Blended learning and teaching in the connected classroom

What K–12 educators can do to overcome the challenges of adopting technology

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Teachers, students, and parents exhibited fortitude and resilience in adapting to online learning during the global health crisis. Now it's time to give them more help in the classroom and to build on data and hard-won insight to shape the connected classroom and the future of education.

Educators, are you ready for the blended classroom?

Blended learning integrates the convenience and flexibility of online instruction with the enduring advantages of the face-to-face classroom environment.

To begin with, it enables access to curriculum content anywhere, anytime. Blended learning can also free up time for educators to work with students individually, which helps teachers differentiate and personalize instruction based on student needs. The end result is improved academic outcomes and better student satisfaction and retention.

However, many K-12 administrators, faculty, and IT professionals lack the guidance to ensure optimal student experiences in blended and remote learning.

And there are many issues to address.

Access is limited. Fifty-nine percent of parents with lower incomes say their children would likely face at least one of three digital obstacles to education: a lack of reliable internet at home, no computer at home, or needing to use a smartphone to complete schoolwork, according to a survey by the Pew Research Center.[1]

Devices matter. Devices are an essential component of the blended learning experience for students and teachers. The relative age, type, and quality of device matter just as much as reliable, high-speed internet access. Especially in lower grade levels that are more dependent on video, high-quality devices are critical to student engagement. In secondary grade levels that offer programs such as career and technical education, devices featuring higher-performance processors may be needed.

Teachers need training. Faculty struggle to adapt to the demands of connected classrooms. As many as six in ten new teachers haven't been trained on how to teach a remote classroom, and nearly seven in ten school district leaders say teachers need additional professional development to use technology more effectively, according to a study by the Rand Corporation.[2]

It's clear that, in many ways, online teaching requires a different skill set than the physical classroom requires, with different tools, and it demands a critical measure of technology proficiency to be effective.

This ebook provides education leaders, faculty, and school IT administrators with insights into the technology challenges students and teachers are experiencing and offers guidance for beginning to close the homework gap. You'll discover advances in education technology and tools that empower teachers to unlock every student's potential. We address four technology factors that stand in the way of successful academic outcomes in blended learning. We then offer a selection of tools for educators to consider that will help future-proof the connected classroom and prepare the workforce of tomorrow.
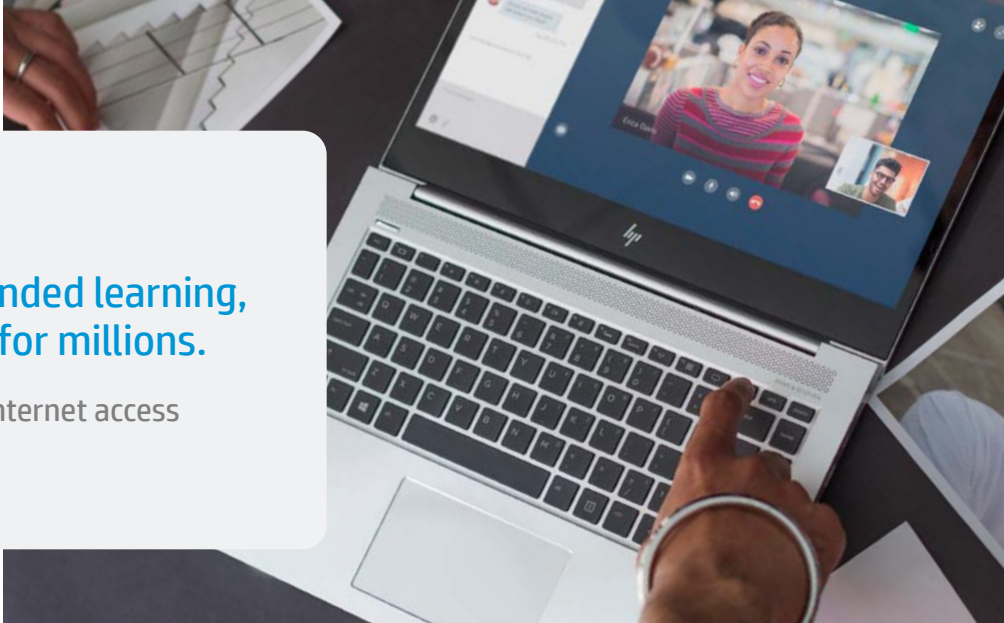
Factor #1

Wi-Fi is the backbone of blended learning, but there is an access crisis for millions.

