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The Economic Value of Chromebooks for Educational Institutions

EXECUTIVE SUMMARY

Technology in the classroom has shifted from being a luxury to being a necessity. Good teachers teach better with the right devices, software, and services at their disposal. And students benefit from the increased levels of interaction and customization such tools provide.

In the past five years, the range of devices available to schools has increased significantly while the average cost per device and the average cost of the associated apps have declined at a rapid pace. Despite the positive momentum around the cost of devices and software, two areas that have remained stubbornly resistant to such progress are the time and the cost associated with the deployment and management of devices. In the past two years, however, significant improvements have been made in these areas thanks to the increasingly widespread deployment of Google's Chromebooks in education. Chromebooks offer low hardware costs, with devices that start at $149. Chromebooks include a full suite of integrated education apps, plus access to more apps in an easy-to-access online store. And equally important, they offer low-cost, built-in deployment and management features thanks to Google's Admin Panel. The result: devices that teachers and students like to use and a lower total cost of ownership (TCO) that allows schools to put the devices into more classrooms.

IDC conducted interviews with 10 school systems located worldwide that are using Chromebooks to support teaching and learning. According to these schools, they are benefiting from the cost and operational efficiencies Chromebooks provide while more of their students are able to take advantage of productive, Web-enabled learning tools. Analysis of interviews with these school systems demonstrates that Chromebooks offer a

Economic Value Highlights

61%
Lower three-year total cost of ownership (TCO)

49%
Lower device cost

93%
Faster deployment

68%
More efficient ongoing device support

91%
Fewer reboots

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61% lower total cost of ownership than the devices they replaced or would otherwise have purchased because:

- Chromebooks are cost effective.
- Chromebooks are operationally efficient, requiring substantially less time to deploy, maintain, and support.
- Chromebooks are reliable, which saves students — as well as teachers and administrators — time that would otherwise be spent on device-related problems.

In addition to these benefits, interviewed schools described how Chromebooks have enabled them to put devices and learning applications in the hands of more students. As a result, teaching and learning are enhanced through greater collaboration, engagement, and access to learning materials.

Situation Overview

Technology as an Enabler of Learning Takes Shape

While personal computers (PCs) have been used in the U.S. education sector for decades, a large percentage of educators have kept the devices at arm's length, and as a result, PCs never delivered the oft-promised revolution in learning. Initial barriers to adoption proved too high to overcome: tried-and-true textbooks, lesson plans, and lectures didn't easily accommodate the addition of interactive software and videos; perpetually overworked teachers didn't have the time or patience to learn the skills necessary to fully embrace these new tools; and the devices themselves were expensive, difficult for students and teachers to use, and exceedingly hard for IT to secure and manage. For years, computers were relegated to special rooms within a school (the computer lab) or — at best — to the back of the classroom, existing as a bolt-on to the traditional classroom experience as opposed to being integrated into student learning.

Fast-forward to the past five years: There has been a dramatic shift in how schools approach computers and technology.

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Embracing Technology in the Classroom

Recent technology innovations have helped hasten the adoption and use of technology in the classroom to drive learning and engagement. With the launch of the tablet computer in 2010, educators quickly recognized the interactive value of the touch-first user interface, and soon Apple's iPads — and later Google Android–based tablets —- began to find their way into K–12 schools. Tablet shipments into U.S. K–12 exploded, growing from close to zero units in 2010 to 2.6 million units in 2012.

The advantages of the devices — including their low cost and easy-to-use operating systems (OSs) — were clear. But educators soon realized that the historical one-size-fits-all device approach was no longer a viable approach; tablet use thrived in interaction-based apps with younger students, while higher-level content creation with older students required a keyboard. Adding a keyboard to a tablet was possible, but it was often costly and cumbersome. Moreover, many educators were reluctant to return to the complexity and higher cost of more conventional computers.

