Power through your high school courseload with a responsive Chromebook

Two Chromebooks with Intel Core i3-1125G4 and Intel Pentium Silver N6000 processors required less time to complete tasks in educational apps vs. two Chromebooks with MediaTek MT8183 and Qualcomm Snapdragon 7c processors

When your students are responsible for rigorous high school courses, a Chromebook™ that can complete tasks quickly is a serious asset.

At Principled Technologies, we hand-timed tasks in a variety of apps to compare the responsiveness of four Chromebooks for high school student use cases:

- Intel® Pentium® Silver N6000 processor-powered Chromebook
- Intel® Core™ i3-1125G4 processor-powered Chromebook
- MediaTek MT8183 processor-powered Chromebook
- Qualcomm Snapdragon 7c processor-powered Chromebook

In our tests, the Intel processor-powered Chromebooks saved time on tasks in apps such as Google Sheets™, Adobe® Lightroom®, and others. These Chromebooks also performed better on benchmarking apps WebXPRT 3 and Speedometer 2.0.

Up to 69% less time
opening, sharing, and creating files while on a Zoom call[†Δ]

Up to 60% less time
unzipping, importing, batch processing, and exporting photos[†Δ]

Up to 76% less time
rendering a model with TinkerCAD[†Δ]

[†]HP Chromebook x360 14ct-cc000 with an Intel Core i3-1125G4 processor ($539.99[1]) and an Acer Spin 512 R853TA-P3R1 with an Intel Pentium Silver N6000 processor ($529.99[2]) compared to an Acer Spin 513 CP513-1H-S60F with a Qualcomm Snapdragon 7c processor ($429.99[3]) and a HP 11a-na0060nr with a MediaTek MT 8183 processor ($299.99[4]).

[Δ]See **the science behind this report** for detailed system configurations and benchmark results.

In this report, text in the peach-colored sections represents fictional scenarios based on the results of PT testing. Though the people aren't real, the scenarios represent a lifelike picture of the benefits users may see in the real world.

How we tested

The devices under test

We compared Chromebooks with processors from Intel, MediaTek, and Qualcomm. To make performance comparisons as fair as possible, we aimed to use Chromebooks with similarly specced processors. On paper, the MediaTek MT8183 processor is less powerful than the others in our report; however, MediaTek's higher-bin processors are not currently available in Chromebooks as of this writing.

Google Workspace and Adobe app scenarios

To test each Chromebook, we hand-timed common scenarios in a variety of apps that high school students use in the course of their work. We used scenarios to reflect how in the real world, users rarely perform single tasks in isolation.

To portray a remote-learning experience, we connected the Chromebooks to a four-way Zoom video call during the Google Workspace scenario. To minimize the effect of network on testing results, we performed testing on the same day, and each Chromebook was connected to the same Wi-Fi network.

Other apps

In addition to our scenario-based testing, we also hand-timed tasks in individual educational apps.

