Promoting Educational Technology in Teacher Preparation

Vision

Our students deserve to have teachers, including novice teachers, who are fully prepared to meet their needs. In today's technology rich world, that means educators need to be prepared to meaningfully incorporate technology into their practice immediately upon entering the classroom. Our nation's motivated and committed pre-service teachers deserve to be trained by faculty using technology in transformative ways that thoughtfully support and measure learning gains.

Faculty at schools of education across the country should operate with a common language and set of expectations for effective and active use of technology in Prekindergarten-grade 12 (P-12) and at postsecondary education levels. Further, schools of education should work with P-12 schools and school districts to provide meaningful opportunities for pre-service teachers, in-service teachers, school and district leadership, and faculty to co-learn and collaborate to better understand and use technology as a tool to transform teaching and learning experiences for learners of all ages. Given the rapid pace at which technology evolves, faculty need regular opportunities to both refresh their capacity and share innovative tools and strategies with other professors and teachers in the field to ensure their technology use is contributing to learning and achievement.

The U.S. Department of Education believes it is important that all programs responsible for pre-service teacher training prepare all graduates to effectively select, evaluate, and use appropriate technologies and resources to create experiences that advance student engagement and learning.[1] We call upon leaders of teacher preparation programs to engage in concerted, programmatic shifts in their approach to pre-service teacher preparation.

STATES CAN ALSO BENEFIT FROM THIS POLICY BRIEF

While this policy brief is aimed primarily at pre-service teacher training programs, states can also benefit from its recommendations. For example, states can identify preparation programs in their respective areas that are examples of effective technology use in teacher preparation and share insights and strategies with other educator preparation programs statewide. Additionally, they can also consider how the use of technology in teacher preparation contributes to a program's effectiveness and can support the pursuit of continuous improvement by leaders of teacher preparation programs as they shift their approaches to incorporate technology.

This vision is becoming a reality at a number of teacher preparation programs across the country. Examples include:

- Pre-service educators participating in the Teaching Residents at Teachers College 2 (TR@TC2) teaching residency program at **Columbia University** participate in activities that engage them in determining how digital resources can be used to support and extend the curriculum. Through its U.S. Department of Education Teacher Quality Partnership grant,[2] TR@TC2 also provides teaching residents with opportunities to learn how to incorporate strategies and supports to better enhance students' abilities to use digital resources both inside and outside of the classroom.[3]

- In the Secondary Mathematics Teacher Education program at the **University of Virginia,** pre-service mathematics teachers have ongoing experiences with technology during their 5-year BA/MT program. Students gain experience in the use of math-focused technology applications and engage in a variety of model lessons that provide them with the opportunity to experience how technology provides instructional opportunities that were not feasible just a few years ago. They also have experiences that allow them to practice teaching mathematics with a variety of technological resources.[4]

- As more districts invest in 1-to-1 computer/tablet programs, **Dominican University of California School of Education and Counseling Psychology** is preparing faculty and pre-service teachers to integrate technology into lesson planning, instruction, and communication. The university is also building and maintaining partnerships with area K-12 school districts with whom they provide technology-oriented professional development to in-service educators, particularly those in lower income schools.[5]

- Recognizing the need to support their graduates once they become in-service educators, the **University of Michigan School of Education** created the 4T Virtual Conference to provide opportunities for both professors and alumni to learn about emerging movements in education technologies.[6]

As schools of education provide more meaningful integration of technology into teacher preparation programs, and provide sustained professional development for faculty, we need to work to ensure that every new teacher is prepared to select and use the most appropriate tools to support transformative teaching and learning.

Purpose of the Brief

The purpose of this policy brief is to:

- Identify key challenges and solutions to the effective integration of technology in teacher preparation
- Provide guiding principles on how to move the field toward effective integration of technology in teacher preparation programs
- Identify areas of opportunity and collaboration for stakeholders across the field

DIGITAL AGE CLASSROOMS: ALBEMARLE COUNTY ENCOURAGES STUDENTS AND TEACHERS TO LEARN WITH TECH TOGETHER

Elementary school students and teachers in Albemarle County Public Schools near Charlottesville, Virginia, are learning together as they use an immersive "sandbox" computer game that allows students to use building blocks and resources they discover to create in a virtual environment. Students and teachers use the immersive and social aspects of the environment to develop thinking, research, and communication skills to solve complex problems. For example, third-grade students in one classroom worked collaboratively in this virtual environment with students at another school to build and connect a bridge that was started at opposite ends by groups of students in classrooms that were miles apart. Teachers might feel uncomfortable using new technology tools like this one, but Ira Socol, the district's Director of Learning Technologies and Innovation, says that teachers do not need to know everything about the technology to create meaningful learning experiences for students. As long as teachers provide students with guidance and coaching, and are confident enough in their digital literacy skills to let students explore the technology, third-graders can figure things out as part of the learning process.

Middle school students don't just consume content through technology; they actively create it. For example, students in Albemarle County engineered and built their own virtual reality headsets. The students initially created a virtual, interactive tour for incoming sixth-graders to the middle school by using a digital media editing tool to record and stitch together video. Since then, students began to work on a virtual tour of Thomas Jefferson's Monticello, which did not previously have one. The students are leading the effort to create a public-facing virtual tour.

At the high school level, the district endeavors to create a learning experience where technology is part of a seamless real world experience. For example, physical education teachers envisioned a health center where students could learn and integrate habits of health into their everyday lives. Working collaboratively with the University of Virginia, students and teachers have been using mobile fitness technology to collect and track health and fitness data to help students learn how to improve their quality of life.

DIGITAL AGE CLASSROOMS: HOWARD-WINNESHIEK ADDS PROFESSIONAL LEARNING TO ENSURE TRANSFORMATIVE USE OF TECH

At Howard-Winneshiek Community School District in Cresco, Iowa, district leaders, educators, and the surrounding community realized the need for an innovative 21st-century learning system and partnered to develop a vision and action plan for a digital learning initiative that would embed technology in instruction and professional learning by 2020. The district first implemented a 1:1 program where every K-6 student in receives a tablet and every secondary student receives a laptop. The district also increased professional learning opportunities for teachers, including adding a district-facilitated Edcamp, to ensure that teachers could incorporate the tablets and computers into classrooms in transformative ways. Howard-Winn noticed an immediate, marked improvement in the way students and teachers engaged with technology. For example, students and teachers are now regular creators of their own digital content, not just consumers, and through the #2020HowardWinn hashtag, interact more frequently and more productively with other learners, experts, and practitioners.