Chromebooks Offer Educators a Solution

Fortunately, the next big thing in education — Google's Chromebooks — was already shipping into the market. Google launched the Chromebook in 2011, and by 2012, the device was already beginning to get attention from educators. Based on Google's always-updated Chrome OS, Chromebooks offered an easy-to-use operating system in a notebook form factor with a built-in keyboard, integrated security, a suite of included apps, and simple deployment and manageability features. Better still, prices started at about $250 per device. In 2013, Chromebook shipments into U.S. K–12 education increased from a few thousand units to 600,000 units. The following year, this total increased to a stunning 3.5 million units, propelling the platform to the head of the class in front of both Microsoft's and Apple's venerable platforms. IDC expects 2015 to be another record-breaking year for Chromebooks, as the devices address many of the key challenges that have plagued personal computers in education since the beginning.

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Chromebook Technology

The casual observer might attribute the entirety of Chromebook's success in education to the low cost of the technology. While low cost is one key factor that gets the attention of educators, Chromebooks also deftly address two other key areas that have traditionally held back devices in schools: They are easy to use and easy to manage.

Easy to Use: The Browser Is the OS

Chromebooks run Chrome OS, Google's always up-to-date operating system. Chrome OS is familiar to anyone who has used a browser to surf the Web. Chrome is built to be fast and

agile, with updates that happen frequently and painlessly. Unlike more traditional PC operating systems that tend to slow down as update after update is applied, the nature of Chrome means it won't slow down over time, and most Chromebooks boot in five seconds or less. And while legacy PC operating systems require additional software to keep viruses and malware at bay, Chrome has integrated security software that doesn't slow down the system and is always current.

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Inside Chrome, Google offers a long list of free apps for teachers and students. Called Google Apps for Education, the suite is headlined by an app called Classroom. Google Classroom is the mission control for teachers and students. It lets teachers organize their digital classroom, create and grade assignments, share content with students and colleagues, and send feedback to students, all in one place. In addition to Classroom, the other Google Apps for Education that are free for schools and do not have any ads included in the education suite are Gmail (email), Drive (online storage), Hangouts (real-time chat), Forms (online information gathering forms), Calendar, Docs (word processing), Sheets (spreadsheets), Slides (presentations), and Sites (intranet and project management). Because each app has an online component, it is easy and straightforward for students and teachers to create, share, and collaborate on projects. Students can also submit private work to teachers and receive individual feedback.

One of the key advantages of Google Apps for Education is that a Chromebook isn't actually required. While Google can provide the best holistic experience on a Chromebook, the fact that all of the apps run in a browser means they work on Chrome browsers running on other devices or even non-Chrome browsers such as Apple's Safari, Mozilla Firefox, and Microsoft's Internet Explorer. This is key for schools that have a mix of hardware, including Windows and Mac OS desktops and notebooks, and Android and iOS tablets. This is also an important factor for schools that have embraced bring-your-own-device (BYOD) programs, where students provide and use their own hardware. As long as the student's device can access the Web, the student can access Google Apps for Education.

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Easy to Manage: The Magic of the Admin Panel

As more schools have moved to embrace technology in the classroom, the complexity and the cost associated with deploying and then managing devices for use by students and teachers have been crucial and ongoing inhibitors. Most other devices are time consuming to set up and difficult to manage; Google's Admin Console allows schools to handle all of these tasks easily and quickly through a simple Web-based interface that costs just $30 per device to maintain.

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One of the key benefits of Chromebooks and the Admin Console is that multiple students can use a single Chromebook over the course of a day. Students sign in to a Chromebook and gain access to all their apps, files, and settings. Later, when they log out of the device, everything is saved to the cloud, and the device returns to its original state. Privacy is maintained, and the device is immediately ready for the next student.

Low Cost: More Devices, More Options

Ease of use and ease of manageability are crucial elements of Chromebook's success in education, but there is simply no denying the fact that the low cost of hardware has been a fundamental driver. When Chromebooks began to gain traction, most of the devices shipping into education sold for $250–300. That's a remarkable price for a durable solid-state device with a keyboard, integrated security and apps, and easy manageability. Today, the starting price for a Chromebook notebook is just $150. In addition, screen sizes have proliferated — today, you can find Chromebooks with screens ranging from 10.1in. to 15.6in. in size.

