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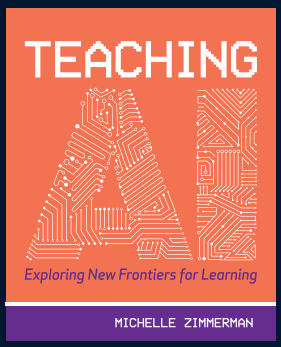

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The International Society for Technology in Education (ISTE) is a nonprofit organization that works with the global education community to accelerate the use of technology to solve tough problems and inspire innovation. Our worldwide network believes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

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PHOTO BY STEVE SMITH

David Benoit introduces ISTE's district partnership program.

Partnerships help leaders meet districtwide priorities for learning

By David Benoit
Senior Director for District and Channel Partnerships

As school districts across the globe work to integrate technology into classrooms, we must acknowledge that one approach, one strategy, one tool never fits all. Every district – whether it's urban or rural, large or small, well funded or not – requires solutions that will help meet its unique student populations and instructional goals.

And therein lies the challenge. Where can districts turn for advice and resources that will put them on the path to meeting their priorities for digital learning? It's a question ISTE is working to answer with its new district partnership program.

Over the last several months, ISTE has been collaborating with several districts to align instruction with technology. When partnering with districts, we start with a full evaluation and end with recommendations based on a district's distinctive goals, always putting learning first, technology second.

The evaluation and the recommendations are based on the ISTE Essential Conditions, 14 critical elements necessary to effectively leverage technology for learning. The Essential Conditions offer educators and school leaders a research-backed framework to guide implementation of the ISTE Standards, tech planning and systemwide change.

And we offer several ways to go about this, from full-service programs that include professional development, customized learning opportunities, online courses and ISTE membership to individual selections from among ISTE's programs that match a district's vision.

Perhaps it's sending a cohort of educators in ISTE U where they can build essential skills for teaching and learning in a digital world.

Or maybe it's helping teachers pursue ISTE Certification for Educators, a unique certification for district educator cohorts to help them move systems from vision to practice by preparing them to redesign learning activities with technology to engage students in real-world, active learning.

There's also districtwide ISTE membership that provides access to vibrant educator communities and professional learning networks for year-round PD and sharing of best practices, along with all the other valuable benefits of ISTE membership.

And we also offer accessible and affordable professional development options like districtwide or team-based learning rooted in ISTE books. ISTE has over 80 titles on critical edtech topics that can be the basis of topical PD and schoolwide or districtwide book clubs.

Finally, in January, we held the first-ever ISTE Digital Leadership Summit where over 200 district leaders worked shoulder to shoulder, guided by ISTE, to plan the change they want to see in their districts. We're planning on holding this extremely well-received event again in 2020.

These district partnerships signify a major expansion of ISTE's engagement at the district level; we've long offered resources and services to individual educators. We're committed to building tools and programs that help leaders guide districtwide transformation and impact every classroom and every student.

If all of this sounds like something your district would like to get on board with, go to iste.org/district to learn more. We can't wait to partner with you on your district's transformation!

Pana M. Asavavatana shares her ideas for providing even the youngest students with problem-solving strategies they can take with them throughout their digital lives.

PHOTO BY DUSTIN RHOADES

Put a handle on it: Teaching for technological fluency

By Pana M. Asavavatana

Have you ever been in a situation where you assign a task involving some type of technology to your students and the first thing out of their mouths is, "How do I do that?" I used to take this as a sign that I needed to walk my PK-1 students through each meticulous step to achieve the outcome I was looking for.

Still, I ended up with students asking me over and over again, "What do I do next?" No matter how carefully I outlined instructions or how often I repeated them, my students weren't becoming more independent. They were instead growing to rely on me as a teacher to guide them through each step when using a digital tool.

This led me to ask myself, in a world where technology seems to govern our methods for organizing and communicating information, what makes a person "fluent" in the digital age? More specifically, what does a competent manipulator of information look like today?

That's when I realized that I needed to stop giving my students step-by-step instructions for completing very specific tasks with digital tools and instead approach technology the way I had been teaching traditional literacy. I needed to provide problem-solving techniques and strategies to build independence.

As Dan Hudkins, my school's chief information officer, often says, "click-here" teaching is outdated and doesn't create students who are technologically fluent. I like to use to the metaphor of "putting handles on learning" as a visual for this aspect of teaching.

Essentially, no matter the grade level, we want to provide our students with strategies they can grab onto and take with them through their digital lives. Ideally, these strategies should survive through the fast-paced changes of the digital world.

So what does this look like in the classroom? I found it helpful to always ask three key questions when planning for learning with the use of digital tools.

What KNOWLEDGE will my students need to be independent? The knowledge your students will need to develop digital fluency differs depending on the age band you teach and what ways you're expecting your students to use technology to support their learning. For example, I work in early childhood and mostly use iPads with my students. My students are still emerging and developing readers, so much of what they depend upon to navigate digital tools is made up of visual information like icons. Therefore, one of the key pieces of

knowledge my students need is to understand various icons and their functions within a tool.

What SKILLS will help my students build the knowledge they need? Students can support and grow their knowledge by developing learning skills. In order to recognize icons and their functions, my students need the ability to analyze these icons in the same way they would pictures in a book, by looking for logical meaning within each image. More specifically, students need to first understand how to analyze new or unfamiliar icons so they can figure out the various capabilities of an app or program. They also need to recognize patterns of icons across apps and programs. This allows students to make generalizations such as, "an arrow icon allows me to share or save material," or "a camera icon indicates that I can take a photo."

How can I provide STRATEGIES that my students can carry with them from one scenario to the next? Students benefit from explicit strategies that target the skills we're trying to develop. This is where I start to devise ways to "put handles" on the learning so that I build independence in my students. To develop analytical and problem-solving skills surrounding icons, I provided my kindergarten students with a routine they could walk themselves through when they were trying to figure out how to execute a specific task within an app.

1. Read the screen. What icons do you see?
2. Ask yourself: What could each of these icons mean?
3. Next ask: Do any of these make sense for what I am trying to do?
4. Tap and test.

I knew that strategies like this were helping my students because they dramatically cut down the number of "What do I do next?" questions I encountered.

When we use technology in our teaching, we should aim to set our students up for success beyond any one specific task. When a student says "I don't know how to do that," view it as an opportunity to introduce knowledge, skills and strategies that push your students to become independent problem-solvers.

In other words, "put a handle on it," and your students will have something to carry with them for life.

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Kevin A. Clark, Ph.D., discusses critical education topics, including digital equity, STEM engagement practices and media diversity.

KEVIN A. CLARK, Ph.D.

PROFESSOR, CHILDREN'S MEDIA EXPERT'S RESUME IS DOTTED WITH INTRIGUING CREATIVE PROJECTS

By Julie Phillips Randles

As professor of learning technologies and founding director of the Center for Digital Media Innovation and Diversity at George Mason University, Kevin A. Clark's research focuses on serious topics like the role of interactive and digital media in education, broadening participation in STEM and diversity in children's media.

But his résumé is broad and also dotted with intriguing creative projects, such as reviewing scripts for "The Snowy Day" movie adaptation at Amazon Studios, guiding Hasbro in future STEAM trends for its toys, providing feedback for the PBS Ready To Learn initiative, consulting with the Cartoon Network on stereotyping and bias issues, reviewing historical and cultural content at Disney Junior, and serving on the board of directors for Fred Rogers Productions.

Along the way, the Bill and Melinda Gates Foundation, Dell, Microsoft, National Science Foundation and even the Entertainment Software Association Foundation have lined up to fund Clark's research.

While portions of his career seem to circle around play, the message of his research is resolute. "One of the best practices for introducing young people to STEM is to really find an interest point that's connected to what they do in their everyday lives," he told a Virginia podcast.

And the ramifications run deep. "I believe STEM education has the potential to improve the educational opportunities for students who are traditionally underserved, but the mere presence of STEM resources is not enough," he said when the Obama administration named him a White House STEM Access Champion of Change in 2014.

Clark says he had no interest in STEM until he stumbled onto a programming class in high school. "I was motivated more by not wanting to incur the wrath of my grandmother if I brought home poor grades rather than by my high school curriculum," he's said. And that enthusiasm fueled his drive to get bachelor's and master's degrees in computer science

Kevin A. Clark says educators should eschew the need to be perfect and embrace their ability to be innovative as a part of their practice.

PHOTO BY TELL CHRONICLES

> Educators are constantly struggling with ways to capture and maintain students' attention, and they're struggling with ways to effectively integrate technology in the classroom.

PHOTO BY GEORGE MASON UNIVERSITY

from North Carolina State University, and eventually a Ph.D. in instructional systems from Pennsylvania State University.

