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# eSCHOOL NEWS

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## 5 innovative ways educators are using digital learning tools

Laura Ascione, Editorial Director, eSchool Media

Digital learning has not always been as ubiquitous as it is today—in fact, a decade ago, the concept made many educators uncomfortable. But today, digital learning resources are embraced as tools that highly-skilled educators can use to boost student engagement and connect classroom lessons to the real world.

Digital Learning Day celebrates this evolution and highlights how educators across the country are using digital learning tools to create authentic connections and personalized learning opportunities for every student, everywhere. Check out All4Ed’s Digital Learning Day resources to find digital learning tools, hear from fellow educators about their



digital learning strategies, and more.

Here, five educators share the digital learning tools and resources that have proven successful in their classrooms and in their schools.

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## What the F? Grading strategies for early career teachers

Steven M. Baule, Ed.D., Ph.D. & Brooke Boulton, Winona State University

According to a recent study, grading is one of the least stressful activities early career teachers have to complete. Grading is time consuming, however, and more grading-related questions are popping up in the news these days. For instance, are teachers allowed to reduce grades for late work? Are students allowed to retake tests on which they did not do well? It is essential that teachers have a clear and supportive grading system in place to address the scrutiny of today’s students, parents, and other stakeholders.

Setting up a grading system requires more than a calculator. A philosophical foundation is important to how a teacher grades. Having a philosophical basis for grading helps instructors explain grades, their meaning, and their

value to students, who may then see the grade as less arbitrary. Two common approaches to further mitigate this arbitrary nature include normative-based grading and criterion- or standards-based grading. To build a strong, meaningful grading policy, instructors must choose the approach that best fits the course design and student learning outcomes.

Instructors who choose a normative approach will grade based upon relative performance. A teacher’s fallback practice may be to grade on a curve; however, curved grading is philosophically flawed in most course level applications. Effective instructional design models and psychometrics generally anticipate that students can master an end-of-course exam with a 70 to 80 percent score. Exams that do not reflect that criteria may have been poorly designed. Otherwise, instructional challenges

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## Tools

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**1. Specialized digital content can support students as they learn specific and individual skills.** While digital science content is abundantly available, digital science content that supports and focuses on lab skills is more difficult to come by. Cristi Watkins Sims, department chair and AP Biology teacher in Arizona, shares her three favorite digital resources that can help support ALL science teachers teaching science lab skills.


**2. Mixed reality glasses can help struggling readers.** Hear from two East Carolina University educators and researchers about how they created a science reading experience for 5th grade students using the Microsoft HoloLens, a mixed reality technology that merges the real and virtual worlds to produce something entirely new. Young readers wore the mixed reality glasses and then looked at a page of scientific text in the real world. The HoloLens was programmed to deliver supplementary con-

tent in the virtual world that could only be seen and heard within the glasses. Because abstract concepts can be intimidating for young learners, the focus remained on supplying additional information for difficult scientific concepts. When the students' eyes paused on a particularly difficult word or phrase, the glasses would deliver audio-visual information to supplement the reading.

**3. Social studies is critical to students' lives beyond the classroom—educators should use every possible tool to engage students in this critical discipline.** Stacey Higgins, a fourth grade team leader at Forest Lake Elementary School, engages students with a host of exciting digital resources that help students connect their lessons to the real world. Those digital social studies tools help Higgins enhance her delivery of instruction and expand students' knowledge of the country's history.

**4. Minecraft Education is a perfect example of taking a digital resource students already love and using it for learning.** "When kids use Minecraft in the classroom, they're so engrossed in

what they're doing that they forget they're actually learning," said technology specialist Kristen Brooks of the Cherokee County School District. "Students excel in their learning when they're encouraged to create projects in a style or format they prefer."

**5. Virtual reality and 3D can be instrumental in helping students develop durable skills.** Once a novel technology, the current mindset seemed to be that VR was just another toy used to consume games and other media. Megan Bateman, a technology/media literacy specialist, art specialist, and data/intervention specialist in Minnesota was not looking to use VR to gamify her classroom. She wanted her students to be able to use virtual reality as a medium for developing the higher-order thinking skills that are critical for thriving in today's digitally connected society. To push students past the consumption mindset, she developed an immersive design adventure that awakened and inspired the 4Cs of learning: creativity, critical thinking, collaboration, and communication. 

## Strategies

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or lack of student engagement could be to blame. Some college courses simply provide a curved score for students to lower the failure rate or to stratify student performance. This, however, does not evidence how students understood the content. Curved grades only show how students performed in relation to other students instead of reflecting students' mastery of the materials.

Issues with curved grading methods were especially problematic when remote teaching was enforced during the pandemic. In many cases, remote learning provided new opportunities for cheating, and students were able to buffer their grades at the expense of those who did not cheat. In traditional bell curve criteria, for each student who earns an A another must fail. Therefore, normative grading practices effectively

promote a winner and loser approach to grading. For instructors looking for a more equitable classroom, normative grading tends to miss the mark.

The other common approach is criterion-based grading. Students who meet an assignment's criteria can earn a passing grade or even an A. This offers greater potential for equity in the grading system. Most letter grade systems are effectively criterion based. A rubric that shows what criteria students must meet to earn an A-F grade communicates clear goals and standards. Students may choose to what degree they engage with an assignment to earn an A, B, or C, for example. One extreme of criterion-based grading is standards-based grading. Students are simply judged on whether they meet the standard. The grade may be Pass/Fail or a "B" in an A-F scale. Other factors eventually shape the final grade, such as whether the instructor accepts late work

or the weight of an assignment toward a final course grade.

