EMPOWERED
LEARNER

CITIZEN SCIENTISTS

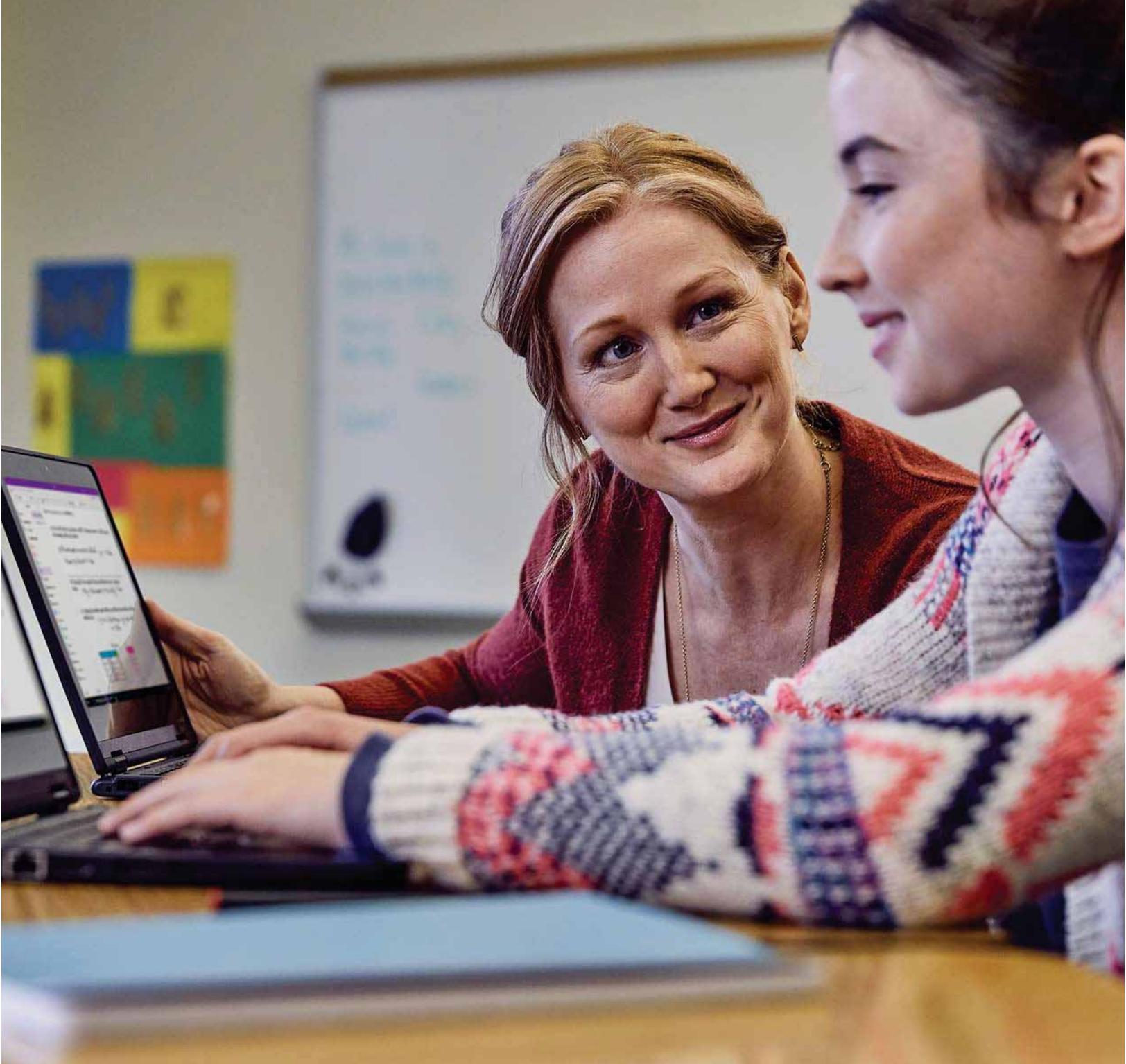**TECHNOLOGY IS BLURRING THE LINES BETWEEN STUDENTS AND SCIENTISTS**

AUTHENTIC INCLUSION

FOCUS ON DESIGN RATHER THAN ACCOMMODATION WHEN USING CLASSROOM TECHNOLOGY

STANDARDS SPOTLIGHT

THE COLLABORATOR STANDARD: RELATIONSHIPS, TRUST MATTER IN COACHING

Help students build future-ready skills, today

Give every student a voice in the classroom with Microsoft tools and technology that help them build the skills they need to be ready for the future.

Free online resources in the Microsoft Educator Center and in-person training at Microsoft Stores help educators find activities, lesson plans, and support to bring a student-centered approach to the classroom.

Microsoft

#MicrosoftEDU
microsoft.com/education

THE EDTECH WORLD IS BIG.
*Start small, find your crew, share in **big successes.***

ISTE Professional Learning Networks (PLNs) are robust peer-to-peer sharing networks that empower ISTE members to connect with other members interested in similar topics.

"The value of joining a PLN is that you meet people with the same interests or who work in an area of education that's very similar to yours, so you can collaborate. You build community and connections across the nation and internationally. It's a chance to really make a home within ISTE that's very personal to you."
–Mia Kim Williams, ISTE Teacher Education Network

With ISTE PLNs you can:

- Attend an ISTE Expert Webinar – 30 minutes to learn something new.
- Ask a question and get real-time support from community members.
- Network with other leading educators and develop long-lasting friendships.

ISTE®
Professional
Learning Network

EMPOWERED
LEARNER

CONTENTS

EMPOWERED LEARNER

![ISTE logo] Connected learning. **Connected world.**

The International Society for Technology in Education (ISTE) is a nonprofit organization that works with the global education community to accelerate the use of technology to solve tough problems and inspire innovation. Our worldwide network believes in the potential technology holds to transform teaching and learning.

ISTE sets a bold vision for education transformation through the ISTE Standards, a framework for students, educators, administrators, coaches and computer science educators to rethink education and create innovative learning environments. ISTE hosts the annual ISTE Conference & Expo, one of the world's most influential edtech events. The organization's professional learning offerings include online courses, professional networks, year-round academies, peer-reviewed journals and other publications. ISTE is also the leading publisher of books focused on technology in education. For more information or to become an ISTE member, visit iste.org. Subscribe to ISTE's YouTube channel and connect with ISTE on Twitter, Facebook and LinkedIn.

Our vision. ISTE's vision is that all educators are empowered to harness technology to accelerate innovation in teaching and learning, and inspire learners to reach their greatest potential.

Our mission. ISTE inspires educators worldwide to use technology to innovate teaching and learning, accelerate good practice and solve tough problems in education by providing community, knowledge and the ISTE Standards, a framework for rethinking education and empowering learners.

For information on advertising in future issues of *Empowered Learner,* please email advertise@iste.org.

Stay connected iste.org

DISTRICTWIDE TRANSFORMATION STARTS HERE!

THE DIGITAL LEADERSHIP SUMMIT IS COMING TO ISTE20!

The Digital Leadership Summit, an integrated event at ISTE20 in Anaheim, brings together system-level leaders worldwide to learn from each other about leveraging the power of technology for systemic change.

Attend to dive into the critical issues all education leaders face and work with other leaders to create actionable solutions.

During this interactive event, you'll also:

- Hear about the latest research into what works for supporting learning with technology.

- Learn how leaders are leveraging the power of technology for systemic change.

- Create a comprehensive plan to accelerate your district's work to incorporate technology to improve learning.

ISTE Digital Leadership Summit
June 28-July 1
Anaheim, California

Learn more at iste.org/DLS

ISTE
DIGITAL LEADERSHIP SUMMIT

We're ramping up for the second annual ISTE Equity Action Forum

By Jessica Medaille
ISTE Senior Advisor

This summer, we'll be hosting the second annual Equity Action Forum at the ISTE Conference & Expo. This is your chance to hear from change-makers, help identify equity issues in education and become part of a team to lead change in your school or district.

It all takes place on Saturday, June 27, from 8:30 a.m. to 3:30 p.m at ISTE20 in Anaheim, and now's the time to apply. In fact, applications are due April 24 (bit.ly/2Gfmybz).

At the first ISTE Equity Action Forum held at ISTE19, a group of dedicated educators came together to learn from experts and take action on issues surrounding diversity, equity and inclusion (DEI) in their own schools and communities.

Over 100 participants and 21 facilitators were first inspired by a panel of change-agent speakers. Then, guided by facilitator Jennie Magiera, president and founder of Our Voice Alliance, the group brainstormed equity issues they wanted to tackle. Once the group's top equity topics were selected, participants worked in teams to begin designing the equity action projects they would pursue throughout the 2019-20 school year.

As Magiera noted, "It's gratifying to see that conversations about equity in education have been happening with more frequency, however, we can and should do more than discuss equity issues. We need to make the leap from talk to action. The ISTE Equity Action Forum is a chance for like-minded educators to take their discussions around inequities to another level and create positive, impactful change."

Here's a look at just a few of the equity action projects in progress:

Concerned about the staggeringly low numbers of people from diverse backgrounds who enter, stay and advance in the field of education, Growing ME: A Mentoring Program Designed to Engage and Empower, is working to virtually match mentors with incoming diverse educators to help them with career access and navigating the first years of teaching and leading as persons of color.

The EduPrideAlliance (edupridealliance. org) came together around a collective passion for inclusion and visibility with the goal of creating community and curating resources to ensure equity and safety for LGBTQ+ educators and students.

Removing Barriers to Learning is working to identify and share Universal Design for Learning (UDL) resources to help remove barriers in the classroom, apply strategies, provide support implementation and analyze the impact on student learning.

The #infoequity team is working to help educators recognize and raise awareness about the disparities in students' level of access to information resources and information-rich experiences.

These teams and others will share their projects and outcomes of their work at a special Equity Ignite Session at ISTE20 in Anaheim on Wednesday, July 1, and several participants will be presenting poster sessions.

If diversity, equity and inclusion are your passion, be sure to apply for this summer's forum. Participation is capped at 100 and requires a year-long commitment. Apply and you could be among the teams that share the results of their projects on stage at a spotlight session at ISTE21!

Join the movement
that's redefining digital citizenship!

Raise your hand and #DigCitCommit

Digital citizenship is critical for today's students and tomorrow's leaders. That's why ISTE and a coalition of like-minded organizations are redefining digital citizenship and shifting the conversation from don'ts to do's.

Inclusive
Open to hearing and respectfully recognizing multiple viewpoints, and engaging with others online with respect and empathy.

Informed
Evaluate the accuracy, perspective and validity of digital media and social posts.

Engaged
Use technology and digital channels for civic engagement, to solve problems and be a force for good in both physical and virtual communities.

Balanced
Make informed decisions about how to prioritize time and activities online and off.

Alert
Aware of online actions, and know how to be safe and create safe spaces for others online.

Make your commitment at digcitcommit.org, then share the five DigCitCommit Competencies with peers, students and parents.