So it's no surprise that, while he doesn't have a silver bullet for how educators can grab students' waning interest in STEM topics in the crucial late elementary/early middle school years, his recommendations do involve engaging professionals in these fields to be a resource. Clark collaborated with the developers of PathwaystoScience.org for the very purpose of connecting communities with available summer and after-school programs.

ISTE recently sat down with Clark to get his take on media and tech use, STEM learning and digital equity.

YOU WERE HONORED IN 2014 BY THE WHITE HOUSE AS A CHAMPION OF CHANGE. HOW DID THAT EXPERIENCE IMPACT HOW YOU OR OTHERS VIEW THE WORK YOU DO?

It was a wonderful acknowledgement from the Obama White House that the work I had been doing was viewed as impactful and moving the needle positively in terms of digital equity. This was also a great opportunity to meet people from around the country who were engaged in digital equity work and research.

We often work in silos, have our heads down and don't get the opportunity to connect with others to see the amazing work they're doing, so it was an opportunity to connect and collaborate with people I wouldn't have met otherwise. And it led to some meaningful partnerships.

For instance, I had been working with Kimberly Scott at Arizona State, but Champions of Change pushed us forward in highlighting the work we were doing and putting us in a place where we could reach out to other people and do other work.

And it led to a convening of STEM practitioners, researchers, funders and policy analysts that allowed us to share knowledge and devise agendas and action items to broaden our understanding and develop pragmatic solutions for traditionally

underserved students to enter and persist in STEM fields.

One result of this convening was the development of a proposal and eventual funding of our "Digital Lives of African American Tweens, Teens, and Parents" national study.

IN THE REPORT FROM THAT STUDY, YOU WRITE ABOUT HOW SMARTPHONES ARE THE DIGITAL ON-RAMP FOR YOUTH, BECAUSE OVER 80 PERCENT OF TEENS HAVE A PHONE AND THEY CAN BE USED TO ACCESS THE INTERNET FROM PRACTICALLY ANYWHERE. STUDENTS CAN WORK ON THEIR HOMEWORK DURING A LONG BUS COMMUTE, FOR EXAMPLE. DO YOU THINK SCHOOLS SHOULD EMBRACE SMARTPHONES AND RETHINK POLICIES BANNING THEM FROM THE CLASSROOMS?

Educators are constantly struggling with ways to capture and maintain students' attention, and they're struggling with ways to effectively integrate technology in the classroom. We should look at the capabilities and challenges that smartphones present and explore how they might provide educational opportunities in the classroom. Smartphones can be beneficial if used properly, but each educator needs to decide how use of phones suits their practice and educational goals.

In this study, we went on to ask about preferences for technology use and teens reported a preference for computers when they have to perform more complex tasks like filling out applications, writing a letter or essay, and applying to colleges.

To categorically advocate for the use of smartphones in all instances may not be the best approach because it may not be the best tool for the tasks students have to perform. Instead, I propose using computers to give students the ability to accomplish complex tasks along with the opportunity to use phones in a structured way, perhaps to do research or to share something with a classmate.

But students often don't want to use smartphones in a structured way, so educators have a challenge, and it's up to them to see what's appropriate and effective in their classrooms.

I don't think a total ban on smartphones is the answer either because it turns them into the forbidden fruit, making them more attractive to some.

PHOTO BY GEORGE MASON UNIVERSITY

> It's one thing to have a computer, but if you don't have anyone who can help you navigate the use of the tool, and if the tool isn't relevant to the tasks you have to perform and the challenges you encounter, then it's really not helpful.

WHAT IS THE SINGLE MOST EFFECTIVE WAY TO NARROW THE DIGITAL DIVIDE AMONG AFRICAN-AMERICAN YOUTH?

It's not one single thing. Giving young people access to technology is part of it. And providing them with access to expertise and support is another.

It's one thing to have a computer, but if you don't have anyone who can help you navigate the use of the tool, and if the tool isn't relevant to the tasks you have to perform and the challenges you encounter, then it's really not helpful.

You can say everyone needs to have a particular piece of hardware, but you need the support, the expertise and knowledge about the application in a way that's relevant and meaningful to the child, the home and the community in which they live. It's a multi-faceted issue.

CAN YOU POINT TO A PROGRAM, IDEA OR STRATEGY IN THE PAST 10 YEARS THAT GIVES YOU HOPE THAT THE U.S. IS CLOSING THE DIGITAL EQUITY GAP FOR STUDENTS OF COLOR, RURAL STUDENTS, GIRLS, LGBTQ STUDENTS AND OTHERS?

The one thing that is encouraging is the movement to teach young people how to create and develop their own media through coding, digital storytelling and video and game-making.

When you give youth from diverse communities a mechanism to tell their stories, provide their perspective, and show you the world they live in and how they see it, you provide opportunities for everyone to be exposed to media that presents a more complete and authentic representation and portrayal of our society and the people the comprise it.

WHY ARE WE STILL WRESTLING WITH ATTRACTING MORE GIRLS INTO STEM FIELDS? WITH ALL THE FUNDING THAT'S BEEN DEDICATED TO IT AND ALL THE INITIATIVES AND PROGRAMS AIMED AT FIXING IT, WHY IS IT SO HARD? WHAT ARE WE DOING WRONG?

I wouldn't say it's what we're doing wrong, it's more about what else we need to do. It's one thing to prepare girls to participate in these STEM programs, but once they get there we have to also make sure there's a welcoming environment that allows them to persist and be successful.

To have a girl who wants to be an engineer get accepted to the college of her choice and then show up and have to deal

PHOTO BY GEORGE MASON UNIVERSITY

with a hostile environment or no support just doesn't work.

We can prepare girls academically and intellectually, but if we put them in classrooms or on jobs where there's no support and they have to endure a hostile environment, it's no surprise that many girls and women decide to leave STEM disciplines and careers.

You can't say STEM content knowledge alone is enough to broaden participation when you have entire organizations and institutions that have actively and structurally prohibited or limited the presence of women and people of color. Women and people of color have always had the capacity to acquire STEM content, but they have not always been accepted or supported by STEM disciplines, organizations or institutions.

YOU'VE TALKED ABOUT HOW INFLUENTIAL PARENTS ARE IN ENCOURAGING STUDENTS TO DEVELOP AN INTEREST IN STEM, BUT MANY PARENTS STILL DON'T SEE VALUE IN ALL THOSE HOURS SPENT ON A COMPUTER ENGAGING STEM-RELATED ACTIVITIES. WHAT DO YOU TELL PARENTS WHO LIMIT SCREENTIME OR DISCOURAGE THEIR KIDS FROM GAMING AND OTHER ONLINE PURSUITS?

I think it's about helping parents understand the career opportunities and pathways associated with STEM, gaming and computing. When a parent understands that the video game industry is a multi-billion dollar industry where their child can do a variety of things from animation to modeling to music creation to acting, they may start to see things differently. Additionally, helping parents understand the requirements and skills needed for those careers will go a long way toward informing parents' decisions regarding extra-curricular activities and academic content that can prove useful in STEM-related careers.

It's about asking things like, "Did you know there are e-sport leagues that give college scholarships? Did you know there are professions where young people can use the skills they develop playing games and creating media?" It's about helping parents understand the connection to current jobs and to the jobs that are coming.

I've had these conversations in informal situations as part of a game design program I ran. Parents would come in and say their kids were playing video games too much, so I realized what was needed were sessions to sit down and talk to them about the industry.

PHOTO BY GEORGE MASON UNIVERSITY

Kids need to understand there are skills and classes you have to take to be a game designer, just as they need to understand what it takes to become a doctor or a lawyer. We need to be more deliberate about conveying what the pathways are to these professions.

And it's incumbent on out-of-school programs that offer STEM programs to also have a career education component for parents and for young people.

Kids need to understand there are skills and classes you have to take to be a game designer, just as they need to understand what it takes to become a doctor or a lawyer. We need to be more deliberate about conveying what the pathways are to these professions.

LACK OF DIVERSITY WITHIN MEDIA AIMED AT CHILDREN CONTINUES TO BE A PROBLEM. HOW WOULD YOU CHARACTERIZE OUR SOCIETY'S SHORTCOMINGS ON THIS ISSUE? WHAT ABOUT THE DIVERSITY OF PRODUCERS OF MEDIA? HOW ARE WE DOING THERE?

As our country becomes more ethnically diverse, there's a gap between the creators and consumers of children's media. Although African-Americans and Latinos consume and are exposed to the most media, they are not equally represented in media creation.

Not only do we need to increase the diversity of portrayals and depictions in children's media, but we also need to increase the diversity of those who create and produce children's media. People of color only make up 3 percent of video game designers, 13 percent of film and television creators and producers, and 25 percent of featured characters in children's books.