16.9 million children lack the home internet access needed to support online learning.

According to the Alliance for Excellent Education, approximately 16.9 million children are locked out of the digital classroom because their families lack the home internet access needed to support online learning, a phenomenon known as the "homework gap."[3]

School-age children in lower-income households are especially likely to lack broadband access. In fact, a National Education Association (NEA) report, "Digital Equity for Students and Educators," revealed that an estimated one-fourth of all school-aged children live in households without broadband access or a web-enabled device such as a computer or tablet.[4] And that's true for both rural communities and urban areas of the US.

The homework gap, whereby students lack the reliable, high-speed internet connectivity needed to complete schoolwork at home, is an especially cruel aspect of the digital divide. Dedicated educators may have a motivated student with supportive parents, yet poor internet access makes it hard for the teacher to assist the learner to reach their true academic potential.

The digital divide has been a pressing issue among education leaders and policy makers for decades. But the near-total shutdown of the US school system during the first wave of the pandemic forced more than 55 million students to transition to home-based, remote learning virtually overnight. That cast these digital inequities into dramatically sharp relief.

Compounding this challenge is that 92% of students rely on Wi-Fi, not a wired connection, according to a Consortium for School Networking (CoSN) study.[5] Wi-Fi speeds often are insufficient for blended learning models. That's true especially for synchronous learning, a conversational format that requires instantaneous feedback and frequent discussion. It's a preferred choice, when feasible, because synchronous learning allows remote students to engage with teachers and interact with online learning materials at the same time as their in-classroom peers.

Wi-Fi can present unanticipated, significant challenges to blended learning environments. Router location, older routers using outdated wireless standards, and even home construction materials such as plaster or concrete can weaken the strength of a Wi-Fi connection. For example, placing a router behind a television or behind a brick wall can impede Wi-Fi signals.

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What education leaders can do

When needed, educational leaders should provide technical guidance to students' families. Explain the importance of optimal Wi-Fi router deployment to mitigate obstacles in internet access and to help ensure successful blended learning outcomes.

Educators can start by working with internet service providers (ISPs) to replace outdated routers and to help families acquire new equipment if their router hasn't been upgraded in a few years. A slow internet connection often is the result of older routers that use outdated wireless standards. A new Wi-Fi standard (802.11ax, now known as Wi-Fi 6) provides a much stronger Wi-Fi connection than do previous iterations.

Furthermore, educators can advise families on optimal router placement and recommend the use of a Wi-Fi extender to boost network connectivity in areas of the home with poor signals. A Wi-Fi extender can lower the latency of the network within its current boundaries. If a student household already possesses a good router, but connectivity remains sluggish or unreliable, instruct the family to make sure the router is positioned as high up and as close to the center of the home as possible—not in a distant room, on the floor, or behind a sofa.

Routers tend to spread signal downward and in all directions. If a router is left in the corner of a house or apartment, a significant percentage of the wireless coverage is sent outside the home. Student households also need a router sufficient to support the number of users and devices spread in the home. Optimally, locate routers away from other electronics and large metal objects. The more obstructions, the more likely something will interfere with the signal. It's more effective to, say, place a router atop a bookshelf or mount it high upon a wall.

Connected classroom tools to consider

The HP Hybrid Teaching Solution takes essential business tools such as videoconferencing, collaboration, and instant whiteboard access and transforms them for the connected classroom.

Consider, for example, the HP Elite Slice G2, the communications center and audio/video hub that every modern school needs. Supporting Zoom Rooms and Microsoft Teams conferencing technology, the Elite Slice G2 pairs with the Center of Room Control—a 12-inch capacitive 1920 x 1280 touch screen—for total system control.