Benchmark tests

Finally, we ran two benchmark tests (WebXPRT 3 and Speedometer 2.0) that measured web-app responsiveness on each Chromebook.
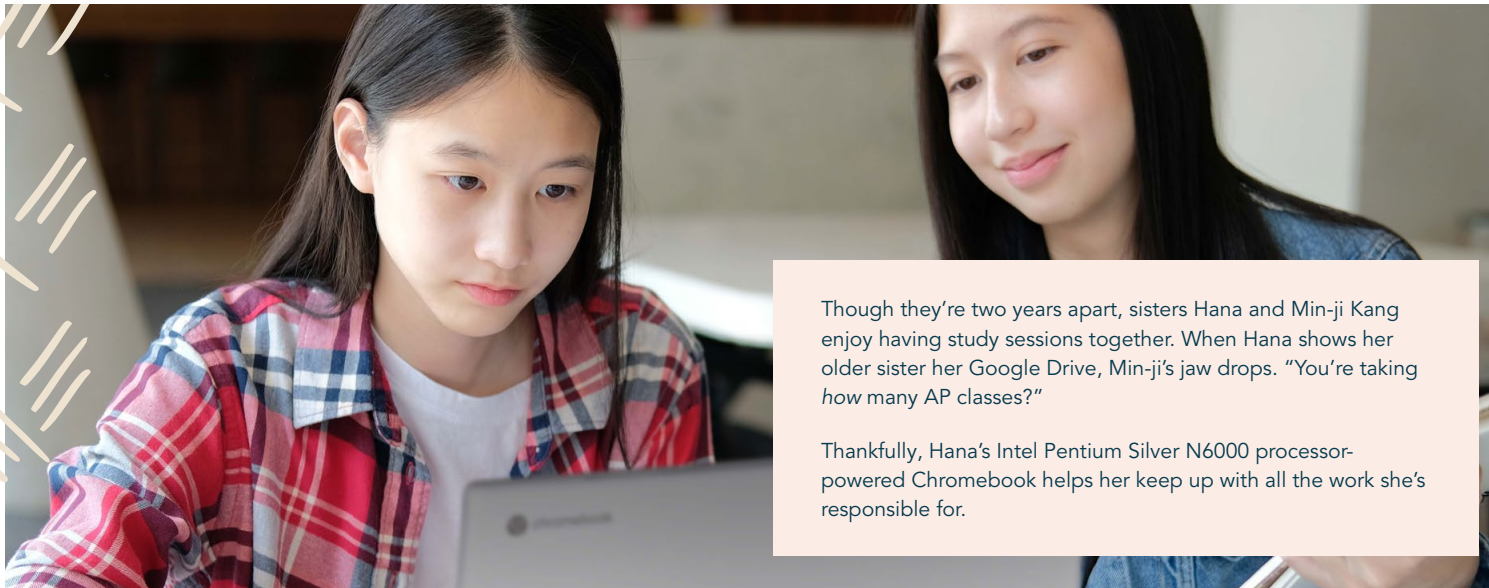
HP Chromebook x360 14ct-cc000 with an Intel Core i3-1125G4 processor

Acer Spin 512 R853TA-P3R1 with an Intel Pentium Silver N6000 processor

Though they're two years apart, sisters Hana and Min-ji Kang enjoy having study sessions together. When Hana shows her older sister her Google Drive, Min-ji's jaw drops. "You're taking *how* many AP classes?"

Thankfully, Hana's Intel Pentium Silver N6000 processor-powered Chromebook helps her keep up with all the work she's responsible for.

Spend less time on tasks in Google Workspace apps

Figure 1 shows the results of our first scenario-based test, which used Zoom alongside several Google Workspace apps. As an example of just one task, when opening a shared Google Slides™ presentation:

- The Intel Core i3-1125G4 processor-powered Chromebook had the best performance of all, requiring 84.4 percent less time than the MediaTek MT8183 processor-powered Chromebook, and 71.4 percent less time than the Qualcomm Snapdragon 7c processor-powered Chromebook

- The Intel Pentium Silver N6000 processor-powered Chromebook came in second, requiring 52.5 percent less time than the MediaTek MT8183 processor-powered Chromebook, and 12.6 percent less time than the Qualcomm Snapdragon 7c processor-powered Chromebook

Save up to 111.1 seconds working with documents, charts, and presentations during a Zoom meeting
with Google Drive, Google Sheets, Google Slides, and Zoom

Launching Zoom | Launching meeting | Opening PDF preview | Viewing a print preview | Opening a shared Microsoft Excel file | Opening a Microsoft Excel file | Inserting a bar graph | Opening a shared presentation | Copying/pasting a graph

