory used by both STEM Partnership School students and university students.

The wind turbine demonstrates to both elementary and university students "the relationship between the atmospheric conditions and the ability to generate electricity," Cordogan said. The wind turbine also reflects "the tendency in America to try to develop more wind-oriented electrical generation." Monitors show the connection between wind speed and how much electricity is being generated.

The solar panels and the wind turbine interact with the electricity grid, so that when the building generates more power than is being used, the excess power is sold back to the local energy supplier. "At that point, our meter essentially spins backward," said Cali.

#### **COLLABORATIVE CHEMISTRY**

In contrast to old-school chemistry labs of long, rectangular benches, where students worked by themselves, the new laboratory tables resemble the shape of a kidney bean, so that multiple students



can gather around a table to work collaboratively. The height of the tables can also be adjusted, depending on the age of the student.

"Most buildings, especially schools, have all of their utility systems hidden by walls and drywalls," explained Spitzig. "As a result, students do not realize what is feeding in the electricity or the air-conditioning or the water. Because the STEM Partnership School building leaves a lot of the utility systems visible to the pupils, they can see the information technology room where all the wiring is set up and all the servers are located." The same holds true for the utility room, where students can see how the boilers work. These windows into the inner workings of the

# **STEM Partnership School** receives LEED Platinum certification

The large green footprint of the STEM Partnership School was validated in May by being awarded a prestigious Leadership in Energy and Environmental Design (LEED) Platinum Certification by the U.S. Green Building Council. Aurora University received a grant from the Illinois Clean Energy Community Foundation to help fund several of the green elements in the school. "We can see the students' enthusiasm as they learn and grow in this space," said Jeff Cali, assistant vice president for administration at Aurora University.

Unlike most platinum-certified buildings, which are recognized primarily in one area, such as 100% renewable energy onsite (net zero) or recycling rainwater, "we had a wide breadth of credits," said Cali. "Even though we are not a net-zero building, we still have 15% onsite renewable energy." Another innovation was for using the school itself as a teaching tool. "You need to have at least 10 hours of tech credit hours per student for the school to be considered a teaching tool," Cali stated.

All the various components of the building, such as the distribution systems, the roof top garden and wind turbine, can be integrated into the curriculum. "We also received exemplary performance for using recycled materials to build the building," Cali said. This included concrete, wood, masonry block and rubber.

Additionally, innovation was awarded for 100% LED lighting. "We do not use any incandescent or compact fluorescent lamps (CFLs)," said Cali, noting that CFLs contain highly toxic mercury. The building also relies on all green cleaning supplies and has a policy of pollutant control.

Energy consumption in the school is running approximately 38% more efficiently than a typical new building. "This platinum certification is a testament to the hard work and dedication of the many partners involved in planning and construction," Cali offered. "We are all proud of the example this building sets for future school construction throughout the country."

> WE ARE ALL **PROUD OF THE EXAMPLE THIS BUILDING SETS** FOR FUTURE SCHOOL CONSTRUCTION THROUGHOUT THE COUNTRY.



building "help students understand how things are put together," Spitzig said.

### **LESSENING THE CARBON FOOTPRINT**

Apart from the physical transparency of the mechanics and technology, the STEM Partnership School building serves a dual purpose of providing a safe environment for younger students and an inviting and open feel to the entire structure. "The building was carefully designed to maintain a high level of security for the elementary and middle school students, but when you step into the building there is a lot of glass and inner transparency," architect Cordogan said. "We also created efficient building systems that do not use a lot of carbon to heat and cool the building."

16

There are two strong common areas in the building. Upon entering the school, one can visually look into the laboratories, which are used by both the younger students and university students. There is also a gathering space called the STEM Forum which allows students to work on projects collaboratively, a skill corporate leaders described as critical for future success in the workplace.

The collaboration taking place within the school is a tangible force that Eagle is extremely proud of. "Here students are able to connect with what is going on, ask questions and be inquisitive. The entire building conveys knowledge. A visitor recently commented 'All you need to do is stand here and you will learn."

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# Teaching Without an Instruction Manual

WHEN TEACHERS FIRST ARRIVED at the John C. Dunham STEM Partnership School to prepare for the new school's opening in 2014, science, technology, engineering and mathematics would take center stage. They entered a world where teaching and learning was primarily in a digital format and the majority of their instructional materials were open source.

Teachers were provided with a new blueprint for learning that had been developed with shared input from major corporations, not-forprofit partners, representatives from national laboratories, educators from the local school districts and Aurora University faculty. Teachers toured manufacturing facilities and learned about the supply chain process. They had regular interaction with corporate and not-forprofit partners and connected with Aurora University faculty who helped them determine how to best bring STEM concepts alive for their students. A large part of the school day was spent in STEM blocks where English, language arts, mathematics and social studies are integrated into the STEM units.

