EDUCATIONAL CONTENT COMPATABILITY: HP 210 G1 NOTEBOOK PC VS. SAMSUNG CHROMEBOOK 2

Learning at a higher level.

Many teachers want to utilize online educational resources, but the wrong device can distract and frustrate students.

The Intel® processor-powered HP 210 G1 Notebook PC, running Windows® 8.1, fully supported more educational content than the Samsung Chromebook™ 2.

Parents, teachers, and school administrators all want to make education engaging, but keeping students focused and interested in learning is a challenge. Technology is always a click away from creating a distraction, in the classroom and at home. Tablets and notebooks that can't properly show the content teachers use in their lessons or assignments, whether from a major publisher's digital curriculum package or other educational sites, run the risk of making students distracted or frustrated. What's more, devices like Chromebooks need Internet access for basic functions, so a slow connection in the classroom is another obstacle to overcome.[1] Leading education software packages and popular educational Web sites are easier to use and more hassle-free on an Intel processor-powered Microsoft Windows 8.1 notebook, such as the HP 210 G1 Notebook PC, than on a Chromebook.

In the labs at Principled Technologies, we ran tests to see how well a couple different device options work with typical educational online content. We tried two popular options currently available to school districts around the U.S.:

- Intel processor-powered HP 210 G1 Notebook PC running Windows 8.1
- Samsung Chromebook 2 with Samsung Exynos 5 Octa processor running Chrome OS 5712.61.0

Of the two devices, we found that the Windows-based HP 210 G1 Notebook PC offered the better experience with fewer problems. With the Intel processor-powered HP 210 G1 running Windows 8.1, you can get a more complete, feature-rich educational experience than with a Samsung Chromebook 2.

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[1] See the full report at www.principledtechnologies.com/Microsoft/Windows_Chromebook_bandwidth_0514.pdf.

We took a close look at education packages from three major publishers, Pearson Education, McGraw-Hill Education, and Houghton Mifflin Harcourt, and other common educational sites that provide science, math, language arts, and other core instructional materials that teachers and students both use. Most of these packages include texts and supplementary materials for students as well as assessment, planning, and tracking tools for teachers. These are Web-based packages that school districts or schools buy for classrooms. We included products for elementary, middle, and high school and resources for the four major curricular areas: math, science, social studies, and language arts. Do system requirements documents and system check tools for these packages and sites show which platforms are supported? For sources that have online portals, we checked compatibility for the portal and the course content. As you can see in Figure 1, there is no consistency for the Samsung Chromebook 2. See Appendix C for more details.

Programs/platforms	HP 210 G1 with Windows 8.1 Pro 64-bit	Chromebook 2 with Chrome OS 35
McGraw-Hill iScience	Yes	No
Pearson Digits on SuccessNetPlus	Yes	No
Pearson TestNav 7	Yes	No
Pearson TestNav 8	Yes	Yes
McGraw Hill Reading Wonders	Yes	No
HMH Journeys Common Core 2014	Yes	Yes
HMH "The Americans" 2012	Yes	Yes

Figure 1: An example of system requirements for various packages and Web sites we tested.

We examined how these education programs looked in the Internet browsers, whether they worked right, and how they felt to use. We also checked out Web-based materials from other sources that teachers might assign to students for extra instruction or enrichment. Most of the supplementary sites we chose were free. These included math videos and assessments on Khan Academy, primary historical sources from the Library of Congress, and science videos from NASA.

We tried each of these products on both of the devices. We ran the online versions of products on the Internet Explorer browser on Windows desktop on the HP 210 G2 notebook and on the Chrome browser on the Samsung Chromebook 2. If the product was offered as an app for the Chromebook 2, we installed and ran it. We also installed and launched e-book readers associated with the app. We then rated each platform on how compatible the platforms were with the educational content in the products. Tests focused on how well the platforms could deliver the digital content that each product offers to students and teachers.

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MAKING THE RIGHT CHOICE FOR STUDENTS

Keeping students active, engaged with their learning, and participating in activities is tough – and varying the type and source of the learning material can help a lot. Teachers need to be able to pull from a variety of resources to create lesson plans without worrying about whether the device a student is using will let them finish the activity. Windows 8.1 devices with Internet Explorer 11 offer a way to cut out those nuisances and allow teachers and students to enjoy the many kinds of educational opportunities the Internet has to offer.

Figure 2 shows the combinations of devices, operating systems, and browsers with which we tested the educational Web sites. See Appendix A for configuration details on each device.

Device	Operating system	Browser
HP 210 G1 Notebook PC	Windows 8.1 Pro 64-bit	Microsoft Internet Explorer 11
Samsung Chromebook 2	Chrome OS 5712.61.0	Google Chrome 35

Figure 2: Tested devices with operating system and browser info.