And Google and its partners have radically expanded the device universe. In addition to standard nontouch notebooks, today you can find touch-enabled notebooks as well as convertible notebooks with tablet functionality. Furthermore, Google has pushed Chrome onto traditional desktop form factors (Chromeboxes), all-in-one desktops (Chromebase), and even $99 USB-sized keys that plug into a monitor or TV (Chromebits). When Chromebooks first launched, only a few hardware vendors offered products. But today, all the major PC vendors offer Chromebooks, as do a growing numbers of mobile device makers.

Finally, it's worth noting that Chromebooks offer one additional benefit: secure testing. A school can administer student assessments, including state standardized tests from the Partnership for Assessment of Readiness for College and Careers (PARCC) and the Smarter Balanced Assessment Consortium (SBAC), through the Admin Panel.

The Economic Value of Chromebooks for Educational Institutions

Study Demographics

In spring 2015, IDC interviewed 10 school systems in 7 countries regarding their experiences supporting teaching and learning with Chromebooks. The interviews consisted of a variety of quantitative and qualitative questions designed to obtain information about the economics of deploying Chromebooks for these school systems as well as the impact of using Chromebooks on their students and faculty. These school systems ranged significantly in size and scope of operations, from large U.S. public school districts to smaller school systems supporting only middle- and high-school students. Interviewed school systems had average enrollments of 29,462 students, with the range of enrollments being 620–145,000 students (see Table 1).

TABLE 1

Demographics of Interviewed Educational Institutions

	Average	Range
Number of teachers	2,034	45–9,000
Number of administrators	543	5–1,900
Number of students	29,462	620–145,000
Number of elementary schools	24	0–70
Number of middle schools	10	0–43
Number of high schools	10	0–31
Number of Chromebooks — total	13,735	320–55,000
Number of Chromebooks — teachers	320	0–1,520
Number of Chromebooks — administrators	92	0–824
Number of Chromebooks — students	13,323	320–55,000
Countries	United States, Canada, United Kingdom, Sweden, Denmark, Australia, and New Zealand	

Source: IDC, 2015

The 10 school systems interviewed by IDC for this study represent a diverse group of institutions in terms of not only size but also geography. Of the 10 schools, 4 are located in the United States, with the other 6 domiciled in Canada, the United Kingdom, Sweden, Denmark, Australia, and New Zealand. The size of the school systems' Chromebooks deployments also varies, ranging from 320 to 55,000, with an average of 13,735 at the time interviews were conducted.

These school systems have taken significant steps toward making Chromebooks their device of choice to support student learning. As shown in Table 2, over half of all devices (56.3%) used by students in a classroom setting in these school systems are Chromebooks. For these school systems, Chromebooks have both replaced legacy devices and served as supplemental devices. These schools have deployed an average of 39.9% of their Chromebooks to replace other devices. While Chromebooks have replaced substantial numbers of desktops and laptops for student use in the classroom, PC laptop use remains most common for teachers and administrators.

TABLE 2

Average Device Bases (%)

Device Type	Students	Teachers	Administrators
Chromebooks	56.3	9.4	3.3
Desktops	21.3	6.3	18.8
Macs (desktops and laptops)	1.8	1.9	7.6
PC laptops	9.5	70.2	56.1
iPads	10.5	11.9	13.6
Tablets (non-Android)	0.0	0.2	0.4
Android tablets	0.5	0.2	0.4

Source: IDC, 2015

Chromebooks have an average 61% lower three-year total cost of ownership compared with devices replaced or alternative devices considered.

Economic Benefits Analysis

Interviewed organizations have achieved substantial economic efficiencies with Chromebooks by reducing spending on devices, needing less staff time to deploy and manage devices, and reducing inefficiencies associated with lost productive time due to device reboots, outages, and other problems. IDC calculates that Chromebooks have an average 61% lower three-year total cost of ownership compared with devices replaced or alternative devices considered:

Chromebooks are easy to deploy, taking less than 10 minutes on average per device compared with 1.8 hours with a replaced or an alternative device.