Plus, join us at ISTE20 in Anaheim to engage with coalition members, ISTE authors, youth leaders and a few of the DigCitCommit Challenge winners!

You can help us reach 1 million students worldwide by 2021!

DigCitCommit

digcitcommit.org
#digcitcommit

ISTE

Personalize professional learning to give teachers choice, empowerment

By Desiree Alexander, Ed.S.

All educators have been there.

You walk into a meeting and see a stranger at the front of the room. Someone else says, "Welcome to mandatory training." You look at the agenda and see the topic is something you already know, don't have any interest in or just don't need right now.

You ask the principal if you'll ever get training on that one thing you really need to know. She tells you she doesn't know, but not to forget the most important thing about this training – to sign in because, again, it's mandatory.

I must admit, I used to be that stranger at the front of the room and I always felt bad because I knew you were in my audience. I tried my best to differentiate so your time wasn't wasted, but even as I taught, I knew there was a better way. Personalizing professional learning is one way to ensure this scenario never happens again.

Development or learning

Many of us still use the term professional development (PD) because we're familiar with it, but the term professional learning (PL) is gaining steam because it more accurately reflects an approach that goes beyond developing as an individual.

And adding "personalized" to the term *professional learning* is another way to evolve what has commonly become known as sit-and-get learning. The end goal of a personalized PL experience is for the teacher to be able to use what's learned to positively affect student achievement. Ideally, it involves teacher choice and empowerment.

Educators should learn in the same way we want them to teach. One of the worst things is when someone tells you to be engaging and not teach all students the same way, while they're teaching educators the same way! Personalized PL expects trainers to demonstrate or model how to teach.

One of my favorite quotes is from Cameron Mattis, head of sales at Teachable. He says, "One moment of aha is worth hours of blah blah." When teachers learn exactly what they need or want to know,

they're empowered and willing to use what they've learned in the classroom.

Here are three ways to make that happen:

1. Find out what teachers want.
Personalized PL allows teachers to choose what content to learn, at the level they need, in the format they want. And the best way to do this is by asking them. You can easily create an online survey using Google Forms, Survey Monkey or another free tool. Need help getting started? Here's one I created: bit.ly/35lBIGV.

2. Offer choices.
Once you've evaluated the survey results, make a list of the top three or four topics that teachers are interested in. Rather than presenting one topic on one day to many teachers, offering choices ensures that teachers are more likely to come away from a session with training that they were looking for. You can also offer sessions at different levels, such as beginner and advanced classes on the same content.

Consider offering asynchronous sessions too, so teachers can learn at their own pace. Self-paced learning can take the form of videos, online classes, webinars, written tutorials, etc.

3. Enlist teachers to deliver sessions.
Chances are, you probably know a lot of teachers who specialize in particular topics. Ask some of them to present to their peers and make sure you offer compensation in the form of comp time, gifts or even just recognition. Tapping teachers not only expands your PL resources, it gives educators opportunities to develop and grow leadership skills.

Ain't nobody got time for that!
I know some of you reading this are feeling that there's just not time to personalize professional learning. I admit it can seem overwhelming at first, but there are some easy steps to help you get started.

If you're a teacher, take control of your own learning. You don't have to wait for permission to learn. Watch a YouTube video, reach out to another educator, attend a lunch-and-learn webinar or go to a weekend workshop.

If you're responsible for providing PL, speak up for personalized PL. It's not that people want to provide ineffective, unengaging PD, but most don't know another way. Start by promoting the personalized model and show how it can make a difference.

Whatever your role, you can play a part in making personalized PL work for you! ¡

DESIREE ALEXANDER, ED.S., IS THE REGIONAL DIRECTOR OF NORTH LOUISIANA FOR THE ASSOCIATED PROFESSIONAL EDUCATORS OF LOUISIANA AND THE CEO OF EDUCATOR ALEXANDER CONSULTING, LLC. AN AWARD-WINNING EDUCATOR FOR 18 YEARS, SHE'S ALSO A MEMBER OF ISTE'S DIGITAL EQUITY NETWORK.

"You don't have to wait for permission to learn. Watch a YouTube video, reach out to another educator, attend a lunch-and-learn webinar or go to a weekend workshop."

INTERVIEW

Yaireska Collado-Vega, Ph.D., explains the importance of space weather and shares how students can prepare for STEM careers like hers.

YAIRESKA COLLADO-VEGA, Ph.D.

NASA RESEARCH ASTROPHYSICIST SHARES HER TRAJECTORY FROM STUDENT TO SCIENTIST

By Julie Phillips Randles

It's 11 p.m. Yaireska Collado-Vega, Ph.D., gets a text message from her colleagues warning that there's a lot of activity on the sun. Think solar flares or particles exploding – strong, fast-moving, sun-based weather events that could affect instruments on a NASA mission, power grids on Earth or astronauts in space.

Collado-Vega, a research astrophysicist at NASA's Community Coordinated Modeling Center (CCMC) at Goddard Space Flight Center, uses the tools and simulations on her computer to see exactly what's happening. Then she gathers with other scientists in the Space Weather Forecasting Team at the CCMC laboratory to discuss the event, review simulation results and provide predictions to NASA missions.

She's in the room because in the 1980s, a lower middle-class family from Puerto Rico saved up for a trip to Disney World and a visit to the Kennedy Space Center Visitor Complex in Cape Canaveral, Florida. The space center stop was for then 6-year-old Yari who loved anything to do with space and declared she wanted to work at NASA.

Collado-Vega started with a bachelor's of science in theoretical physics at the University of Puerto Rico-Mayaguez, then three years later walked away with a master's in physics. Without taking a break, she plunged into her doctorate, earning a Ph.D. in space physics from The Catholic University of America, passing with honors and membership in Sigma Pi Sigma Physics Honor Society. Her thesis title: "The Evolution and Motion of Transient Events in the Solar Wind-Magnetosphere Interaction."

Yaireska Collado-Vega says space weather forecasting is important because it protects many of the technologies we use every day.

PHOTO BY GENNA DUBERSTEIN/NASA

> **"**
>
> Her team sends the information that helps NASA missions decide whether to turn their satellites away from the sun or shut them down temporarily so they aren't damaged during a solar event.

But Collado-Vega wasn't merely sitting behind a desk with her nose in a book. She grabbed the opportunity for a summer internship at the NASA Goddard Space Flight Center, studying the sun-Earth connection by identifying magnetopause boundary crossings using observations from various spacecraft. For more than eight years, she was a graduate student trainee at NASA's Geospace Physics Laboratory. She clocked in as a teaching assistant at both of her universities. She was also an adjunct professor of general physics at Stevenson University in Maryland.

Each step was leading to her goal from the very beginning: In 2013, she accepted a position as a space scientist at Goddard. Her official role was as lead and senior forecaster for the space weather forecasting team.

Her team sends the information that helps NASA missions decide whether to turn their satellites away from the sun or shut them down temporarily so they aren't damaged during a solar event. And because

she also serves as an education and public outreach specialist for the team, Collado-Vega has become the go-to person for stories about eclipses, sunspots and solar storms. She's appeared on camera enough to be listed on IMDb.

In fall of 2019, she was promoted to research astrophysicist at Goddard, continuing to study the effect solar phenomena has on Earth's magnetic field, environment and satellites.

"We are more dependent on technology than ever before, so space weather forecasting is so important because it protects the technology we use every day," Collado-Vega has told reporters. "Everybody has a cell phone and everyone uses GPS, and if we aren't prepared for a coronal mass ejection, that can affect everyone."

But what makes her heart sing are the opportunities she can use to be a role model. Take, for instance, the 8-year-old girl who wanted a signed picture at the Total Solar Eclipse show late last year. "I felt so happy
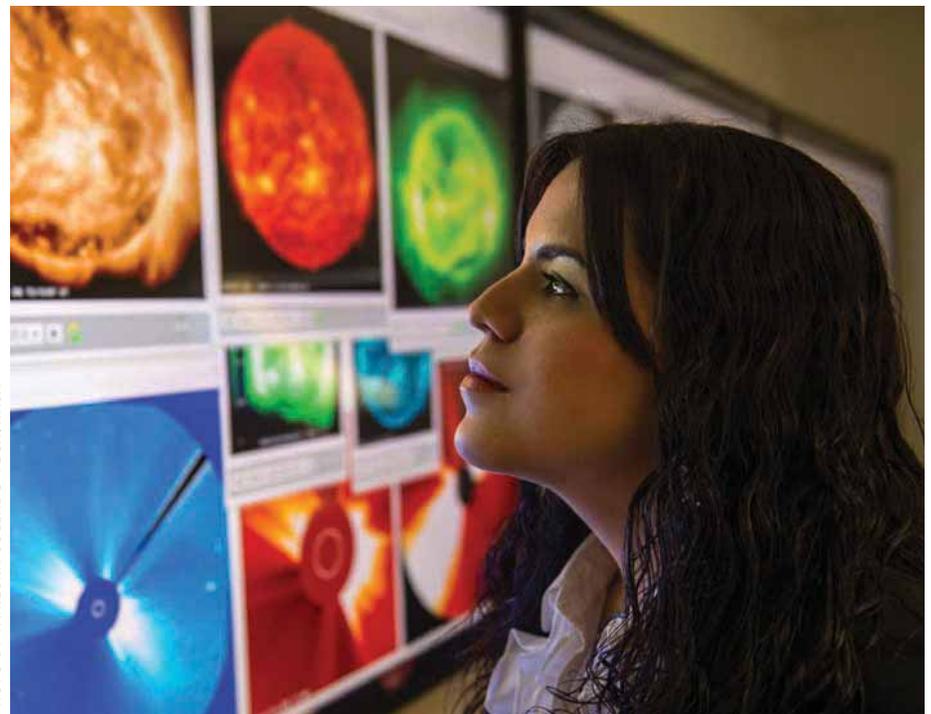

PHOTO BY YAIRESKA COLLADO-VEGA/NASA

and flattered," Collado-Vega shared on her Facebook page. "That is my ultimate goal. I want girls out there to know that anything is possible."

For nearly a decade, ISTE has collaborated with NASA to provide educators with resources to involve students in real-world scientific study. We sat down with Collado-Vega to discuss her career, how students can prepare for similar roles and how her work protects us from space weather.

IN ADDITION TO BEING A SCIENTIST, YOU DO PUBLIC OUTREACH AND EDUCATION FOR NASA'S COMMUNITY COORDINATED MODELING CENTER. HOW DID YOU LAND IN THAT ROLE? AND WHAT DO YOU ENJOY MOST ABOUT IT?

When I started, I noticed there weren't many females in the field and also that there weren't many Hispanics. Sixteen years ago at Goddard, I think I was the only Spanish-speaking person in the whole building.

After being a summer intern for NASA, I went back to Puerto Rico and started doing presentations about my work and I noticed that people got excited about it. I decided to do the same thing when I came back to Goddard as an employee.