To give the best representation of how the devices might work with the digital content, we chose four cross-sections of grades and courses. For each of these, we looked at digital content that one or more students or teachers might use in the course of a day while working on a lesson in one of four areas:

- Middle school math
- Elementary school language arts
- Middle school science
- High school social studies

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OUR RESULTS

We ran into the fewest problems on the Windows 8.1-based HP 210 G1 Notebook PC. Minor problems included thumbnail images of photographs on one Web site that were too small to be helpful, which meant we had to click on several of them to find the photo we wanted. In addition, the print on some of the e-books was hard to read on the small notebook screen. The Intel processor-powered HP 210 G1 was the only device able to show all the content without major problems.

We had more, and more serious, issues with the Chromebook 2. A few of the Web sites required Java, which the Chrome browser doesn't support on the Chromebook 2, and one app had 3D content that failed. Some of those sites provided content through Chromebook 2 app, but they didn't always give us complete answers to our problems.

Some of the sites warned us of problems in advance with either messages when we logged in, through easy-to-find system information pages that listed supported platforms, or system check pages that compared our platforms to minimum requirements. More frustrating were the sites where most content displayed well, but with no warning or error message. If a video doesn't play or a picture doesn't display without notice, it could stall a lesson plan or disrupt a homework session, causing students to lose focus.

In our results figures, a green check means the site and software worked without issue. An orange exclamation point means the site did not list the software as meeting the requirements for use, so there is no guarantee for support. A red x means the site did not function as intended. To see how we tested each site, see Appendix B.

Middle school math

Sheena is an eighth grader at a big middle school. The district for her school was able to afford a device for every student at her school. Her Algebra teacher regularly uses Pearson Digits and Virtual Nerd math videos for assignments. Yesterday, Sheena finished an assessment and did some reading. She took a test as practice for end-of-year tests, and then watched a Virtual Nerd video and played a MangaHigh.com game in the My Math Universe portal. Then, she watched Khan Academy videos, and answered some review questions. Finally, she used Minecraft to create scale models for practice on ratios. Her teacher encourages students to use the popular game and the class will have a future project based on it. Which device would let Sheena do all of this without getting frustrated?

Figure 3 shows what we found worked and didn't work on each device. For detailed explanations of our interactions with each site, see Appendix C.

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Math class scenario

	HP 210 G1 Notebook PC	Samsung Chromebook 2	
Completed an assessment and reviewed a new topic in Pearson Digits	✓	!	
Prepared for end-of-year testing by taking an online practice test with TestNav 7	✓	✗	Required Java specific security features
Watched a Virtual Nerd video and played a Mangahigh.com game in the My Math Universe portal	✓	✗	Game did not display
Watched Khan Academy videos and took an assessment	✓	✓	
Downloaded and opened Minecraft, and created a shape using ratios	✓	✗	No app available

Figure 3: The compatibility of our test devices with the tasks in this scenario. The Web sites and applications, and their activities, are typical of those used in middle school math classes.

> *What's the right choice for Sheena?*
>
> We used the Intel processor-powered HP 210 G1 Notebook PC with Windows 8.1 to do all of these math tasks in the Web browser without any problems. With the Samsung Chromebook 2, we could not take the online-practice test with TestNav 7 or use Minecraft.

Elementary school language arts

Will is a fifth grader at a magnet elementary school that focuses on the arts. His school pushes technology in the classroom and promotes the educational relationship between technology and creativity, so his language arts teacher, Mr. Spivey, likes to assign varied content and fun tasks to develop reading comprehension. This morning, Mr. Spivey used Houghton Mifflin Journeys Common Core online program to create a lesson plan that included a short story from the student e-book and a magazine article that the students read during class time. They also looked at the New York City settings of one of the stories they read with QuickEarth.

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Will likes to read to his second grade sister Molly, so after dinner, he volunteered to help her with a homework assignment that asked a family member to read aloud an e-book to her and review vocabulary. Which device would let Will and his teacher do all of this?

Figure 5 shows what we found worked and didn't work on each device. For detailed explanations of our interactions with each site, see Appendix C.

Language arts class scenario

	HP 210 G1 Notebook PC	Samsung Chromebook 2	
Prepared a lesson plan for students and reviewed e-books using Houghton Mifflin Journeys Common Core software	✓	✓	
Opened QuickEarth to locate some details about the New York setting of the book	✓	✗	Browser incompatibility; required plug-in
Viewed three vocabulary word definitions and read aloud an e-book using McGraw Hill Reading Wonders	✓	!	

Figure 5: The compatibility of our test devices with the tasks in this scenario. The Web sites and their activities are typical of those used in elementary school language arts classes.

What's the right choice for Will and his teacher?