DIGITAL AGE CLASSROOMS: SCIENCE LEADERSHIP ACADEMY IMPLEMENTS PROJECT-BASED LEARNING SUPPORTED BY TECH

High school students at the Science Leadership Academy (SLA) in Philadelphia, Pennsylvania, learn in an inquiry-driven, project-based magnet school focused on 21st-century learning. Since its inception in 2006, SLA has been a 1:1 laptop school, providing all students with the tools they need to fully engage in the pedagogical model. SLA has since added a middle school that provides a learning environment similar to that available in the high school.

Technology use at SLA is now ubiquitous, necessary, and presumed. Every teacher views the available technology tools as essentials for engagement and empowerment of students in a modern educational setting, and students never view its use as a special moment in class. During one recent learning activity, for example, students designed a digital moisture monitoring system for an outdoor rain garden. Their design allowed them to monitor soil temperature and moisture levels to determine when plants needed watering. Another learning activity, a capstone project, culminated in the creation of a "smart beehive" that uses sensors to monitor the behavior and health of bees inside.

CHALLENGES

The remarkable pace of the transition to digital learning in America's schools has made it challenging for teacher preparation programs to stay ahead of the curve. For example, three years ago, just one third of districts had access to high-speed broadband in their schools and classrooms. Now, 81% of schools have access.[7] The pervasiveness of broadband dramatically increases technology-based learning opportunities for students and professional learning opportunities for in-service teachers. But it also underscores the need for teacher preparation programs to reflect the current educational technology use in today's P-12 schools, so teachers arrive confident, experienced, and ready to lead.

However, even though educator preparation programs that hold accreditation from agencies such as the Council for the Accreditation of Educator Preparation (CAEP) are required to provide evidence that they are meeting specific technology standards, many pre-service graduates feel unprepared to use technology effectively in their classroom practice on their first day of in-service teaching.[8] P-12 districts and schools have tried to address the issue by providing rapid remediation to their newest teachers by teaching standardized basic technology practices and modeling effective instructional strategies that seamlessly integrate educational technology to support student learning.[9] High rates of teacher turnover and the subsequent cycle of rapid remediation of new teachers makes it difficult for districts to keep up.[10]

WORKING DEFINITIONS

Pre-Service Teacher Preparation Program
A sequential set of coursework and field experience, most often at institutions of higher education, that prepare teacher candidates to become in-service teachers.

Pre-Service Teaching
Period in which teachers are matriculating through traditional teacher preparation program and teaching regularly in classrooms under the direction of a mentor teacher, but are not yet in an official teacher capacity in P-12.

In-Service Teacher
Certified, matriculated teachers who are in an official teacher capacity in P-12.

GUIDING PRINCIPLES

The U.S. Department of Education's Office of Educational Technology (OET) National Educational Technology Plan (NETP) is the flagship educational technology policy document for the United States. The 2016 NETP, *Future Ready Learning: Reimagining the Role of Technology in Education,*[11] articulates a vision of equity, active use, and collaborative leadership to make everywhere, all-the-time learning possible. This policy document specifically recommends that teacher preparation programs consider how to better prepare pre-service teachers, in-service teachers, and those who prepare teachers to design and implement transformational learning experiences enabled by technology in the classroom.

Based on the recommendations of the NETP and the work of teacher preparation innovators who participated in an Educational Technology in Teacher Preparation Innovation Summit convened by OET and ASCD, OET developed four guiding principles for the use of technology in pre-service teacher preparation programs. While we recognize that every community has different capacities and resources related to technology, pre-service teachers need to be prepared to consider how technology can play a role in providing ongoing professional learning opportunities, engaging diverse learners, supporting student learning, and closing persistent achievement gaps.

Four Guiding Principles

The four guiding principles developed by the OET are:

- Focus on the **active use** of technology to enable learning and teaching through creation, production, and problem-solving.

- Build **sustainable, program-wide systems of professional learning** for higher education instructors to strengthen and continually refresh their capacity to use technological tools to enable transformative learning and teaching.

- Ensure pre-service teachers' experiences with educational technology are **program-deep and program-wide,** rather than one-off courses separate from their methods courses.

- Align efforts with research-based **standards, frameworks, and credentials** recognized across the field.

Simply consuming media or completing digitized worksheets falls short.

PASSIVE USE

Media production

Interaction with experts

Global connections

Immersive simulation

Design

Coding

Peer collaboration

ACTIVE USE

Guiding Principle #1:

Focus on the **active use** of technology to enable learning and teaching through creation, production, and problem-solving.

Teachers must be equipped with the skills to integrate technology seamlessly into their instruction in ways that move beyond mere presentation and communication to a place of creation, innovation, and problem-solving. With the increased investment in infrastructure and classroom technology by school districts nationwide, the use of technology in teaching can no longer be an afterthought in lesson and unit planning. Therefore, teacher preparation programs must ensure instruction focuses on the active use of technology.

To meet this aim, coursework should go beyond simply viewing presentations or slides and provide pre-service teachers opportunities to use technology in ways that allow for active engagement. For example, pre-service teachers enrolled in a University of Michigan's School of Education course participated in a simulation activity that allowed them to use virtual tools to review primary sources and explore houses on the grounds of Greenfield Village, an outdoor museum in Dearborn, Michigan, as a way of supporting the learning of history.[12]

Additionally, faculty in teacher preparation programs need their own experiences with the meaningful use of technology to model best practices in their courses. At Vanderbilt University's Center for Teaching, for example, members of the academic community have access to resources such as guides created in-house, in person one-on-one support, and a regular lecture series, *Conversations on Digital Pedagogy,* that allows faculty to develop a plan to successfully integrate technology into their curriculum. The Center also highlights effective use of technology to support student learning in the higher education setting through its Leading Lines podcast.[13]

DEFINING ACTIVE AND PASSIVE USE

Active Use
The active use of technology allows for greater interaction with technology by students and teachers. Examples of active use in the classroom include peer-to-peer collaboration, the production by students of published content (such as blogs and videos), real-time interaction with experts, and connecting with other learners across the globe.

Passive Use
Passive technology use involves activities in which students have very little interaction. Examples of passive use in the classroom include digitized worksheets and activities that only require students to consume content produced by others.

TOWSON UNIVERSITY OFFERS LEARNING EXPERIENCES DESIGNED AROUND ACTIVE USE OF TECHNOLOGY

Towson University is working with local school systems in Baltimore County, Maryland, to provide authentic learning experiences for its pre-service teachers prior to their clinical internships. Faculty work to partner pre-service teachers with an in-service teacher in the local area as part of a course on Universal Design for Learning.[14] Pre-service teachers observe their host class and identify a real learning barrier that may be removed by using technology tools they are learning about in their coursework. Throughout the course, pre-service teachers investigate how different tech tools and pedagogical practices may be integrated to meaningfully address the needs of students and the in-service teacher in their host classroom. Pre-service teachers then present their findings and recommendations to the in-service teacher and faculty.