A mastery approach in criterion-based grading allows students to retake exams or resubmit assignments until they meet the standard. Two common modifications to this approach are: 1) students must turn in an assignment on time and demonstrate an effort meet the criteria; and 2) students who repeat an assignment cannot earn a higher score than the highest score among those who completed the assignment without resubmitting. Allowing students to turn in corrected tests is another way to encourage a review of materials towards mastery. Using the same point limitations, this will prevent students with a 98 percent from resubmitting while offering an opportunity toward mastery for students who earned below an A.

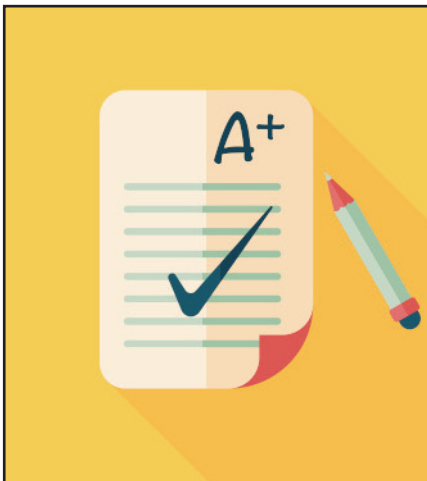
Determining how to handle late work is its own issue, yet one deeply connect-

**Strategies, page 3**

## Strategies

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ed to an effective grading system. Some would argue that late work should always be accepted without deductions. This could become a burden for instructors, however, and impede students' progress toward mastery. Allowing unapproved late work without penalty limits an instructor's ability to guide and intervene as necessary for student success. When students wait to turn in assignments until the end of a course, this can be just as destructive as deduct-



*Ideally, assignments should be building blocks for students to practice skills needed for the final assignments in the course. Grading routine daily homework may be more of an exercise in compliance than in grading for understanding.*

ing points for late work. What begins as a kind gesture may prove detrimental to student learning. To remedy this, instructors need to find a late work balance that meets the needs of the students, the course, and themselves.

Time and experience impart great wisdom in deciding what late work policy works best. One common approach to late assignments is to mark down a letter grade or percentage for each day an assignment is late. Potentially, instructors could offer one "free" missed assignment per unit or course.

Another approach is to encourage students to communicate if they might be late. Though forgiveness may be easier to obtain than permission, encouraging students to communicate is a proactive approach. In most cases, students who ask for extra time can have it. Another day or two could be the difference between a B and an F for some students, and it means less negotiation between the student and instructor in the long run. Ideally, assignments should be building blocks for students to practice skills needed for the final assignments in the course. Grading routine daily homework may be more of an exercise in compliance than in grading for understanding. The same is true at some level with participation. Participation grades must be thoughtfully balanced to ensure they reward engagement in class activities and are not simply rewarded for showing up to class.

A no-zero policy is another grading approach that encompasses late, missing, or sub-par work. Many students spend time figuring out if they have a mathematical chance to pass even with an extremely high final exam score. If students determine they cannot pass,

they may not even try. A "0" in a percentage system can destroy a student's mathematical potential to pass, and most research shows repeating a course provides little incentive for students to improve. The no-zero policy can help students who take more time to understand concepts or who struggle with materials early in a course. The no-zero policy effectively eliminates zeroes from the grading scale. A simple solution, for example, is to move to grading on a 4-point scale with 4 = A in the grade book. It has the same effect as

replacing a percentage-based GPA zero with a 50 percent. Like any well-intentioned policy, instructors must make sure it is not abused.

Ultimately, grading and student success are a partnership. In K-12, this includes parents, students, and instructors. Post-secondary educators may partner with students, advisors, and even counselors when discussing a student's progress. Conversations and grading policies that reflect more equitable practices will hopefully continue to evolve as stakeholders understand more about student needs following the pandemic. In both K-12 and higher education, accountability, engagement, and communication among everyone involved in a student's success are critical to progress, both for students and for the broader state of education. It is essential that we remember grading is simply a communications tool to assist students in being successful, it is not an end in itself.

**eSN**

*Dr. Steve Baule is a faculty member at Winona State University (WSU), where he teaches in the Leadership Education Department. Prior to joining WSU, Baule spent 28 years in K-12 school systems in Illinois, Indiana, and Iowa, and two years teaching in the University of Wisconsin System. For the 13 years prior to moving to the university level, Baule served as a public -school superintendent. He has written 10 books on a variety of educational and historical topics and has served on the editorial boards for two journals. Baule earned an advanced diversity and equity certificate while in the UW system. He holds a doctorate in instructional technology from Northern Illinois University and a doctorate in educational leadership and policy studies from Loyola University Chicago. Brooke Boulton has taught writing and literature in the Midwest for over a decade. Currently, she teaches in the English department and in the Doctor of Education program at Winona State University.*

# 5 ways educators can leverage ChatGPT

Some educators are nervous about students using artificial intelligence to cheat on assignments, but these tools can enhance teaching and learning

## Josh Corbett, 6th Grade Social Studies and Writing Teacher, Central Minnesota

Artificial intelligence is currently walking itself through the hallways of our schools and some teachers may not be leveraging this tool to enhance their teaching methods. Instead, many educators and learning institutions are nervous about the student use of artificial intelligence to pass assignments and assessments. Here are five tips for educators to enhance their learning methods and help students grow.

### 1. Create rubrics for all assessments with ease.

ChatGPT, one of the most well known artificial intelligence tools, can curate useful tables of resources for educators to minimize the need to search for information. One way educators can harness this optimization is by asking the software to produce a baseline rubric, with the teachers' needed areas of assessment, for the educator to review. Type these prompts into the chat feature for a preview of the power ChatGPT can provide:

- Create a table of educational grants, with links, for classroom supplies.
- Create a presentation rubric, with 1 thru 4 scale, for organization, content, delivery, and creativity.

### 2. Spark a new idea.

Artificial intelligence can help teachers spark a new idea by making suggestions for ways to engage students. Teachers plug in their lesson needs and artificial intelligence can help spark some ideas. These ideas do not replace the teacher, rather, they help set educators on the path of lesson creation with an added spark. Try these prompts in ChatGPT for yourself:

- Create a lesson for *My Side of the Mountain* that includes art.