I remember one time that really had an impact on me. I was giving a presentation at a school in Washington, D.C., and when I finished a little girl came to me and said, "I didn't know I could become a scientist." That will stay with me forever.

After that I thought, "This is going to be one of the things that I'll do in addition to my work: showing people that you can be a female, you can be a scientist, you can wear makeup, you can be whatever you want, and you don't have to follow any stereotype."

I like the student interaction and seeing the faces when I explain something scientific and people actually understand it. When I do a presentation, I try to make sure I understand who the audience is and that they can really grasp the science.

We do extremely important and exciting work, and sometimes people don't know how to explain it. That's why people don't care about it. But when you change the way you explain things and people understand you, then they say, "Oh wow, this is amazing" and they really get into it.

When I speak in schools, I love hearing that students are interested in physics or some other scientific field; that's really rewarding.

THERE REMAINS A LACK OF WOMEN AND PEOPLE OF COLOR IN THE SCIENCES, ESPECIALLY SPACE SCIENCES. WHAT DO YOU THINK IS THE SINGLE MOST IMPORTANT THING EDUCATORS AND OTHERS CAN DO TO ENCOURAGE UNDER-REPRESENTED GROUPS TO PURSUE SCIENCE?

That's a very tricky question. Sometimes the people on TV or in documentaries talking about science are all very similar. You need to show the actual people doing this work and that there are young people out there working hard to make things happen. Don't just show the senior scientists. Also show the young scientists working on the instrumentation or working on the mission. It's important to show everybody that's working in science.

If you're a female scientist, go to schools; let students know that they can become a scientist. Sometimes there's a stereotype and we have to break that. Even this article is making a step toward that. People see differences, they see diversity.

YOU'VE SAID THAT YOU WANTED TO BE A NASA SCIENTIST WHEN YOU WERE 6 YEARS OLD. WHO WERE SOME OF YOUR ROLE MODELS IN SCIENCE?

I was 6 years old when I went to Kennedy Space Center and said I wanted to work for NASA. I always liked science and was very curious. At first, like a lot of kids, I wanted to be an astronaut. But as I grew up, I learned more about the entire science field and

PHOTO BY YAIRESKA COLLADO-VEGA/NASA

> 66
>
> This is going to be one of the things that I'll do in addition to my work: showing people that you can be a female, you can be a scientist, you can wear makeup, you can be whatever you want, and you don't have to follow any stereotype.

> **To be honest, my first physics class was really hard and by the middle of the semester I was ready to quit and change majors.**

physics in particular. In high school, I wasn't sure what I was going to do with my life. I actually applied to study tourism and I also looked into law school.

But then I decided to stay with what I really liked, which was physics. I went to University of Puerto Rico-Mayaguez and I started the physics curriculum. To be honest, my first physics class was really hard and by the middle of the semester I was ready to quit and change majors. I went to one of my professors, one of the best professors I've ever had, and asked him to sign my withdrawal from the field. I wanted to switch to electrical engineering. He looked at me and said, "You're not going anywhere. You're a very good scientist even though you don't know it yet."

I said, "How can you say that. I have a C in your class." He responded, "We're just starting. You need to let it settle in and be sure you understand it well and you'll see. I'm not going to sign this; just give yourself a couple of months and if you fail the class or you just can't do it, then I'll sign it."

And here I am.

I call this professor my *padrino*, which is like godfather, because without him I wouldn't be here. I really had my mind set on changing majors. He believed in me and convinced me to stay. A month after that I started getting A's on the tests, and I realized I could really do this.

I also always read about famous scientists and I was really into Einstein. I've always been interested in scientists, and I read to my daughter about women scientists and mathematicians like Sally Ride and Katherine Johnson.

WHAT IS "SPACE WEATHER" AND WHY DOES IT MATTER TO US ON EARTH?

Space weather is the conditions in space that are mostly dominated by the sun's activity. The sun has an 11-year solar cycle and every cycle has a maximum and a minimum. In the maximum you get a lot of activity like solar flares and coronal mass ejections, which are the events that can accelerate high-energy particles.

Every single type of activity has a different effect. Some of them can change the environment of the Earth's upper atmosphere, the ionosphere, and that can cause a lot of problems for communications and GPS signals for example. We use GPS not only to know where we're going, but also for credit transactions and for agriculture and we have to protect those assets because we use them all the time every day.

Coronal mass ejections can actually make what we call geomagnetic storms. Those storms can cause problems with the instrumentation of satellites and create energetic particles that travel at high speed. These particles can damage the instrumentation of satellites in space and create a hazardous radiation environment for astronauts.

Right now, we're mostly focused on robotic missions, but we're working very closely with Johnson Space Center on space radiation analysis so we can help develop better models that will provide predictions for solar energetic particles so we have an idea of the radiation environment that astronauts are going to be in when they go to the moon and then to Mars.

WHAT IS NASA DOING TO BETTER UNDERSTAND THE SUN AND PREDICT SOLAR EVENTS?

The CCMC, where I work, hosts state-of-the-art space weather models. The idea is to have them available for the community. We also do validation for the models and prototype new models and tools so they're ready for operations.

PHOTO BY YAIRESKA COLLADO-VEGA/NASA

We're also tasked with helping other organizations with the transitions of the tools we've created to operations. We're the bridge between the developers and the community. We're very strong on the research part but at the same time, we're prototyping those tools and models using forecasting so we can determine if the models are accurate.

PHOTO BY NASA

WHY SHOULD THE AVERAGE TEACHER LEARN ABOUT THE SUN OR SPEND TIME TEACHING STUDENTS ABOUT THE WEATHER THE SUN CREATES IN SPACE?

It's important to understand what can damage the instrumentation of the satellites that are out there because we depend on technology every day. Everybody has a smartphone now and the sun can affect those, too. And the sun can cause power grid disruptions, which has a strong societal impact.

> **We have models, simulations and other tools that can show you the solar system, how the activity of the sun creates an eruption and how it travels and affects planets, including Earth.**

WHAT TECHNOLOGY DO YOU USE TO HELP PEOPLE LEARN ABOUT THE WORK YOU DO? HOW DO YOU USE IT?

We've developed a lot of different tools that are exciting to use and see. Everything for handling forecasting is on our computers. We have models, simulations and other tools that can show you the solar system, how the activity of the sun creates an eruption and how it travels and affects planets, including Earth.

It's really amazing to see that and to show people how we understand the field and how we study it.

HAS YOUR ORGANIZATION EVER AVERTED A MAJOR DISASTER?

We work in support of missions, so we help on the support of those missions in space and the developments of new ones. Sometimes there are anomalies and then we do space weather assessments to help the missions understand what's going on and if space weather was related to such anomaly.

Our work is very important on the development of new missions because of our knowledge of space weather and its many anomalies. Because of our critical assessments, decisions have been made for various missions.

We've also done research into solar storms arriving on Earth, but we haven't had a really strong one since the Carrington Event in 1859.

WHAT MATH AND SCIENCE DISCIPLINES DO YOU USE TO DO YOUR JOB?

I use lots of physics. A lot of math – from calculus to algebra. We use a lot of plasma physics that goes into understanding fluid dynamics and electromagnetism. You have to understand those things and how they work together.

We use computer science and we have computer scientists working with us. And we need a lot of people who are computer science experts because we work with large amounts of data.

I also code. I know several coding languages and I'm learning Python now.

IS THERE ANYTHING YOU WISH YOU OR YOUR TEACHERS WOULD HAVE DONE DIFFERENTLY WHEN YOU WERE A STUDENT?

Actually, I wouldn't change anything. I went to a really good private school from kindergarten to high school, and I'm very grateful that my parents worked really hard to provide that.

I had a very good education. I was lucky that at this school they made sure we knew how to organize our time and learn how to apply ourselves to study.

I'm one of those kids who was in the transition period where we didn't have any computers at school and then we had them. We had good teachers, and I remember having a project when we first got computers where we had to create a program to sell something to people and I had to do the coding for that. It's so great if you're exposed to that kind of work as a kid.

My daughter is in school now and I do believe that we need to let kids be kids also. Things are changing a lot, and it's good if kids get exposed to some things early in life, but sometimes we need to let them be kids. They need that balance and they shouldn't be stressed out.

I see my daughter doing some pretty challenging math in kindergarten and she gets frustrated and sometimes she doesn't want to sit down for a long time. We need to be sure we don't burn them out; they need balance.

WHERE CAN EDUCATORS FIND RESOURCES APPROPRIATE FOR STUDENTS TO LEARN MORE ABOUT SPACE WEATHER?

There's an education tab on the CCMC website (go.nasa.gov/37aRCEs) that goes

to something we call REDI Bootcamp. It has tutorials on space weather and it shows how we analyze it, why we care about it and how we run our simulations. The tutorials can be used for different grade levels.

HOW CAN WE HELP STUDENTS LEARN TO USE TECHNOLOGY IN WAYS THAT PREPARE THEM FOR CAREERS LIKE YOURS?

It's important for them to make sure they do well in math and physics courses and to learn how to code. Having a student that knows Python from school is a plus.

Help students understand coding, how to analyze data, and provide strong courses in science and math. That's the whole package. ⚡

Check out the classroom resources from NASA and ISTE at bit.ly/3989W2t.

> ❝
> It's important for them to make sure they do well in math and physics courses and to learn how to code.

See the ISTE STUDENT STANDARDS in ACTION!

We've unveiled 28 videos illustrating how real teachers address the ISTE Student Standards indicators in their classrooms.