- **Cost efficiencies.** Chromebooks cost an average of 45.8% less than the devices they replaced or alternative devices, and schools are realizing overall device-related savings of 49.2% when taking into account server, licensing, and other cost savings enabled by Chromebooks. This saves an average of $317 per Chromebook over three years in device-related costs.
- **IT efficiency benefits.** Chromebooks are easy to deploy, taking less than 10 minutes on average per device compared with 1.8 hours with a replaced or an alternative device. In addition, Chromebooks require less effort to manage (67.9%), troubleshoot (91.9%), and apply security settings (74.6%). This saves time worth an average of $602 per Chromebook over three years.
- **Improved device reliability and performance.** Chromebooks minimize interruptions to students and potential lost productive time for teachers and administrators with their reliability and durability. On average, Chromebooks experience only minutes of unavailability per year per device due to reimaging, reboots, unplanned downtime, and hardware failures.

Cost Efficiencies

School districts interviewed for this study reported seeking cost-effective device solutions that would help them extend device use to as many students as possible. Typical of educational institutions, they face challenging decisions about how to spend most efficiently and effectively. Several of the interviewed organizations brought Chromebooks into their classrooms as a supplementary or additional device for students to use, but more have replaced existing devices — typically desktop and laptop PCs — with Chromebooks. They credit the price of Chromebooks with helping them expand their device bases and provide devices to more students.

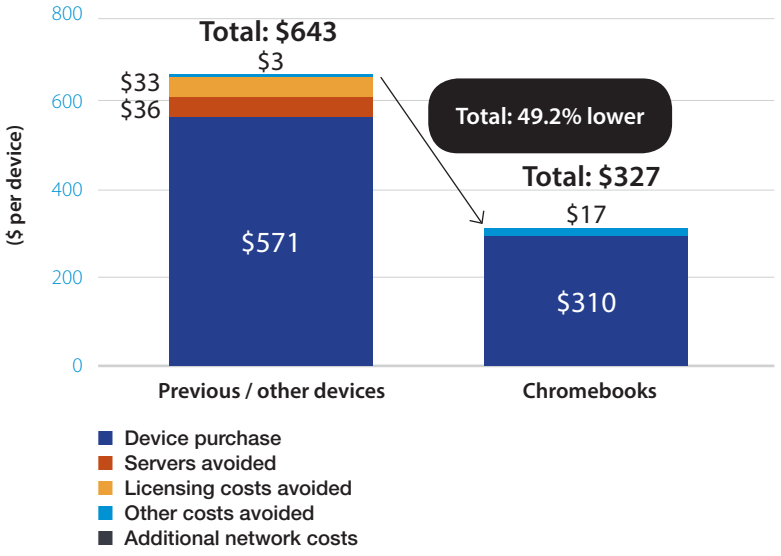
On average, these school districts have paid $310 per Chromebook and the accompanying Chromebook Management Console compared with an average price of $571 per device they replaced. In addition, school districts required server resources to support applications running on their legacy devices, whereas they do not need servers to support cloud-based Google Apps. They have also avoided the licensing costs associated with legacy devices and applications, which can be quite costly when taking into account the thousands of devices at many of these school systems. This means that these organizations are now paying an average of $327 per Chromebook over three years — including some additional costs for networking that results from "our students actually using them," as one school district told IDC — compared with $643 per legacy device. This translates to 49.2% lower spending per device over three years for these organizations (see Figure 1).

According to another school district, Chromebook's price point has enabled the school system to reach a 1:1 user-device ratio, something it never could have done given the cost of its previous devices.

According to interviewed school systems, these cost advantages of Chromebooks directly impact the ability of the school systems to support more of their students with Web-based learning devices. As one school system explained, "The number of devices that we can put into the system with Chromebooks significantly outstrips what was there before." According to another school district, Chromebook's price point has enabled the school system to reach a 1:1 user-device ratio, something it never could have done given the cost of its previous devices: "We now have a 1:1 device solution with Chromebooks … Without Chromebooks, either we would have fewer devices or we would have had to spend four times as much to get to the same point." For these school systems, being able to expand the number of students who have daily or consistent access to educational applications on Chromebooks represents a substantial advantage and supports their core missions.