- Design a lesson for subtracting three-digit numbers that involves regrouping.
- Create a lesson that increases a student's reading fluency at a second grade reading level.

### 3. Help with learning targets or "I Can Statements."

Creating learning targets or "I Can Statements" can be a daunting task, especially when a particular content area can have over 40 standards per academic year. Educators can ask ChatGPT to create a table of their specific state standards and corresponding suggested learning targets. This list still needs to be looked at by educators before agreeing to using them in the classroom, but the time ChatGPT saves is very valuable to PLC's and schools. Here are a couple of example prompts for you to modify to your specific standards to enter into ChatGPT:

- Write a table of your state's 6th grade social studies standards and "I Can Statements" sorted by standard number.
- Create a table of vertically aligned SD mathematics standards from Kindergarten to 3rd grade.

### 4. Professional development

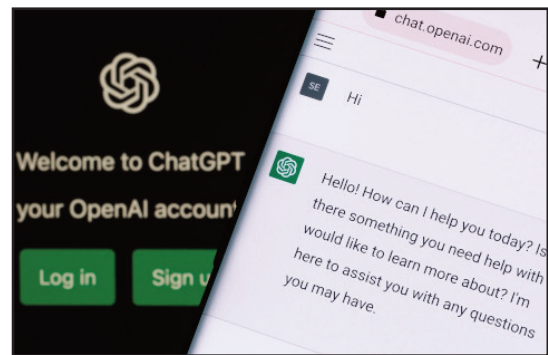
Using ChatGPT can help point educators in the direction of latest information regarding the desired professional development topics. From exploring blended learning resources to learning how to incorporate coding into a classroom, educators are only limited by their desire to learn. Asking ChatGPT to highlight areas of interest is a new way for educators to explore options they might have missed otherwise. Some areas of exploration might include, but

are not limited to, the following:

- What tools help promote personalized learning in a 1st grade classroom?
- How can educators gamify reading assignments in a high school setting?


### 5. Research

Exploring the researching capabilities of ChatGPT can highlight areas of interest for educators as they develop lessons, advance the field of education, and even help educators with their relationship to their current employer.



Below are some areas of research to get you started:

- Create a table of median teacher salaries by state, sorted from highest to lowest.
- Generate a timeline of important events of Martin Luther King Jr.'s life.
- What is the history of <insert your school district here>?

As artificial intelligence walks our school halls, I would recommend educators start learning how to utilize artificial intelligence tools like ChatGPT. We know our students will use it, so why shouldn't educators also learn to use these tools for the positive advancement of education? 

*Josh Corbett is currently a sixth grade Social Studies and Writing teacher in Central Minnesota. He enjoys his family, the outdoors, and exploring educational technology-related tools.*

# Building pathways to successful STEM careers for ALL learners

**Anne Papakonstantinou,  
Director & Adem Ekmekci,  
Director of Research and  
Evaluation, Rice University  
School Mathematics Project**

The journeys that children take through education are not as straightforward as most people think.

In recent years, close to 70 percent of students went straight from high school to college, with those going to four-year universities typically outnumbering those enrolling in two-year colleges by roughly two to one. But a growing number of young people are forging new paths that involve a detour around college altogether.

College-going rates have been trending down since before the COVID-19 pandemic. And a national survey conducted in 2021 by ECMC Group found that less than half of high school students said they planned to attend a four-year college or university—a decrease of more than 20 percentage points from 2019.

That's a real shame. Students who pass up college can close off good careers in STEM fields—science, technology, engineering and math—even if they struggled in school in these same subjects. Plenty of STEM jobs don't require four years of college—just two or sometimes less. A lot of recent high school graduates might be surprised to know that some STEM careers that don't require an expensive bachelor's degree pay really well.

Building better pathways to STEM careers starts with teachers, counselors and parents—and a few basic math concepts.

There's a common perception that young people don't pursue STEM degrees or careers because math and other STEM subjects are too hard. That's nonsense. Math is much more than trigonometry and physics and calculus. At its basic level, math is about



learning to think and solve problems. Learning basic math skills such as reasoning, estimation, and measurement can open doors to good careers in growing fields such as allied health, health care, medical offices and construction trades. To point students toward STEM careers that require mastery only of basic math, teachers from kindergarten through 12th grade must share the joy of learning math and show all students that math is a crucial skill.

School counselors must do a better job of recognizing the wide range of opportunities after high school and guiding all students—not just the ones heading to four-year colleges. High school counseling offices are chronically understaffed, and many counselors are saddled with the task of administering high-stakes tests in addition to everything else on their plates. Schools and school districts need to invest more in the people positioned to help high school graduates navigate a complex world of school and work options.

Parents need to learn about potential career options available to their children. Too many parents think the only paths to success are becoming a doctor or lawyer. They need to open their eyes to other possibilities. Teachers and high

school counselors aware of good STEM opportunities can help guide their children. Visits to local companies and technical training providers can provide glimpses of even more options.

Everyone involved in a child's life must have high expectations and not limit young people. When Anne was a high school calculus teacher at an urban school in Houston, she told the mother of one of her best students that her son should go into engineering. The mother told Anne she wanted a real estate career for her son because she didn't want him to be disappointed when he failed at engineering. This young man overcame his mother's fears and is now supporting his family as a successful mechanical engineer.

The lesson here: Children respond to how adults treat them. They will succeed when their teachers, counselors and parents support, encourage and push them to do better than they ever thought they could do. The young adults who spoke at the Rice University School Mathematics Project's recent spring conference are proof of this. They told us how they left high school without a clear plan but thankfully found their way into STEM fields,

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# Why educational robotics is a critical STEM learning tool

STEM learning can be challenging, but educational robotics offers students an opportunity for a hands-on, guided problem solving learning experience

**Laura Ascione, Editorial Director, eSchool Media**

Engineering is a critical part of STEM education, and engineers play a role in creating, improving, and maintaining some of today's most valued and essential things, from smartphones and airplanes to zippers and roller coasters.