This project highlights Towson's efforts to model the active use of technology in the classroom to address real-world challenges.[15] Recognizing the importance of modeling effective technology use for K-12 students, faculty at Towson are modeling how pre-service teachers can use problem-based learning to nurture technology as a tool for creating solutions that can have a real impact on their communities.
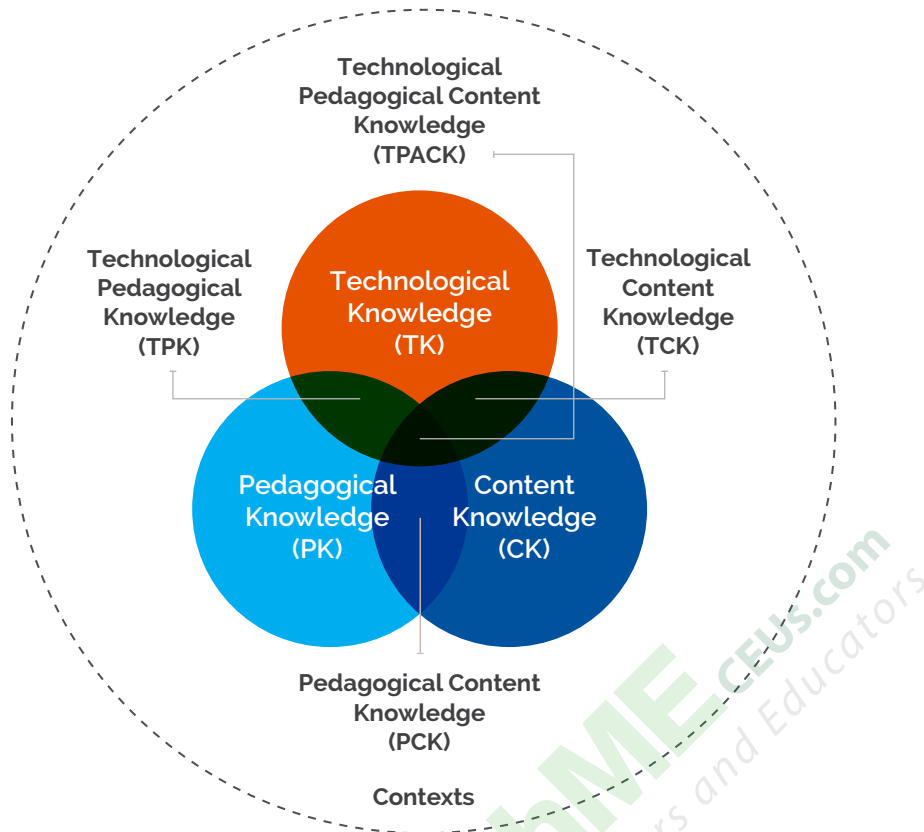
Guiding Principle #2

Build **sustainable, program-wide systems of professional learning** for higher education instructors to strengthen and continually refresh their capacity to use technological tools to enable transformative learning and teaching.

Schools of education that intend to bridge the gap between what teachers need to know about technology in modern classrooms and what they are learning in pre-service teacher programs must have a process for supporting instructors' professional development around technology and pedagogical integration. Because technology develops and evolves at a rapid pace, faculty and instructors of teacher preparation programs also should be provided with ongoing, job-embedded opportunities designed to maintain and grow their ability to use technology to transform the learning of pre-service educators.

To create expert teachers, preparation programs may find it helpful to incorporate a combination of skills and knowledge often referred to as TPACK: Technological Pedagogical Content Knowledge. Graduates should be able to incorporate a solid knowledge of content matter, a deep understanding of how students learn, and a practical facility with technology.

Technological Pedagogical Content Knowledge (TPACK)

Technological Pedagogical Knowledge (TPK)

Technological Knowledge (TK)

Technological Content Knowledge (TCK)

Pedagogical Knowledge (PK)

Content Knowledge (CK)

Pedagogical Content Knowledge (PCK)

Contexts

ℹ DEFINING TPACK

TPACK is a framework consisting of Technological, Pedagogical, and Content Knowledge that provides educators with a model to determine how their knowledge, based in the three areas, intersects to effectively use technology to support student learning.[16,17]

Content Knowledge (CK): This component of the framework focuses on educator knowledge about the subject matter, including the "deeper knowledge fundamentals of the disciplines" an educator teaches.

Pedagogical Knowledge (PK): This component of the framework focuses on the practice of teaching, specifically the knowledge of learning theories, teaching methods, strategies for student assessment, and applications to the learning environment.

Pedagogical Content Knowledge (PCK): This component, which merges the elements of pedagogical knowledge and content knowledge, focuses on an educator's ability to represent the subject matter in a way that considers student learning preferences as well as prior knowledge related to the content with the ultimate goal of increasing student understanding.

Technological Knowledge (TK): This component of the framework highlights educator knowledge of available technological tools and their ability to achieve selected tasks.

Technological Content Knowledge (TCK): This component of the framework highlights educator ability to understand how specific technologies can be used to effectively support student learning within the content area.

Technological Pedagogical Knowledge (TPK): This component of the framework highlights the relationship between teaching, learning, and technology use. In other words, TPK is an understanding of how the use of technology can transform how educators teach the content, and how students interact with and learn the subject matter.

At the core of the these components is TPACK, which is an understanding of how the use of technological tools and resources enhances teaching, and provides students with deeper learning experiences that lead to greater understanding and mastery of the content.

The dotted line around the framework represents the various contexts that include student background, subject matter, and available resources that can influence how TPACK is applied in a practical sense.[18]

THE UNIVERSITY OF SOUTHERN CALIFORNIA EXPANDS ONBOARDING AND CONTINUED PROFESSIONAL DEVELOPMENT MODEL FOR FACULTY AROUND TECHNOLOGY

To improve their own online instruction, full-time and adjunct faculty at the University of Southern California (USC) collaborated on a data-informed process of course redesign to better meet the needs of their students. USC realized that student feedback via surveys and exit interviews were paramount in enhancing the program with the latest technology and pedagogy. Using student responses, faculty members continue to develop an internal community of practice to give each other feedback on how to improve virtual classroom practices and learn about new techniques and technological tools. For example, faculty members developed a video-based onboarding process where new faculty can engage with multimedia, resources, and lesson plans. Looking ahead, faculty are working toward creating an inventive video-based professional development model for flipped learning[19] as part of a new version of the Master of Arts in Teaching (MAT) program.

Prior to these changes, online course deliverables consisted of five papers and asynchronous discussion boards. Today, students are working collaboratively on online-based documents, recording sample video lessons for constructive peer critique, providing and receiving virtual feedback from colleagues and professors, building dynamic concept maps via web presentation platforms, and learning through flipped instruction models. As more K-12 schools shift to variants of flipped instruction, USC faculty models this work for pre-service teachers and colleagues who increasingly recognize how these pre-recorded videos and prompts can maximize in-class instructional time at the K-12 level and in higher education.