At all levels of the creative process, there should be people with diverse perspectives, backgrounds, experiences and lifestyles who also have the power to make decisions and suggestions that will improve the accuracy and authenticity of children's media properties.

WHAT CAN TEACHERS DO TO PROMOTE DIVERSITY IN THE MEDIA THEY USE WITH STUDENTS?

Teachers should solicit suggestions from students and colleagues, and strive to use diverse media throughout their classroom practice, not just limited to specific times like Black History Month.

Teachers should look for diverse representations in individual sources and across their collection of resources, and they should also be looking for resources from non-traditional places like YouTube, museums and publishers of diverse books.

Teachers can curate lists and share those lists with their colleagues to spread the use of diverse resources. For instance, I feature a list of diverse resources on my center website (cdmid.gmu.edu/features/).

WHAT WAS YOUR MOST INTERESTING OR REWARDING EXPERIENCE DESIGNING MEDIA FOR YOUTH?

Early on in my career and prior to becoming a professor, I was fortunate to be part of an education technology startup that provided innovative educational content to school districts around the country. As a content designer and manager, it was very rewarding to be able to design educational video games that featured diverse characters and stories, as well as create curricula content that included the often-overlooked historical contributions of women and people of color.

After becoming a professor, I found it rewarding to run a video game design program for middle and high school students. It was rewarding to see students mature and develop as program participants, and then move on to mentor their peers, and eventually teach the game design classes and play a more active role in running the program.

In an effort to become more actively involved in the development of more inclusive children's media, I currently serve on the Barbie Global Advisory Council, YouTube Kids & Family Council, Children's Advertising Review Unit (CARU) academic adviser board and Fred Rogers Productions board of directors. I've also consulted on the movie adaptation of the book *The Snowy Day*, and I'm involved in children's media efforts led

by companies like Pinna and Highlights. But I'm most excited about my current work on a preschool property based on the beloved children's book *I Love My Hair* by Natasha Tarpley.

IF THERE WAS JUST ONE THING YOU COULD CHANGE ABOUT HOW TEACHERS OR SCHOOL LIBRARIANS THINK ABOUT HOW THEY APPROACH THEIR JOBS, WHAT WOULD IT BE?

Some educators feel they have to be perfect and right all of the time, but I think teachers should embrace their ability to be innovative as a part of their practice.

Teachers often don't see themselves as innovators and yet every day, they figure out creative ways to reach children with varied abilities, backgrounds, experiences and knowledge.

If teachers can find new ways to reach every child in their classrooms, then I think they are more than capable to create interventions, apps or other tools that meet the educational needs of students and their families. More teachers should recognize that they are innovators!

WHAT ARE SOME WAYS EDUCATORS CAN CONSTRUCTIVELY ENGAGE DIVERSE FAMILIES IN THE CONVERSATION ABOUT USING MEDIA AND DIGITAL TECHNOLOGIES FOR IMPACTFUL LEARNING?

One is to recommend diverse content to everyone, not just students and families of color. You can hand a book about black inventors to a white family. We need to rethink the notion of diversity and inclusion and understand that presents the opportunity to give a full, authentic representation of history and everyday life.

Secondly, educators should become more familiar with the communities they serve and get a sense of the media that's preferred and consumed in those communities.

Lastly, we all need to go beyond the traditional diverse content. It shouldn't be limited to Martin Luther King Jr., Harriet Tubman and Cesar Chavez – educators, parents and others involved in selecting media for children should strive to find content that goes beyond the very familiar and comfortable.

If we identify and understand that by introducing someone like Susan LaFlesche Picotte, a Native American doctor, to all children, it helps create a more authentic and complete picture of our nation and its people, which may lead to increased respect and appreciation of everyone's contribution to our society.

PHOTO BY TELL CHRONICLES

“If teachers can find new ways to reach every child in their classrooms, then I think they are more than capable to create interventions, apps or other tools that meet the educational needs of students and their families. More teachers should recognize that they are innovators!

Innovate, iterate, educate

SOMETIMES TEACHERS' SMALL IDEAS MAKE THE BIGGEST DIFFERENCE

By Nicole Krueger

Most teachers saw a bunch of hooligans with behavioral problems. But Bijal Damani saw something different: a group of brilliant teenagers bursting with energy, trapped within the confines of the classroom.

Tasked with transforming the disruptive 10th graders into future entrepreneurs, she knew right away traditional teaching methods weren't going to work.

"After talking to them, I realized they were simply restless because we were teaching them the wrong way," says the former marketing manager, who left the corporate world to teach business at SN Kansagra School in Rajkot, Gujarat, India.

She made a proposal. Instead of learning business concepts from a book, students would experience them firsthand by running their own bazaar.

"It was kind of radical as far as the Indian education system was concerned," she admits.

School leaders reluctantly green-lighted the project, dismissing it as a waste of time. Parents told her she should just stick to the book. With no support from her school community, Damani forged ahead, praying the project would at least break even.

In its first year, the three-day bazaar featured nearly 50 products and netted 8,000 rupees (the equivalent of $133). The so-called hooligans voted to donate their proceeds to local underprivileged kids. They also started paying attention in class, and their grades improved by up to 70 percent.

Thinking the project a "one-year wonder," Damani dusted off her hands and moved on – until the following year, when a group

of parents asked her to consider re-opening the bazaar, citing its positive impact on students.

As the Galaxy Bazaar became an annual tradition, it started to expand. Each year, students conducted market research and added new features, including a food zone, a game zone and a glam walk. They even started selling cars. Each year, profits grew exponentially, reaching $216,000 in 2018.

Now in its 14th year, the Galaxy Bazaar has been replicated by at least six other schools in the city, as well as several colleges in southern India. It has also become a case study for social entrepreneurship, earning recognition from organizations such as UNESCO and Forbes.

And it all happened because one teacher tried out an idea everyone thought was a waste of time.

SMALL APPROACHES TO BIG IDEAS

When educators talk about transforming learning, they often envision sweeping reforms and districtwide initiatives. But these types of efforts tend to be costly, slow to implement and prone to stalling on the way down the ladder as they "become diverted, diluted, lose strength or get rejected as ineffective or erroneous," says education researcher Peter Serdyukov.

"The only way to create sustainable change is to support the tiny ones."

If educators want to keep up with the accelerating pace of change in a technology-driven world, they need a new model for transformation – one that fosters a grassroots ecosystem of innovation in which teachers rapidly prototype, pilot and iterate small solutions that have the potential to grow into big changes.

"The only way to create sustainable change is to support the tiny ones," says Michael Cohen, author of the book *Educated by Design* and an ISTE 2018 keynote speaker. "Let teachers feel important. Give them license to experiment and explore and put creative hats on to solve problems and create opportunities for students."

Educators, like tech companies, need to operate in a state of perpetual beta, says Scott McLeod, an associate professor of educational leadership at the University of Colorado Denver.

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

"There should be a lot of iteration," he says. "We often don't view teacher resilience or organizational resilience as important. We try an idea, and if it doesn't work, we'll walk away rather than learning from it. I see that all the time. You get one shot, and either it works or it doesn't."

The iterative process, on the other hand, requires educators to examine why the idea didn't pan out, make small tweaks and see if anything changes. Even if an idea never takes off, simply doing the work of iterating can yield instructional gold as teachers become experts at reflecting on their own practice.

MAKING INNOVATION THE STANDARD

Innovation has become such a broadly used term, it's veering into buzzword territory. But what is it, really, and how do we know when we've gotten there?

It's easy to conflate technology with innovation, but they're not the same. Simply implementing a new tool doesn't necessarily constitute innovation, while innovation doesn't always require technology. The new ISTE Standards for Educators reflect this difference, calling upon teachers to become designers of authentic, learner-driven activities while also exploring promising new practices that leverage technology to improve learning.

"It's hard to put into words my excitement when I saw the revamp of the ISTE Standards, which started to use the language around the role of being a designer – that design was part of their toolkit as a teacher," Cohen says. "Educators are designers. They just need the vernacular. They need the descriptors to realize, 'Oh, I already do this.' "

The standards can seem daunting at first, and the prospect of innovating can intimidate educators who are more comfortable with traditional teaching methods. But when they reframe innovation as a series of small steps toward solving a specific problem in the classroom, it becomes much more accessible.

"When you're talking about any innovation, you have to start small," Damani says. "I may not have any kind of say in policy or any say in administrative processes, but I do have a say in what happens in my class."

The design formula is simple: Define a problem or goal, brainstorm solutions and choose one to try. Then test, measure, iterate and repeat.

Rather than attempting ambitious, long-tailed efforts, educators should start off with smaller test samples and shorter timespans, Cohen says.

"You don't need to spend a full year on something. Ninety days can give you a good snapshot of how successful it is."