This year, Engineers Week celebrates "Creating the Future," and it emphasizes the vital role engineers play in cre-

ating innovative solutions to some of the world's most pressing problems and biggest challenges. Highlighting engineering also encourages students to pursue engineering classes and, potentially, engineering career paths.

motivation to pursue it. Because STEM is not a standalone, core academic subject, it's implemented differently all over the country. Ultimately, through STEM learning, students should have the opportunity authentically apply their learning to solve real-world problems.

STEM is often introduced in middle and high schools, but by that time, many students have already avoided it, said

problem-based learning challenges early on. This motivates students to tackle more difficult challenges.


"Students as young as 6 and 7 form an opinion about their proficiency in STEM subjects, and once that opinion is formed, it becomes very difficult to change," he said. "Our job is to arm teachers with tools so they can introduce young students to authentic, engaging, fun activities. Now students can see themselves as someone in a STEM field—now they have the capability to do one of these STEM subjects."

Educational robotics bridges the gap between rigid lessons and lessons that are too unstructured to motivate students, McKenna said. VEX Robotics leans heavily into the idea of guided problem solving—the idea that students have enough structure to understand their challenge or task, but enough space to explore different solutions.

Teachers ensure students have the background knowledge to begin the challenge and they set expectations for what success looks like. As students move through a challenge and the problem-solving process, teachers take away some scaffolding that was in place in earlier stages. Students can achieve their goal in different ways, trying different approaches and processes.

"You want a level of guidance and structure, and as students progress, you slowly take that scaffolding away and allow students to apply creative solutions to the problem," he said.

This type of STEM exploration helps students realize that they can be STEM students.

"There's no such thing as a math brain or a reading brain. We can become good at anything if we put enough time towards it," McKenna said. 



ating innovative solutions to some of the world's most pressing problems and biggest challenges. Highlighting engineering also encourages students to pursue engineering classes and, potentially, engineering career paths.

When students become interested in STEM at a young age, their critical thinking, collaboration, creativity, and communication skills have a chance to thrive. Sustaining that interest is important, too, particularly because girls and underrepresented minority groups quickly lose interest in STEM learning—and never regain

Jason McKenna, director of Global Educational Strategy at VEX Robotics and author of *What STEM Can Do for Your Classroom: Improving Student Problem Solving, Collaboration, and Engagement, Grades K–6*.

Early STEM exposure—and successes or failures in STEM learning—can often make or break a child's willingness to participate in STEM learning. Educational robotics can turn this downward trend around by incorporating all aspects of STEM in an engaging way that helps students reach success in

# Strategies to help IT leaders combat imminent cyberattacks

As long as effective measures are in place, including reliable endpoints and resilient zero trust, cybersecurity threats can be managed

## Warren Young, Area Vice President - SLED, Absolute Software

It is undeniable—the education sector is prone to cyberattacks from malicious cybercriminals due to the amount of personal data available across user devices and organization networks. Just this past fall, the FBI, CISA and MS-ISAC issued an alert on Vice Society, whose actors have been known to disproportionately target the education sector with ransomware attacks.

While cybersecurity is certainly a top concern among this sector, tight budgets and resources mean that it is often not addressed until a major incident occurs. Given the imminent nature of today's threat landscape, now more than ever, the urgency surrounding how best to protect and mitigate such attacks is at an all-time high.

With 40 percent of education devices found to have sensitive data stored, educational institutions must be adequately prepared to proactively prevent and respond to potential cyberattacks before a system breach occurs.

## Understanding Complex IT Environments

Despite schools primarily returning to the classrooms, the ramifications from rapid acceleration of remote learning brought about during the pandemic are still being felt today—some of which present new challenges across the industry. With limited resources, visibility and budget, IT and security teams have been forced to address obstacles remotely. On the IT front, this can make it difficult to locate, track, manage and more importantly, reclaim missing devices—regardless of platform—from a

single, cloud-based console.

Emerging concerns over the inability to measure student device usage and verify online activity remains a persistent challenge. This, in tandem with failing security controls such as encryption, outdated anti-malware, and vulnerable OS versions, has created a plethora of vulnerabilities and increased risks for cyberattacks.

## Boosting Endpoint Visibility

Education organizations were found to have endpoints that were connecting in from nearly three locations per day (2.89). This may not be surprising given the digital nature of most schools today; however, paired with the analysis on sensitive data, it's evident that corporate endpoints are at an increased risk of compromise.

Whether on or off a campus network, it's crucial to activate a persistent connection to all your endpoints in order to provide unrivaled visibility and control. When institutions integrate these capabilities, they are then able to effectively geolocate, freeze, and wipe remote devices. From there, organizations can better plan, execute, collect, control, and monitor all remote devices.

Maintaining complete endpoint security requires a number of elements to be in place:

- For starters, the endpoint software should be embedded in the firmware of all devices, where it can't be removed.
- Upon its activation, users should instantly have self-healing digital connection to all of their endpoints regardless of if they're on or off an institution's network.
- It is important to ensure inventory is



an automatic process, where information can be fed from all endpoints. This should always remain efficiently up to date, without the need for any additional infrastructure.

- Beyond these capabilities, encryption and anti-malware monitoring should help to provide an even stronger barrier, restoring faulty safeguards remotely, without any human intervention needed.