SAINT LEO UNIVERSITY BUILDS SUSTAINABLE LEARNING THROUGH INVESTMENT IN COMMUNITY

In 2014, Saint Leo University developed a technology summer institute for in-service teachers in the Pasco County School District to build their capacity in the use of technology in the classroom.[20] The institute modeled a "community of learners" approach, where college faculty and in-service teachers were co-learners in developing a better understanding of how to use technology more effectively in teaching and learning. Since its inception, the institute has offered intensive professional development to sixty in-service teachers who agree to provide support and mentorship to Saint Leo's pre-service teachers.

As part of the institute, in-service teachers receive intensive summer development, year-long mentorship, and their choice of a tablet device or a class set of virtual reality devices. In turn, in-service teachers must complete a year-long action research project taking a concerted look at how their selected tool can transform student learning.

In 2016, Saint Leo developed an advanced Teacher Technology Leader Institute to train institute alumni on how to develop sustainable professional learning opportunities within their schools and serve as mentors for in-service teachers working on action research projects. Mentors meet once a month with in-service teachers for project updates to address challenges, and to develop concrete next steps for implementation. In-service teachers meet as a group twice a year to receive feedback and to present their findings to institute colleagues, mentors, and faculty.

Guiding Principle #3

Ensure pre-service teachers' experiences with educational technology are **program-deep and program-wide** rather than one-off courses separate from their methods courses.

Research has shown that providing pre-service educators with a single educational technology course does not sufficiently prepare them for the current technology-rich classrooms becoming more common throughout our nation.[21] One instructional technology course does not lead to sustained effective integration of technology into pedagogical practice. However, research has shown that continuous exposure can improve teachers' attitudes and beliefs toward technology use in the classroom.[22]

To better prepare our pre-service teachers to use technology effectively to support student learning, we must move toward a model in which the use of educational technology is embedded throughout preparation programs. For example, pre-service teachers in science education courses can gain experience creating science investigation learning experiences that allow students to use digital scientific probes or sensors to collect real-time data. Pre-service history teachers enrolled in methods coursework can gain experience in creating learning experiences that use primary sources from digital collections available from various libraries and museums worldwide. Pre-service teachers of all potential grades could build websites as an assignment to increase communication with families.

Guiding Principle #4

Align efforts with research-based **standards, frameworks, and credentials** recognized across the field.

While teachers may work in a wide range of settings and cultural contexts with different types of access to resources, every student in the country deserves a teacher who can use available technological tools to better meet student needs. To ensure rigor, quality, and preparedness of teachers, we need a common language to articulate expectations around effective use of technology by students, teachers, school and district systems, and at the university level. This can be done by creating field-wide sets of competencies, frameworks, and credentials for the following four groups: teacher preparation programs; teacher preparation faculty; pre-service educators; and in-service educators. By uniting around a common set of expectations and language, pre-service educators can be assured that those tasked with preparing them to use digital tools to support student learning have the skills necessary to do so no matter which institution they choose. It also ensures that teachers can continue to build their skills as they move into an in-service role.

A number of educational technology leaders and leading educational organizations have made strides toward refining educational technology preparation for pre-service educators. For example, CAEP, whose goal is to "advance excellent educator preparation through evidence-based accreditation" (Council for the Accreditation of Educator Preparation, 2015), worked closely with ISTE to create joint ISTE-CAEP standards for technology facilitators, technology leaders,

and secondary computer science educators. In addition, the development of CAEP's Content and Pedagogical Knowledge standard was influenced in part by ISTE's 2008 teacher standards, high-lighting the long-standing collaborative relationship between the two organizations.[26,27]

At the Educational Technology in Teacher Preparation Innovation Summit members of the teacher preparation community shared various initiatives geared toward refining how pre-service teachers are prepared to use technology. One group of higher education professors joined forces to create a uniform set of competencies for teaching with and about technology. Another group of higher education faculty shared their progress in creating a set of micro credentials that will allow pre-service educators and higher education personnel to demonstrate what they know, what they can do, and what they can teach others about the use of educational technology. These efforts are supported by others in the field. For example, led by Randy Hansen of the University of Maryland University College and Arlene Borthwick of National Louis University, editors from a wide variety of peer-reviewed journals are on track to release an editorial supporting this work in mid-December 2016.

DEVELOPING STANDARD COMPETENCIES FOR TEACHING WITH AND ABOUT TECHNOLOGY IN TEACHER PREPARATION

Teresa Foulger, an associate professor at the Mary Lou Fulton Teachers College at Arizona State University, is leading a working group of educational technology faculty-researchers to develop a set of competencies for use by teacher educators in teacher preparation. The goal of the Teacher Education Technology Competencies (TETC) project is to define the knowledge, skills, and behaviors of higher education faculty who support pre-service teachers in learning to teach with technology. The competencies are being created using crowdsourced scholarly literature as a base, then a collaborative Delphi methodology where input is attained from an international base of teacher educators and content experts. The research team plans to release the competencies in Spring 2017.

BADGING CONSORTIUM PREPARES TO RELEASE MICRO-CREDENTIALS

Led by Rick West, an associate professor of education at Brigham Young University's David O. McKay School of Education, and Kyle Peck, professor of education at Penn State University's College of Education, a coalition of educational technology leaders has committed to creating a set of micro-credentials, or badges, as a way for pre-service educators and faculty to demonstrate what they know, can do, and can teach others. The team plans to create a set of micro-credentials based on the ISTE Standards for Teachers and hopes to release them in 2017.

NORTH CAROLINA DIGITAL LEARNING COMPETENCIES FOR IN-SERVICE EDUCATORS

In 2013, the North Carolina House Bill 23 tasked the State Board of Education with developing digital teaching and learning competencies that demonstrate skills needed by educators to create digital learning environments. On their behalf, the Friday Institute for Educational Innovation at North Carolina State University collaborated with a wide variety of state stakeholders, including deans of education, local school districts, and legislators, to develop the North Carolina Digital Learning Plan. Released in September 2015, one recommendation in the plan tasked stakeholders to "develop and implement digital competencies for teachers and administrators as required by SL 2013-11." (North Carolina Digital Learning Plan, 2015).[28]

The North Carolina Learning Competencies for Classroom Teachers, inspired by International Association for K-12 Online Learning (iNACOL), International Society for Technology in Education (ISTE), and the North Carolina Professional Teaching Standards, was released in June 2016 and provides in-service educators with a standardized framework to strengthen their practice and use technology effectively to support student learning in their respective learning environments. An additional set of competencies was released for school administrators that provides a roadmap to improve practice, build capacity, and support the effective use of technology to support student learning in schools. North Carolina plans to implement these standards in July 2017.[29]

It should be noted that as teacher preparation programs move toward implementing these four principles, care must be taken to ensure that pre-service teachers' experience with educational technology and planning learning experiences for students complies with standard security and privacy standards. These include the Family Educational Rights and Privacy Act (FERPA),[30] the Children's Online Privacy Protection Act (COPPA)[31] and the Children's Internet Protection Act (CIPA).[32]

CALL TO ACTION

This brief provides guiding principles and compelling examples of preparing pre-service teachers to effectively use technology to transform student learning. It is our intent that teacher preparation programs embrace these principles and build upon the work of innovators highlighted in this document and others similarly engaged. The Department encourages all teacher preparation programs to commit to the four principles of educational technology in teacher preparation, strengthen their partnerships with P-12 districts to better understand the skill set that teacher graduates need to effectively use technology to support student learning, and take immediate action to begin implementing the principles laid out above. The Department also encourages simultaneous research that identifies the most effective practices in preparing teachers in teacher preparation programs to identify and implement educational technology meaningfully in their future classrooms.