"I think there's a nice space where innovation, strategy and execution all live together. Innovation for the sake of innovation – let's do something cool – isn't an effective practice. But when we have this cool thing that's tied to a need we have, and we fully flesh it out, that's where we get to successful innovation."

Even if an idea never takes off, simply doing the work of iterating can yield instructional gold as teachers become experts at reflecting on their own practice.

LEVERAGING STUDENTS AS INNOVATION PARTNERS

When educators prototype, pilot and iterate new ideas in the classroom, they're not just improving their own practice. They're also modeling the types behaviors they want to see in students, such as a willingness to take risks and the tenacity to push through failure.

Ultimately, "it's about building the capacity of students to be more resilient and effective problem-solvers," Cohen says.

One way to build that capacity is to tap students as innovation partners. When Burlington High School in Massachusetts implemented its 1:1 program, school leaders knew both teachers and students would need extra support as they sought creative ways to integrate the technology into their classrooms. The most efficient way to build tech capacity, they decided, was to bring students on board – so they created one of the first student-run "genius bars" in the U.S.

Students who initially staffed the school help desk acted as part tech support, part consultant as they collaborated with teachers to find fresh approaches to learning with technology. Eight years later, as the school's technology needs have evolved, students play less of a tech support role and spend more time pursuing passion projects that sometimes become pilots for classroom innovations.

From experimenting with drones to using the visual coding software Processing as a tool for learning and prototyping, "they've taken things they've been interested in and come up with projects we've done in class that have spread throughout the school," says instructional technology specialist LeRoy Wong.

"Help desk helped give me a space to work on some of my ideas," adds senior Gati Aher, who headed a team that researched and developed a tech support chatbot as part of ISTE's artificial intelligence (AI) chatbot pilot program. "As a student, I feel like if I can add something new to this conversation, then it's not like a one-way street where teachers give the same lecture every year."

CREATING A CULTURE OF INNOVATION

Embracing the iterative design model enables both students and teachers to more fully embody their role as designers as they pilot small-scale solutions in the classroom. But in most schools, many barriers to innovation remain. From risk aversion to pushback from parents or education leaders, a school's culture can quash new ideas before they have a chance to germinate.

So how can school leaders provide fertile ground for innovation?

The ISTE Standards for Education Leaders address this by emphasizing their role as systems designers and empowering leaders, responsible for building systems that continually improve the use of technology to support learning while creating a culture where teachers are empowered to innovate.

That doesn't mean leaders can – or should – attempt to reshape their school's culture all in one blow. Rather, by using the iterative model themselves, they can take incremental steps in the right direction, piloting programs such as innovation nights where teachers from across the school or district come together to share their successes, or innovation grants to help teachers get their ideas off the ground. They can also begin addressing some of the barriers to innovation within their school communities.

Take edtech procurement, for example. Overly slow or restrictive procurement processes often stand in the way of teacher innovation, hindering their ability to quickly acquire new tools. But some education leaders are rethinking the way they approach procurement in an effort to encourage more experimentation.

Rowan-Salisbury School District in North Carolina created an edtech playground in its central office, where teachers can try out the latest technology to get a feel for whether it might serve their students' needs. Drawing inspiration from the ISTE Conference & Expo vendor floor, Chief Strategy Officer Andrew Smith designed the space to support experimentation and play in a low-stakes environment, while also guiding teachers toward a more strategic approach to technology.

"I think there's a nice space where innovation, strategy and execution all live together," he says. "Innovation for the sake of innovation – let's do something cool – isn't an effective practice. But when we have this cool thing that's tied to a need we have, and we fully flesh it out, that's where we get to successful innovation."

As teachers step into their role as innovators, it's also up to leaders to provide an avenue for scaling and spreading successful ideas. Tech coaches and other technology specialists, in particular, play a key role in cross-pollinating classrooms by sharing innovative practices from elsewhere in the school or district and helping teachers adapt them for their own use.

That sharing element is essential in helping great ideas grow from small-scale pilots into larger movements, which is why some of the most innovative educators also have the most robust professional learning networks. Not only can teachers lean on their networks for ideas and support, but they can also broadcast their successes for other educators to replicate. And as those successes build, they can use their collective voice to effect greater change.

"All the like-minded educators who have a certain vision and would like to change education from the inside out, we have to get together," Damani says. "Nowadays, with the internet, geographical boundaries do not matter. So let's all get together, and once we have proven something, we'll have a better say when in dialogue with policymakers. We have to have a voice. We have to speak up."

But above all, she adds, educators need to keep experimenting.

"If you think students will benefit from something, go ahead and do it. If you're doing good, more and more people will join, and it will become a movement.

"The process is magical."

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

Boris Yarmakhov describes how NOTO is providing critical PD to Russian teachers.

Russian educators develop digital competencies with PD based on the ISTE Standards

By Boris Yarmakhov, Ph.D.

Computers have been used in Russian schools since the 1980s, first as curious machines that helped computer science teachers explain how information is stored and processed, and then as tools students could use to write code and solve sophisticated algorithmic tasks.

Thanks to governmental programs beginning in the early 2000s, computers and the internet have now reached virtually every Russian school.

Still, the Russian educational system faces a serious lack of teachers who are well-prepared to use technology in classroom and provide students with skills that will help them to thrive in the global economy of the future.

Another issue Russian educators are confronted with is the inequality in career development opportunities between educators from big cities and those from rural areas who drastically lack adequate resources for professional development. As most teacher training in our country is still provided offline, educators who live in remote areas away from academic centers have limited professional growth opportunities.

To overcome these obstacles, a group of innovative Russian educators established the Russian Association for Technology in Education (NOTO), an ISTE affiliate, in 2017.

NOTO aims to create an open forum that brings together educators, governmental agencies and businesses interested in promoting edtech in Russian schools. We launch and join programs that help meet rigorous education standards, along with some that help bring the opportunities that modern edtech provides to every Russian classroom.

As the CEO of NOTO, I'm particularly concerned about providing Russian school teachers with full-fledged opportunities for professional development. That's why we created an online platform, "Pathway to the Future," that aggregates edtech courses for teachers.

Teachers who complete the program acquire important skills they can pass along to their students. Along the way, they've organized more than 50 school hackathons and taught students to use design thinking and to work collaboratively using visual programming languages like Scratch, App Inventor and Alice. Due to their efforts, the Russian student Scratch-using community grew from 5,000 to 60,000.

The content of "Pathway to the Future" is built on the ISTE Standards and thus provides opportunities for developing and mastering digital competencies for teachers. Last year, about 10,000 teachers from 82 regions of Russia participated in the program.

To help teachers build their digital skills, we've also developed a certification program that allows them to master one of five chosen areas of professional expertise, such as Leader of Change, Educational Designer, Teacher of the Digital World, Teacher Maker and STEAM Teacher.

Educators who chose to develop their skills in those areas study online and offline with leading instructors in the field, participate in professional contests, collaboratively create learning materials and study international experience in the field.

In 2019, a group of the first 50 certified NOTO teachers will gather for a certification academy to gain hands-on experience in using digital technologies for innovative teaching.

NOTO is a young but fast-growing community of innovative educators. We hope that our organization, in partnership with other nongovernmental organizations, will facilitate change in education in our country.

We believe that the role of teachers is crucial for this purpose, and all of our efforts focus on providing educators with the necessary skills and knowledge to transform teaching and learning in Russia.

BORIS YARMAKHOV IS THE CEO OF THE RUSSIAN ASSOCIATION FOR TECHNOLOGY IN EDUCATION (NOTO) IN MOSCOW. HE HOLDS A PH.D. IN PHILOSOPHY AND WAS A FULLBRIGHT SCHOLAR AT HARVARD UNIVERSITY. AN EXPERIENCED EDUCATOR AND RESEARCHER SPECIALIZING IN LEARNING ANALYTICS AND BLENDED LEARNING, YARMAKHOV IS ALSO THE AUTHOR OF THREE BOOKS.

Kids learn to code by being 'nerd farmers'

By Nicole Krueger

Can a group of eighth graders end world hunger using Arduino and a 3D printer?

Maybe not. But they can make one heck of a salad – and in the process discover how coding can help them solve real-world problems.

That's the goal of Eric Smith's project-based technology class at The Woods Academy, a private Catholic school in Bethesda, Maryland, where middle school students combine coding, electronics, design and agriculture to create smart hydroponic planters. Equipped with sensors, a pump and an LCD screen, their devices monitor plants' temperature and humidity levels and automatically add moisture when needed.

During the 10-week project, spread out over two years, students design and build their own planters, then test them out by growing lettuce in the classroom.

"We were trying to find something more authentic for kids to do that relates to real-world global issues that, potentially, their generation will have to solve," says Smith, a classroom teacher who now serves as the school's director of technology.