47.9 sec
83.3 sec
102.7 sec
159.0 sec

Up to **69%** less time△

■ HP Chromebook x360 14ct-cc0000 with an Intel Core i3-1125G4 processor
■ Acer Chromebook Spin 512 R853TA-P3R1 with an Intel Pentium Silver N6000 processor
■ Acer Chromebook Spin 513 CP513-1H-S60F with a Qualcomm Snapdragon 7c processor
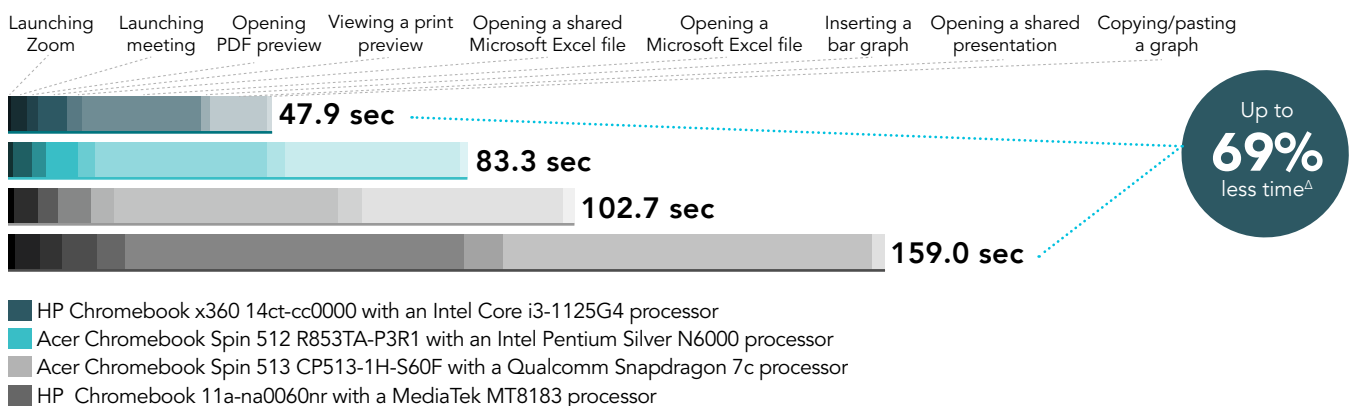■ HP Chromebook 11a-na0060nr with a MediaTek MT8183 processor

Figure 1: Time (in seconds) to complete tasks in Google Workspace apps while connected to a four-way Zoom meeting. Less time is better. Source: Principled Technologies.

Zoom

Zoom is a teleconferencing and video chat app that enables users to connect, share ideas, and participate in remote events, seminars, and more. Individuals and companies around the world use Zoom as an integral part of their day-to-day operations.[5]

Google Workspace

Last year, Google rebranded its G Suite app offerings as Google Workspace—but you'll still get the same productivity and collaboration tools you've used in the past, including Google Docs™, Google Slides, Google Meet, Google Drive, and more.[6]

△See **the science behind this report** for detailed system configurations and benchmark results.

While Hana starts doing research for a history paper, Min-ji is processing raw photo data from a physics experiment. Her Intel Core i3-1125G4 processor-powered Chromebook lets her import, edit, and export photos quickly using Adobe apps.

Edit photos in less time

Figure 2 shows the results of our second scenario, which involved several photo-related tasks. When unzipping a set of 280 photos from the desktop:

- The Intel Core i3-1125G4 processor-powered Chromebook again had the best performance, taking 74.8 percent less time than the MediaTek MT8183 processor-powered Chromebook, and 69.7 percent less time than the Qualcomm Snapdragon 7c processor-powered Chromebook

- The Intel Pentium Silver N6000 processor-powered Chromebook required 59.4 percent less time than the MediaTek MT8183 processor-powered Chromebook, and 51.2 percent less time than the Qualcomm Snapdragon 7c processor-powered Chromebook

Save up to 903.6 seconds working unzipping, importing, and editing photos
with Adobe Lightroom

Unzipping photos   Importing photos   Batch processing photos   Exporting photos as .JPG

578.2 sec
661.8 sec
976.2 sec
1481.8 sec

Up to **60%** less time△

■ HP Chromebook x360 14ct-cc0000 with an Intel Core i3-1125G4 processor
■ Acer Chromebook Spin 512 R853TA-P3R1 with an Intel Pentium Silver N6000 processor
■ Acer Chromebook Spin 513 CP513-1H-S60F with a Qualcomm Snapdragon 7c processor
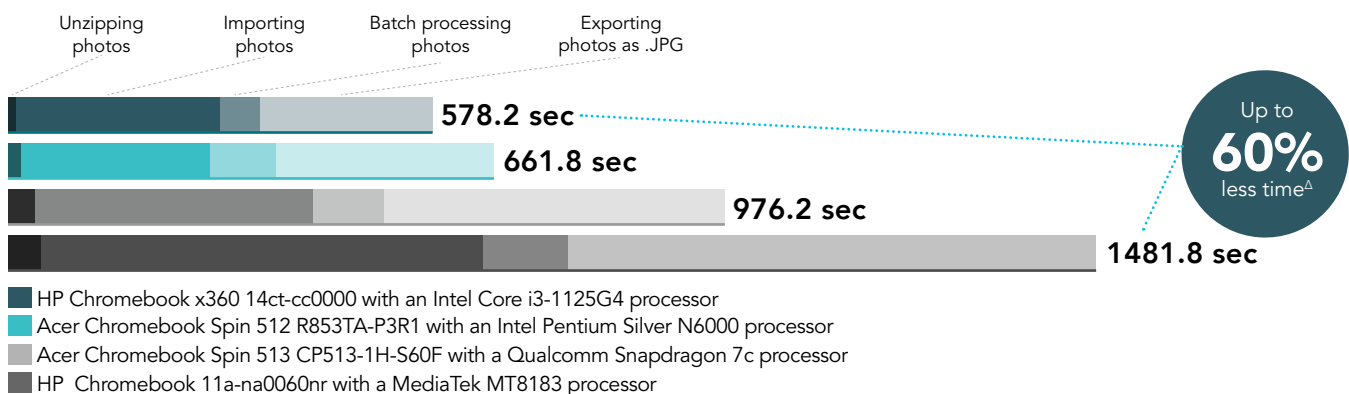■ HP Chromebook 11a-na0060nr with a MediaTek MT8183 processor