FIGURE 1

Cost per Device Comparison



Source: IDC, 2015

IT Efficiency Benefits

School systems using Chromebooks in the classroom reported that they have dramatically reduced the time burden per device on individuals supporting device deployment, management, troubleshooting, and applying security. These institutions traced these efficiencies to their ability to apply policy and rules remotely to any number of devices at the same time through the Chrome Management Console as well as the reliability and ease of using Chromebooks.

Time savings for these school systems started with their Chromebook deployments. The time it took these school systems to deploy Chromebooks varied substantially; perhaps not surprisingly, those that opted to migrate legacy applications into the Google Cloud at the same time as they deployed Chromebooks required more time and staff effort. Still, even those organizations reported needing less time than with their previous devices. Many school systems described putting Chromebooks into use as requiring little more than taking them out of the box and starting them, thanks to centralized configuration and deployment. These school systems reported spending an average of 57.3% less time per device on deployment. One school system described the ease of deploying Chromebooks as follows: "Deployment of Chromebooks doesn't take weeks — it takes hours. No testing. Just roll them in with the Google Console, which takes seconds per machine, and then take them out."

Interviewed organizations now spend 67.9% less time managing Chromebooks than previous devices and 74.6% less time managing security.

Once deployed, Chromebooks require much less time to manage, troubleshoot, and secure than replaced devices. The ability to manage fleets and apply security policies through the Chrome Management Console means that interviewed organizations now spend 67.9% less time managing Chromebooks than previous devices and 74.6% less time managing security. Meanwhile, the strong reliability of Chromebooks has reduced the amount of time these school systems must devote to troubleshooting by an average of 91.9%. Complex operations that used to add up to significant time across large device bases, including patching, adding applications, and setting policy, now take far less time and are much less burdensome with Chromebooks (see Table 3).

School systems using Chromebooks provided several examples of these types of efficiencies:

- **Ease of management:** "I would say that we are saving more than 70% of our time on managing the devices. If we were going to do this with another device, we'd have to almost double our staff … [W]e have all of these devices now, but we don't hear people talking about managing them."
- **Ease of adding applications:** "With Chrome, you can add applications via the Admin Console. With Chrome, for 3,000 devices, it would take ... an hour. With [our previous devices], for the 3,000, I'd say that it would take 300 hours."
- **Ease of security and updates:** "We selected Chromebooks for the security, for the included software updates, the sustainability, [and] not having to actually touch the devices very often for updates."

TABLE 3

IT Efficiencies — Chromebooks for Education

	Previous/Other Devices	Chromebooks	Change (%)
Deployment (hours per device)			
Time to deploy	1.82	0.12	93.2
Hours of FTE time for deployment	4.38	1.87	57.3
Ongoing (hours per device per year)			
Time to manage	4.26	1.37	67.9
Time to troubleshoot	1.43	0.12	91.9
Time to apply/manage security	0.06	0.02	74.6
Total ongoing	**5.76**	**1.50**	**73.9**

Source: IDC, 2015

Improved Device Reliability and Performance

Interviewed school systems also reported benefiting from the reliability of Chromebooks. They said that their Chromebooks experience fewer problems and other issues that impact users, including reboots (90.4% fewer), file losses (86.4% fewer), requiring reimaging (99.6% fewer), and hardware failures (27.0% fewer). Further, when these types of issues do occur with Chromebooks, their resiliency and speed of restarting mean that the impact on users is minimized. One interviewed school described the impact of Chromebook's reliability and ease of use on students' perceptions of Chromebook technology as follows: "Students are so much happier now because availability is so much better, and it takes a couple of seconds rather than 5 minutes to fix a problem. We measured their happiness using a five-level graded scale where 5 is the best and 1 is not good. Prior to Chromebooks, the students rated IT support at our schools 2.1, and after, it was 3.8." Another school system explained how Chromebook's ease of use is enabling: "Chromebooks are extremely user friendly. They work no matter where they are, teachers can understand them without having one, and the Chrome browser can be used on any device with the same experience." The result is that Chromebooks provide students with a more consistent learning experience with fewer device-related interruptions and problems while teachers and administrators who are using Chromebooks lose less productive time to unavailability of applications and trying to sort out problems when they occur (see Table 4).