> **EDUCATIONAL TECHNOLOGY IN TEACHER PREPARATION CHALLENGE**
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> Schools of education across the country have committed to acting on the Four Guiding Principles by accepting OET's Educational Technology in Teacher Preparation Challenge. The most up to date list of programs that have accepted this challenge can be found at http://tech.ed.gov/edtechtprep/.

Our recommendations to achieve this goal are as follows:

Field at Large

- Intentional, programmatic, system-wide discussion and planning for use of educational technologies by all pre-service teachers.[33]

Higher Education Instructors/Administrators of Teacher Preparation Programs

- Job-embedded professional development for all teacher preparation faculty focused on the use of current educational technologies to support pre-service teacher learning in the same ways pre-service teachers will be expected to support their students' learning.

- Provision of both faculty and pre-service teachers with regular exposure to and experience with teaching and learning technologies and strategies relevant to online, blended and face-to-face environments and their affordances and constraints.

Standards/Accreditors

- Timeline of skills and standards for educational technology use by pre-service teachers throughout their preparation programs.

- Plans for ongoing professional development for teacher preparation faculty and pre-/in-service teachers to maintain competencies in educational technology as the field advances, including micro-credentialing

Teachers

- Seek ways to partner with schools of education to create more sustainable professional co-learning opportunities with teacher preparation instructors and pre-service teachers.

- Stay up to date on current educational technology solutions and strategies in order to be in a position to mentor pre-service teachers in their use in their classrooms.

States and School Districts

- Work with local universities to build sustained opportunities for pre-service teachers to engage with high-quality teachers demonstrating effective use of technology to support student learning

CONCLUSION

Every graduate of a teacher preparation program should possess a set of skills regarding educational technology that reflects modern teaching and learning environments.[34] An entire ecosystem of educational technology tools has emerged over the last five years that can help build a more nimble, informed, and continuously improving teaching force in America. Now is the time to connect pre-service teachers with these tools.

1 Choosing the Best Opportunity

As you begin the process of designing apps and tools for learning, focus on solving problems that have a significant impact on your intended users. Apps that simply digitize traditional practice are less meaningful than apps that support more effective approaches to teaching and learning based on sound research. This section presents ten opportunities that technology has the potential to address. This is by no means an exhaustive list, but it represents some of the most urgent needs that we hear from educators, parents, and students across the country. Each section describes the opportunity, shows why it is important, and provides some possible approaches to spark your creativity. Many solutions will address more than one of these opportunities.

Learning Powered by Technology

The U.S. Department of Education's National Education Technology Plan (NETP) presents a vision for learning powered by technology. The NETP explains how technology can support personalizing learning to address students' individual needs and interests as well as provide access to learning opportunities anywhere and throughout a person's life. The plan describes how technology-based assessments can be unobtrusively embedded into learning activities to support just-in-time assistance, measure important student competencies, and provide feedback to inform continuous improvement efforts across the entire education system. The NETP also suggests a new role for teachers as they shift to connected teaching, joining networks of individuals forming professional communities to support student learning and act on insights from data provided by technology. The NETP envisions a learning infrastructure that provides access to people and resources at all levels of the education system and a role for technology in enabling the redesign and transformation of schooling in ways that increase efficiencies, reducing the time teachers must spend on administrative activities.

Opportunity 1: Improving Mastery of Academic Skills

Perhaps the most obvious place for apps and tools to be helpful is in providing support for teaching academic concepts such as math, science, language arts, social studies, and world languages. New learning activities that help students increase academic proficiency are in high demand. In particular, teachers are seeking tools to help increase opportunities to practice skills in authentic environments and help students take more control of their learning. Each state posts its curriculum standards that show the specific skills that are taught in the state in each content area.

Why is this important? Students need to demonstrate proficiency in certain academic skills in order to move from one grade to another and to graduate from high school and then from college or other training programs. These are skills that are important for students to have to be successful in their careers or postsecondary education. Yet international tests like the Program for International Student Assessment (PISA) show that U.S. students are falling significantly behind those in other countries in mathematics, reading, and science (see *LA Times* article [Are America's Students Falling Behind the World?](#)).

What would help? Create apps to teach academic skills in more meaningful ways than traditional textbooks and lectures. Give learners an opportunity to practice in realistic settings. This might be done through interactive simulations (e.g., models of ancient cities that allow students to experience history or virtual chemistry simulations that might be unsafe to reproduce in a classroom). Think beyond delivering content—are there tools that enable students to build and create projects that encourage deeper exploration of a particular topic? Consider merging teaching and assessing to pinpoint knowledge gaps along the way to mastery through probes of understanding or by identifying

> ## Innovate, Don't Digitize
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> The value of technology for transforming learning is lost if it is only used to digitize traditional materials (e.g. scanning worksheets makes them digital, but doesn't improve the learning experience). Instead, think about innovative approaches that allow students to engage with content differently. What does technology make possible that could not be done before?

competencies through formative assessments that are seamlessly embedded in the learning materials. New forms of media such as educational games can break traditional molds, allowing students more freedom to explore, create, and collaborate, and can open the door to more immersive learning experiences. While research has been conducted to identify effective teaching methods for just about every subject, those methods don't always make it into practice in the classroom. Creating apps that put research-based methods into practice can greatly impact instruction and learning.

Opportunity 2: Developing Skills to Promote Lifelong Learning

Researchers and educators recognize that students need to develop not only academic skills, but also non-cognitive social and emotional skills and behaviors that lead to their long-term success. For example, what attitude do they have about learning? Do they feel like their abilities in a subject are fixed ("I'm just no good at math!"), or do they recognize they can grow ("I can succeed at math, but I will need to learn some new strategies in order to approach this problem set")? Non-cognitive skills such as perseverance, self-regulation, and effective strategies for approaching learning enhance student motivation and engagement, and there are many ways apps can be designed to support the development of these non-cognitive skills and behaviors, with promising results (see [Readiness for College: The Role of Noncognitive Factors and Context](#) from the University of Chicago and the Bill and Melinda Gates Foundation).