Empowered Learner
(ISTE.org/ELvideo)

Innovative Designer
(ISTE.org/IDvideo)

Creative Communicator
(ISTE.org/CCvideo)

Digital Citizen
(ISTE.org/DCvideo)

Computational Thinker
(ISTE.org/CTvideo)

Global Collaborator
(ISTE.org/GCvideo)

Knowledge Constructor
(ISTE.org/KCvideo)

Watch them all on the ISTE Standards playlist **(ISTE.org/StandardsVids)** or **subscribe to the playlists for each standard.**
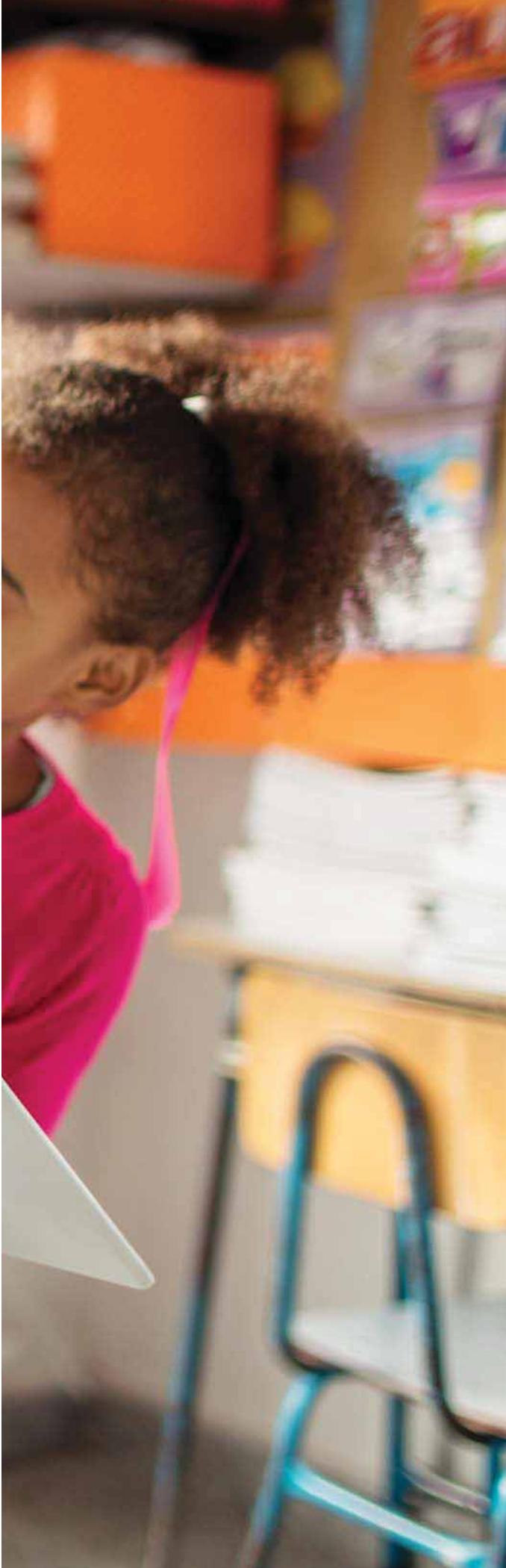
Authentic inclusion

Focus on design rather than accommodation when using classroom technology

By Jennifer Snelling

Educator Chris Bugaj remembers when his daughter was learning about insects and the environment as a second grader. One day, the assistant principal came to school dressed in a beekeeper's outfit. He told the students he was an amateur beekeeper and asked for their help saving his bees because they were dying.

Bugaj, author of *The New Assistive Tech: Make Learning Awesome for All,* recalls that his daughter came home that day ready to save those bees. She and her fellow students did their research and picked a project that was appropriate to their skills and abilities. Some made posters about planting clover, others made verbal presentations on pesticides, a few recorded podcasts with an entomologist.

Flexibility was an integral part of the project because all students were able to use their individual talents to solve a problem. They were able to research by reading books, listening to information using a text-to-speech app or searching online using a program displaying the words with lots of white space to make it easier to read.

Contrast this with the more typical way of approaching inclusion: accommodation.

The instruction usually begins with something like asking students to turn to a certain page in a book, already putting kids with dyslexia and other visual impairments at a disadvantage. Often, a student with a disability may be physically in the classroom, but seated

Authentic inclusion
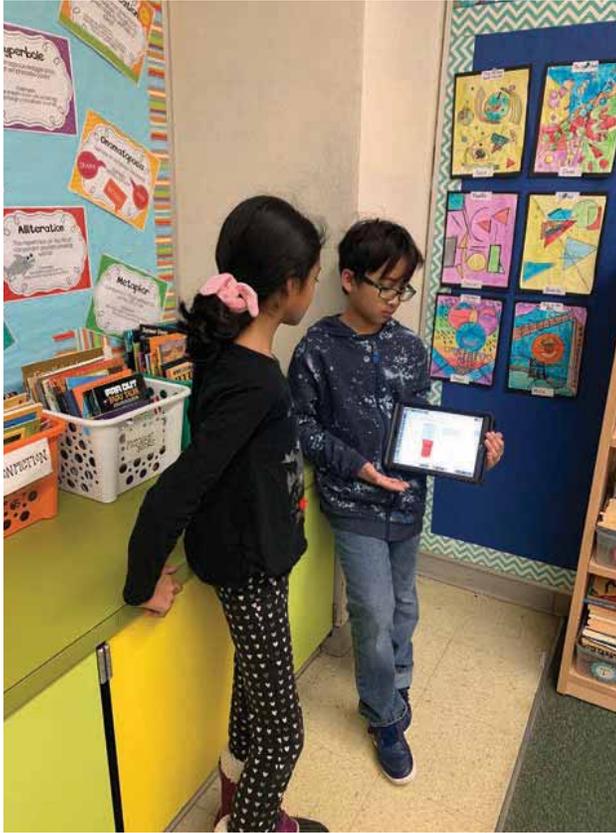
Why not design classrooms and lessons that allow for flexibility in the approach to learning and method of demonstrating that learning? Isn't that truly an equal opportunity for success?

at the back table with an aide. While the rest of the class works on the assignments, the aide adapts the lesson for this student.

Accommodation "is not really about authentic inclusion," says Bugaj. "But rather a way of getting their inclusion numbers up. Instead, imagine if they can use technology to research in whatever way works for them, as well as present that knowledge in a way that highlights their abilities. We need to challenge teachers and administrators to think about authentic inclusion, to think about design instead of accommodations."

What Bugaj is describing is Universal Design for Learning (UDL). The traditional model of inclusion identifies students based on labels or diagnoses and makes accommodations. UDL, on the other hand, starts with acknowledging the variability we all have in learning preferences and motivation.

Why not design classrooms and lessons that allow for flexibility in the approach to learning and method of demonstrating that learning? Isn't that truly an equal opportunity for success?

UDL has three principles:

1. Multiple means of representation, meaning that information is offered in more than one format, such as video or hands-on learning, in addition to textbooks.

2. Flexibility in action and expression, meaning kids have multiple ways to interact with the material and demonstrate knowledge, such as an oral presentation instead of a pen-and-paper test.

3. Multiple ways to tap into student passions. Students can choose from assignments that are relevant to their lives.

The bee project is an excellent example.

If these principles sound familiar it's because they're reflected in the Empowered Learner standard in the ISTE Standards for Students.

"If you design your classroom to meet everyone's needs, anyone can participate," Bugaj says. "I look at where we were 20 years ago. Whereas before we had to fight to get one computer for one kid, now we're living with a plethora of technology and are on the cusp of changing the design of our instruction."

More than differentiation

Teachers are familiar with differentiation and accommodation, but UDL asks teachers to design for students they haven't yet met. Doing so can benefit a school or classroom year after year with a built-in system to address the needs of English language learners, the emotional needs students bring into a classroom and the needs of students identified as gifted and talented. Many schools are already doing something similar using multi-level tiers of support, project-based learning or personalized learning.

Authentic inclusion is the next step.

"UDL is about designing for the disability you will have in your classroom at some time. While a wheelchair is easy for anyone to see, students can struggle with less readily identifiable issues, such as attention deficit disorder, a learning disability or diabetes," says Mindy Johnson, director of digital communication and outreach at CAST, a nonprofit organization that studies and promotes UDL. "Teachers often design for the students they see in front of them, but they may not be seeing the whole student. Accessibility is the welcome mat to learning. UDL goes further by taking into account the way the brain is structured and the networks in the brain that help us learn."

The Every Student Succeeds Act (ESSA) of 2015 was the first time the U.S. K-12 education law defined and endorsed UDL. In fact, UDL is referenced numerous times throughout the bill and states are encouraged to design assessments using UDL principles,

award grants to local education agencies that use UDL and adopt technology that aligns with UDL.

UDL may have started out as a way to address the needs of students with disabilities, but the goal is to help all students become expert learners, beginning with providing a flexible environment.

UDL guidelines fit easily into the ISTE Standards for Students framework because both are about designing for learner variability. UDL provides a road map for developing learner-centered, tech-enriched experiences.

Bugaj suggests backward mapping to understand which tools will be most universally used in a school. For example, start by pulling out all the accommodations for individualized education programs (IEPs) and sort them by frequency. Determine which technology students use most for accommodation. Then use that as a road map to make those accommodations available for everyone. Do this every three years, and, over time, your school or classroom will become increasingly universal.

Closing the achievement gap

Like many school districts, the Groton-Dunstable district in Massachusetts had an achievement gap between students with disabilities and the rest of the student population. The annual progress report and performance index (PPI) for students with disabilities was 42, 33 points below the 75-point target for this population. To put this number in context, the "all students" group scored 89 points. In 2014, the district implemented UDL programming using systemwide professional development, planning time and visioning to create an action plan throughout the district. By 2015, the PPI score for students with disabilities was 64; by 2016, the score rose to 79.

"Our achievement gap was a chasm," recalled Kristan Rodriguez, who was superintendent at the time. "As a colleague often said, 'If the only students who are successful in our schools are those who arrive ready to learn, we have failed miserably.'"

One of the biggest challenges students face is when a medical condition keeps them from attending school. Fairfax County Public Schools has found a technology-based solution that allows for real inclusion, even when a student can't physically be there.

Traditionally, homebound students have relied on a tutor coming to their home once a week. Now, homebound students can attend classes every day with the help of the Fairfax double robot. The wheeled robot with a screen and camera allows Alex, a junior at Chantilly High School, to collaborate on group projects and virtually interact with her peers, despite a medical issue that keeps her at home. Alex has thrived, maintaining excellent grades in her honors class.

We have the tech; now, we need the change

UDL is a mindset and a practice; a pedagogy-first stance. While it can be implemented without technology, the mindset can be optimized through thoughtful use of assistive tech.

Many technologies began as ways to assist disabled students, but have become useful for everyone. For example, touch screens were originally designed for people who couldn't use keyboards or a mouse, but now everyone can use them. Voice dictation and word prediction are also examples of technologies that were designed as accommodations but are now making things more accessible for a variety of students not identified as special needs.

Most schools have access to tools and don't even know it. Companies like Microsoft, Apple and Google recognize that if they build their products with accessibility in mind, they meet the needs of everyone. For example, iPads have a text-to-voice feature that can be turned on in settings. Microsoft has Immersive Reader, which adds spaces for those with dyslexia or visual impairments. Chromebooks have a dark mode for the visually impaired.

Captioning is another example. Some schools have elected to be "captions on," meaning videos always routinely have closed captioning turn on. Some schools ask families to do the same when they watch television at home. This normalizes captioning for all students and helps with reading and language skills.

"The big change is that we don't have to rely on more specialized solutions with technology," says Luis Perez, technical assistance

> Many technologies began as ways to assist disabled students, but have become useful for everyone.

UDL tech tools

Here are some ways UDL tools can help all learners thrive:

Co:Writer and Snap&Read: These Chrome apps offer text-to-speech, word prediction and a screenshot reader.

Learning Ally: Provides audiobooks and support services for students with dyslexia.

Microsoft's Immersive Reader: Microsoft's free extension supports literacy development through screen modifications that include focus mode, which sustains attention and improves reading speed, font spacing and short lines.

iPad accessibility tools: Speak Screen adds auditory reinforcement for students, Safari Reader reduces visual clutter when exploring the web and Guided Access helps learners stay focused in a specific app.

Mindnode: This mind-mapping tool helps students brainstorm. Using graphics and notes, students can connect thoughts and clarify ideas.