## Embracing Resilient Zero Trust

Given the growing threat of cyberattacks underscoring organizations' abilities to depend on conventional perimeter-based defenses to protect critical systems, the Zero Trust approach has taken precedence. Under a Zero Trust approach, access to applications and data is denied by default. With the White House mandating federal compliance with zero-trust architecture by 2024, security and compliance are no longer mutually exclusive but rather, adopting a Zero-Trust security model is a necessity in order to remain compliant. Given the anticipated federal shift in policy across our nation in 2023, it is likely educational institutions will follow suit and implement their own Zero Trust requirements to ensure they remain resilient despite ongoing threats.

Solid network resilience is crucial to build on a platform of strong user verification as this is the most strategic means of preventing a breach of IT sys-

**Cyberattacks, page 16**

# Use these 5 learner-centered models to inspire educators

**Laura Ascione, Editorial Director,  
eSchool Media**

School models are, for the most part, outdated—and very overdue for replacement. When students reach high school, research shows that close to 66 percent of students are disengaged. But even students who do successfully navigate their schooling emerge with only a specific (and often narrow) skillset that may or may not match their strengths or interests.

Conventional schooling often leaves students disillusioned, questioning their intelligence and value as it is framed by a system that needs an overhaul.

Learner-centered education can play a critical role in reshaping education systems, offering a more holistic approach to meeting learners' needs and helping students find fulfillment in their academic accomplishments.

K-12 Value Networks: The Hidden Forces That Help or Hinder Learner-Centered Education, a report from the Clayton Christensen Institute and authored by CCI senior research fellow Thomas Arnett, offers insight into understanding why schools struggle to change their instructional models, along with tips to establish and support learner-centered education models.

Program leaders, sponsors, learners and their families, staff, community partners, and funders are all critical to the success of these learner-centered education models.

The report describes how five different learner-centered education models—The Met, Virtual Learning Academy Charter School, Iowa BIG, Village High School, and Embark Education—were able to launch and grow their models by assembling value networks congruent with their vision for learner-centered education.

**1. The Met:** The Metropolitan Regional Career and Technical Center, known as The Met, is a network of six small, public high schools located in Providence and Newport, Rhode Island. The hallmark of The Met's learner-cen-



tered model is that its learners go out in their communities for two days out of the week to lead real-world projects as interns for partner organizations. For example, learners might work with a local bakery, a law firm, a tech company, or a recording studio.

When learners join the Met, they and their families work with an advisor to identify their strengths, needs, and interests, and then develop an individualized learning plan with an internship as its centerpiece. Learners are responsible for researching potential internship opportunities and communicating with partner sites to arrange their internships. Advisors coach them as they do their research and outreach to ensure that internships match their needs and interests.

**2. Virtual Learning Academy Charter School:** The Virtual Learning Academy Charter School (VLACS) is a statewide virtual school created in 2007 that serves K–12 learners throughout New Hampshire. The concept for the school came from the superintendent of the Exeter Region Cooperative School District, who saw an opportunity to take advantage of a new charter school law to apply for a statewide charter. Rather than create another conventional school, however, the superintendent recognized the distinctive value of using a virtual school model to offer a wide array of

flexible, part-time and full-time learning options unavailable through brick-and-mortar campuses.

VLACS's competency-based model is highly adaptable to learners' needs and interests. It offers a range of options for learners to earn credits: through online courses, learner-designed projects, and out-of-school learning experiences such as internships and travel. Learners who take online courses move through those courses at their own pace and earn credit whenever they're able to demonstrate mastery of designated competencies. For projects and other learning experiences, VLACS aligns these experiences with state learning standards and then measures learners' mastery of standards using performance-based assessments.

**3. Iowa BIG:** A community conversation about the knowledge and skills young people need to become engaged and successful members of the community as adults was linked with an initiative to send 60 community leaders back to school alongside learners over a four-month period. Through this experience, the community leaders realized that most learners were disengaged in school. Partitioning content into discrete subjects and courses made the learning boring and the teaching hard. Meanwhile, the work learners did in

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# My top 3 digital science lab resources

It can be challenging to find digital learning tools that specifically support lab science, but these resources fit the bill

**Cristi Watkins Sims,**  
**Department Chair &**  
**AP Biology Teacher, Arizona**

As a former molecular biologist turned college and 7-12 educator, I have taught laboratory science classes for the past 3 decades. I've seen a lot of changes in science education (especially digital content) over the last 30 years, but one challenge has remained the same: students have to learn laboratory skills.

As a science department chair at a high-performing public high school in Arizona, I can attest firsthand to the stress this component of science education places on young, new science teachers who may not have the benefit of being a trained research scientist in college and who feel intimidated to lead an entire class of 30+ adolescents through a lab that they must by themselves prepare everything for.

This insecurity can lead to many 7-12 science teachers opting not to complete many hands-on labs with their students either because they lack the resources or the confidence to do so. Add to this the fact that districts often emphasize and require science teachers to host and participate in school and district Science Fairs, and it is no wonder that good science teachers are hard to come by.

While digital science content is abundantly available, digital science content that supports and focuses on lab skills is more difficult to come by. Here are my 3 favorite digital resources that can help support ALL science teachers teaching science lab skills:

**1. Discovery Education's Pivot Interactives:** This is my number one super recommendation! Whether it is supporting junior high, high school, or undergraduate college labs in physics, chemistry, biology or earth science, Pivot offers lab experiences that are real

(not cartoons) and truly interactive where students can analyze real data (depicted through videos) and even select their own data to collect. The auto-graded questions embedded along with the open-ended free response questions allow for immediate feedback to students about what they are doing and if they are on the right track or not (something that even in-person labs do not have.) The scientist-generated questions are all designed to not only provide verification that students are learning what they are supposed to be learning, but also help model how a lab should be executed for newer science teachers who may not already be comfortable doing so on their own.

Each interactive is also fully customizable by the teacher so can be scaffolded

searchable activities presented on this website are targeting students who need Science Fair projects but it is also a fabulous lab resource which can provide teachers with scientist-derived investigations that can be tested using readily available and cheap materials supporting science skills for students both in class or at home (for independent work).

