

# Educational Technology and the Pre-K–12 Environment: Implications for Education Leaders, Teachers, and Students

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## INTRODUCTION

“More than 65% of children entering primary school today will ultimately end up working in completely new job types that do not yet exist” (World Economic Forum, 2016, p. 3). Today’s Pre-K-12 students need to develop the college and career readiness skills that will enable them to be successful in the technologically driven jobs of the future. “To be successful in their lives beyond school, students need to develop skills and abilities that enable them to become proficient creators, collaborators, communicators, and critical thinkers” (Grimes & Cohen, 2022, para. 3). The Partnership for 21st Century Learning (P21) refers to these skills as the 4Cs: creativity, collaboration, communication, and critical thinking (Battelle for Kids, n.d.). Additionally, Pre-K-12 students will need to have advanced technology skills to be problem solvers, content creators, and multi-taskers as they work on complex and multi-faceted projects. The best way that today’s students will be prepared for the jobs of tomorrow is if Pre-K-12 teachers engage in the use of digital learning tools across all content areas in the Pre-K-12 curriculum.

Technological innovation over the past two decades has forever altered today’s Pre-K-12 education landscape. “Revolutionary advances in information and communications technology (ICT)—particularly disciplines associated with computers, mobile phones, and the internet—have precipitated a renaissance in education technology (ed-tech), a term used here to refer to any ICT application that aims to improve education” (Escueta et al., 2017, p. 2). ICT and content-neutral technologies will empower Pre-K-12 teachers to change the way they teach their students throughout the 21st Century. Ed-tech tools range from the use of artificial intelligence, virtual reality, augmented reality, and apps to specific digital learning tools. Teachers and students in high-needs Pre-K-12 schools will require the greatest support to implement and use these existing ed-tech tools to foster digital equity in education. Additionally, schools and teachers will need support and innovative ideas for navigating remote instruction without universal internet access or devices for their students—particularly those in high-poverty schools in rural and urban school districts. The creation and use of ed-tech tools and apps that do not require internet access, or that could be downloaded while in a connected school environment, could be a start in creating more equity for all Pre-K-12 students attending schools in urban, suburban, and rural districts. States and individual school districts should seek out and review innovative ICT options and ed-tech tools to help teachers provide high-quality instruction even when internet access is not possible for students in their home environments.

DOI: 10.4018/978-1-6684-7366-5.ch015

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## **BACKGROUND**

### **Content-Neutral Technologies in Pre-K-12 Teaching**

For several decades, many scholars have argued that ICT as educational devices facilitate the adaptation of teaching to each student, even during the remote learning that took place during the COVID-19 pandemic. Some have indicated that this is because they can promote collaboration, interactivity, the use of multimedia codes, and greater control of learning by the learner (Collins & Halverson, 2010; Jaffee, 1997). When ICT are used in this way, their integration into the curriculum would contribute to the acquisition of 21<sup>st</sup> Century competencies (autonomy, collaboration, critical thinking, and problem-solving) that the Organization for Economic Cooperation and Development (OECD) (Ananiadou & Claro, 2009) links to “global competence” that should define current education throughout the world (Ertmer et al., 2015).

Content-neutral technology is multi-disciplinary and can be used across many subjects and content areas in the Pre-K-12 teaching environment. Content-neutral technologies include “communication and collaboration tools as well as web-based digital media, and these technologies increase students’ access to information, ideas, and interactions that can support and enhance sense making, which is central to the process of taking ownership of knowledge” (National Council of Teachers of Mathematics, 2011, para. 1). Literature further suggests using content-neutral and content-specific approaches to technology integration in teaching content-based curricula in schools (NCTM, 2011). Content-neutral technologies include communication and collaboration tools and web-based digital media that are more open-ended and promote an inquiry environment while content-specific technologies promote prompting and meaningful subject knowledge (Harris et al., 2009; Lin et al., 1999; NCTM, 2011). The creation of a Pre-K-12 virtual classroom library or reading room can be an effective way to engage students in the subject matter that is being taught and can be done in a content-neutral or content-specific way. This can be accomplished using Google Slides and Bitmoji (Fuentes & Grimes, 2020; Van Pate, 2022). These virtual classroom libraries and reading rooms can be organized around author studies, by subject/topic, around genre studies, student reading levels/decodable text based on skill, and include stuffed animals or character rooms (specific to elementary levels only). Another content-neutral technology that can be used by teachers is digital binders and notebooks to assist students in note taking, essay writing, and creating checklists for project-based learning assignments.

Moving beyond the concept of virtual classroom libraries, reading rooms, and digital binders/notebooks, interactive instruction either live or self-paced can be implemented across grade levels and content areas through Google Slides with NearPod and PearDeck as well as by using Hyperdocs. Google Slides is a free presentation web application that includes nearly all the capabilities of a traditional presentation program such as Microsoft PowerPoint and offers the benefit of cloud storage (Computer Hope, 2021). A HyperDoc is a digital document—such as a Google Doc—where all components of a learning cycle have been pulled together into one central hub (Gonzalez, 2018). Within a single document, students are provided with hyperlinks to all of the resources they need to complete that learning cycle (Gonzalez, 2018). In addition, virtual wall displays on a Google slide classroom can serve as an effective way to engage students in phonics (consonant and vowel sounds), vocabulary words, as well as engaging in anchor charts or displays. There are myriad ways to recreate the physical classroom into a virtual classroom environment appropriate for Pre-K-12 students.

To encourage student participation in the virtual classroom environment, Pre-K-12 teachers should consider implementing a classroom management reward/incentive system. One way this can be done is through supporting and encouraging students’ engagement in the remote learning environment. This

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