

A person with dreadlocks is wearing a VR headset and pointing towards the right. They are sitting at a desk with a computer monitor and keyboard. The background shows a classroom with other students and computers. The entire image has a warm, orange-tinted overlay.

FORTINET®

**SECURITY AS AN
ENABLER OF eLEARNING
IN K-12 AND HIGHER
EDUCATION**



CONTENTS

INTRODUCTION

3

SECTION 1: EDUCATION TECHNOLOGY WILL CONTINUE TO EVOLVE RAPIDLY

4

SECTION 2: EMERGING TOOLS CREATE NEW DATA VULNERABILITIES

8

SECTION 3: INTEGRATED, COMPREHENSIVE SECURITY ENABLES SAFE eLEARNING

9



INTRODUCTION

NEW LEARNING TECHNOLOGIES CREATE NEW VULNERABILITIES

As corporate and consumer technology progresses at a breakneck pace, innovators in education work feverishly to harness emerging capabilities. Everything from analytics to robotics are finding their way into today's leading-edge schools.

Teachers and administrators at all levels—from kindergartens to medical schools, and beyond—are utilizing new technologies. Some promise to enhance engagement and comprehension for students who might not thrive in a traditional environment. Others personalize lessons so that each student moves at his or her own pace. Such tools have enormous promise to improve learning and provide insights into student progress that were simply impossible just a few years ago.

On the flip side, however, these distributed and often less-protected technologies expand the attack surface of a higher-education institution or K-12 school district, potentially opening the door to data thieves and others looking to wreak havoc through a network intrusion. And despite limited IT resources, schools must be vigilant in mitigating the security risks presented by emerging technologies.

IT managers and IT administrators in the education sector who are designing data protection and threat-prevention measures for their institutions need to take into account that:

- Education technology will continue to evolve rapidly.
- Emerging tools create new application and data vulnerabilities by adding complexity and expanding the attack surface.

01 EDUCATION TECHNOLOGY WILL CONTINUE TO EVOLVE RAPIDLY

The pencil, first mass-produced in the 1860s,¹ is one of the few 19th-century classroom tools still in use today. Innovation has transformed education, especially in the past several years, and it's only the beginning. Cloud computing, the Internet of Things (IoT), and artificial intelligence (AI) are a few notable technologies that enable a wide variety of tools that enhance teaching, learning, collaboration, problem-solving, and creativity.

TAKING ADVANTAGE OF CLOUD APPLICATIONS

Many educators looking to leverage the latest curricular tools are turning to cloud applications. With limited staffing and budgets, IT managers and administrators in K-12 and higher education are generally looking to “spend less money and time on technology and more money and time on teaching and research.”² Software-as-a-Service (SaaS) technologies enable schools to offer students, teachers, and administrators access to innovative software without adding to the workload of an IT team that might already be overtaxed.

To provide students with a convenient way to use cloud-based

applications, many schools are providing them with mobile devices such as tablets or Chromebooks. Making a world of information available at students' fingertips—while removing the need for application deployment and management—is driving demand for cloud-based educational technologies.

Cloud-based gamification, for example, is gaining popularity as a way to keep this generation of learners engaged. Games can be powerful learning tools, as they are “incredible packages of teaching, learning, and assessment.”³

A side benefit of schools' adoption of cloud and mobile technologies is that it helps ensure innovative teaching tools are distributed more equitably. Digital gaps in education are a concern for teachers, administrators, and policymakers alike. Cloud technologies help level the playing field by giving students from all sociodemographic backgrounds, in a wide range of school settings, access to the same learning platforms.

¹ Adrienne D. Coles, “[Mass-Produced Pencil Leaves Its Mark](#),” Education Week, June 16, 1999.

² Betsy Reinitz, “[Enterprise IT Perspectives on the 2017 Top 10 IT Issues](#),” EDUCAUSE Review, January 17, 2017.

³ Ryan Schaaf and Jack Quinn, “[12 Examples Of Gamification In The Classroom](#),” TeachThought, April 25, 2017.

IoT IS IMPACTING eLEARNING

As it's permeating many other aspects of society, IoT is also entering classrooms. Some educators are using 3D printers to bring lessons to life, enabling students to create models of engineering designs or print topographic maps to better understand geography.⁴ Others are using interactive projectors to keep students more engaged.⁵

The most prevalent IoT technology in today's classroom may be the interactive whiteboard. These tools simplify the display of visual elements of lessons, but they also do much more. They connect easily to online resources teachers can use to reinforce the curriculum. In addition, they are also interactive; students may be able to write on them with fingers or manipulate images they display.⁶

The use of industrial and service robots is growing quickly.⁷ Not to be left out, robotics is increasingly being used in classrooms, as well as in after-school competitions. A recent study notes that, "K-12 educators are harnessing the study of robotics to promote critical and computational thinking, as well as to foster hands-on learning in STEM subjects and beyond."⁸ In addition, three states—Connecticut, Minnesota, and Texas—have sanctioned programs in their schools to establish robotics as a varsity sport.⁹

As costs come down, wearable technologies have enormous potential to shape learning. For example, Google Glass could be used in higher education to display supplemental



information during lectures, watch lab experiments from a safe distance, or get medical training.¹⁰

⁴ [Thingiverse Education](#), accessed March 9, 2018.