Newsela: This database of nonfiction articles on current events are aligned to curricula and available in a number of reading levels. The articles are attached to a comprehension quiz and writing prompt.

specialist at the National Accessible Educational Materials Center at CAST. "Accessibility is built in. That also removes some of the stigma from the tools that has been imbued in the technology from a historical perspective."

Madison Datz, a fourth grade teacher at Horace Mann Elementary in Oak Park, Illinois, began designing her classroom around UDL last year. She used to think of assistive technology as a tool specifically for students with an IEP or a 504 plan but now sees the technology as benefitting all her students.

With the help of an assistive technology coach, Datz's entire class learns to use assistive technology, such as Co:Writer, an app with word prediction. As a student begins to type a word, the app suggests a word as an option, and the student can click on the one they want. The app also reads the students' sentence back to them so they can make sure it is what they intended to say.

Datz says Co:Writer is helpful for struggling spellers as well as English language learners. The assist from the app lets students more accurately represent their knowledge rather than limiting themselves to words they already know how to spell.

Datz recently covered a reading standard that asked students to describe a character, setting or event from a book they were reading. She gave the students options to be creative in how they demonstrated their understanding.

One student wrote a song about a character, videotaped himself singing it and showed it to the class. Another student made a table

using Google Docs and gave each of the characters a grade along with an explanation of their ranking. A third used Explain Everything, a virtual whiteboard, to set up an auction with items from the setting. He priced objects and created symbols for the story, designed graphics and typed out responses. When he hit "play" the class could listen to his auction.

"Kids want to do well, but sometimes when they have barriers, the subjects can become frustrating. They can succeed in content knowledge when you take away the barrier of reading or writing responses," Datz says. "Technology makes the possibilities endless."

Take apps that read back what students write to help them identify errors. Snap&Read lets students choose a dictionary for a particular topic, say Ancient Egypt, and provides vocabulary related to that topic. English learners can type a word in their native language and the app will provide the English word.

"We know that all our students have a lot of variability in the way they learn and how they can show us what they're learning," says Sheri Lenzo, the assistive technology coach who introduced Datz's class to the apps. "Oftentimes, tools that are created to compensate for a disability are good for the general population. We don't want our students who need those supports to feel singled out or self-conscious, so we just make it integrated as part of the regular school materials and teachings."

Lenzo is helping teachers throughout her district apply assistive technology literacy support tools as well as leading workshops for parents on how to use the tools. She says it's often difficult to identify the student with a 504 plan in these classrooms.

As with Datz's class, Lenzo gives everyone the demonstration, then turns them loose. She says it's often the students with the IEPs who have used the tech before who help their peers learn a new skill.

"UDL is a great equalizing platform," says Lenzo. "Students who are good writers, write. Students who use the keyboard, do that. For many students, UDL is a game-changer." ⸜

JENNIFER SNELLING IS A FREELANCER WHO WRITES FOR A VARIETY OF PUBLICATIONS AND INSTITUTIONS, INCLUDING THE UNIVERSITY OF OREGON. AS A MOTHER TO MIDDLE AND HIGH SCHOOL-AGED CHILDREN, SHE'S A FREQUENT CLASSROOM VOLUNTEER AND IS ACTIVE IN OREGON SCHOOLS.
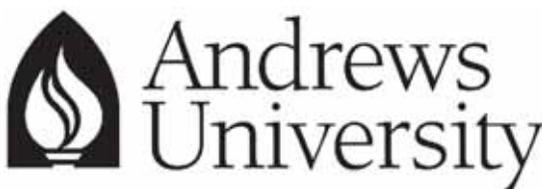
Students' smartphones are centerpiece in debate on privacy

By Jerry Fingal

To learn about the Bill of Rights and the right to privacy, civics teacher Katrina Traylor Rice asks her students to go beyond reading primary-source documents. She actually has them take out their phones and check their privacy settings.

Students quickly learn that some of their apps know exactly where they are and have access to their photo galleries and other personal data. What they may have thought was private isn't.

The exercise is all part of Rice's effort to drive home the Bill of Rights to the 10th grade students in her Introduction to the Law and Speech Communication course at Jesse Bethel High School in Vallejo, California.

"The amendments are really simple," Rice said. "They're actually really short. But really attacking them and understanding their implications is a much more in-depth process."

With the Fourth Amendment, which explicitly prohibits unreasonable searches and seizures, Rice starts with the students watching "Citizenfour," a documentary focused on Edward Snowden's disclosures about a massive U.S. government surveillance program.

The film poses questions about exchanging privacy for national security, and whether more security and less privacy actually makes the nation safer.

"Those are questions I don't have an answer to," Rice says. "I don't teach the unit with the secret answer in my head. It's something that I, as an adult, grapple with. I'm not sure what the best answer is, and I understand both sides of the controversy."

From national security, Rice brings the issue into students' lives through their phones. Students might be surprised by what personal data they're

PHOTOS BY KATRINA TRAYLOR RICE

providing, but they're usually not moved to actually do anything about it.

"What's fascinating is that when they watch the film, they don't like that the government has access to information," Rice says. "But when they look at all the apps on their phone and see how they have access to their information, they're OK with it. I can't explain that because I'm not a teenager. But that's interesting for me as a teacher to see that they generally come to this conclusion that they actually don't want the government spying on them, but if these apps ask for permission, they'll give them all of their data in order to play their game."

The point of the lesson, however, isn't for students to delete apps. It's to make them aware of what they're giving up.

"It's important that students know they have the power to make decisions about their privacy," Rice says.

"It leads to more knowledge and awareness, and shows that they do have options to opt in or opt out, even though opting out might mean they can't use the app. But they're also looking at the bigger questions that our government and our society have to grapple with about whether we're OK with not having as much protection of our privacy as maybe the Fourth Amendment intended."

As part of the project, Rice has the students do a mock Supreme Court hearing where they act as lawyers and argue about whether the government should have access to private information or why smartphone app companies should be able to access personal information. The rest of the students act as Supreme Court justices and decide the cases.

How the students rule varies from class to class. The students are faced with so many varied opinions that it's difficult to come to a unanimous decision, Rice says.

"It varies every period," she said. "But they get a chance to really discuss the issue and learn more about the Supreme Court process and how cases are heard and decided."

If Rice feels a class needs to develop writing skills, she will have students write an opinion about why they agree or disagree with the decision that was made.

Why does it work?
It promotes critical thinking.
Because there is no correct answer, students have to think critically to decide for themselves what they think is right. Is it an unacceptable invasion of privacy when app companies harvest personal data in exchange for using their products and disclose what they're doing? Most students think not.

"I think it's so compelling because they know I don't know the answer and they really feel like they have a voice. They have to figure out what it means to them rather than having to figure out the right answer."

It prepares them to live in the digital world.
Understanding the privacy landscape as it relates to apps and digital tools is an essential skill.

"It adds to their understanding that they need to learn things for themselves," Rice says. "They realize they need to make sure information is coming from reliable sources and then to still be skeptical because sometimes there are things that aren't being shared with us."

It addresses the ISTE Standards for Students.
The project is a good example of Digital Citizen standard 2d: "Students manage their personal data to maintain digital privacy and security, and are aware of data-collection technology used to track their navigation online." (Watch a video on this indicator at bit.ly/39xnK6Z.)

"I think they become more thoughtfully skeptical of information fed to them," Rice says. Students adopt an attitude of "'let me check for myself, let me look at the settings myself, let me do the research and investigate.' And not just accept information as true."

JERRY FINGAL IS A FREELANCE WRITER AND EDITOR SPECIALIZING IN EDUCATION, BUSINESS AND FINANCE.

Citizen scientists

TECHNOLOGY IS BLURRING THE LINES BETWEEN STUDENTS AND SCIENTISTS

By Nicole Krueger

For students in Iqaluit, Nunavut – a fly-in community in Northern Canada – climate change isn't an abstract concept measured in degrees or inches. It's a tangible reality, visible in the sinking pylons that support their homes and the changing landscape that makes traditional hunting grounds inaccessible, restricting their food supply.

"They're living it. They're not just talking about polar bears losing their habitat, but students are seeing that happen. They're seeing polar bears come into their community where they're not supposed to be," says Mali Bickley, classroom collaboration specialist for TakingITGlobal, a nongovernmental organization (NGO) that uses technology to empower students to tackle global challenges.

Isolated on the wrong side of the digital divide, their experiences and observations have gone largely unnoticed by the rest of the world. But that changed for students from Aqsarniit Middle School when they used videoconferencing technology to connect with Lee Gambol from the Cleveland Museum of Natural History. Not only did Gambol teach them the science behind the environmental changes they were witnessing, but the students got to share their first-hand account of what climate change looks like on the ground.

"Students actually taught the expert something she had absolutely no idea about. It was an incredible learning experience," Bickley says. "When they had their voices heard by a climate change expert in the U.S., it really validated their understanding and their voice surrounding climate change."

Across the globe, there's a new synergy forming between students and scientists. Learners of all ages are forming collaborative partnerships with working scientists, participating in authentic scientific inquiry and contributing meaningful data to citizen science projects. Using a broad range of technologies, from smartphones and tablets to videoconferencing and collaborative websites, they're helping to build and analyze vast global datasets and devise solutions to real-world problems.

Citizen scientists

"There's a huge opportunity for our kids to not just stand by and read from a textbook, but for them to see that science is happening now, right in front of them, right outside the door, and they have the ability to contribute to that."

In the process, they're learning that despite their youth, they have something valuable to offer the scientific community.

"There's a huge opportunity for our kids to not just stand by and read from a textbook, but for them to see that science is happening now, right in front of them, right outside the door, and they have the ability to contribute to that," says Janice Mak, K-12 science curriculum specialist for Paradise Valley Unified School District in Arizona.

"Everything technology enables us to do has really democratized education and broken down barriers. It's causing us to question and challenge what we traditionally think of as scientists."

STUDENTS AND SCIENTISTS WORKING TOGETHER

How much water once existed on Mars? How did the planet make the transition to the cold and dry climate that exists today? As scientists puzzle over these questions, they've begun bringing students on board to help study data collected by the Mars Odyssey spacecraft orbiting the planet.

A few years ago, seventh and eighth graders from Explorer Middle School in Arizona joined Arizona State University's (ASU) Mars Student Imaging Project. They selected a specific region of the planet – the Valles Marineris – and launched an inquiry into how the abundance of water-related minerals differed between the deepest and shallowest sections of the valley. They hypothesized that they would find the greatest abundance in the deeper parts of the valley because water collects in low-lying areas.

To facilitate their research, scientists captured a current image of the region using the Odyssey's THEMIS camera, which images Mars simultaneously in five visual and 10 infrared bands or colors. Students analyzed the image, comparing it to past images of the same region, and collected more than 1,000 data points, which they graphed to identify correlations between elevation and the abundance of water-related minerals.