Figure 2: Figure 2: Time (in seconds) to complete tasks in Adobe apps. Less time is better.
Source: Principled Technologies.

Adobe Lightroom

Adobe Lightroom is a free photo editing and camera app that enables you to use customizable filters and other options to create your next photography project.[7]

△See **the science behind this report** for detailed system configurations and benchmark results.
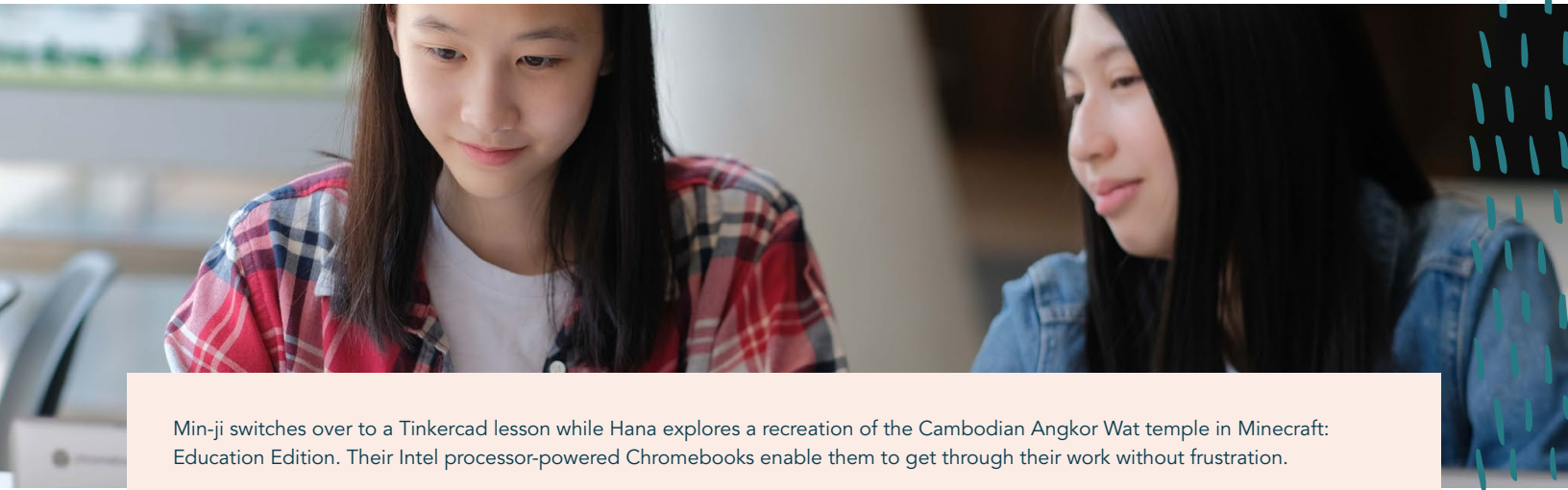
Min-ji switches over to a Tinkercad lesson while Hana explores a recreation of the Cambodian Angkor Wat temple in Minecraft: Education Edition. Their Intel processor-powered Chromebooks enable them to get through their work without frustration.