With climate change threatening global food supplies and more than 800 million people in need of emergency food assistance in 2017 alone, a growing number of countries are turning to technology for a sustainable answer to the world's hunger crisis. Inspired by the success of farmers in the Netherlands, who are using agritech to drastically increase their crop yields while reducing resource consumption, Smith devised what he dubbed the "nerd farmer" project to get students thinking about solutions.

PHOTO BY ERIC SMITH

Why does it work?

Scaffolded learning helps build coding skills.

Before students begin designing their hydroponic planters, they've already developed many of the skills they'll need to draw upon. Starting in seventh grade, they leave behind drag-and-drop coding and venture into JavaScript. They practice troubleshooting, experiment with programmable electronics and design an automated fish feeder. In eighth grade, they start learning about how hydroponic systems work by testing water level sensors, building humidity sensors and creating basic pump systems. Finally, they're asked to put all of these individual labs together to create their smart planters.

Students fail – a lot.

Even though they've already learned how to build the planter's various components, making all the parts work together is an entirely new challenge. Smith loves it when they don't get it right away. "I

PHOTOS BY ERIC SMITH

want them to have a bit of a struggle. It builds grit," he says. "They have to pull together and figure it out, and they have to support one another, just like in a work environment."

They start thinking like designers.

Before building their hydroponics system, students are charged with designing and 3D printing a regular soil planter. Some get so inspired by the project they start bringing other designs to class. "It's neat when they go home and design – not for a grade, but because they're passionate about it – and they want to come in and build and see their work brought to life."

So far, Smith is encouraged by the feedback he's received. Other schools are showing interest in the project, and even some eighth graders – a notoriously hard sell at times – have given it their thumbs-up.

Their favorite part?

"At the end of the class, we make one big salad and eat it.

Taking the pain out of finding new edtech tools

As free apps and edtech tools continue to proliferate, vetting and implementing them has become a thorny issue for education leaders.

Is the tool compatible with the district's IT infrastructure? Will it put students' privacy at risk? Does it make a difference in learning outcomes, or is it just another piece of gratuitous technology? These questions often get overlooked as teachers feel their way through an increasingly complex edtech landscape.

Tech-savvy educators research edtech options using tools like ISTE's Edtech Advisor, powered by LearnPlatform. But some educators still aren't sure where to begin.

When leaders at Sun Prairie Area School District in Wisconsin needed a way to specifically address student privacy concerns without putting the brakes on technology use, they devised a 48-hour vetting process that steers teachers toward the safest and most effective options while allowing them the freedom to choose tools that work for them.

"There's a fine line between really wanting people to dive into edtech and being purposeful and thoughtful about the way they dive in," says Keleen Kaye, the district's digital learning manager.

Teachers seeking new technology solutions can start by consulting her database of more than 100 pre-vetted apps, which are evaluated on how well they meet student privacy standards and district learning goals. They can then choose an app from the approved list and start using it right away, or they can propose an app they want to use and Kaye will research it for them – typically within 48 hours. As each new app is vetted, it gets added to the

database along with tailored suggestions for how it can be used.

Why does it work?

It's easy, and reliable.

With a growing body of free tools available online, teachers can currently easily bypass official procurement procedures, making it all but impossible to safeguard student data. Rather than requiring teachers to use the vetting process, Kaye lures them in by taking the pain out of finding new tools by providing a reliable, helpful resource, that holds both sides accountable.

"If we want people to use technology and use it well, we need to make sure we have buy-in," she says. "There's no reason for teachers to have to go through my process when everything is at their fingertips."

Teachers make more strategic choices.

One of the most common edtech pitfalls is using technology for its own sake, rather than for what it can help students achieve. "When people come to me asking for a list of apps they can use, I ask them what they're trying to do with their kids," she says. "It's not about the thing, it's about what you're trying to do with the thing."

They can focus on what matters.

When teachers no longer have to do the hard work of vetting, they have more time to focus on improving student outcomes. They also spend less time spinning their wheels with shiny new apps that don't really move the needle. It's especially helpful for educators who are just getting their feet wet with technology, Kaye says.

As the database of apps continues to grow, her next step is to start aligning the tools with the ISTE Standards.

"We're building the plane while flying it," she says. "There are so many teachers out there using different things, and we want to get the word out and get everybody to be a lot more thoughtful. We're trying to get ahead of curve here."

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

BEING THE CHANGE WE SEEK

HOW DIVERSE VOICES STRENGTHEN SCHOOLS

By Jennifer Snelling

"Change will not come if we wait for some other person or some other time. We are the ones we've been waiting for. We are the change that we seek."
– Barack Obama

Diversity and equity are threads running through the quilt of our national conversation. Over the last few years, everything from #MeToo to immigration policy to the Black Lives Matter movement has intensified this conversation, pulling on that long historical thread and threatening to unravel the ties that bind our country.

Some of us may have thought for a brief moment that we were on our way past racism, sexism and discrimination based on sexual orientation, religion or physical ability, only to be shocked by the hatred and prejudice simmering just below the surface.

And in spite of demographic shifts, policy changes and national equity movements, opportunity gaps still exist for underrepresented groups. Our schools, often a microcosm of larger society, are not immune.

In 2014, for the first time in U.S. public schools, the percentage of Latino, African-American, Asian and other students of color exceeded the percentage of white students, according to the National Center for Educational Statistics. While the full mosaic of America is evident in the makeup of our students, the fact is, teachers and educational leadership still look a lot like they always have.

DIVERSE EDTECH LEADERSHIP IS AN OPPORTUNITY NOT ONLY TO INCREASE EMPATHY THROUGH CONNECTIONS, BUT ALSO TO INCREASE INNOVATION AND CREATIVITY, AND MAKE OUR SCHOOLS STRONGER.

Eighty-four percent of teachers are white. More than 40 percent of public schools in the U.S. don't have a single teacher of color. Men are significantly underrepresented in classrooms, and just 2 percent of teachers are African-American men, according to a U.S. Department of Education report.

This lack of diversity is true for school leadership as well. Only about 6 percent of school superintendents are nonwhite, and roughly 25 percent are women.

Multiple studies have suggested that students are often more successful when they have role models who look like them.

"A role model who looks like you can serve as that North Star who orients you," says Luis Pérez, technical assistance specialist at the National Center on Accessible Educational Materials. "You can see a tangible representation of what you can accomplish. Regardless of where you start, there's a blueprint for you to follow."

Pérez speaks from personal experience. When he first came to the U.S. from the Dominican Republic at age 11, he struggled with language and behavior. He was assigned a social worker who was also Dominican. No educator was more important to him than that social worker.

"He was college-educated and became the person I wanted to emulate," says Pérez.

There's perhaps no place where it's as important for students to see people who look like them than schools. Whether that means schools include people from diverse genders, races, ethnicities, abilities, income or backgrounds, the key is inclusivity at all levels, including edtech leadership. Diverse

edtech leadership is an opportunity not only to increase empathy through connections, but also to increase innovation and creativity, and make our schools stronger.

What does inclusivity look like? If you're a diverse voice in edtech, how do you get a seat at the table and a voice in decision-making? If you're in a leadership role already, how do we find diverse voices and help amplify them? If you're an ally for inclusion, what can you do to further the cause?

Here, we share the personal experiences of four edtech leaders:

Desiree Alexander

DIVERSITY VS. QUALITY, A FALSE DICHOTOMY

Desiree Alexander is an award-winning education consultant and founder and CEO of her own company, Educator Alexander Consulting. When she receives an award or is accepted into a program, she's often the only person of color or the only woman there.

"You always have this nugget in the back of your mind. Do the people there see you as someone who is accepted because of your worth or who was accepted to check a box? I've learned to get over it," she says. "But for some people, it is a barrier because they don't want to be seen as a pity hire."

Even if she could forget she was different, there are subtle reminders. For example, when Alexander worked in a supervisory position at a school district, she had a male colleague who reported to her. Staff at the district would often go to the man to ask questions, even when he was standing right next to her.

"It wasn't done because they are racist or sexist," says Alexander. "It's because that's what they were taught and what they're comfortable with. If we don't stop and look at those things, it does become sexist or racist."

Alexander has personally had to call out racist behavior. A company she was contracting with said it wanted to be more diverse and sent out a statement saying they were looking to hire more diverse people. That statement included reassurances that the quality of work wouldn't lapse. Alexander pointed out that if they were putting out a statement that they were hiring more people generally, they would never feel the need to include a statement about the quality. Why did they feel the need to do so when stating they were diversifying their hiring?

"Some people talk a good game, but that doesn't mean there's not going to be sexism or racism," she says. "I was further away from the table than I thought I was."

Toutoule Ntoye

SEEK DIVERSITY

Sometimes to get a seat at the table, you have to invite yourself, says Toutoule Ntoye, an instructional coach with Los Angeles Education Partnership and founder of Pivot-Ed, a nonprofit that supports student athletes. Ntoye says he's not always invited to meetings, but if he has a stake in the topic, he will ask to attend or just show up.