After a year of seeing students respond to the school's approach, Aurora University's Dr. Ed Howerton became convinced that this is the way to learn. "Science creates the most opportunity for discovery learning," says Howerton, associate professor at Aurora University and director of the STEM Partnership School in its first year. Asking students essential questions about science and supporting them on the journey as they actively dig for answers inspires excitement for learning.

The innovative curriculum grew out of conversations that started years earlier involving AU faculty, corporate partners, teachers and not-for-profit partners to determine what skills students would need to be prepared for the workforce of the future, said Dr. Chetna Patel, chair of physical sciences at AU and faculty liaison for the STEM Partnership School. Led by Pete Wright, Caterpillar's supply chain manager, and Ray Dagenais, who was then with the Illinois Mathematics and Science Academy, the group met at Caterpillar over several months and developed a basic framework of outcomes for teachers and students. The framework focused on four areas: career awareness, interpersonal skills, industrial experiences and design process understanding.

The school's curriculum is organized around six STEM units that spiral through the grades: matter and energy; forces and motion; structure and functions of organisms; ecosystems and adaptations; geology and space; and weather, climate and human impact. For six to eight weeks, the students live and breathe one unit.

Here's how a typical lesson might go: Teachers present open-ended questions to prompt the students to explore different concepts. Students may have to bring in mathematics skills by taking measurements and doing calculations. They may decide it makes sense to find the mean of those measurements, so the teacher may pause and lead a mini-lesson about finding the mean. Later, students may search nonfiction texts for background material on a particular idea. They may create a PowerPoint

SCIENCE CREATES THE MOST **OPPORTUNITIES** FOR DISCOVERY AND LEARNING.

DR. SHERRY EAGLE, EXECUTIVE DIRECTOR OF THE INSTITUTE FOR COLLABORATION AT AU, LEADS A PROFESSIONAL DEVELOPMENT SESSION IN JUNE 2014 ATTENDED BY THE FIRST GROUP OF TEACHERS, STAFF AND AU FACULTY WHO TAUGHT AND SUPPORTED THE STEM PARTNERSHIP SCHOOL. THE SCHOOL OPENED IN AUGUST 2014.

of their findings and present it as a group to their peers. Throughout the day, the unit concepts may be reinforced in art, music and physical education. Students also have instruction in reading and mathematics, among other subjects, to make sure all Common Core State Standards are covered. Dr. Sherry Eagle, executive director of Aurora University's Institute for Collaboration, said the curriculum development process for the STEM Partnership School was unique because the school wasn't just asking the corporate and nonprofit representatives for a few thoughts about the curriculum; they were inviting the external partners to be part of the design team and to maintain a regular seat at the table. The faculty at the university took a bold step of leading the design,

20



implementation and assessment of the curriculum.

The group realized that teachers often were not made aware of how science, technology, engineering and mathematics could be used in various jobs their students might encounter in the future. Educating and developing STEM teacher-leaders also became part of the school's mission. By bringing in area teachers for two- to four-year assignments to the school, they could expose them to the resources and professional development offered by corporate partners, nonprofit partners and AU faculty. After the teachers' assignments ended, they would return to their home schools as teacher-leaders who could re-energize STEM education.

To launch the curriculum development effort, the university offered a course to introduce

teachers to different industries and current-day manufacturing processes. Cabot Microelectronics, Caterpillar, Exelon, Nicor Gas, Scheck & Siress, Tellabs and Waste Management were among the corporations that became partners. In regular meetings, representatives from these companies explained in detail why STEM was so critical to their industries. "By investing in education, especially in the STEM areas, we are giving students the opportunity to advance their learning and ultimately drive innovation in their chosen careers," said Beth Reese, who was then president of Nicor Gas.

According to Bill Schubert, senior director at Waste Management, "working with the staff and teachers at the STEM Partnership School has allowed our engineers and technicians to participate in a working laboratory to help pioneer educational protocol."

Teachers toured Caterpillar's manufacturing facility, Nicor Gas's natural gas storage facility and spent time at Fermilab's Teacher Resource Center. "This really opened teachers' eyes to see how STEM is so important," Patel said. Through the university's next course, the group immersed itself further in developing the curriculum, using the Next Generation Science Standards as a foundation and aligning instruction to the Common Core Standards.

The school doesn't look like the traditional school. Classrooms and laboratories are filled with students investigating and experimenting in the same facilities used by college students.