"Students are so much happier now because availability is so much better, and it takes a couple of seconds rather than 5 minutes to fix a problem."

TABLE 4

Reliability KPIs - Chromebooks for Education

	Previous/Other Devices	Chromebooks	Change (%)
Frequency per device per year			
Reboots	135.14	12.86	90.4
File losses	6.10	0.83	86.4
Reimaging	2.66	0.01	99.6
Hardware failures	0.09	0.07	27.0

Source: IDC, 2015

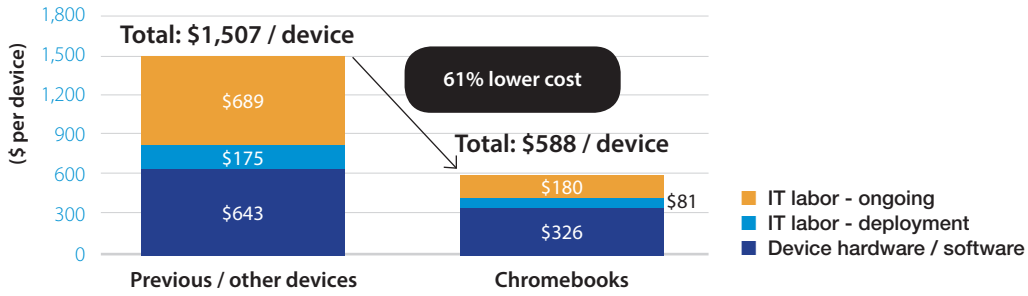
Chromebooks are cost effective, require less staff time to deploy and manage, and suffer fewer outages and other problems that take time to remedy.

Total Cost of Ownership of Chromebooks for Education

The TCO of Chromebooks is much lower than the TCO of the devices that the school systems replaced or otherwise would have purchased. IDC calculates that, over three years, the TCO of Chromebooks will be 61% lower on average than the TCO of these alternative devices because Chromebooks are cost effective, require less staff time to deploy and manage, and suffer fewer outages and other problems that take time to remedy. For interviewed school systems, reducing device-related TCO from a three-year average of $1,507 to $588 creates cost and staff efficiencies that can be reinvested in providing more devices to support teaching and learning (see Figure 2).

FIGURE 2

Three-Year TCO Comparison — Chromebooks Versus Other Devices for Education



	Previous / Other Devices ($)	Chromebooks ($)	Cost Savings / Avoidance ($)	Cost Savings / Avoidance (%)
Device cost	643	326	317	49.2
Deployment cost	175	81	93	53.4
Device management and support cost	689	180	509	73.9
Total	1,507	588	919	61.0

Source: IDC, 2015

IDC Analyze the Future

Benefits of Chromebooks for Education for Teaching and Learning

Improved Student Engagement and Experience

Interviewed school systems provided a number of examples of how they believe Chromebooks are supporting teaching and learning in their schools. One school system reported increased collaboration and ultimately engagement in the classroom with Chromebooks: "We've done an extensive evaluation of the impact of giving more students access to devices with Chromebooks. We've got increased student engagement. We have students collaborating more and fewer disciplinary issues in class … Statistically, student engagement has increased … [and] the natural decline from K to 12th grade has been mitigated, so student engagement is not decreasing, which it would without devices." Especially for students who might have had to use devices in computer labs or at specific times, having more consistent access to learning applications can be very advantageous. Another school district noted that students save several minutes when opening and closing Chromebooks, improving the classroom experience for students: "The difference is that the Chromebook, if you open it up, it instantly comes on, whereas with a laptop, if it's asleep or you close it, you lose those 3-5 minutes per period 6 times per day."

"We've got increased student engagement. We have students collaborating more and fewer disciplinary issues in class … Statistically, student engagement has increased."