Save time in Tinkercad and Minecraft: Education Edition

After performing scenario-based testing, we tested tasks in a few apps in isolation. Figures 3 shows the results of these tests. Notably, when using Tinkercad to render blocks from a model project:

- The Intel Core i3-1125G4 processor-powered Chromebook took 76.2 percent less time than the MediaTek MT8183 processor-powered Chromebook, and 59.6 percent less time than the Qualcomm Snapdragon 7c processor-powered Chromebook

- The Intel Pentium Silver N6000 processor-powered Chromebook took 65.5 percent less time than the MediaTek MT8183 processor-powered Chromebook, and took 41.3 percent less time than the Qualcomm Snapdragon 7c processor-powered Chromebook
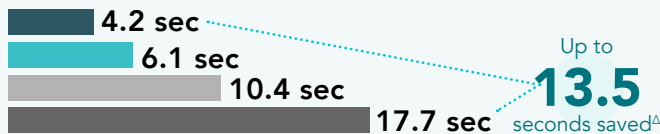
Copying and tinkering
with Autodesk Tinkercad

11.1 sec
12.8 sec
19.6 sec
27.6 sec

Up to
16.5
seconds saved[Δ]

Render blocks from a model
with Autodesk Tinkercad

4.2 sec
6.1 sec
10.4 sec
17.7 sec

Up to
13.5
seconds saved[Δ]

Launching the application
with Minecraft: Education Edition

4.6 sec
5.3 sec
6.6 sec
8.9 sec

Up to
4.3
seconds saved[Δ]

■ HP Chromebook x360 14ct-cc0000 with an Intel Core i3-1125G4 processor
■ Acer Chromebook Spin 512 R853TA-P3R1 with an Intel Pentium Silver N6000 processor
■ Acer Chromebook Spin 513 CP513-1H-S60F with a Qualcomm Snapdragon 7c processor
■ HP Chromebook 11a-na0060nr with a MediaTek MT8183 processor

Figure 3: Time (in seconds) to complete tasks in Autodesk Tinkercad and Minecraft: Education Edition. Less time is better. Source: Principled Technologies.

Autodesk Tinkercad

Tinkercad is a browser based program for computer aided design. Common Sense Education® gave Tinkercad a 5 out of 5 star rating, citing its pedagogical technique and level of engagement.[8]

Minecraft: Education Edition

The best selling video game of all time isn't just for having fun outside of school.[9] Minecraft has an education edition that features classroom management tools and pre-made lesson plans on everything from code to history to social emotional learning (SEL).[10]

[Δ]See **the science behind this report** for detailed system configurations and benchmark results.

Web-based benchmark comparison

In addition to timing tasks in various apps, we also compared the results of two benchmark tests: WebXPRT 3, a browser-based benchmark that uses HTML5 and JavaScript to assess a device's ability to handle tasks in online apps and websites, and Speedometer 2.0, which simulates users on a device and measures the time required for those users to complete web-based tasks.

Figures 4 and 5 show the results of WebXPRT 3 and Speedometer 2.0 benchmark testing respectively. Again, the two Intel processor-powered Chromebooks achieved markedly higher scores on each test, suggesting that they may be more responsive while web browsing and using web apps.
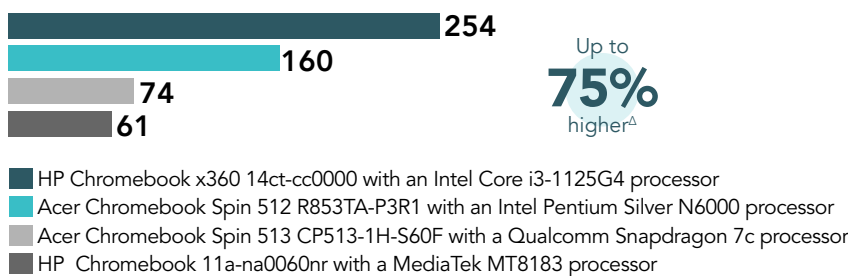
WebXPRT 3 score

254
160
74
61

Up to
75%
higher[Δ]

■ HP Chromebook x360 14ct-cc0000 with an Intel Core i3-1125G4 processor
■ Acer Chromebook Spin 512 R853TA-P3R1 with an Intel Pentium Silver N6000 processor
■ Acer Chromebook Spin 513 CP513-1H-S60F with a Qualcomm Snapdragon 7c processor
■ HP Chromebook 11a-na0060nr with a MediaTek MT8183 processor

Figure 4: WebXPRT 3 scores. Higher is better.
Source: Principled Technologies.