Teachers soon embraced the benefits the new school structure gave their students. "We had time and the freedom to answer students' questions instead of always having to redirect them back to the one point we're supposed to talk about today," said Arin Carter, who served as the school's third-grade teacher last year and now serves as the new STEM Partnership School director.

AU faculty members continue to be a resource for teachers, who often want to explore STEM

WE ARE GIVING STUDENTS THE OPPORTUNITY TO ADVANCE THEIR LEARNING AND ULTIMATELY DRIVE INNOVATION IN THEIR CHOSEN CAREERS



6

concepts more deeply outside the classroom. Patel's office is right next to the STEM Partnership School, and she helps connect teachers to faculty specialists in botany, chemistry and other areas. Many teachers may not have been exposed to this level of science since they were in college themselves, Carter said, and appreciate being able to learn from the AU faculty.

The corporate and not-for-profit partners participate in regular meetings with teachers where they discuss how to approach upcoming units and what the partners may contribute in the way of resources or expertise. The corporate partners also developed interactive displays that are used to connect the concepts students are learning in class to the work these companies do in the field.

In her visits to classrooms, Angela Whitfield, director of operations and technical standards for Nicor Gas's parent company, AGL Resources, said she was surprised by the careers the students already were considering. "Occasionally, you'd hear the usual firefighter or police officer, but more often, it was astrochemist or forensic psychologist," she said.

For year two and beyond, the focus for the John C. Dunham STEM Partnership School will be to further refine the curriculum to reflect the needs of its students. "I would expect the curriculum to continually evolve," Eagle said. "It's grounding on currency is truly important."





# Meet New Director Arin Carter

When Arin Carter saw how her third-grade students were engaging in the STEM units during her first year as a teacher at the John C. Dunham STEM Partnership School, she knew the learning strategies utilized at the school would be effective. "Never in my career had I seen students so motivated and excited to learn. I'm not talking about two or three students, it was my entire class," Carter said.

Carter, who has both a bachelor's in elementary education and a master's in curriculum and instruction from Aurora University, had originally been selected for a four-year teaching commitment at the John C. Dunham STEM Partnership School. But she emerged as the new director when Dr. Ed Howerton's term as interim director ended and he returned to his role at the University's School of Education. Coming from within the current staff, colleagues said she brings an intimate knowledge of the school's mission and vision, an educator's knowledge of what good teaching looks like and a positive attitude that resonates across the school.

Dr. Sherry Eagle, executive director of AU's Institute for Collaboration, said a teacher from within the school was a logical choice for the new director. "That is the goal — to develop teacher leadership, and we actually are demonstrating that within our own school," Eagle said.

Dr. Chetna Patel, AU's faculty liaison to the STEM school, agreed that Carter could push the school ahead in its second year.

"She has a good understanding of the vision of the STEM Partnership School, which is all about collaboration, sustaining the partnerships we currently have and using the faculty to support the teachers and students," said Patel. Carter's Aurora roots run deep — she

was born and raised here, and is a graduate of West Aurora High School. She then worked as a teacher in the West Aurora School District for 13 years. In addition to two degrees from AU, she also has a second master's degree in educational leadership from the American College of Education. As for the year ahead, Carter said she is focused on welcoming the new students and the teachers being added to the school from Batavia School District 101, which has joined as a partner. She also is excited to expand her work with other partners and the university. "Those connections are such an important part of what makes our school different," Carter said. "Each touch point contributes something special to the overall experience and to the education of our students. It's a main reason why I have the best job in the world."

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24



# HOW DID THE JOHN C. DUNHAM STEM PARTNERSHIP SCHOOL PERFORM IN ITS FIRST YEAR?

A RECENT EXTERNAL, INDEPENDENT EVALUATION OF THE SCHOOL'S PERFORMANCE IN YEAR ONE HIGHLIGHTED SEVERAL **CAUSES FOR OPTIMISM, MOST NOTABLY, THE COLLABORATIVE** SPIRIT THAT SPARKED THE **CREATION OF THE SCHOOL.** 

A value for diversity and the respect exhibited in the school's partnerships were cited as strengths of the school.

In 2014-2015, the Dunham STEM Partnership School completed the first year of enacting the vision of a multi-generational STEM living laboratory for four districts. Built on a history of collaborative STEM learning and led by the Institute for Collaboration, the school showed progress in implementing several key components of the vision. The quality of the partnerships and STEM Units, key contextual factors established this year, demonstrated important strengths as well as areas to focus improvement in upcoming years.