Best of all, it is free and it offers labs for all science subjects and levels. This is a particularly great resource for elementary teachers who haven't specialized in science education but who still want to engage their students with science labs where they (the teacher) feels supported.

**3. Edpuzzle:** This resource is more generic than the previous two, in that you



folded easily to target what the teacher wants. In addition, since the Arizona Department of Education purchased Discovery Education's K-12 platform for the whole state, that content can further enhance and support the Pivot lab resources. Honestly, Pivot is absolutely worth every penny of the \$5/student price tag.

**2. Science Buddies:** While not digitally interactive per se, the digitally

can take any video and embed relevant auto-graded questions to give students immediate feedback. The good news is that the videos can be of real experiments and phenomena, but the downside is that you either have to make your own or dig through other teachers' Edpuzzles in order to find what you need. In this way, it does require lab expertise, so it lacks the teacher support highlights of the other

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# 4 key ways schools can strengthen and advance cybersecurity strategies

Implementing a proactive cybersecurity posture is a difficult and time-consuming—yet necessary—process

## Chris Percival, Director of Technology, Maconaquah School Corporation

In a 2022 survey, 72 percent of the participating school administrators responded that cybersecurity was either a priority or high priority for their district leadership and local school boards. However, only 14 percent of the respondents said their district was very prepared for a cyberattack event.

This alarming disparity between prioritization and preparedness is indicative of the challenges school districts are facing pertaining to cybersecurity. As the Director of Technology at Maconaquah School Corporation located in north-central Indiana, I know firsthand that implementing a proactive cybersecurity posture is a difficult and time-consuming—yet necessary—process. School districts are prime targets for hackers; therefore, we must be prepared.

In our own school corporation, we have adopted four key practices that enable us to continuously strengthen and advance our cybersecurity mitigation and prevention strategies.

### 1. Get Creative With Your Budget

Like many school districts, our IT budget has not increased to address the growing number and variety of cyber threats; in fact, it has stayed the same for the past five years. That can make it challenging to add new defenses, but we have found ways to strengthen our posture through strategic and creative financial planning.

One shift we have made is leveraging hosted and/or managed services to fill staffing gaps and eliminate expen-

sive and unpredictable capital expenses. For example, we previously had an on-prem firewall solution that was managed by a former staff member. When they left, I made the decision to switch to ENA by Zayo's hosted firewall so that I did not have to spend the time and money hiring and training a new employee who would likely leave after six months for a higher paying job in the private sector.

To attain leadership buy-in for this new direction, I broke down the monthly costs of buying a new on-prem firewall solution and included estimated hiring, training, and repair fees over the lifecycle of the equipment. This enabled district leaders to see a side-by-side cost comparison of using a hosted, cloud-based firewall service versus an on-prem solution. Once they saw those numbers and realized the hosting service also included access to ENA's team of security experts, they supported the decision to transition to cloud-hosted firewall.

Additionally, evaluating tech and app user usage is another way we are freeing up funds to support cybersecurity. With so much money being invested in educational software, it is critical to monitor if teachers and students are using our paid learning tools. We regularly survey teachers and review usage data to assess and adjust our licensing. This enables us to free up budget dollars and reinvest these funds in proactive cybersecurity tools like DDoS mitigation. We adopt the same approach with infrastructure and network solutions, seeking out bundling and other cost-savings opportunities to free up funds we can use to support our cybersecurity strategies.

### 2. Find Trusted Partners Who Bring Additional Expertise and Support

With IT staff members stretched so thin, it is imperative to find great companies you can depend on to help you. I have five primary companies that I trust and who have a great track record working with us. Even if their pricing is a little higher, the benefits far outweigh the costs because they are reliable and responsive, they know the ins and outs of our network, and they understand our goals and objectives.

For example, we have been working with a company for 10-plus years, and they are very familiar with our IT environment. I asked their team over the holiday if they could update our firmware and upgrade our server that runs our application management and patches. Their team remotely completed the work in half a day whereas it would have taken me much longer to finish those upgrades, and I have the peace of mind of knowing their experts took care of everything.

### 3. Train and Retrain

Most school districts have some type of cybersecurity training program in place for staff, but we are building a training culture centered around empathy and understanding. Teachers are busy. When they have 25 kindergarten students running around, and they get a spoofed email that looks like it is from a legitimate sender, it is easy to understand why they might accidentally click a link.

To address this, we have created some of the following training channels

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## Cybersecurity

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to reinforce best practices with current staff as well as onboarding new team members:

We hosted a “Know Before You Click” training campaign reinforced by monthly phishing simulations with built-in 30-minute cybersecurity trainings.

We conducted a Little Phish Cybersecurity weekly video series that addressed cybersecurity issues in an engaging way and was followed up with a short-written synopsis.

We host a two-day professional

development academy in the summer for teachers and staff.

Our training programs are always evolving to meet the needs of our staff, but the most critical factor is that the training never stops, and it never will. To be proactive, we must be diligent about educating staff members and ourselves about the very real threats that exist in today’s digital landscape.

### 4. Continuously Identify and Address Your Vulnerabilities

As with training, school districts should never remain idle when it comes to evaluating and addressing their vulnerabilities. We have spent the last few

years identifying and fixing gaps in our cybersecurity posture and defenses. For example, when I became the technology director, I discovered every teacher had local administrative rights to their C drive. We have since removed those rights and corrected the issue, but those are the types of problems that can go unnoticed and leave a district’s network exposed. Conducting regular audits and evaluations has put our district in a stronger position, but the work is never complete. To be diligent, we must proactively assess our cybersecurity weaknesses and defenses regularly.