Their research culminated in a paper, which was peer reviewed by a planetary geologist, and a two-day field trip to ASU, where they further investigated and tested their hypothesis under the guidance of an ASU scientist.

"One powerful piece of the equation is students seeing themselves as part of

the collective inquiry and helping to make advances," says Mak, who chose the project for her students because of its alignment with the Next Generation Science Standards (NGSS). "They're no longer just reading about scientific discoveries in a textbook. They can see themselves as a part of the way things are transforming."

Worldwide, hundreds if not thousands of citizen science projects are tapping ordinary people, including students, to help observe, collect and classify data to pinpoint areas for closer study. While NASA satellites can capture thousands of terabytes of data per year, scientists also need on-the-ground measurements to form a complete picture of Earth's complex systems. Citizen science offers a way to ground-troop their data. Through the GLOBE Observer program, whose goal is to study the environment and changing climate, students from more than 119 countries are helping to monitor on-the-ground environmental conditions for NASA, contributing more than 150 million measurements over the past two decades.

"If you want to learn science, you need to do science. This is real science, and students are involved in the entire scientific process," says coordinator Holli Riebeek. "They go out and ask a question, and they have procedures that enable them to take valid scientific observations that a real-world scientist could use. They're actually observing the real world and drawing their own conclusions."

And that's just one example. Using websites like SciStarter and Zooniverse as a jumping-off point, educators can find authentic research projects for almost any subject or geographic location. Students can take photos of their backyards to help identify potential mosquito breeding sites, analyze images of space for anomalies that could indicate a hidden planet in our solar system, or use their smartphones to measure the size of trees. They can also access real-world scientific datasets for use in their own classroom projects.

PHOTO COURTESY OF ALLISON SHELLEY/THE VERBATIM AGENCY FOR AMERICAN EDUCATION: IMAGES OF TEACHERS AND STUDENTS IN ACTION.

"Citizen science projects provide students the opportunity to ask and answer questions, and experience true scientific discovery and the joy of learning something completely new – qualities often stripped from science education that relies on demonstrations of concepts rather than inquiry and scientific skill-building," says Christine L. Goforth, head of citizen science at the North Carolina Museum of Natural Sciences in Raleigh.

REAL-WORLD SCIENCE? THERE'S AN APP FOR THAT

Students at Medford Memorial Middle School in New Jersey wanted to help reduce the threat of mosquito-transmitted disease in their region, where 44 cases of the West Nile virus were reported in 2018. They decided to launch an investigation into where disease-bearing mosquitoes might breed during their active season.

"If you want to learn science, you need to do science. This is real science, and students are involved in the entire scientific process."

Citizen scientists

"A lot of the tools and sensors people use for science data collection are becoming accessible"

Through Mosquito Habitat Mapper, a NASA-sponsored citizen science project that invites teachers and students to scout their communities for potential breeding grounds, they learned how to identify and report such locations via an app to help scientists predict future disease outbreaks. Unsatisfied with merely walking around their schoolyard and making on-the-ground observations, however, the students researched how scientists are using drones in Central America and Africa to identify potential breeding areas.

"They decided to use drone technology to fly over six of the schools in their districts and use images from the drones to help them identify where to go and look for mosquito larvae in the spring," says Dorian Janney, campaign coordinator for the GLOBE Mission Mosquito citizen science community.

Such inquiries wouldn't have been doable a decade ago. Advances in technology have made powerful data collection tools widely accessible for average citizens, including students. Affordable photography drones are now sold in toy aisles. For less than $10, a smartphone owner can buy an attachment that magnifies images up to 60 times – helpful for identifying different types of mosquito larvae, Janney says.

"The combination of smartphone technology and the internet makes things possible that weren't possible even 10 years ago," Riebeek says. "A lot of the tools and sensors people use for science data collection are becoming accessible. We're not using multi-thousand-dollar sensors anymore. You can get an infrared camera put on your smartphone now."

Participating in citizen science projects not only helps students think like scientists, but it teaches them that a smartphone can do more than just play YouTube Videos – it can double as powerful data-collection tool.

"They have this powerful tool right in their pocket with a camera and an accelerometer and a magnetometer," says Ben Smith, supervisor of educational technology at Lincoln Intermediate Unit in Pennsylvania.

"The biggest thing their phones can do is reporting. They can open up an app and take real-time measurements with it and report those out. That's the best tool there is. They also have the camera so they can take pictures of wildlife and upload them to different sites that study biodiversity. The camera can also be used to capture light pollution. There's a magnetometer for measuring magnetic field strength and an accelerometer to measure the acceleration of gravity."

Apps like Google's Science Journal can help students explore the scientific capabilities of their tablets and smartphones and begin experimenting with the built-in sensors many don't even realize their devices have. Mak has used the app with kids as young as third grade.

"Putting the power of technology in their hands, connecting it with science and the world around them, and pairing it with the human ability to make observations and from those find patterns – that's the power," she says.

FROM CITIZEN SCIENTISTS TO GLOBAL CITIZENS

The world has lost nearly 20% of its coral reefs to pollution, overfishing and coastal development. Today, more than 60% are now under immediate threat. In Malaysia, whose living reefs diminished 5% between 2012 and 2017, high school students studying the global loss of coral decided to take action.

Students at MARA Junior Science College of Merbok in Kedah, Malaysia, took to the water to pursue their studies. They learned how to snorkel so they could see the effects of coral reef loss firsthand.

After Skyping with marine biologist Puteri Nurshazmimi Binti Zaidi, they used Minecraft Education to design a coral cage, a type of underwater device scientists are using to encourage rapid coral growth.

The project culminated in a final dive to submerge their cage and plant new coral to help replenish the local reef population.

They conducted their research in 2019 as part of The Goals Project, a global effort to enlist students in advancing the United Nation's Sustainable Development Goals (SDGs). The UN identified these 17 global goals, which span a range of social, economic and environmental issues, in 2015 to create a blueprint for a more sustainable future. Last year, more than 1,600 classrooms participated in projects related to the goals, many combining scientific inquiry with environmental stewardship.

"I believe part of the work of teachers is to create a world of global citizens, and one of the best ways to do that is to help them develop an understanding of what's going on in the world, to interact with others around the world to solve authentic problems," says Elizabeth Azukas, Ed.D., assistant professor of professional and secondary education for East Stroudsburg University in Pennsylvania.

"We need to focus on implementation of a more global curriculum. That is the world that students live in, and it will continue to become even smaller in some ways. When we're talking about issues related to the ocean, for example, it becomes really complicated because no one country owns the ocean, and there's no governing body for the ocean. How do we negotiate those types of things together?"

Teaching the SDGs is just one way educators can use scientific inquiry to craft students into responsible global citizens. Participating in real-world science offers numerous benefits even for students who don't go on to pursue scientific careers. As voters and environmental stewards, they'll

"I believe part of the work of teachers is to create a world of global citizens, and one of the best ways to do that is to help them develop an understanding of what's going on in the world, to interact with others around the world to solve authentic problems."

Citizen scientists

be more prepared to make informed decisions about natural resources. They'll also have a framework to rely on if they ever feel their community is under threat.

"If these students are curious about the air quality of their neighborhood since a new factory moved into their town or are concerned about the impact of local logging being done in the national forest in the surrounding mountains, they will have participated in science studies, collected data and have the necessary experience to begin researching and studying these things for themselves," science teacher Lynda Jenkins writes in the *Cultural Studies of Science Education* journal.

In a "post-truth" era, these authentic science experiences can also help ground students in the scientific method as a way of thinking critically and sifting through misinformation.

"Students are collecting their own data and drawing their own conclusions. One of the powerful aspects of citizen science is that when you think about the attack science is undergoing, particularly climate science, we want students to be able to debunk what fake news is by taking their own measurements and doing their own science," Smith says.

"Students gain an appreciation for the life that's around them," Smith says, "and that's what serves them best down the line because if they understand how to take these measurements and develop their own conclusions, they'll be in a better situation to appreciate and also apply those lessons later in life." ⚲

NICOLE KRUEGER IS A FREELANCE WRITER AND JOURNALIST WITH A PASSION FOR FINDING OUT WHAT MAKES LEARNERS TICK.

Tools for teaching real-world science

Interested in bringing more authentic scientific inquiry into the classroom? Below is a starter toolkit to help educators begin integrating citizen science and the UN Sustainable Development Goals (SDGs) into the classroom.

SciStarter: This teacher-friendly site lets educators search more than 3,000 citizen science projects by location, scientific topic and age level. It's like Match.com for citizen science. **scistarter.org**

Zooniverse: Another popular platform for people-powered research, Zooniverse connects citizen volunteers of all ages to real-world science projects. **zooniverse.org**

iNaturalist: A joint venture between the California Academy of Sciences and the National Geographic Society, this app lets users record their observations of the natural world, share them with other naturalists and discuss their findings. **inaturalist.org**

The GLOBE Program: Educators can browse classroom activities and other free resources for this NASA citizen science project, or they can dive deeper by joining the program, completing the training and implementing GLOBE science protocols in their classrooms. **globe.gov**

Smithsonian Science for Global Goals: Engage students in inquiry-based experiences in their local community with these field-tested and age-agnostic educational materials related to the SDGs. **ssec.si.edu/global-goals**

The Goals Project: Join a network of classrooms across the globe as they work in tandem to help advance the SDGs. **goalsproject.org**

SDGs in Action: Ready to take action on the SDGs? This app lets you invite others to participate in your events and see what others are doing to advance the global goals. **sdgsinaction.com**

STANDARDS
SPOTLIGHT

*Clara J. Alaniz unpacks two Collaborator
standard indicators from the new ISTE
Standards for Coaches.*

The Collaborator Standard:
Relationships, trust matter in coaching

By Clara J. Alaniz

As a district-level specialist in the Plano (Texas) Independent School District, I support 7,000 staff members and 53,000 students. That's a lot of people – too many, of course, to work with individually! But still I make a point to work with individual educators as much as possible because in my role, relationships matter.

Coaching is just one part of my daily responsibilities as a digital learning spe-cialist, but it's an important part, and the refreshed ISTE Coaching Standards help me in this role. The Coaching Standards describe the skills and knowledge coaches need to support educators with effective technology integration.

The Collaborator standard within the Coaching Standards instructs coaches to "establish productive relationships with educators in order to improve instructional practice and learning outcomes." I'd like to share how my relationship with one educa-tor addressed two of the indicators of the Coaching Standards.

In 2014, I was leading a professional learning session when I met Rocio, a teacher at a middle school in my school district, who mentioned an interest in digital learning. In the months that followed, I saw her in a few professional learning sessions that focused

"Partner with educators to identify digital learning content that is culturally relevant, developmentally appropriate and aligned to content standards."

on digital tools. It was clear to me that she was eager to learn new and innovative practices to use in her Spanish classroom. I asked her to reach out to me with any questions or if she ever wanted to collaborate during a planning period.