For example, when a new program was being rolled out at his school, staff held a

IF YOU'RE A DIVERSE VOICE IN EDTECH, HOW DO YOU GET A SEAT AT THE TABLE AND A VOICE IN DECISION-MAKING? IF YOU'RE IN A LEADERSHIP ROLE ALREADY, HOW DO WE FIND DIVERSE VOICES AND HELP AMPLIFY THEM? IF YOU'RE AN ALLY FOR INCLUSION, WHAT CAN YOU DO TO FURTHER THE CAUSE?

THE WAY TO ENSURE WE SEE THINGS FROM A DIVERSE PERSPECTIVE IS TO INCLUDE PEOPLE WITH THOSE PERSPECTIVES.

meeting about which students would participate. The project wasn't in his purview, so he wasn't invited, but he decided to attend and advocate for a greater diversity of students to be included.

Ntoye points to the example of the H&M advertisement featuring an African-American boy wearing a sweatshirt that reads, "Coolest monkey in the jungle," widely considered racist. "We see many examples in the business world where they didn't have a diverse group of folks making decisions," he says. "There's was clearly no one in the room who could have said, 'That's a bad idea.'"

The way to ensure we see things from a diverse perspective is to include people with those perspectives. Those perspectives should echo the demographics of the stakeholder group, i.e., students.

"If you have a mix of people who look like the people you're serving, then you're more likely to get decisions that will benefit all. The more diverse people you're serving, the more diverse your decision-making body has to be," says Ntoye.

That's not always an easy task since we're often naturally surrounded by people who look like ourselves. It requires school leaders to seek diversity. If you don't see anyone who looks different than you, expand your circle by attending conferences or seeking out diverse perspectives on social media.

Equally important is making sure the diverse staff you already have is welcome. People often don't realize they're harboring bias. In that case, it's the responsibility of those who see it to call it out for the good of everyone.

"If I'm feeling microaggressions from staff, students are probably feeling that, too," says Ntoye. "We need to know how to identify it and get past it. We have to be courageous and make sure it's an ongoing conversation, not just because it's diversity day."

Natalia LeMoyne Hernández
BELIEVING IN HERSELF

Natalia LeMoyne Hernández was 15 and living in her native country of Colombia when her father died. She and her mother moved to Argentina to live with her aunt in Buenos Aires, where Hernández finished high school and attended teacher training college. She moved to Fayetteville, North Carolina, on a Visiting International Faculty program.

There, she discovered that not everyone wants to listen to what you have to say when you speak with an accent. Fortunately, Hernández found someone who listened to her – a mentor who could relate. Her mentor's husband was from a different country and had also experienced discrimination. She helped Hernández set up training across the district to share the innovative way she was using GarageBand to teach English language learners.

"The key was that someone believed in me, and I was then able to show by my actions through time that I'm knowledgeable and provide value," says Hernández.

Hernández continued to grow professionally and earned certifications. These extra efforts have given her presence and respect in her new school district in New York. Although she still encounters discrimination, she now stands up for herself.

Hernández has a co-worker, whom she describes as very friendly and not intentionally discriminatory, who made a joking reference to a Latina character by calling her "Chiquita banana." She says she knew he was a joke and didn't let it fill her with anger and resentment, but she still needed to tell him that his jokes were not OK. Things changed for the better after that.

"If you approach someone with resentment or anger, that's going to come back to you in some shape or form," she says. "We should use these opportunities to teach."

Luis Pérez

NOTHING ABOUT US WITHOUT US

Luis Pérez didn't intend to end up in edtech. He was initially planning to go into IT, but a car accident led to his diagnosis with a visual impairment. He knew that the odds of employment aren't not high for people with disabilities, but his technology background made him decide there was no reason for that to be the case.

"Technology levels the playing field for people with disabilities and allows them to showcase their abilities," says Pérez. "So many technologies used in schools and the workplace are built in now." For example, for people who struggle with typing, there's talk-to-text technology.

That doesn't mean there aren't unique challenges. Pérez says most people with disabilities don't expect others to know how to accommodate them, but it's always appreciated when people ask if there's anything he needs to participate in a meeting. Although people can feel uncomfortable asking, something as simple as that sends a powerful message of inclusive intentions.

DIVERSITY RESOURCES FROM EDTECH LEADERS

Looking for ways to increase your diversity IQ?
Check out the resources below, recommended by edtech leaders.

A Seat at the Table: Diversity in Edtech
An ISTE webinar featuring the panelists in this article. (bit.ly/2Hz19xz)

Racial Equity Tools
Website that provides tools, research, curricula and ideas for those seeking to increase their understanding and work toward social justice. (bit.ly/2TT9wp3)

Project Implicit
Free implicit bias assessment. (bit.ly/1b9JX9x)

Rhianon Gutierrez
Digital learning specialist in the Boston Public Schools who works at the intersection of media, education and cultural inclusion. @RhianonElan

Kenneth Shelton
Edtech speaker and techquity voice. ISTE Digital Equity PLN 2018 Excellence Award winner. @k_shelton

Join the conversation on Twitter using the hashtag #ClearTheAir, #RJLeagueChat, #UDLChat, #DiveIntoUDL.

Sometimes there's a notice at the bottom of an announcement requesting that people ask if they need an accommodation. Pérez said when he was first diagnosed, he didn't feel comfortable asking for accommodations. Now, he stands up for what he needs and encourages others to do the same.

While many people feel uncomfortable drawing attention to someone's disability by asking about accommodations, Pérez says, please ask. If the intention is to make sure that the person's voice is heard, the question is unlikely to be offensive. This is especially true if the conversation directly impacts others with disabilities.

"It's important to feel you are listened to, you are valued," says Pérez. "In the world of special ed, we call that self-determination. Nothing about us without us."

JENNIFER SNELLING IS A FREELANCER WHO WRITES FOR A VARIETY OF PUBLICATIONS AND INSTITUTIONS, INCLUDING THE UNIVERSITY OF OREGON. AS A MOTHER TO ELEMENTARY AND MIDDLE SCHOOL-AGED CHILDREN, SHE'S A FREQUENT CLASSROOM VOLUNTEER AND IS ACTIVE IN OREGON SCHOOLS.

Knowing what to solve opens doors to discovery

By Mary Howard

Innovation leads to progress in industry as well as in education. Steve Jobs suggests that "Innovation distinguishes between a leader and a follower." Considering the great impact of innovation and reflecting on the Innovative Designer standard in the ISTE Standards for Students got me thinking about how I can alter my pedagogy in my sixth grade science class to allow for more student innovation.

The ISTE Innovative Designer standard expects students to:

Use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.

The standard is couched with instructionally compelling terms such as *deliberate design process, considering design constraints* and *creating innovative artifacts*. As I've migrated through each of the indicators of the Innovative Designer standard, I've seen how broad and approachable this standard is.

A CLOSER LOOK

The design thinking process is a tool for designing creative solutions to existing problems. This process is typically a cyclical process, beginning with defining and

identifying problems and progressing through a cycle that emphasizes iteration. Engineering solutions came to the forefront in science classes as districts began to adopt the Next Generation Science Standards (NGSS) in 2016.

When the standards were written, a calculated choice was made to replace the term "technological design" with "engineering design." In doing this, NGSS focused a lens on the "iterative cycle of design that offers the greatest potential for applying science knowledge in the classroom and engaging in engineering practices."

The standards focus on three component ideas of engineering design:

1. Defining and delimiting engineering problems involves stating the problem to be solved as clearly as possible in terms of criteria for success and constraints or limits.

2. Designing solutions to engineering problems begins with generating a number of different possible solutions, then evaluating potential solutions to see which ones best meet the criteria and constraints of the problem.

3. Optimizing the design solution involves a process in which solutions are systematically tested and refined, and the final design is improved by trading off less important features for those that are more important.

The ISTE Innovative Designer standard reflects this "define, design and optimize" approach by specifically referencing the design process and, as such, opens the door to creative thinking, engineering practices and capturing the power of innovation.

With ISTE's Innovative Designer standard in mind, I initiated more design thinking opportunities for my students by implementing experimental design challenges or STEM challenges in my classroom. In doing so, I learned how a measured approach to these challenges is critical for student learning.

Laying out the steps for students can have a big impact on enhancing their skills in addressing innovative design challenges.

EXPERIMENTAL DESIGN CHALLENGES

As a science teacher, integrating engineering (STEM) design challenges is a natural fit, and students love them! After all, what sixth grader doesn't want to balance a marshmallow on the top of the tallest tower of spaghetti using only 12 inches of tape?