⁵ Art Feierman, "[The 2017-2018 Best in Classroom, Projector Award Winners](#)," ProjectorReviews.com, June 3, 2017.

⁶ Janelle Cox, "[Technology in the Classroom: The Benefits of Smart Boards](#)," TeachHUB.com, accessed February 21, 2018.

⁷ Frank Tobe, "[22 research reports forecast sustained robotics industry growth](#)," The Robot Report, October 5, 2017.

⁸ A. Freeman, S. Adams Becker, M. Cummins, A. Davis, and C. Hall Giesinger, NMC/CoSN Horizon Report: 2017 K-12 Edition, Austin, Texas: The New Media Consortium, 2017.

⁹ Elevating Robotics to a Recognized Interscholastic Activity, FIRST, accessed March 28, 2018.

¹⁰ "[36 Ways To Use Wearable Technology In The Classroom](#)," TeachThought, December 28, 2015.

In a recent survey, 46% of K-12 and higher-education IT managers said they expect IoT technologies to have a major impact on education in the next two years.¹¹ Respondents cite numerous benefits of incorporating these tools into classrooms, including:

- Increasing student engagement
- Enabling a more personalized education
- Improving measurement of student success¹²

AI IS ALSO ENHANCING LEARNING

Artificial intelligence (AI) is at the top of the list of technologies expected to shape the future of education. As one eLearning thought leader and practitioner puts it:

“One of the key challenges of classroom management has always been that every student learns at a unique pace. When a particular lesson is geared to the students who are taking the longest to grasp its concepts, those who understood more quickly will inevitably be bored. But moving at the pace of the class’s fastest learners will likely leave some students behind.”

What AI introduces to this teaching puzzle is the ability to tailor a curriculum to each student’s individual needs. Adaptive learning programs and games focus on a specific topic with which a student has struggled in the past and can repeat



concepts until students master them. They can also provide immediate, targeted feedback. Incorporating this type of personalized learning into a classroom environment improves students’ ability to master the subject matter.¹³

“While many of us have even seen headlines predicting that robots will begin replacing teachers within the next 10 years, good teachers will never become obsolete. However, artificial intelligence is beginning to transform classrooms through customizable content, and tracking and monitoring diagnostics.”¹⁴

¹¹ “[The Internet of Things Smart School Infographic](#),” June 8, 2016.

¹² “[The Internet of Things Smart School Infographic](#),” June 8, 2016.

¹³ Daniel Faggella, “[Examples of Artificial Intelligence in Education](#),” TechEmergence, September 1, 2017.

¹⁴ Cameron Paterson, “[Artificial Intelligence in Education: Where It’s At, Where It’s Headed](#),” Getting Smart, October 22, 2017.

Likewise, AI offers a vehicle for customized tutoring for students who need extra help. Bill Gates, as an example, imagines a world in which tutoring systems built on AI provide personalized support for everyone—from middle schoolers struggling with their algebra assignments to grandmothers trying to learn a new language.¹⁵ Specifically, Gates anticipates that chatbots will be able to walk students through even the most difficult subjects very soon, checking their assumptions and guiding their learning.¹⁶

Some observers predict that students of the future will have their own personal, AI-driven tutors that follow them from early learning through college, and perhaps even graduate school, identifying areas of weakness and providing extra help when necessary.^{17,18}

One more area where AI holds great promise is its ability to identify teachers' professional development needs. Just as an AI-based tutor might pinpoint a student's struggles, a similar tool could monitor lessons and make recommendations for improvement.



¹⁵ Adam Avery, "[Artificial Intelligence Promises a Personalized Education for All](#)," The Possibility Report from The Atlantic, accessed January 29, 2018.

¹⁶ Matt Weinberger, "[Bill Gates says the next big thing in tech can help people learn like he does](#)," Business Insider, April 25, 2016.

¹⁷ Dyllan Furness, "[That's 'Professor Bot' to you! How AI is changing education](#)," Digital Trends, August 27, 2017.

¹⁸ Rafi Letzter, "[IBM's brilliant AI just helped teach a grad-level college course](#)," Business Insider, May 27, 2016.



02 EMERGING TOOLS CREATE NEW DATA VULNERABILITIES

Unfortunately, for resource-constrained educators, a K-12 school district, technical college, community college, or university that embarks on digital transformation by bringing cloud, IoT, and/or AI technologies into classrooms increases its vulnerability to security threats. The attack surface expands with cloud use, and most IoT devices were not designed to include security.

In addition, cyber criminals see schools of all sizes as attractive targets. They have long stored personal information on students and staff, in addition to valuable research data. Deploying personalized learning tools further enriches the store of information that needs protecting.



03 INTEGRATED, COMPREHENSIVE SECURITY ENABLES SAFE eLEARNING

If not protected, the expanded attack surfaces that new technologies bring open the door to new threats, endangering data, applications, and users. To enable safe and innovative eLearning, educational institutions need leading-edge technologies that guard the network against advanced threats at every point of vulnerability. Further, security solutions for the network, endpoints, access, email, and web applications, along with advanced threat protection, should be integrated. They can then share threat intelligence and deliver fast, automated response to threats anywhere in the network.

It's also key for this integration to give IT staff full visibility of security events throughout the borderless network.

With a security strategy that delivers integrated protection across all attack vectors, K-12 IT administrators and higher-education IT managers can adopt new eLearning technologies with confidence that they won't introduce security gaps.

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188485-0-A-EN