I made it a point to stop by her classroom when I was visiting her campus. Sometimes, I would just say hello and other times we would chat about an upcoming lesson she had planned. These casual chats turned into deeper conversations that focused on the digital tools she was selecting for her lessons and how the tools would improve student learning. I made sure to follow up with her and ask how the lesson went. I wanted to reflect upon the lesson with her so I could better understand how she integrated digital tools. I also wanted to make myself available to her and reassure her that I was her partner.

ISTE Coaching Standards 3a: *"Establish trusting and respectful coaching relationships that encourage educators to explore new instructional strategies."*

The key to addressing this indicator is active listening. In our conversations, I discovered how Rocio likes to learn and explore

new instructional strategies. I learned how she implemented those new strategies. I understood the learning goals she established for her students.

I worked to provide the kind of learning opportunities that suited her, but also pushed her slightly out of her comfort zone. Rocio has a 1:1 Chromebook classroom and wanted to try giving the students more opportunities to create presentations using digital tools and give feedback to each other. Rocio trusted me to take her out of her comfort zone because she knew my intention was to support her growth, but more importantly, she knew that I respected her and listened to her. As the years have gone by, our trustful bond has only grown stronger.

I guided Rocio through a few digital tools that were completely new to her, and I presented the tools in a way that was respectful of her preferred way of learning. Together, we evaluated the tools to see which one would best support the learning goals for the lesson.

ISTE Coaching Standards 3b: *"Partner with educators to identify digital learning content that is culturally relevant, developmentally appropriate and aligned to content standards."*

Recently, Rocio asked me to collaborate with her and another middle school Spanish teacher, Janeth, for an upcoming lesson. The English-speaking students were going to compare a home in the United States to a home in a Spanish-speaking country. Previously, they had students demonstrate their learning by presenting a slideshow of images. In an effort to address ISTE's Empowered Learner Student Standard 1c, the teachers wanted to explore digital tools the students could use to demonstrate their learning in different ways as well as provide feedback to each other.

For our first step, we filled out a TPACK (technological, pedagogical, and content knowledge, tpack.org) chart. We clarified the content standards and defined what we wanted the students to learn and understand

by the end of the lesson. An established learning target in the lesson was for the students to demonstrate an understanding of Spanish vocabulary words related to daily routines of home life. Students would also demonstrate a respectful view of cultural differences and perspectives while curating their own cultually relevant resources. Additionally, students would have opportunities to select and evaluate digital resources – which addresses ISTE's Knowledge Constructor standard indicators 3b and 3c – and apply standard methods for citing sources – which addresses Digital Citizen standard indicator 2b.

For our second step, we reviewed whether a new digital tool would improve student learning. Rocio knew that I view her as the expert of her classroom. She knows the content and the learners in a much deeper way than I do. Together, we used our collective knowledge and expertise to plan meaningful learning experiences for the students. We selected Padlet for this lesson because it has 10 different ways for students to demonstrate their learning, including videos, screencasting, voice recording, digital maps and images. The students were given the opportunity to choose any of the 10 formats, or a combination of them, to create their presentation. Also, we had students use the commenting feature in Padlet to provide feedback to each other.

During the lesson, the students were to search for their own images, citing sources correctly along the way. The images of the homes would be arranged in an order that explained the similarities and differences of daily life at home. The students could use the integrated features of Padlet to create and deliver their oral presentations.

The students then had a "gallery walk" within Padlet to listen to the presentations of other students. Because the oral presentation were recorded, the students had an opportunity to re-play, if necessary. They could also comment below each presentation to provide feedback. This made the lesson more engaging and also allowed the students to practice the ISTE Student Standards of Digital Citizen and Creative Communicator.

The students enjoyed the lesson, and the teachers were very pleased with the results. It was their first time using Padlet, so they helped each other troubleshoot and learn how to make their visual presentations. One student chose to use the map feature in Padlet. On the global map, he pinned where his home is located in the United States and pinned a home in El Salvador.

When the students clicked on a pin, a text bubble appeared with descriptions of the homes, written entirely in Spanish. He pointed out their differences but found many more similarities. He called his presentation, "*Mi Casa es tu Casa*" which literally translates to "My House is Your House." But this expression has a much warmer translation, which is "make yourself at home."

Throughout the process of designing this lesson, we knew we had the same goal – to improve instructional practices and learning outcomes. It can be somewhat difficult to be this open with a colleague, but because we are true partners, the process was enjoyable and served to make our bond even stronger. An added bonus of this particular collaboration was the other Spanish teacher, Janeth. Through this process, Janeth and I began our own journey toward a trusting and respectful relationship.

When working with any educator, it's my goal to establish trust so we can build a relationship. When I first met Rocio, she stood out to me because she mentioned an interest in digital learning. However, even if an educator doesn't mention that, it's my hope that in all professional collaborations, there's always a sense of respect and trust as we work toward common goals. It's my hope that there's joy in working with each other. It's also my hope that they're so comfortable, they're "making themselves at home" in our collaborations.

CLARA J. ALANIZ HAS BEEN AN EDUCATOR SINCE 1999, SERVING AS A CLASSROOM TEACHER AND A DIGITAL LEARNING SPECIALIST. SHE'S AN ISTE CERTIFIED EDUCATOR WHO SERVED ON THE TECHNICAL WORKING GROUP TO REFRESH THE ISTE EDUCATOR STANDARDS IN 2017 AND THE COACHING STANDARDS IN 2019.

Don't miss *Transform Learning Through Technology: A Guide to the ISTE Standards for Coaches*, included with this issue.

"When working with any educator, it's my goal to establish trust so we can build a relationship."

Self-paced PD just got more convenient

Some of ISTE's bestselling titles are now available as audiobooks, with more to come! Listen as you commute, work out or wind down. Self-paced PD has never been more convenient.
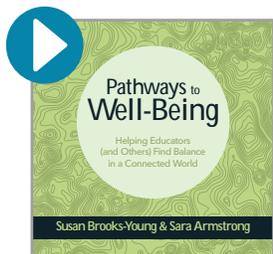
Pathways to Well-Being: Helping Educators (and Others) Find Balance in a Connected World

Support your well-being and prevent burnout with these six life-enriching elements connected to the ISTE Standards.

iste.org/PathwaysAudio
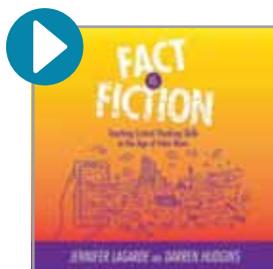
Fact vs. Fiction: Teaching Critical Thinking Skills in the Age of Fake News

Get resources to help students discern fact from fiction in the information they access at school and on the devices they carry in their pockets and backpacks.

iste.org/FactFictionAudio

Also available on Audible & wherever you purchase audiobooks!

Hot new titles from ISTE

Two forward-looking titles offer fresh perspectives to help guide today's learners.
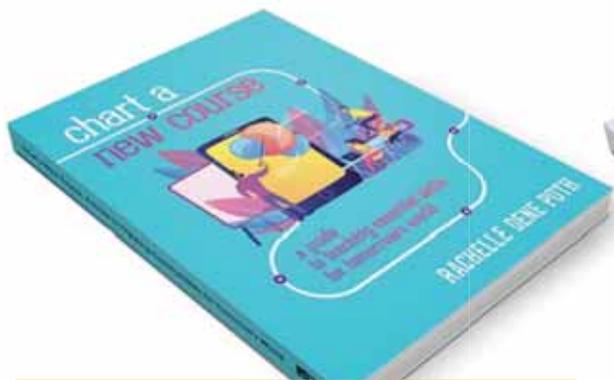
Chart a New Course: A Guide to Teaching Essential Skills for Tomorrow's World

Order today!
iste.org/EssentialSkills
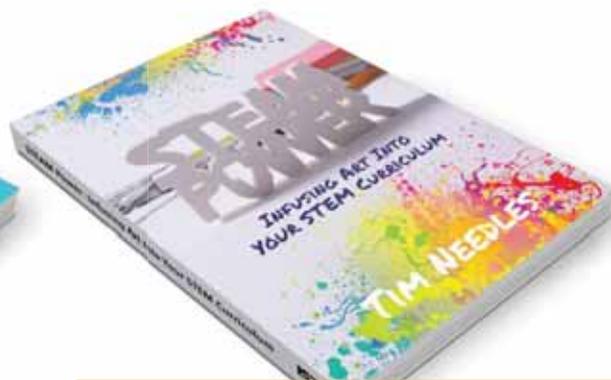
STEAM Power: Infusing Art Into Your STEM Curriculum

Order today!
iste.org/STEAMPower

Here's what a full-featured education program can look like

By Mariana Montaldo

It's a regular school day. In a classroom with high-tech equipment, English lessons are taking place via videoconference. In another classroom, students are coding a prototype that uses MicroBits to automatically turn on classroom lights when it's too dark. On the playground, some students are flying a drone to take pictures of the school's roof in an effort to discover why rain water has been flooding a nearby orchard so they can come up with a solution.

This is a snapshot of a typical school day at public schools in Uruguay, a result of a government policy implemented in 2007 to reduce the digital gap and leverage technology for learning. Let me introduce you to *Plan Ceibal* (ceibal.edu.uy).

Plan Ceibal is a government initiative with a focus on technology inclusion in education, implementing 1:1 learning and building education projects on top of it. As a result, every student and teacher in the public school system, from first grade through middle school, receives a tablet or laptop provided by the government. Every school – rural and urban – has internet connectivity and is equipped with videoconferencing technology so students can participate in a range of activities.

But providing technology and making it available to everyone was just the first step. Content development, education projects and teacher education are crucial for technology to impact learning.

Computers are motivating for students, but pedagogical content is also necessary. With that in mind, *Ceibal* provides 75 educational apps and four platforms – two math platforms, a learning management system for teachers and students, and a digital library for all citizens.

Many projects are implemented at the national level. One example is *Ceibal en Inglés*, a blended English learning project that involves weekly videoconferences with a remote teacher and related activities in a learning platform that's helping solve for the lack of teachers in many parts of the country. There's also our Annual Robotics and Coding Olympic Games, a two-day showcase of STEAM projects aimed at solving local problems using technology such as robots, drones or MicroBits. Students create models and prototypes and share them with real audiences, also helping to advance their communication skills.

The role of teachers in such a highly technological environment is fundamental. Technology has the power to enhance learning, inform teacher practice with relevant data and accelerate processes, but leadership and pedagogical knowledge are crucial aspects of implementing any innovative practice with good results.

To support teachers, *Plan Ceibal* provides opportunities for teacher development in a variety of formats, including online seminars, workshops and blended courses. The focus is on new pedagogies and innovative ways of teaching that use technology to enhance or enable learning processes. Digital citizenship, coding, STEAM projects and computational thinking, along with methodologies, such as project-based learning and design thinking, are some of the distinctive features of this training.

Plan Ceibal collaborates with the public education system and has shifted teaching and learning in Uruguay, making a great contribution to innovation and high-quality education.