Unfortunately, hackers and cyberattacks are not going to go away. Until new funding opportunities are made available, K-12 schools need to reexamine their budgets and find sustainable ways to strengthen their cybersecurity defenses. eSN



*Unfortunately, hackers and cyberattacks are not going to go away. Until new funding opportunities are made available, K-12 schools need to reexamine their budgets and find sustainable ways to strengthen their cybersecurity defenses.*

*Chris Percival is the Director of Technology at Maconaquah School Corporation, located in Bunker Hill, Indiana. Chris and his team of IT professionals are responsible for supporting all uses of technology usage in the school system, including software, hardware, web-based applications, infrastructure, security, student database management, and connectivity. Chris has been with the district since 2012, joining the team as a computer systems engineer before being named the Director of Technology in 2017. Chris is certified educational technology leader (CETL) and attained certifications in Cyber Hacking and Vulnerability Management from his alma mater, Purdue University, in 2022.*

# Balancing sustainability and innovation in education

**Thomas Weeks, Ed. D., Chief Technology Officer, Hillsborough County Public Schools**

As recipients of public funding and taxpayer dollars, K-12 school budgets and spending expenditures are under a microscope. Relief funds stemming from the pandemic have only sharpened the focus, particularly on infrastructure and technology investments. In my role as Chief Technology Officer at one of the nation's largest school districts, Hillsborough County Public Schools (HCPS), being accountable and ensuring we are making prudent financial decisions is a top priority for my team.

Striking a balance between innovation and sustainability is a challenge most school districts are facing. At HCPS, we have adopted three guiding principles that serve as the driving force and framework behind every IT decision—equity, efficiency, and excellence.

## Equity

At HCPS, we are committed to delivering equitable learning opportunities to all students. From an infrastructure standpoint, that means eliminating the digital divides that exist within our own campus. Students in Building A must have access to the same level of high-quality Internet as students in Building B, regardless of a school building's age or geographic location. If students in Building B experience frequent lag or downtime, their learning will be disrupted and result in learning loss.

To remedy this, we are building a future-ready wide area network (WAN) that can scale with user demand to deliver robust and reliable connectivity campus-wide. Additionally, we have been working with K-12 partners like ENA by Zayo to assess, design, and deploy upgraded wireless local area networks (WLAN) at several of our buildings.

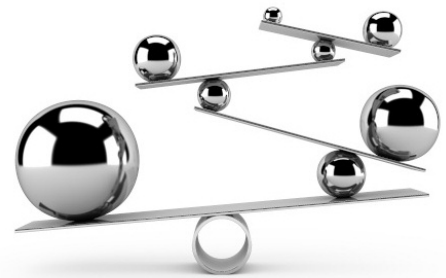
Delivering Internet access beyond our buildings is also a priority. Currently, we assign mobile hotspots to students who need access outside of school. However, our long-term strategy is to research private LTE options and potentially build a sustainable and cost-effective LTE network to help address the access gaps that exist within our community.

## Efficiency

Even though school districts have seen an influx of federal relief funds over the past few years, it is important for technology leaders to keep efficiency in mind as they create their technology strategies. At HCPS, sustainability is a key focus. We need to be responsible stewards and have a funding plan in place to ensure we can continue to support and fund the initiatives and technologies we are implementing to avoid wasting both time and money.

In just the past two years, we have created several efficiencies in our device management process. For example, we have switched to universal adapters to eliminate the time and expense it takes to locate and replace missing adapters for student devices. We are also seeking to become a 1.5-to-1 district in terms of student devices to eliminate delays when devices are broken. We want technology to enhance the learning experience, not impede it. If a student's device stops working, that is disruptive. We need to reach the point where we can seamlessly address those types of issues to ensure learning continuity.

Additionally, like many other districts, we've experienced staffing shortage challenges. Partnering with vendors and using their engineering expertise to fill in the gaps has enabled our HCPS staff to focus on other time-sensitive matters and be more efficient with their time.



## Excellence

Finally, all the work we are doing at HCPS is being measured and judged by a standard of excellence. We are working together to build a future-ready digital learning environment that can support our students and staff—both inside and outside the classroom. That work entails eliminating a piecemeal approach to our infrastructure and implementing streamlined industry standards and rulesets. We have also created a training center for our employees to ensure they have the professional development resources they need to be successful in their careers.

By aligning our IT goals and strategies with the principles of equity, efficiency, and excellence we are ensuring that we are implementing sustainable and transformative changes that meet our district's vision of preparing students for life. **eSN**

*Thomas Weeks, Ed. D. serves as the chief technology officer (CTO) for Hillsborough County Public Schools. In his position, he provides leadership for the information technology services (ITS) organization supporting the students and employees of the nation's seventh largest school district. Prior to his selection as CTO, he served the district for five years as the department manager for infrastructure and shared services, where he focused on the data communication network and project management. Thomas earned his Doctor of Education degree in Leadership Studies with a focus on Educational Technology from Wilkes University.*

## Models

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school had little connection to real-world problems, careers, and citizenship. Then came the founding of Iowa BIG, a high school learning experience sponsored by four local districts that enables learners to earn core credits by doing authentic projects.

The typical day of an Iowa BIG learner is half conventional and half learner-centered. For part of the day—either the morning or the afternoon—learners attend their local high schools. Then for the other half of the day, they go to an Iowa BIG site for real-world learning experiences. The model works with partner companies and organizations across Cedar Rapids to conceptualize projects learners might complete. Learners then work with partners to co-design interdisciplinary projects that both align with the academic and life goals of the learner, as well as the business or nonprofit needs of the partner. Projects might include creating museum exhibits, helping optimize processes at a hospital, hydroponic farming, or developing a messaging campaign for an animal shelter.


**4. Village High School:** The Village diverges markedly from standard approaches to high school education. Its learners receive all of their core academic content—English, history, social studies, and math—through mastery-based online courses. This format elim-

inates the need for scheduled class times and allows learners to progress at their own pace and test out of modules that they already have expertise in. Online courses at Village High School create time and capacity for the most learner-centered features of its model: its array of in-person electives.