The Elite Slice G2's side-firing speakers provide audio, while four upward-facing microphones capture voice input. Online connectivity is supported either by the integrated Ethernet jack or Wi-Fi.
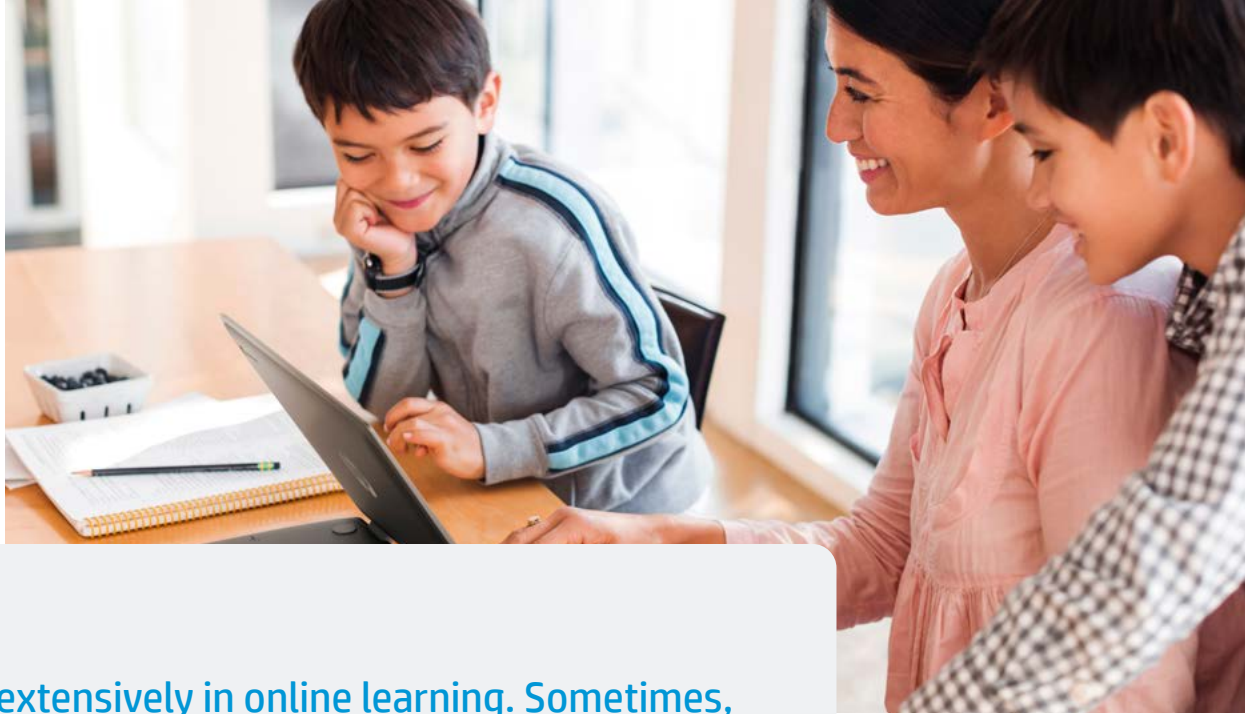
Factor #2

Video is used extensively in online learning. Sometimes, home internet connections aren't up to the task.

7 in 10 students share a home internet connection. There may not be enough bandwidth to support all users in a home.

Video has become an essential element in K-12 education—beyond recorded lectures and online learning resources. With the advent of remote and blended learning models, video is now used extensively for virtual meetings, live online classes, on-demand tutorials, and one-to-many video lessons.

According to the CoSN study, more than **85% of network traffic to support students** in a remote learning environment is used for video, both for direct instruction and instructional support.[5] These applications consume considerable amounts of bandwidth and often run concurrently with data-intensive synchronous video sessions.

In synchronous video classroom sessions, students use video to interact with each other in small-group instruction. Teachers may require students to leave cameras on to monitor and support student engagement, and students use video to submit homework assignments and communicate with teachers. If students lack adequate upload speed or clear audio and video streaming, essential learning tasks can be completely derailed.

In cases where multiple students share a single home internet connection, these challenges are only compounded. There may not be enough bandwidth to go around. The CoSN survey found that **70% of students live in a household with other school-aged children**.[5] Using smartphones and tablets in addition to a student's district-supplied computer also increases home bandwidth requirements. When multiple users and devices are streaming, internet performance may be further compromised.

The Federal Communications Commission (FCC) established a household minimum standard of 25 megabits per second (Mbps) for download speed and 3 Mbps for upload speed. However, the FCC's household minimum standards were established at a time when people weren't viewing video and uploading data as frequently as they do now. Three Mbps is hardly an adequate upload speed for blended or remote learning for an individual student, let alone multiple students and family members accessing the internet simultaneously in a household. For today's connected classroom, this legacy advice no longer applies.