MARIANA MONTALDO IS A TEACHER AND THE INSTITUTIONAL LIAISON AT *PLAN CEIBAL* WHERE SHE WORKS WITH STRATEGIC ALLIANCES IN EDTECH. SHE HAS A MASTER'S DEGREE IN BILINGUAL AND MULTICULTURAL EDUCATION. FOLLOW HER ON TWITTER @MONTALDOMARIANA.

Early adopter Jennifer Parker has spent 30 years training fellow educators to successfully integrate technology in their classrooms.

Jennifer Parker

She's working to bridge the transformation zone

By Nicole Krueger

The year Microsoft Office hit the shelves, Jennifer Parker got her first teaching job as a business teacher for a career center in Michigan. Within a few years, she was showing business educators across the state how to integrate Power-Point into their instruction.

Then the internet made its public debut. By the mid-1990s, she had begun presenting at state education conferences on web resources and online search strategies for teachers.

Since those early days, Parker has focused her career on training fellow educators. From running technology boot camps to developing online professional learning courses, she's spent the past three decades working tirelessly to help her colleagues traverse what she calls the "transformation zone."

"The pendulum has definitely swung. We've moved away from technology basics to a job-embedded integration model, and not all of our K-12 educators are prepared for that transformation," says the co-creator of 21things Project, a suite of websites that connects educators to free technology tools and tutorials.

"There are teachers in the trenches who are still struggling with knowledge of technology basics, and they're expected to adjust to this new role of job-embedded technology magic. It's the expectation nowadays that teachers be tech-savvy, that they log into student information systems, use data warehouses, use online formative assessments and administer online tests. But many in the trenches do not have those skills – not just veterans, but new teachers.

"We're trying to bridge that transformation zone."

It's an enormous task, especially when you consider that some teacher preparation programs require just a single edtech class. But Parker doesn't flinch from the challenge. Hired right out of her student teaching gig before she even graduated from college, she's worked in four different counties in Michigan as a district instructional technology and media specialist, a director of secondary media and technology and, currently, an interactive learning/school improvement and data consultant for Macomb Intermediate School District – all while earning two master's degrees and a Ph.D. in education.

She has also served on state advisory committees, coordinated professional learning for Michigan's education data portal and co-chaired

Jennifer Parker says not all educators are prepared for the transformation from basic tech use to a job-embedded integration model.

"We're trying to help teachers understand the basics they should know and be able to do."

the Michigan Digital Learning Conference. She's helped refresh both the ISTE Standards and the Michigan Department of Education Technology Standards, presented countless conference sessions, taught dozens of IT courses and run a blended learning academy for teachers in her district.

And that's just the tip of the iceberg.

In 2008, after developing a host of courses and training sessions, she and a group of colleagues decided to start putting their professional learning online so teachers everywhere could access it. They created 21thingsforteachers, a website packed with free tools, tutorials and instructional strategies to help teachers build technology skills. The website not only earned two ISTE Seals of Alignment, but it became so popular it outgrew its name and spawned several sister sites.

"We're trying to help teachers understand the basics they should know and be able to do. Then we try and get them to a more integrated approach – not just expecting kids to use Microsoft Word but taking it to the next level and inviting collaboration, inviting kids to personalize their learning experience by choosing from a buffet of tools," says Parker, whose dedication has earned her a 2019 DENny Award from Discovery Education as well as the ISTE 2018 Outstanding Leader Award.

"Instead of telling students to double-space their Word doc, tell them, 'I want to know what you know about the Civil War,' and let them choose how. It could be a presentation, a multimedia project, a short film, a makerspace activity. 'You use the tools at your fingertips to show me you know what the topic is about.'"

Although her passion for digital age learning is palpable, Parker admits she fell into it by accident. Fascinated by the study of rocks, she initially planned to go to law school, move to Texas and negotiate contracts for the oil industry. It was her father who suggested getting her teaching credentials just in case her geology career didn't pan out. Before she knew it, she was taking business education classes, working with computers and feeling like she'd come home.

Now that her own three kids are grown, Parker has even more time to dedicate to her mission. Although she just celebrated her 30th anniversary as an educator, she has no intention of slowing down.

"I've got 30 more in me. What keeps me going is enthusiasm," she says. "People say I'm the Energizer Bunny. I don't sleep a lot, but I always try to come to the table with fresh ideas. I want people to be as excited about this transformation as possible."

NICOLE KRUEGER IS A FREELANCE WRITER AND JOURNALIST WITH A PASSION FOR FINDING OUT WHAT MAKES LEARNERS TICK.

TAKE ACTION

*Ji Soo Song shares ISTE's recommendations
for how state and district leaders can best
leverage ESSA's Title IV-A funding.*

Tips for implementing, advocating for ESSA funds

By Ji Soo Song
ISTE Senior Policy and Advocacy Associate

In December 2015, the U.S. Congress passed the Every Student Succeeds Act (ESSA), a sweeping update to the No Child Left Behind Act that profoundly shaped public education for nearly 14 years. ESSA includes a new provision called Title IV-A that funds a range of programs and activities, including those that promote the effective use of edtech.

Thousands of schools have already benefited from Title IV-A funds. In line with Congressional intent, districts around the country are using the federal dollars to improve student learning experiences by developing educators' capacities to use edtech effectively. In a national survey of over 1,000 districts, 90% of respondents indicated that continued investment of Title IV-A funds for edtech priorities was important to their district.

However, the executive branch has repeatedly threatened elimination of Title IV-A from the federal budget. Thanks to the continued advocacy of ISTE and our members nationwide, as well as other supporters, Congress has gradually increased its funding over the last several years. The program is funded at $1.21 billion for 2020.

This represents an excellent opportunity for education leaders to bolster their edtech priorities. ISTE provides the following core recommendations for state and district leaders to best leverage Title IV-A:

Take a collaborative approach. Invite classroom educators, librarians, edtech coaches and other stakeholders to discuss the most critical investment priorities and determine how the implementation of evidence-based programs and activities may be best supported. Consider how federal dollars may be strategically invested to build educators' capacities to apply the ISTE Standards in the classroom. For example, Wyoming began using Title IV-A funds to support 100 educators enrolled in the ISTE Certification program. The state's Professional Teaching Standards Board will qualify ISTE-certified educators for the state's instructional technology endorsement.

Provide Title IV-A implementation resources with a strong edtech component. ISTE's "Using ESSA to Fund Edtech" guide (bit.ly/2sdaap7) informs strategies for investing Title IV-A funds, including how technology can support many of the allowable uses of Title IV-A funds, even those that don't explicitly reference technology. State leaders may choose to feature such resources on a dedicated Title IV-A technical assistance webpage. See the Wisconsin Department of Public Instruction's webpage for an example (bit.ly/2RfzNPU).

Collect data and stories from stakeholders. To ensure that Congress continues to fund Title IV-A, advocates must have access to information about how federal dollars have substantively contributed to improving educator quality and student learning experiences. These stories may also help spark ideas among neighboring states and districts. Let ISTE know how your state or district is using Title IV-A funds to support edtech by contacting advocacy@iste.org.

Finally, ISTE encourages educators and advocates to reach out to district or state leaders to see how they're investing Title IV-A funds, and then help them understand that federal dollars can and should be leveraged in ways that allow more educators to use technology effectively in the classroom.

Transform your practice

Build critical skills for teaching and learning in a digital world with ISTE U, a virtual hub of best-in-class professional learning. Explore unique edtech topics in online, self-paced courses for teachers, coaches, librarians and school leaders!

Courses offered year-round include:

- Artificial intelligence
- Computational thinking
- Digital citizenship
- Future ready librarianship
- Open educational resources

Introducing short-form courses on learning through gameplay and the ISTE Standards.

Learn more and register today at iste.org/ISTEU

ISTE U is powered by **D2L**

iste.org/ISTEU

EMPOWERED LEARNER

COMMUNITY VOICES

This question was asked and answered in ISTE Connect (iste.org/connect), home of ISTE's Professional Learning Networks.

What are some good resources to address cyberbullying?

NetSmartz
(bit.ly/2N3wPvm)

In our district, the tech trainers share resources and present assemblies. I put together a Wakelet collection (bit.ly/35ysCGv) of resources. NetSmartz has a helpful site with facts to consider.

Karyn Fillhart, technology training specialist
Chino Valley Unified School District, Chino, California

CASEL
(casel.org)

We approach cyberbullying from the social-emotional learning angle, and we created our own school campaign with student poster designs. There are a number of great resources like casel.org and commonsense.org.

Tim Needles, art and media educator
Smithtown High School East, St. James, New York

Digital Futures Initiative
(dfinow.org)

I have been using Digital Futures Initiative's free cyberbullying and health curriculum. It includes online training and videos.

Darci Lindgren, computer technology coordinator
Holy Family School, Lindsay, Nebraska

Microsoft Digital Literacy
(microsoft.com/en-us/digitalliteracy/home)

Microsoft Digital Literacy addresses communication using email, online chat, online safety and privacy, and online civility. It's all online, and students can progress at their own rate.

Carrie Gahagan, instructional technology coach
Prince William County Schools, Manassas, Virginia

#ICANHELP
(icanhelpdeletenegativity.org)

I recently connected with a founder of the #ICANHELP organization at the Association for Middle Level Education conference. My former colleagues have implemented their programs and had rave reviews of their work! We're looking at bringing them to our school.

Shannon Murphy,
technology integrator
Franklin Road Academy,
Nashville, Tennessee

21things4students
(remc.org/21things4students)

I found 21things4students last summer and love it! I also use Interland – Be Internet Awesome and Common Sense Media curriculums. If you have a subscription to BrainPOP, it has some good materials as well.

Kim Thomas, digital design teacher
Madison School District 38,
Phoenix, Arizona

Common Sense Education
(commonsense.org/education/digital-citizenship)

Interland – Be Internet Awesome
(beinternetawesome.withgoogle.com)

Our school district uses the Common Sense program. It has an excellent curriculum available for K-12, with many resources for students, parents and educators. Google also has a great program called Be Internet Awesome.

David Clough, instructional technology resource trainer
Henrico County Public Schools, Henrico, Virginia

Where are you now?

Where do you want to be?

[The right degree can take you there.]

Master of Arts in Learning, Design and Technology

Go beyond "watch a video, take a quiz." Create immersive experiences in instructional design.

NEW

ISTE Recognized Program Dec. 2019-24 — Educator Standards

CMU is proud to be the first higher education institution with a master's program that meets all the International Society for Technology in Education's Standards for Educators. ISTE's rigorous review process ensures that our graduates have the theory, tools and experience they need to distinguish themselves as leaders in educational technology. Also, as you progress through the program, you will be prepared to submit a portfolio of your work to earn the ISTE Certification for Educators.

Doctor of Education in Educational Leadership

Step into leadership with the knowledge and skills to make your vision a reality.

Doctor of Educational Technology

Assess, evaluate and implement new instructional technologies across districts and institutions.

Get started TODAY! Central Michigan University

cmich.edu/global | 877-268-4636 | cmuglobal@cmich.edu