More than Working Harder

Developing grit or perseverance does not just mean working harder. Rather, students who display grit have developed confidence that they can solve a problem and have developed a toolkit of strategies to apply when faced with new challenges.

Why is this important? There are many non-cognitive skills that are critical for an individual to strive for and succeed in reaching long-term goals. Researchers have found that habits such as tenacity and perseverance can have just as strong an influence on achievement as intellectual ability. There is growing evidence that learning environments can be designed to foster development of these skills. In 2013, the White House Office of Science and Technology Policy (OSTP) and the U.S. Department of Education hosted a meeting of researchers, practitioners, and industry representatives to discuss the impact of students' beliefs about their academic abilities (see *How Can We Instill Productive Mindsets at Scale?*, a report from leading researchers in the field on the meeting's research agenda regarding instilling productive mindsets).

What would help? Identify which non-cognitive skills and behaviors you are trying to develop and build opportunities to do so into your apps. Growth mindset, for example, is more likely when students believe they can achieve and when they believe that intelligence is malleable rather than fixed (see Stanford professor Carol Dweck's work on fixed versus growth intelligence mindsets). Accordingly, an app might frame mistakes as opportunities to learn and reward students who persist through solving difficult problems. It might also

Technology Brings "Growth Mindset" to Schools

With funding from the U.S. Department of Education's Small Business Innovation Research (SBIR) program, New York City-based Mindset Works developed SchoolKit, an app designed to strengthen academic and social-emotional success. Through animations, assessments, and classroom activities, students learn a growth mindset—the understanding that ability develops with effort. Pilot research in nine middle schools found significant increases in students' growth mindset, which related to increases in learning goals, positive beliefs about effort, and positive academic habits and behaviors (such as resilient responses to failure and better learning strategies). These changes also related to increases in students' GPA. Since launching in 2012, SchoolKit has been used by tens of thousands of students around the country, including all middle schools in Washington, D.C. The app is based on Carol Dweck's research on growth mindsets.

support goal setting, allow students to choose learning activities, and encourage achievement against objective standards. To improve self-regulation, students may be asked to reflect on their effort and to consider how difficult they find the material. Apps that reward hard work and tenacity should be favored over those that reinforce simply getting the right answer in order for students to advance to a new level. Game designers are particularly adept at motivating persistence, and much can be learned from the methods they use to inspire players to persevere in the face of difficulty and frustration. Finally, behavior management is an important non-cognitive skill. Teachers, especially those new to the profession, may need help establishing a productive classroom environment and climate (see this article on Classroom Management from the American Psychological Association), and classroom management apps could reward positive behaviors, potentially decreasing unwanted behaviors.

Opportunity 3: Increasing Family Engagement

Involving parents and caregivers in the learning process is a key element to ensuring student success. It is particularly essential for students who need special assistance, such as those who struggle with learning disabilities. Often parents feel left out of the education process, especially those whose work, school, or family responsibilities make it difficult to connect with teachers and school leaders during regular school hours. The Harvard Graduate School of Education published an article on the benefits of family engagement that included a summary of research on how to most effectively engage families. Family and community engagement—for students of all ages—is a focus for the U.S. Department of Education, and its family and community website provides resources for early learning in families overall and in special populations like military and migrant families as well as homeless children.

> ✔
> ## Tip: Many Types of Families
>
> When developing your app and the communications around it, remember that families come in many different configurations, so more general terms like "parent," "caregiver," or "family member" apply to more situations than "mother" and "father."

Why is this important? Schools have a tremendous role in engaging and supporting students, and parents help in many ways, including making sure that children start on par with their peers. Providing parents with at-home activities (as PBS KIDS has done in its Parents Play & Learn app and Zero to Three has done in its Let's Play! app) to support in-class learning reinforces the idea among families that not all learning has to take place in school. Parental engagement could come from daily progress updates, easy tools to communicate with a child's teacher, and resources to connect school learning to practical home activities. Connecting parents of all backgrounds to school communities empowers them to become active, informed advocates for their children throughout their education.

What would help? Familiarize yourself with ways to engage families (some ideas are provided by the Response to Intervention Action Network article) and then think about how to apply those principles to engage families through technology. For instance, could your app provide information to caregivers about student progress and homework in near real time and in languages spoken at home? Can your tool be used on a smartphone or in an offline mode for homes without an Internet connection? Does it help parents stay involved in their children's school activities while

balancing work or other responsibilities? For parents whose first language is not English or who may come from cultures outside the United States, can your app better help them understand and navigate the K–12 school system, including their local school?

Opportunity 4: Planning for Future Education Opportunities

Preparing for college and navigating the application process can be challenging, and the sticker price for college can be overwhelming and misleading. For example, a more prestigious college that appears to be expensive may actually be cheaper than other options once scholarships and financial aid are factored in. Using technology to help students and their families make better decisions about their future education has great promise. Many students do not apply to college because they do not know what institutions they could qualify for or how to take advantage of financial supports that may be available to them. All students, but particularly underserved students, would benefit from tools that engage them long before their final years in high school to help plan their academic path to graduate and apply to and complete postsecondary education.

Why is this important? Research, including a <u>recent College Board study</u>, has shown that students who graduate with a degree, even an associate degree, far outpace their peers in income generated over a lifetime of employment. Even career and technical education programs often require a two-year degree. Yet the process of planning for, applying to, and financing college can feel daunting—especially for first-generation college students and their families.

What would help? Financial aid navigators, course planners, remote college counseling, and college-to-career maps all can help students plan for and be successful in their future education plans. Additionally, new tools and apps targeted at helping school counselors could increase both the reach and amount of support counselors can provide students (on average, half the number of counselors are available to high school students as is <u>recommended by the American School Counselor Association</u>). Additionally, open state and federal datasets can be used to create apps for managing college finances and to identify skills needed for different types of jobs. Imagine a "jobs available at graduation" tool that uses labor statistics about job growth. Also needed are tools that interface with college course catalogs and let students interactively plan various paths to college completion. Imagine an app that lets students identify and communicate with alumni of the institution that they are attending (or plan to attend) in fields that interest them so they can gain perspective and advice.

Opportunity 5: Designing Effective Assessments

Understanding what students know and how much they are learning is an important part of education. Traditionally teachers have made educated guesses about how much their students are learning based on classroom observation and reviewing homework. Teachers often struggle, mostly because of time, with creating assessments that truly align with the skills they want to measure. They also spend hours reviewing and grading student work that could be better spent preparing lessons and working with students.