Often team-taught and generally in-person, these courses are inspired by teachers' and learners' own passions. They cover myriad different topics, often in an interdisciplinary format: from *Adulting 101*, *Renewable Energy*, and *Beekeeping* to *Comparative Religions* and *International Relations*. Many electives take advantage of the Village's flexible format. For an elective on ceramics, learners spend an entire day every week working on ceramics projects; and one physical education elective takes learners out into the Colorado Rockies for hiking and rock climbing. The grading model in electives is also different—closer to a workplace evaluation than to conventional points earned on assignments and tests. Learners and teachers sit down together to discuss learners' progress and work, and decide on a grade together.

**5. Embark Education:** Miguel Gonzalez, a career educator, launched Embark Education in 2019 out of a coffee shop and a bike shop in North Denver, CO. His goal was to create a learner-centered model at the intersection of authentic experiences and relationships. That goal translated into a

private, tuition-free micro-school serving approximately 50 sixth- through eighth-grade learners. Embark's two businesses, *Pinwheel Coffee* and *Framework Cycles*, enable learners to engage in projects that integrate academics with real-world questions. For example, while working on the practical skill of crafting the perfect cappuccino under the guidance of adult baristas, learners investigate the differing mathematical ratios of ingredients present in a latte versus a cappuccino, and the chemistry behind the extraction of caffeine from coffee beans.


These integrated "shop projects" include a combination of direct instruction within the three core academic disciplines (math, science, and humanities); personalized learner exploration; and practical work within the bike and coffee shops. They enable learners to master foundational academic skills while simultaneously experiencing the application of these skills in the world beyond the classroom. Learners' projects for the businesses must contribute to the success of the businesses. For example, learners don't work on problems that the businesses have already solved, such as having learners apply math and science to reinvent the latte. Instead, Embark's leaders look for opportunities that leverage the unique advantage of having learners' on site to make the businesses better than what they could do alone. 

## Science

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two resources. But it is still a great resource for those teachers who know their stuff plus it embeds assignments directly into Google Classroom. Edpuzzle is free for keeping up to 10 Edpuzzles but does cost money for unlimited storage.

Teaching lab science doesn't have to be scary or daunting when using these resources! Pivot Interactives is a fabulous way to both help introduce students to real labs as well as provide additional

at-home practice with the benefit of immediate feedback for auto-graded questions and support for newer science teachers who are insecure about leading labs. Science Buddies has GREAT (subject-searchable) examples of labs that can be done cheaply and easily with home materials and easy-to-follow protocols. And Edpuzzle requires a bit more know-how but allows for questions to be embedded within videos of phenomena or experiments to make sure that students are understanding what is happening in labs. With these tools at your fingertips, you are sure to be a Science Lab Teacher SUPERSTAR! 

*Cristi Watkins Sims has a Master of Science degree in Evolutionary Molecular Biology plus completed 3 years of Ph.D. research in Molecular Biology and Human Genetics before having and raising 4 children. She has taught all levels of science from 7th grade through undergraduate labs and lectures and was also on the Arizona Department of Education committee that recently updated the state science standards. She has judged science fairs for over 30 years and is currently the department chair and AP Biology teacher at a top-performing public high school in Chandler, Arizona.*

## STEM

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which were more accessible than they thought.

Colton, one of these young adults, said he was terrible at math in high school. After a series of dead-end jobs, he started looking for a real career. Pipefitting seemed within reach — except for the math. But a union local helped him quickly learn enough algebra and geometry to get work. He’s now an HVAC pipefitter working on major construction projects and proud of what he has been able to accomplish.

This story is anecdotal, but there are data to suggest that learners like Colton can find success in STEM careers even if they don’t go straight from high school to college and even if they did not have good K-12 math and science experiences. The Rice University School Mathematics Project recently published a study of the efficacy of The College of Health Care Professions in preparing Hispanic students for jobs in allied health fields. This Houston-based institution serves a large population of Hispanic and first-generation students and students 23 and older. Many CHCP are economically disadvantaged, single parents or working multiple jobs.

Between 2012 and 2018, according to our study, nearly 80 percent of CHCP’s Hispanic students graduated

from certificate and associate’s programs—a rate much higher than state and national averages. Even better, 80 percent of graduates landed jobs in their fields of study. We were also encouraged to see first-generation college graduates placed in jobs at the same rate. This is a good example of how colleges can use stackable, flexible programs and wraparound services to help learners access careers based on math and science.

Children and college students don’t come to school to fail. They come to learn. What has happened—and why they miss out on good STEM careers—is that many educators fail to teach them. Many don’t advise or support them or know how to guide them or connect with them.

But when all students are held to high standards, supported throughout their educational journeys and directed toward the many science and technology opportunities that don’t require learning high-level math, they might find that STEM careers are more possible than they might think. **eSN**

*Anne Papakonstantinou is the Director of the Rice University School Mathematics Project. Adem Ekmekci is the Director of Research and Evaluation at the Rice University School Mathematics Project.*

## Cyberattacks

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tems. More specifically, Resilient Zero Trust functions as a means of verifying users on a case-by-case basis, to assess, identify and alert of any suspicious behavior. When teams are notified of these threats in advance, they can freeze or shut-down potentially compromised entities to stop threat actors in their tracks. When this action is taken, this prevents hackers from moving laterally across a network, where they could cause even further damage to confidential records.

### Ensuring Resilience for the Long-Haul

In today’s era of hybrid education, devices may travel with students and faculty across campus or even across the globe. Despite the benefits of staying connected, this new way of learning has created immediate concerns for information security; however, institutions shouldn’t remain fearful. So long as effective measures are in place, including reliable endpoints and resilient zero trust, there is no threat too big that can’t be contained. **eSN**

*Warren Young is the Area Vice President – SLED at Absolute Software.*

## eSCHOOL MEDIA INC.

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