In these challenges, students progress through a process that addresses myriad innovative design skills, such as using a deliberate design process, creating innovative artifacts, generating ideas, exhibiting a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.

But simply throwing STEM challenges at students and watching them puzzle it out isn't enough. Experimental design requires a great deal of scaffolding. Laying out the steps for students can have a big impact on enhancing their skills in addressing innovative design challenges.

A SCAFFOLD FOR DESIGN CHALLENGES

When establishing experimental design challenges, it's important to provide students

with opportunities to analyze the problem and establish the *criteria* and *constraints* they're faced with as they address a challenge.

The first indicator of the Innovative Designer standard states:

4.a. Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.

The process of tackling a design challenge is much more complex than just knowing what to solve. Students need to recognize specifically what's involved in the problem before they can be tasked with solving it. So it's important to approach the initial phases of a design challenge in a very methodical way, by explicitly summarizing the problem and focusing on criteria and constraints.

To introduce problem formation, I pose a very traditional design challenge called the Duncker's Candle Problem. In this problem, students need to determine how to affix a candle to a wall so that it will not drip wax onto a table. They can use only a candle, a box of thumbtacks and a matchbook.

I only provide students with an overview of the challenge – not the materials – and they must clearly articulate the problem and establish the constraints and criteria before they can proceed to determining possible solutions. In this way, they're armed with a broader analysis of the challenge and can consider a wider range of solutions as they progress to the design phase.

The approach begins by sharing a brief summary of the problem. Students are asked to state what items they are working with and what solution they are seeking. Summarizing is often a task learned in English language arts class and a skill that doesn't necessarily transfer to science or STEM problems, so my students need

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scaffolding as they state the problem. The following guiding questions aid them in this first step:

1. What is the required outcome of the task?

2. What materials are you working with?

By answering these questions, students come up with acceptable statements of the problem. An example problem statement that my students developed for the Duncker Candle Problem was: "Attach the candle to a wall while collecting the wax with only a box of thumbtacks and a matchbook." Or, "A candle must be attached to the wall with only a box of thumbtacks and a matchbook, but still not not drip on the table."

IDENTIFY CRITERIA AND CONSTRAINTS

We then expand our understanding of the design challenge by identifying the criteria within the challenge and the constraints. Admittedly the terms *constraint* and *criteria* can be unfamiliar to sixth graders, so I give them question stems to help with their evaluation.

For constraints, I ask students to consider the limitations on them with respect to the problem. They need to evaluate what materials are available (or not available) and they need to establish an overall picture of what factors they need to keep in mind to successfully proceed with their solution. One compelling question that elicited a lot of discussion was the "constraint" that they had to obey the laws of science and that they could not simply make the candle hover or suspend the wax in mid-air!

We view criteria like a report card: How will you know if you've been successful? This forces students to not only recognize any specific requirements of the project, but makes them more analytical during the process as they realize there are specifications that must be met while they're creating their designs.

After students successfully formulate the problem and identify constraints and criteria, they're ready to be highly engaged in innovative design throughout the next steps as they determine possible solutions and then design them.

As a scaffold to experimental design thinking, this is where we stop. We share our ideas with one another and discuss our results as well as the proposed "acceptable" solution.

THE NEXT DESIGN CHALLENGE

As a follow-up to this experimental design challenge, I give students a real design challenge involving spaghetti, tape and a marshmallow (because again, who doesn't want to build a tower like that?). I find that they can address a design challenge much better after having practiced the process.

During our second design challenge, we focus on scaffolding the latter steps in the design process. With the marshmallow challenge, students have the opportunity to build the tower and apply the criteria they've established.

Of particular note is the importance of the iterative step in the experimental design process, which is a critical component in all real-world engineering projects. Experimental design isn't a one-time shot. It's important for students to realize that there could be a better way to solve the problem, and it's critical for us to allow them the space and time to reflect on their solutions and improve their designs.

Reflection and iteration lead students to the concept of optimization and drives students toward altering, adjusting, reflecting and improving their work in what could conceivably be an endless process. Like editing and revising a piece of writing, working toward a solution that best reflects our efforts is a critical skill in the experimental design process.

Formulating the problem and identifying criteria and constraints are the first steps toward integrating design challenges as a part of the Innovative Designer standard. When the process is effectively scaffolded, students have a greater understanding of their tasks as they continue through the design thinking process.

With this approach, the skills of analyzing and implementing possible solutions, with the goal of achieving the most efficient and effective combination of steps and resources, will benefit from a solid problem-formulation foundation and open doors to greater student discovery and innovative design skills.

Mary Howard (@mrshoward118) is a sixth grade teacher at Veronica E. Connor Middle School in Grand Island, New York. She teaches English language arts and science, and was a finalist for the 2018 New York State Teacher of the Year. Howard features many of her educational technology adventures and musings on her blog yoursmarticles.blogspot.com.

Formulating the problem and identifying criteria and constraints are the first steps toward integrating design challenges as a part of the Innovative Designer standard.

As ISTE commemorates its 40th anniversary, we celebrate Joe Kmoch, one of our longest-serving members.

Joe Kmoch

Retirement hasn't slowed this CS advocate one bit

By Nicole Krueger

If there's an initiative to boost computer science in schools, Joe Kmoch – one of ISTE's longest-serving members – probably has a hand in it.

He helped develop some of the earliest K-12 computer science standards. He wrote grants securing $2 million in funding to train more than 250 CS teachers. He helped establish the Wisconsin chapter of the Computer Science Teachers Association, coordinates a statewide awards program for high school women interested in technology careers, and speaks at national STEM conferences.

And that's just since he retired.

"A friend of mine regularly tells me I fail at retirement," says Kmoch, a former math and computer science teacher who now works as an education consultant, helping schools develop CS curricula. "When I get up in the morning, I have to figure out which of five things I've got to do first."

That's fine with him. He's been advocating for computer science education since the early 1970s, when he was a fresh-out-of-college math teacher with a growing fascination for computers. Those were the days of the Olivetti Programma 101, the first commercially available programmable desktop computer. It cost $3,200, had the bulk of an AV cart and weighed about 60 pounds. Only three other schools in his area had one.

"It had the capability of your watch nowadays," he recalls.

When he couldn't stop raving about it to his colleagues at Rufus King High School in Milwaukee, his department chair suggested he get one and start teaching computer science classes. His mission in life began to take shape: Get more students and teachers interested in CS.

After collaborating on one of the nation's earliest career-readiness programs for data processing, he transferred to Washington High School, where he spent the rest of his teaching career building up its computer science program. By the end of the '80s, with around 700 students taking CS classes, things seemed promising.

"The goal was to let kids get enough exposure to computer science so they could make some decisions for themselves as to whether they want to continue on with this or move on to something else," he says.

Then the "dark days" of the early 2000s hit. Computer science landed on the chopping block in many schools, alongside music and art, because budget-strapped leaders didn't see any value in it.

Joe Kmoch has been advocating for computer science education since the early 1970s. Retirement hasn't kept him from his mission.

PHOTOS BY C&N PHOTOGRAPHY

"CS for all is not about having a bunch of siloed classes. It's not about making sure everybody takes the intro to computer science class at the high school level. What it is about is infusing computer science concepts and computational thinking into all other subjects."

Even within ISTE, where Kmoch led the Special Interest Group for Computer Science (now the Computer Science Network) for six years, interest in CS was waning.

"In some cases, I would go to math conferences and get myself on the program, and I was maybe the only person talking about computer science at the entire conference," he recalls.

His persistence is now paying off. With technology permeating nearly every industry, the need for CS education has grown impossible to ignore. Corporate leaders have sounded the alarm about the increasingly dire shortage of professionals with computer science knowledge, and education leaders are finally listening. "CS for all" initiatives are sweeping around the globe, prompting entire states and countries to commit to teaching computer science to every student.

"CS for all is not about having a bunch of siloed classes," Kmoch says. "It's not about making sure everybody takes the intro to computer science class at the high school level. What it is about is infusing computer science concepts and computational thinking into all other subjects."

His mission is still far from complete, however.

"In Wisconsin, there's still the fact that only around 30 percent of the high schools offer any computer science at all, so we still have this gap," he says. "A lot of schools are not doing anything. So more school districts, more school boards, have to be convinced that this is important for their kids – and in many cases, for the survival of their communities."

Although he retired from teaching in 2004 to help care for his ailing parents, he hasn't slowed down a bit. For him, retirement means he can continue working on his mission without having to worry about getting paid for it.

"I pretty much live this stuff," says Kmoch, whose tireless efforts earned him the ISTE Making IT Happen Award in 2015. "When I'm 80 or 90, maybe the bowling thing will be fine, but right now I want to stay involved. This is exciting stuff for me."