Closing the Gap to One-to-One Device Targets

Several school districts referenced the fact that the lower cost of ownership of Chromebooks in and of itself enables them to provide Web-based learning devices to more students. One school district explained that Chromebook's price point and lower overall cost of ownership were enabling the school district to provide more comprehensive support to students who need it. The school district explained that it could not afford to provide devices to all students with special needs who can sometimes benefit substantially from having access to Web-based applications and programs. As the school district explained, "We have thousands of claims from children with special needs in our system … We couldn't afford very much and could only support hundreds of claims per year … With Chromebooks, almost every kid has access. Chromebooks has transformed how we look at special education and how we support these kids …"

"We're now at 100% one-to-one device ratios with Chromebooks in 6th, 7th, and 8th grades."

While not all interviewed school systems have a defined objective of reaching 1:1 student-device ratios, there was consistent agreement that putting devices in the hands of as many students as possible is beneficial. These schools said that Chromebooks are helping them reach one-to-one device environments or at least significantly reduce their student-device ratios. As one school explained, "We're now at 100% one-to-one device ratios with Chromebooks in 6th, 7th, and 8th grades. And we are working up to higher grades and down to 5th grade in the next year. It's about a third of the students overall. Before Chromebooks, it was lower — let's say 5%."

IDC has calculated the net cost for a hypothetical school to move to a one-to-one device ratio with Chromebooks.

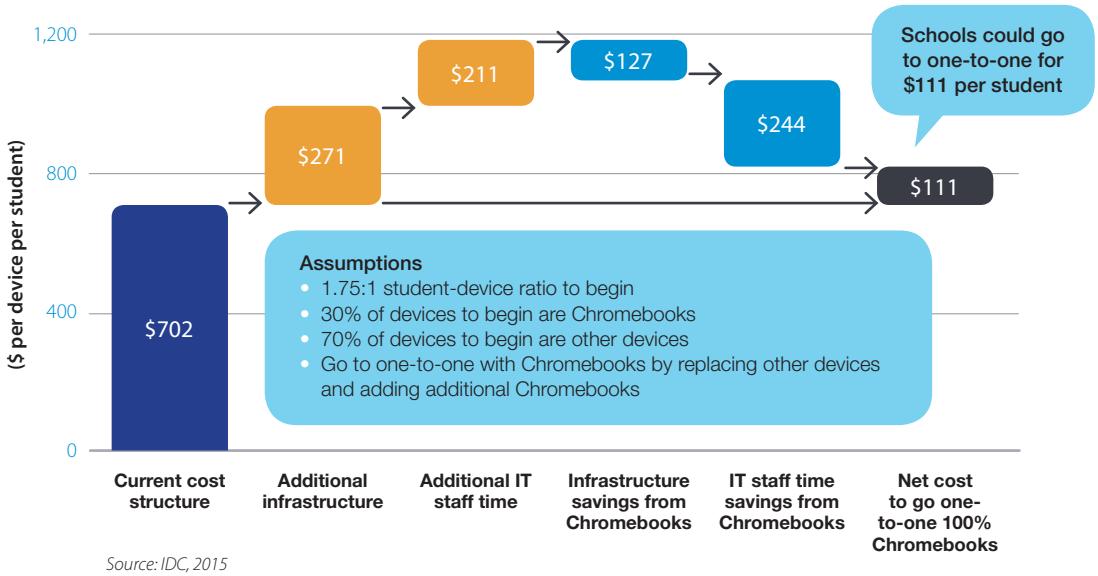
Based on device cost and the time needed to deploy and manage Chromebooks compared with interviewed schools' previous or alternative devices, IDC has calculated the net cost for a hypothetical school to move to a one-to-one device ratio with Chromebooks under the following assumptions:

- 1.75:1 current student-device ratio, with 30% of these devices being Chromebooks and 70% being other types of devices
- Go to one-to-one device ratios by replacing other types of devices with Chromebooks and adding Chromebooks

As shown in Figure 3, this hypothetical school could replace other types of existing devices with Chromebooks and save $127 and $244 per student on infrastructure and labor costs, respectively. As a result, given the assumptions discussed previously, this school could move to a one-to-one device environment at a net cost of $111 per student, including all infrastructure and labor costs.