What education leaders can do

School superintendents, other educational administrators, and IT professionals must ensure that students not only have high-speed bandwidth *to the home*, but also receive dedicated high-speed access *within* the home. Education leaders can assist families to accurately calculate bandwidth requirements and ensure home internet access provides sufficient upload capabilities.

When calculating the bandwidth requirements for a household, multiply the recommended per-student bandwidth requirements by the number of students in the household, while adjusting for other household members and factors impacting internet usage. Network requirements to support a home with three to six children are markedly different from network requirements to support a home with one child. Use the formula below.

Single-Student Bandwidth Requirements

✕ **The Number of Students/Family Members Who Concurrently Use Internet in the Household**

Recommended Household Bandwidth

Connected classroom tools to consider

The Logitech Brio 4K is a simple plug-and-play webcam that streams crisp, clear visuals. The camera's dynamic autofocus feature continuously keeps the teacher in frame, and the video webcam offers 5x digital zoom. The Brio 4K also provides a horizontal field of view of up to 90 degrees so that students participating from home can get a clear view of the classroom, increasing their engagement. Plus, the Logitech Capture software offers teachers intuitive yet powerful options such as text overlay.

Educators might also want to consider the Jabra PanaCast, which uses three 13-megapixel cameras to capture a 180-degree view of the classroom. Its stand-out feature is the ability to highlight and toggle between up to three white- or blackboards. PanaCast comes with speakers built into the bar and two microphones and works with most collaborative services.

A new FCC minimum standard should be set at 25 Mbps for download speeds and 12 Mbps for upload speeds per student.
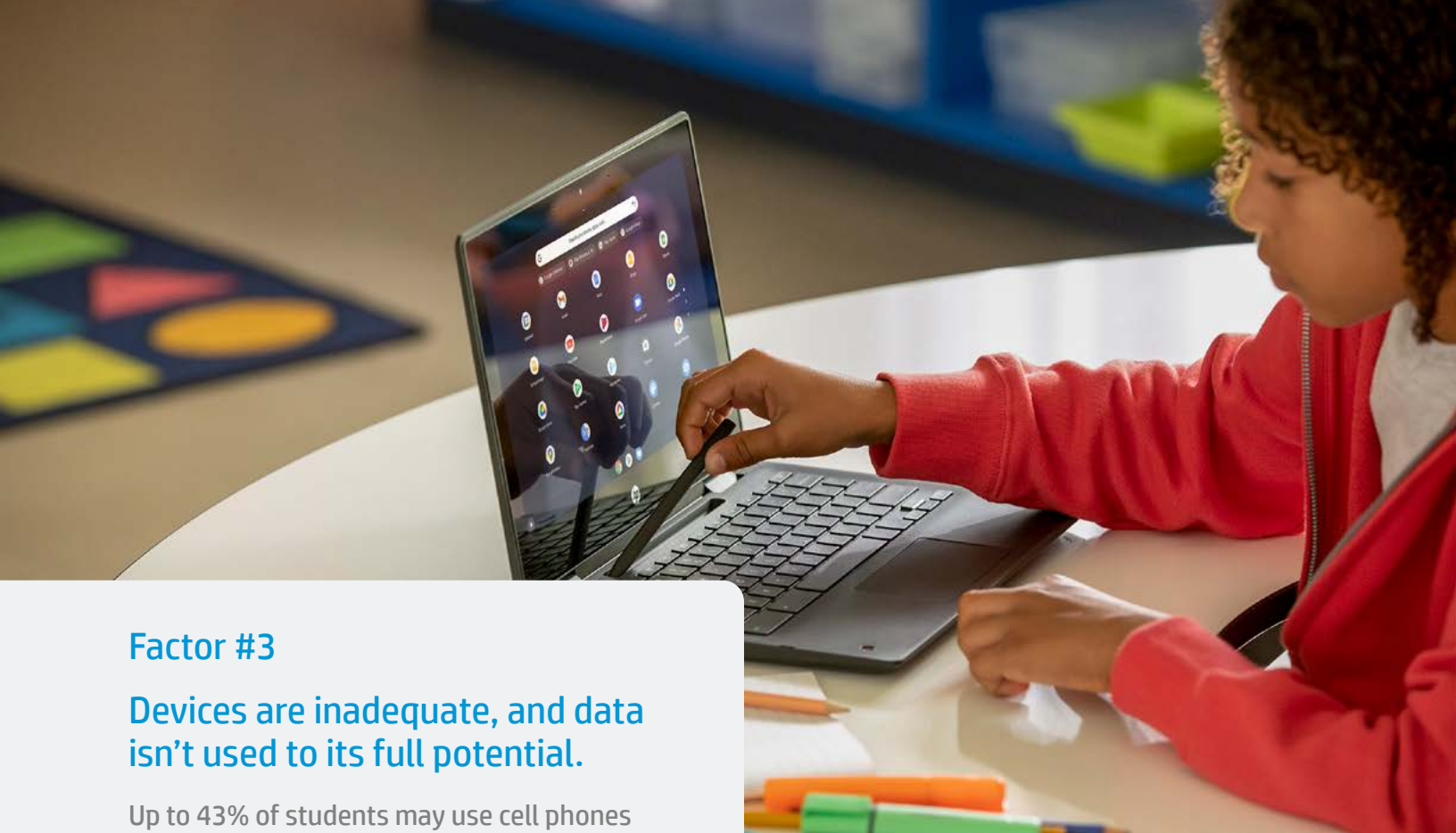
Factor #3