In addition, information from formal assessments is often not available quickly enough to inform instruction. Data from high-stakes assessments, for example, may actually come after a student has moved to a new grade and new teacher. Even grading quizzes or homework takes so much time that teachers often are not able to turn around the assignments quickly enough to change their instruction for the next day. True data analysis can also be time-consuming and difficult using many current assessment practices and formats.

Tip: Assessment Types

There are two main categories of assessments. Formative assessments are frequent and ideally embedded within a learning activity. They provide quick and continual snapshots of student progress over time. Summative assessments generally occur at the end of an instructional unit, are generally more formal, and are often used to determine a final grade or ranking. Both play key and complementary roles in understanding where students are on their learning trajectories.

Why is this important? Well-designed formative and summative assessments provide teachers and students with just-in-time feedback on progress towards mastery of content and allow educators to personalize learning pathways for their students. With feedback that is almost immediate, educators can strategically adjust instruction more quickly to meet the needs of diverse learners

What would help? Technology provides a variety of new opportunities to rethink the way we assess student learning. Tools that help teachers create and share formative assessments, automate grading, and streamline providing feedback to students allow teachers to focus more of their time on instruction. Expanding assessment item types (beyond multiple choice questions, etc.) can provide educators with a more detailed and sophisticated understanding of what their students know and can do. Simulations, heat maps, and ranking are all examples of technology-enhanced assessment item types that are beginning to be incorporated into digital assessments.

Traditionally, education has struggled to develop meaningful assessments that measure non-cognitive skills such as persistence, creativity, collaboration, and critical thinking. (For more information on these skills, see the Partnership for 21st Century Skills Framework for Learning.) Consider creating tools that help develop and assess these kinds of skills.

Aligning assessments with learning goals is crucial to success. Make sure you clearly understand what you are measuring. It is crucial to measure what is important not simply what is easy to measure.

Opportunity 6: Improving Educator Professional Development

The same personalized, collaborative, anytime/anywhere learning that technology can enable for students should be available for educators and administrators. Advances in technology can make just-in-time personalized professional learning available to educators wherever they may be, putting teaching tips and access to educational experts in their hands. Technology-enabled professional learning can help educators find setting-specific answers and guidance for helping their students learn. For more on designing online communities of practice for educators, see the Department's Designing Online Communities of Practice.

Why is this important? Educators must constantly learn and improve their teaching skills in order to support their students. One-size-fits-all professional development sessions cannot meet the specific needs of each teacher in a school or college. Educators need tools that help them tap into the expertise of their peers by accessing networks of reliable professional support and resource sharing. This is particularly important for new and pre-service teachers.

What would help? Tools to help connect educators to one another and to expert educational researchers are key to effective professional learning in a digital world. In addition, educators need job-embedded, differentiated, and on-demand access to content that supports their mastery of effective instruction. To be of greatest use, resources to support educators in their professional learning might include ones that:

- connect educators with each other and to educational experts
- help teachers reflect on their own practice
- provide educators support to master new strategies, techniques and tools
- are available on-demand
- differentiate for a range of levels of readiness and expertise
- curate content so teachers can find appropriate support and ideas quickly
- showcase content-specific best practices

Also consider aligning tools and resources to relevant professional standards (e.g., National Board for Professional Teaching Standards Certificate Areas).

Finally, any tools built for teacher professional development should be designed according to principles of adult learning and foster a growth mindset similar to the concepts explained above for student learning. The Connected Educators web page features several channels and tools for helping educators connect to colleagues across the country.

Opportunity 7: Improving Educator Productivity

In addition to the time spent teaching and interacting with students, educators have enormous administrative burdens throughout a school year—preparing lessons, finding teaching materials, grading, reporting, communicating with parents, and supporting school functions to name a few. When administrative tasks are streamlined, teachers and leaders can spend more time working with students and deepening their professional learning. Some ways to boost educator productivity include creating tools that help teachers personalize learning for students (adjusting instruction for students who need extra time or different learning approaches), make it easier to provide feedback to students and parents, and helping teachers create, adapt, and share lesson plans, learning resources, and assessments with other teachers.

Why is this important? Teachers are a critical factor in student success, and helping teachers reduce time spent on administrative tasks enables them to spend more valuable time with students. Teachers, especially in urban schools, are at risk of leaving the teaching profession or moving to other schools (as reported in a recent Education World article). Teachers need custom productivity tools similar to those found in other professions. With these

tools, teachers will be able to spend more of their time and effort focusing on students and their learning. To hear what teachers say about their profession and how to reform it, see Educators Lead the Transformation of the Teaching Profession from the U.S. Department of Education website.

What would help? Apps and tools to help teachers streamline workflow, personalize instruction, support needs of diverse students, create and share lessons, and communicate efficiently with parents and other stakeholders can all help productivity. To most effectively adjust instruction, teachers need to track student progress and identify areas of struggle. Student performance data are becoming increasingly available to teachers in real time, but without tools to help make sense of the data or quickly identify important trends, it can be too time consuming for teachers to find the value. Design tools that organize data visually for easier interpretation. Especially for new teachers, tools that make it easier to discover, modify, and share learning resources aligned with curricular standards would be a huge time-saver.

Tip: Onboard Quickly

When developing productivity tools, pay careful attention to how long it will take teachers to learn a new tool (onboarding). Design in such a way that time-consuming training or tutorials are not required. Support should be readily available for educators with questions when using a tool.

Opportunity 8: Making Learning Accessible to All Students

Many students have differing educational needs that must be addressed—from physical disabilities to acquiring a new language—in order to learn effectively. They may need special tools to interpret learning content (e.g., decoding mathematical notation and symbols) or support for taking notes or organizing information in structured ways. Technology can increase the ability for students with differing needs to participate in the same learning activities as their peers. App developers can address these needs in three ways. First, functionality can be added to *all* apps to make them accessible to students with diverse needs, such as the ability to increase the font size or have text read aloud. Second, apps can be created to address specific learning needs, such as providing a digital word-board to children who can't speak. Third, tools can personalize learning to adapt to a variety of learner needs, such as providing alternative explanations, examples, and visualizations to help a student understand difficult concepts. The National Center for Learning Disabilities is a good place to find information about learning disabilities, and more on web accessibility can be found at the World Wide Web Consortium. Accessibility needs to be considered as a feature to be built in from the outset; as these W3C videos demonstrate, watching users with disabilities navigate learning apps and tools with assistive technologies can be illuminating.

Universal Design for Learning

The Center for Applied Special Technology (CAST) developed Universal Design for Learning (UDL), a framework for making curriculum inclusive of "flexible approaches that can be customized and adjusted for individual needs." The CAST guidelines encourage instructional practices and educational content that embrace the widest possible diversity of learners. The UDL approach encourages the development of tools that consider this diverse range of users in the original design rather than add-on features. To see the guidelines, refer to the CAST website.