While building a new model of a school from scratch understandably takes an incredible amount of work and planning, the report noted the progress the STEM Partnership School staff had already made in bringing the STEM-focused curriculum to

life. By the end of the first year, teachers had already successfully implemented the six units of study that had been collaboratively developed by committees of school district teachers, university faculty, corporate partners and not-for-profit partners. All units were aligned with state and national standards.

"The teachers, the faculty, the nonprofit world and the corporate world all have the belief that this is theirs, and they have that ownership because they developed the curriculum collectively," said Dr. Sherry Eagle, executive director for the University's Institute for Collaboration. "In order to do that, educators and our corporate and not-for-profit partners needed to understand each other's worlds and had to be incredibly respectful of those worlds."

As for the impact on the children, one of the goals of the STEM Partnership School is to make children more aware of future career possibilities in the sciences. On that measure, the evaluator found that students in the STEM Partnership School were more knowledgeable of STEM careers in comparison to other students.

In year one, measuring student content knowledge was piloted using one test for the Forces and Motion unit. Elementary students' scores showed statistically significant gains from pre- to post-test. Middle school students' scores did not change at a statistically significant level. The state-required assessments (PARCC) were also administered, however scores were not available at the time of printing. These scores will serve as a baseline for future evaluation.

#### AVERAGE COMPOSITE ATTITUDE SCORE VS. BENCHMARK



Student interviews and surveys indicated that students found the work "challenging but worthwhile" and that they appreciated the access to technology and labs. Students are engaged in hands-on learning and are excited about interactions with partners.

The dual mission of the John C. Dunham STEM Partnership School is to train both students and teachers in STEM, and the school made progress

**A VALUE FOR DIVERSITY AND THE RESPECT EXHIBITED** IN THE SCHOOL'S **PARTNERSHIPS WERE** CITED AS STRENGTHS.

> toward that goal by welcoming in visitors from all sectors throughout the school year. In the course of developing the school, the university also created three graduate level courses for teachers, focused on implementing an integrated STEM curriculum. Teachers in the STEM Partnership School also

26



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began work on a doctorate in curriculum this past summer, participating in a class co-taught by faculty from the School of Education and the College of Arts and Sciences.

As for areas of improvement, the evaluator recommended continued work to formalize how partners and the teachers at the school work together and document their accomplishments. Clearly defined data collection practices will be implemented to maximize the usefulness of the information received.

Partners voiced optimism about what the collaborative nature of the school will lead to in the future. When speaking about Waste Management's involvement in the STEM Partnership School, William Schubert, senior director of disposal operations, states, "The cooperation of industry is necessary to provide this practical perspective and help influence the new methods of STEM education." Dr. Chetna Patel, faculty liaison to the STEM Partnership School, shared a similar perspective. "We never do anything in isolation. It's the faculty, the partners and the teachers." This collaborative spirit is what makes the school special.

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# SCIENCE HAS ALWAYS BEEN IN AURORA UNIVERSITY'S DNA



JUST BEFORE THE TURN OF THE 20TH CENTURY, MENDOTA COLLEGE OFFERED ITS STUDENTS THE OPPORTUNITY TO EXPERIMENT IN ITS STATE-OF-THE-ART SCIENCE LABORATORY. ACCORDING TO THE COLLEGE'S 1898-99 ANNUAL REPORT, "THE AMES' CHEMICAL AND PHYSICAL LABORATORIES HAVE BEEN EQUIPPED WITH APPARATUS AND MATERIAL SUFFICIENT TO TEACH THOSE SCIENCES IN THE MOST THOROUGH AND SATISFACTORY MANNER. ALMOST EVERY EXPERIMENT IN A STANDARD TEXT BOOK CAN BE ILLUSTRATED AND PROVED BY THE USE OF THE APPARATUS ALREADY PROCURED, AND LARGE AMOUNTS WILL BE ADDED EACH YEAR." MENDOTA COLLEGE BECAME AURORA COLLEGE IN 1912, AND WAS LATER RENAMED AURORA UNIVERSITY IN 1980.

29



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> NAMED "MOLECULE OF LIFE" AND DESIGNED BY AU ALUMNUS MICHAEL SHERER, THIS STRIKING AND ELEGANT SCULPTURE STANDS PROMINENTLY ON DISPLAY IN FRONT OF THE JOHN C. DUNHAM STEM PARTNERSHIP SCHOOL. THE PIECE, REPRESENTING STRANDS OF DNA, WAS MOVED FROM ALUMNI HALL IN 2014 TO BE AN INSPIRATION TO THE STUDENTS ATTENDING THE NEW SCHOOL ON THE AU CAMPUS FOCUSING ON SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS. ITS STEEL AND CONSTRUCTION WERE DONATED BY AURORA COMPANY GARBE IRON WORKS.