Devices are inadequate, and data isn't used to its full potential.

Up to 43% of students may use cell phones to do schoolwork.

For blended learning to be effective, students must have access to reliable computers. Full stop.

But when the Pew Research Center canvassed lower-income parents with children whose schools shut down during the pandemic, some 43% said their children likely would have to do schoolwork on their cell phones, and 36% said it was likely their children would be unable to complete schoolwork because they did not have access to a computer at home.[6]

Moreover, even newer devices intended for the classroom may be insufficient for remote and at-home learning environments. For example, students working on newer devices with limited memory and processors have more challenges than students equipped with devices with better specifications.

Not surprisingly, students report a worse learning experience when they have old or inadequate equipment.

Elementary and secondary students require up-to-spec equipment for different reasons. Younger students' blended learning activities often rely heavily on video. Mature pupils need computers that support data-intensive technology applications such as coding and content creation.

Additionally, the CoSN study revealed that most school districts don't collect quality, curated data to assess device and home connectivity issues.[5] When they lack actionable data, school districts risk making ill-advised decisions and procurements, straining limited financial resources.

What education leaders can do

Educators must ensure students have the optimal devices for successful learning.

Device capabilities include the type and speed of the central processing unit (CPU), number of cores, and the amount of available memory. Given the need for video and audio, consider computer equipment that offers features such as integrated webcams, microphones, and headphone ports. Capabilities such as these can ensure learners of all grades have the computing power needed, especially to support video and STEAM education.

Think about security. Because so many students use Wi-Fi from various locations, configure devices and applications to ask students for authentication before online sessions. Enforcing authentication to access district resources lets the school system know who's using them, offers better support, and ensures a safe learning environment. In addition to the security benefits, it also yields invaluable insights that can improve group and individual academic performance.

With improved data capture and analysis, school leaders can make better decisions about student devices and home internet support.

Connected classroom tools to consider

HP designed its Chromebook x360 11 G4 EE with extremely mobile—and studious—pupils in mind. The Chromebook 11 provides students up to nine hours of battery power. Its chassis is rugged and spill-resistant. *And* it features the latest, most powerful Intel® Celeron® processor. Along with dual-array mics and a 720p HD front-facing camera, the G4 even takes a page from the HP ProBook G8, offering a 360-degree hinge that allows for multiple screen configurations.