Why is this important? Schools normally won't be able to use your app if it's not accessible to students with disabilities. The Department of Education has issued guidance describing how two civil rights laws, Section 504 of the Rehabilitation Act and the Americans with Disabilities Act, apply to technology used in schools. When you design with accessibility in mind, not only do you facilitate school district compliance with civil rights laws, but your apps will become much more beneficial to your users as well, even those who may not have specific learning disabilities. Consider how entrance ramps to buildings (designed to provide access for people who use wheelchairs) also benefit children on bicycles or parents pushing strollers. The text description added to a website to make sure a person who is blind can use a screen reader might also improve searchability for all users of the site. Apps developed to assist in communication could be a life-changing experience for learners with autism, cerebral palsy, or Down syndrome. With appropriate technology, English learners (ELs) have the ability to access the same content as

Tip: Useful Hashtags

Consider tapping into educators' current conversations about supporting diverse learners by searching hashtags such as #ldchat, #atchat, and #spedchat.

their peers and can leverage their native language and academic skills to "transfer" to the work in English, as shown in [this report produced by Cambridge University Press.](#) Generally, content should be communicable in a variety of formats so as to increase the applicability of the tool. Specifically, this may be manifested as delivery of content in *more than one* of the following forms: text, pictures or illustrations, audio, and video (whereas any one format may be insufficient to meet an individual's special needs).

What would help? Think about the human-machine interface you are building. Are there multiple ways for users to interact with and respond within your app? Could a user control your app by voice? Will it interoperate with a screen reader? Does it take advantage of accessibility settings in device operating systems? Does your app support varying levels of complexity, interaction, and support? Making your content accessible is good. Solving fundamental access problems in communication, organization, and social interaction is better. Features that customize the delivery of learning must not clutter or confuse the delivery itself, and so developers may place such settings or controls within a separate functional area of the tool.

Using a 3D printer, students at CrossRoads Middle School in Columbia, SC, created a prosthetic hand for Alyssa, an 11-year-old girl from Charleston, SC.

Stories From the Field: Designing Ed Tech Products

Stephanie Castilla is the Technology Integration Specialist at the Highlander Institute where she works with educators on a daily basis to discover models for implementing new technologies that support teaching and learning.

"Designing ed tech products for schools is an incredibly challenging and rewarding experience. Each day brings new insights and opportunities as I work with others to define and refine problems and solutions. When teachers are your target users, it is critical to empathize with their day-to-day work life. Teachers face increasingly changing expectations. They come to new applications with varying degrees of understanding, and many times they feel forced to integrate solutions into their classrooms that they themselves did not choose. With more deadlines, standards, and requirements placed on them, it is incredibly important that the tools they use not require extensive training or follow-up and, more important, that they genuinely solve a problem experienced by the teacher and not just by administration. This level of empathy is fundamental when you design anything for day-to-day use.

Well-designed experiences have the power to make someone's day more productive while providing them with opportunities to find more enjoyment and inspiration in their work. Ultimately, the key role of a designer in the ed tech space is to work each and every day to highlight the inherent joy and satisfaction found in teaching and learning and to maximize the opportunities available to all who seek to experience it."

Opportunity 9: Closing Opportunity Gaps

An opportunity gap refers to unequal access to resources or opportunities. Rural students often have less access to resources found in urban settings such as museums, cultural centers and industry experts, for example. Job shadowing and internship opportunities may be more limited in many communities. Less wealthy communities often cannot afford to provide the well-equipped libraries, rich educational experiences, and classroom equipment and resources found in wealthier communities.

The technology gap is one form of opportunity gap. Despite the growing sense that digital tools are common in educational settings, access to them is far from equal. While some schools and students have access to top-notch resources, others, such as those in highly impoverished locations, are significantly lagging behind. Without the tools, content, and connections to high-quality learning tools and experiences, these teachers and students cannot be expected to provide and experience learning in ways equal to their peers. This opportunity inequity is addressed in greater detail in the U.S. Department of Education Office for Civil Rights' October 2014 Dear Colleague Letter, which focuses on gaps based on race, color, or national origin but could be useful in approaching any opportunity gap.

Why is this important? All students have the right to an equitable education. This right should not be affected by geographic location, family income, or any other demographic factor. Apps provide the opportunity for students to access content and expertise that may not be available within the bounds of a physical school building.

What would help? While recent years have seen an increase in the amount of open education resources (OER), many teachers lack the training or time to comb through and evaluate them. The creation of pathways for the curation of content verified for quality and standards alignment and the sharing of curated sets or playlists would alleviate unnecessary stress on teachers and increase the availability of low-cost, high-quality learning materials for all. Additionally, tools designed to help students and teachers access expertise in all areas from curricular content to improved teaching practices could help better leverage the usefulness of Internet connectivity. Finally, be mindful of equity of technical accessibility when designing products. Users on slower systems should be able to access and experience an application or service with the same ease as those using more cutting-edge technology.

Opportunity 10: Closing Achievement Gaps

Achievement gaps occur when one identifiable group of students outperforms another by a significant amount. For example, the National Assessment of Educational Progress (NAEP—the Nation's Report Card) provides data that show significant gaps in mathematics and reading ability between Hispanic and white students and between black and white students (results are on the U.S. Department of Education's NAEP website). Gaps can also exist among groups such as children who are economically disadvantaged, in foster care (as reported by the *Los Angeles Times* in Students in Foster Care Face 'Invisible Achievement Gap'), or those belonging to a historically low-performing group (see the Michigan Department of Education's African American Young Men of Promise

Initiative website). Nationwide standardized tests are not the only place where gaps are evident. State and local assessments along with results from Advanced Placement course completion and testing can also help you understand achievement gaps and areas of need. For example, computer science Advanced Placement courses lack significant participation by girls and minorities, a gap described in this 2014 *Slate* article, No Wyoming Students Took the AP Computer Science Exam Last Year.

Why is this important? Demographic factors should not systematically limit academic achievement and thereby future opportunities. All students deserve the chance to pursue college and careers in areas that interest them and should not be disadvantaged because of gender, race, economic status, or any other factor. Achievement gaps in the United States have persisted for many years and need to be closed.

What would help? Everything we have discussed to this point can make a difference: helping teachers, involving parents, strengthening non-cognitive skills, targeting academic subjects, and improving accessibility help to promote equal education opportunities for all students. Illustrating how your product helps to achieve these goals while working to close gaps in achievement makes it more compelling to educators and more likely to succeed in schools.

"This course was developed from the public domain document: U.S. Department of Education, Office of Educational Technology, Education Technology and Teacher Preparation Brief, Washington, D.C., (2016)"

"This course was developed from the public domain document: U.S. Department of Education, Office of Educational Technology, Ed Tech Developer's Guide, Washington, D.C., (2015)"