Speedometer 2.0 score

169.0
83.1
45.8
28.4

Up to
83%
higher[Δ]

■ HP Chromebook x360 14ct-cc0000 with an Intel Core i3-1125G4 processor
■ Acer Chromebook Spin 512 R853TA-P3R1 with an Intel Pentium Silver N6000 processor
■ Acer Chromebook Spin 513 CP513-1H-S60F with a Qualcomm Snapdragon 7c processor
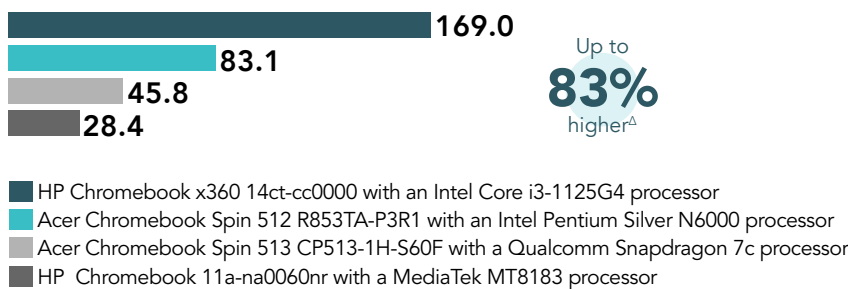■ HP Chromebook 11a-na0060nr with a MediaTek MT8183 processor

Figure 5: Speedometer 2.0 benchmark scores. Higher is better.
Source: Principled Technologies.

After hours of research, Hana's head is about to burst—she's in desperate need of a break. She looks over to her sister's work and gets curious about how physics experiments work.

Min-ji shows her sister a few interactive physics websites to explain some basic concepts. It's a fascinating demo, but all the physics talk only makes Hana want an even longer break.

[Δ]See **the science behind this report** for detailed system configurations and benchmark results.

Conclusion

With so many models of Chromebook available to purchase, knowing how these devices perform with commonly performed work can help you make a decision.

In our assessment and comparison of four Chromebooks' responsiveness, we found that two Chromebooks powered by Intel Core i3-1125G4 and Intel Pentium Silver N6000 processors enabled us to save time completing tasks in a variety of educational apps compared to two Chromebooks powered by MediaTek MT8183 and Qualcomm Snapdragon 7c processors. Some of our data points come from a scenario-based test where each Chromebook was connected to a four-way Zoom call as we performed tasks. The two Intel processor-powered Chromebooks also achieved higher scores on two web-based benchmarks, WebXPRT 3 and Speedometer 2.0.

_____

1   "HP Chromebook x360 Convertible Laptop - 14ct-cc000," accessed October 25, 2021, https://www.hp.com/us-en/shop/pdp/hp-chromebook-x360-14ct-cc000-2e6x3av-1.

2   "Acer Chromebook Spin 512 (R853TA)," accessed October 25, 2021, https://www.acer.com/ac/en/US/content/model/NX.A91AA.002.

3   "Acer Chromebook Spin 513," accessed October 25, 2021, https://www.acer.com/ac/en/US/content/model/NX.HWYAA.001.

4   "HP Chromebook 11a 11a-na0060nr," accessed October 25, 2021, https://www.hp.com/us-en/shop/pdp/hp-chromebook-11a-na0060nr.

5   "Video Conferencing, Cloud Phone, Webinars, Chat, Virtual Events | Zoom," accessed September 30, 2021, https://zoom.us.

6   "Introducing Google Workspace and a new set of offerings to better meet your needs," accessed September 30, 2021, https://workspaceupdates.googleblog.com/2020/10/introducing-google-workspace.html.

7   "Adobe Lightroom," accessed September 30, 2021, https://play.google.com/store/apps/details?id=com.adobe.lrmobile&hl=en_US.

8   Marianne Rogowski, "Tinkercad Review for Teachers," accessed September 30, 2021, https://www.commonsense.org/education/website/tinkercad.

9   Tom Warren, "Minecraft still incredibly popular as sales top 200 million 126 play monthly," accessed September 13, 2021, https://www.theverge.com/2020/5/18/21262045/minecraft-sales-monthly-players-statistics-youtube.

10 "Minecraft Official Site | Minecraft Education Edition," accessed September 13, 2021, https://education.minecraft.net.

Read the science behind this report at http://facts.pt/GGMDRJ6 ▶

Principled Technologies®

Facts matter.®

This project was commissioned by Intel.