But what about higher-level learning and STEAM projects, with demanding processing needs such as animation, graphical rendering, and data science? Here, the HP ZBook Power G7 Mobile Workstation is up to the challenge. The ZBook Power G7 is no mere laptop, but a powerful workstation with an Intel® Core™ i7 processor and 16 GB of memory.
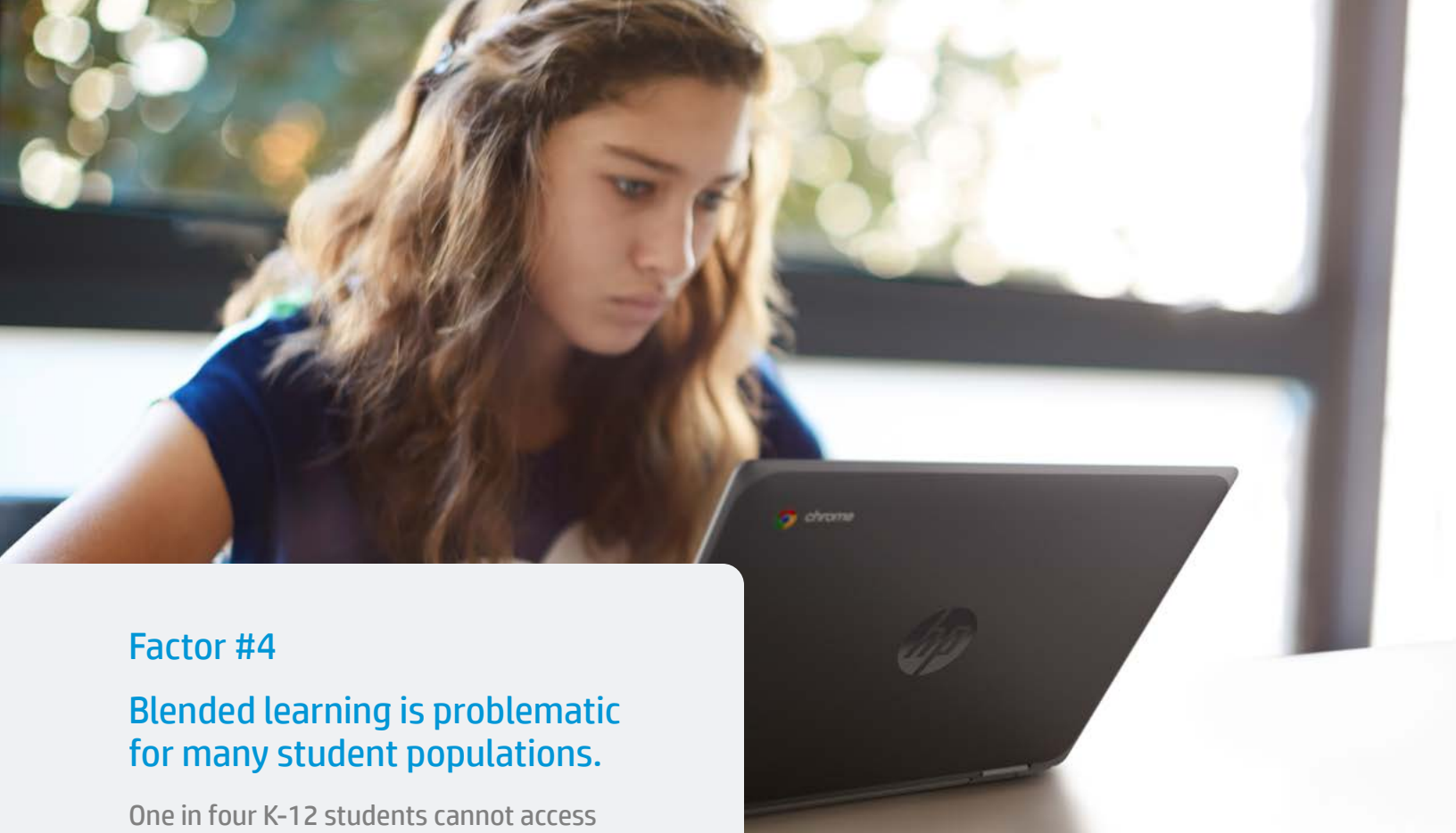
Factor #4

Blended learning is problematic for many student populations.

One in four K-12 students cannot access the internet from home.

According to a study by the NEA, one of every four K-12 students in the US lacks home internet access or a web-enabled device such as a computer or tablet.[4]

Students who live in underserved regions of the country, such as rural communities or on the edges of suburban areas, have limited internet access and availability. These disparities only increase among many Black, Latino, and Native American students, whose families often face more difficult economic hardships.