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

State leadership matters for edtech funding

By Janice Mertes
Assistant Director of Digital Learning, Wisconsin Department of Education

In Wisconsin, the goal of the Digital Learning and Technology team is to help our state's educators leverage digital tools to increase student engagement and outcomes, rather than to develop educators' capacities to use any one specific device or piece of hardware. This prioritization of edtech-enabled learning over the tools themselves – grounded in the core principles of the ISTE Standards for Students and the Future Ready Schools Framework – is reflected in our statewide edtech plan, the Wisconsin Digital Learning Plan, which outlines our commitment to provide students with innovative learning experiences that are equitable, personalized, applied and engaging.

A new federal grant opportunity has allowed us to further support our districts as they implement this statewide vision in a way that meets the unique needs of their students. Under the Every Student Succeeds Act (ESSA), federal dollars authorized in Title IV-A can be used to fund programs and activities that promote effective uses of edtech. The law permits district leaders great latitude over how this Student Support and Academic Enrichment (SSAE) grant can be spent. Therefore, Wisconsin recently led efforts to collaborate with our district leaders as they brainstorm how to get the most bang for their buck.

Our team directly engaged with district leaders to collect information on how they envision allocating the SSAE grant. They expressed interest in funding STEM programs, blended learning initiatives, after-school learning opportunities and increasing educator conference attendance, among others. We then connected district leaders with several key resources – aligned to both the Wisconsin Digital Learning Plan and their specific priorities – to help guide their budgeting strategy.

Examples included the Future Ready Digital Dashboard tool, which can be used by district leaders to determine their district's current level of digital readiness, and ISTE's "Using ESSA to Fund Edtech," a comprehensive implementation guide that recommends evidence-based uses of the SSAE grant. Both can be found on the Wisconsin Department of Public Instruction's website.

Here are three lessons learned from our state's experiences thus far:

Take a collaborative approach by inviting district leaders to the table. Depending on the specific needs of their students, districts will have different priorities for how they plan to spend the SSAE grant. It's imperative to have this information in hand to determine how state leadership can best provide support.

Provide districts with Title IV-A implementation resources aligned to both statewide and district priorities. Feature those with a strong edtech component – such as the Future Ready needs assessment and ISTE's Title IV-A implementation guide – on an easily-accessible technical assistance website. Host additional opportunities, such as webinars, to walk district leaders through some of these resources and spark ideas on spending the SSAE grant in effective ways.

Collect data and stories about how educators have successfully leveraged the SSAE grant. Only recently did Congress vote to significantly increase federal dollars available through the SSAE grant. Communicating information about how the money has contributed to innovative learning experiences will be critical to advocating for future Title IV-A funds.

With these three tips, you can help your state's school leaders navigate the federal funding opportunity the SSAE grant represents.

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

What are the best digital portfolio platforms to use across a district?

Google Drive/Sites
sites.google.com

Digital portfolios are a big initiative in our district right now. By the end of 2019-20, all K-12 students will need to exhibit grade-level appropriate digital portfolio skills. The tools Google Drive, Google Sites and Seesaw are used to support this work and help our students share and reflect upon their learning artifacts.

Katherine Heywood, digital learning coordinator
Wake County Public School System
Raleigh, North Carolina

Schoology or district LMS
schoology.com

We looked at some third-party options and finally decided that the portfolio feature within our LMS, which is Schoology, will work for our needs. I'd encourage the district to look at tools they already use to see if the tool can be adapted for digital portfolio creations. When teachers see the project as part of something they're already doing, instead of "one more thing," they might feel better about using the tool.

Diana McGhee, director of technology and information
Fort Thomas Independent Schools
Fort Thomas, Kentucky

Seesaw
web.seesaw.me

Seesaw has an option where the students' portfolios can be passed on year after year if you purchase the school edition. There is a cost involved (ours was about $5 per kid). Whoever the administrator of the school account is passes the students on to their next class before the next school year starts.

Allison Sowa, technology coach
St. Francis Xavier School
Lincoln, Nebraska

OneNote
office.com/onenote

OneNote works great! Students can insert files, draw, handwrite, type and add YouTube videos, PDFs, documents, etc. Students could have a separate section for each school year. Their work can be shared with others who have viewing or editing access. If they create it in their education account, they'll want to move it to a personal account when they graduate or leave the district. The best part? OneNote is free and multi-platform.

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

Digication
digication.com

I first became aware of Digication when Stony Brook University used it to support the Coursera MOOC "Introduction to Computational Arts." Digication made its platform available for the course learners to capture and share the outcome of their projects. Later, the University at Buffalo adopted the platform as the campuswide e-portfolio tool.

Lisa Stephens
assistant dean, engineering
University at Buffalo

Bulbapp
bulbapp.com

Our district recently met with Bulbapp, and they presented to us a very unique platform for students to create digital portfolios. I was really impressed with the user-friendly interface and the simplicity of the platform. Currently, our students are using Google Drive to house their school work, but Bulbapp allows more student ownership and creativity.

Zeshan Khan, digital learning coach
Irving Independent School District
Irving, Texas

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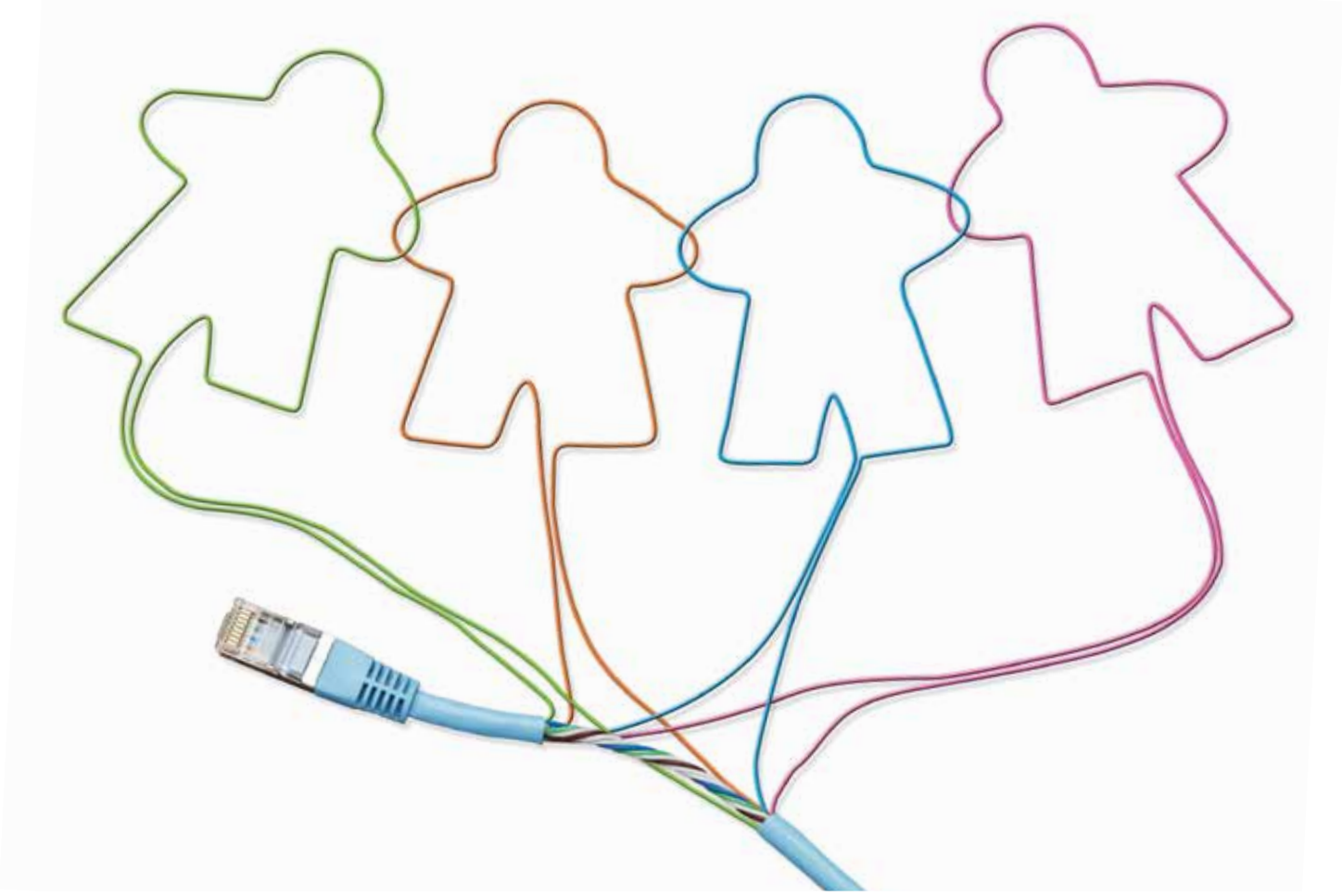

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