FIGURE 3

Cost Analysis for Going to a One-to-One Student-Device Environment



Source: IDC, 2015

Challenges and Opportunities

Despite the clear value proposition of Chromebooks, challenges persist. Key among them are the persistent suggestion that all students must learn Microsoft Office to be job worthy, the perception that Chrome's inability to run Windows applications means valuable legacy software must be left behind, and the ongoing fallacy that all Chrome applications require a persistent Internet connection that not all students have.

While Microsoft is ubiquitous in the workplace today, Google presence has grown, with more than 5 million businesses using Google Apps for Work today. And use of Google's suite of apps is growing quickly at colleges and universities; the majority of the U.S. News & World Report's top 100 universities in the United States use Google Apps for Education. In fact, Google's success in this area has forced Microsoft to evolve its suite and act more like the upstart. Students using Google Apps will not enter the workforce at a disadvantage.

While it is true that Chrome won't run legacy Windows applications, a quick check of the Google Play for Education store shows that, in nearly every case, there now exists a Chrome app that offers a comparable set of features. Need a video editing app? Try WeVideo or Magisto. Need to edit audio? Check out TwistedWave or Beautiful Audio Editor. Photos? Use Polarr or Pixlr Editor.

Finally, it's true that in the early days of Chromebooks, Chrome Apps, and Google Docs, there were serious limitations around what you could accomplish offline, without an Internet connection. But Google has made massive strides in this area. Most apps work fine in offline mode, syncing changes once the device is back online. The company and its partners offer details about each app's offline capabilities in the descriptions available in the Google Play for Education store.

Google has opened a world of opportunities within education for Chromebooks.

In addressing the key challenges outlined previously, Google has opened a world of opportunities within education for Chromebooks. The low cost of buying, deploying, and managing the devices means schools can outfit more classrooms with the technology. As more schools embrace both Chromebooks and the Google ecosystem, more app developers will support the platform, offering ever improving software and services geared toward education; better apps and services will drive schools to outfit more classes; and so on. This virtuous circle creates dramatic opportunities for all involved, from students and teachers to developers to hardware providers.

Summary And Conclusion

Increasingly, school systems must find ways to leverage technology to support their teaching and learning environments to meet expectations of parents and students. However, many school systems have struggled to overcome budgetary and staff limitations as they seek to extend device deployments. Through its Chromebooks for Education offering, Google has sought to provide schools with a device that can help them overcome these limitations while still providing strong functionality for the classroom. Based on interviews with 10 school systems that have Chromebook deployments ranging from several hundred to tens of thousands, IDC's analysis shows that these school systems are achieving substantial cost savings and operational efficiencies while still benefiting from the reliability and ease of use of Chromebooks. According to these schools, the net result is that the TCO of Chromebooks is much lower than the TCO of the devices they replaced or otherwise would have used. These efficiencies have allowed the schools to put devices in the hands of more students and teachers, which is creating a more robust learning and teaching environment for the students they serve.

Appendix

IDC's standard ROI methodology was utilized for this project. This methodology is based on gathering data from educational institutions as the foundation for the model. Based on these interviews, IDC performs a three-step process to calculate benefits and investment costs:

- Measure the savings from reduced IT costs (staff, hardware, software, maintenance, and IT support), increased user productivity, and improved revenue over the term of the deployment.
- Ascertain the investment made in deploying Chromebooks and the associated training and support costs.
- Project the costs and savings over a three-year period and calculate total costs associated with Chromebooks ownership.

IDC bases the financial calculations on a number of assumptions, which are summarized as follows:

- Time values are multiplied by burdened salary (salary + 28% for benefits and overhead) to quantify efficiency and manager productivity savings.
- Downtime values are a product of the number of hours of downtime multiplied by the number of users affected.

- The impact of unplanned downtime is quantified in terms of impaired end-user productivity and lost revenue.
- Lost productivity is a product of downtime multiplied by burdened salary.
- Lost revenue is a product of downtime multiplied by the average revenue generated per hour.

Because every hour of downtime does not equate to a lost hour of productivity or revenue generation, IDC attributes only a fraction of the result to savings. As part of our assessment, we asked each school system what fraction of downtime hours to use in calculating productivity savings.

Note: All numbers in this document may not be exact due to rounding.

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