And then there are the 1.5 million students who are homeless, a significant disadvantage in our increasingly digital world.[7]

In the wake of the pandemic, some ISPs began offering free satellite internet and government-funded discount programs to qualifying households for a limited time. However, these programs, including Lifeline and the new Emergency Broadband Benefit that assist households struggling to afford internet service, come with data caps that limit what a student can accomplish online.

1 in 4
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What education leaders can do

Local communities have critical roles to play in creating long-term solutions to the homework gap. School districts cannot solve this problem in a vacuum. Educators need to be part of a community conversation that involves local elected officials, as well as the business and philanthropic community.

Educators can leverage federal and emergency funding to equip students with hardware that meets remote and blended learning requirements for every level or course of study—STEAM or otherwise. Furthermore, they can work with ISPs and community leaders to establish bandwidth reliability and lower pricing for student households.

Especially for those students lacking a permanent home, who move frequently, or who rely on emergency shelter, schools can provide Wi-Fi hotspots for students supported by E-Rate funding. **E-Rate** is a federal program that helps schools procure and distribute hotspots, connected devices, and other technology.

Connected classroom tools to consider

HP ZCentral Remote Boost is a desktop solution that enables students in remote environments to access their school's workstation via their own computer, mouse, and keyboard. ZCentral Remote Boost helps to mitigate the network latency that can limit online students' participation and performance.

With this collaboration tool, all students can connect to the school's workstation and work simultaneously on the same projects, whether they use Mac, Windows, or Linux operating systems.

Professional development

According to the RAND Corporation, **69% of school district leaders believe that teachers need further training on technologies** used in remote and blended learning.[2]

The CARES Act and ARP Act note professional development as a key area of investment for school districts. Consequently, federal funding can be used to develop innovative strategies that help K-12 educators improve technology use in teaching activities and lesson planning.

HP partners with **Educational Collaborators** on professional development. A national consulting organization composed of many of the best practitioners in the field, Education Collaborators provides educational technology and professional learning services to help school districts achieve their maximum potential.

HP Education Solutions: empowering teachers, inspiring students

While teachers, students, and parents have bravely grappled with changes to the traditional educational environment during the past year-plus, expectations for excellent teaching and learning experiences are higher than ever.

To help exceed those expectations, HP provides resources for education leaders and IT professionals tasked with finding remote and blended learning solutions, education products that empower teachers to unlock every student's potential, and tools that help teachers effectively manage classroom productivity.

To that end, HP Education Solutions help students stay connected, efficient, and productive whether they're in the classroom or studying from home.

We also encourage education leaders to work with Partnership and Technology for Humanity (HP PATH), a program dedicated to ensuring digital equity for underserved students. The digital divide and homework gap, as with any human dilemma, are solvable. HP's goal is to accelerate digital equity for 150 million people by 2030.

HP believes true digital equity requires exceptional hardware, fast and reliable connectivity, quality content, and the skills and confidence to use next-gen educational technology.

By all indications, blended learning is here to stay. We encourage education leaders and other stakeholders to download the **HP Education Solutions Buyer's Guide** to identify optimal solutions for blended learning classrooms and to empower teachers to unlock every student's potential.

[1] Pew Research Center, https://www.pewresearch.org/fact-tank/2020/09/10/59-of-u-s-parents-with-lower-incomes-say-their-child-may-face-digital-obstacles-in-schoolwork/

[2] RAND Corporation, Remote Learning is Here to Stay—Results from the First American School District Panel Survey, https://www.rand.org/pubs/research_reports/RRA956-1.html

[3] Alliance for Excellent Education, https://futureready.org/homework-gap/

[4] National Education Association (NEA), https://www.nea.org/resource-library/digital-divide-and-homework-gap-your-state

[5] Consortium for School Networking (CoSN), https://www.cosn.org/digitalequity

[6] Pew Research Center, 53% of Americans Say the Internet Has Been Essential During the COVID-19 Outbreak, April 30, 2020, https://www.pewresearch.org/internet/2020/04/30/53-of-americans-say-the-internet-has-been-essential-during-the-covid-19-outbreak/

[7] Tim Walker, 'They're Invisible': Number of Homeless Students Reaches New High, NEA, February 12, 2020, https://www.nea.org/advocating-for-change/new-from-nea/theyre-invisible-number-homeless-students-reaches-new-high