We could use the Intel processor-powered HP 210 G1 Notebook PC with Windows 8.1 to complete all of these Language Arts tasks in the Web browser without any problems. We were unable to run QuickEarth on the Chromebook 2.

Middle school science

Pat is a seventh grader at a middle school dedicated to the arts. One of the key ideas that Pat's teacher pushes on the students is seeing how different science can be and how much it affects everyday life. Pat's fourth period science class has been given a set of URLs and her teacher asked the students to look at those Web sites and explain the types of science described in each. Pat first reads an assigned chapter in the class's

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e-book. She then browses through the Web sites. While browsing, she makes notes on paper to match the Web site to a science.

Figure 3 shows what we found worked and didn't work on each device. For detailed explanations of our interactions with each site, see Appendix C.

Science class scenario

	HP 210 G1 Notebook PC	Samsung Chromebook 2
Read an assignment and took an assessment within a McGraw-Hill iScience e-book	✓	!
Took a quiz, played a game, and completed a puzzle from the NASA Web site	✓	✓
Watched a video, played a related game, and took a quiz on the video using BrainPOP	✓	✓
Looked at photos, read an article, and watched a video from the NASA Curiosity Rover	✓	✓
Used the 3D Anatronica interactive anatomy explorer to look at neck anatomy	✓	✗ — App reported that it was incompatible with the browser version

Figure 3: The compatibility of our test devices with the tasks in this scenario. The Web sites and their activities are typical of those used in middle school science classes.

What's the right choice for Pat?

With the Intel processor-powered HP 210 G1 Notebook PC with Windows 8.1, we could do all of these Science tasks in the Web browser with no issues. On the Samsung Chromebook 2, we completed most of the tasks without issue using either the browser or a Chrome App.

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High school social studies

Abigail is an eleventh grade social studies student taking an American History survey course. This week, her teacher Ms. Majors has been assigning shorter than usual readings in the online textbook so they have free time to research topics for their next major paper. She has set daily checkpoints for the paper. For the first checkpoint tomorrow, she has asked students to present the broad topic area for their paper. Abigail is excited about several topics and is having a hard time making up her mind. To help decide, she accesses the Web sites for the US Library of Congress and Googles Historic Moments collection to see what materials are available in those sites looking at materials related to her three favorite topics: Civil War Photography, Civil War band music, and the Gettysburg Address. She uses Google Maps to locate historic sites.

Figure 6 shows what we found worked and didn't work on each device. For detailed explanations of our interactions with each site, see Appendix C.

Social studies class scenario

	HP 210 G1 Notebook PC	Samsung Chromebook 2	
Read selections from "The Americans," an HMH e-book	✓	✓	
Viewed a Civil War map, listened to a recording of music, looked at its original score, played an MP3 file, viewed a slide show of photos, and watched a Webcast at the U.S. Library of Congress Web site	✓	✓	
View the "Inspired by the Gettysburg Address" collection from the Google Cultural Institute	✓	✓	
Looked at a battlefield location in 3D with Google Maps	✓	✗	Could not enter Earth View with "Lite Mode"

Figure 6: The compatibility of our test devices with the tasks in this scenario. The Web sites and their activities are typical of those used in high school social studies classes.

What's the right choice for Abigail?

On the Intel processor-powered HP 210 G1 Notebook PC with Windows 8.1, we completed all of these Social Studies tasks in the Web browser without any problems. We could do most of the tasks on the Samsung Chromebook 2, but not the Google Earth task.

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DON'T TOUCH THE CHROMEBOOK 2!

We tested with an HP 210 G1 Notebook PC that came installed with Windows 7 Home Premium 64. We upgraded the OS to Windows 8.1 Pro and did our testing on the desktop with the IE 11 version we installed. Both the HP 210 G1 and the Samsung Chromebook 2 were notebooks with full-sized keyboards and touchpads. Neither device included a touchscreen, but the HP 210 G1 is available with a touchscreen upgrade and equipped with Windows 8.1. Samsung does not offer a touchscreen option for the Samsung Chromebook 2.

Touchscreens can provide ease and efficiency for tasks. Students may prefer the touchscreen when reading or interacting with e-books, or when filling out multiple-choice tests. Elementary students, not yet proficient in typing, may enjoy using the touch screen to do their work. Schools can opt for the touchscreen for some or all students, depending on the needs of students and available funds.

CONCLUSION

There are tons of benefits to online educational tools and kids are used to being online, so teachers can utilize Web-based learning materials to make learning more engaging and fun. When students have to use a device that doesn't work with all of the learning content teachers assign or they're interested in, however, they can become disengaged. Whether the content comes from a publisher and enhances normal classwork, or is supplementary content that a teacher could offer for extra credit or added practice, it's critical that the student's device offers a complete learning experience.

Of the two devices we tested, the Windows 8.1-based HP 210 G1 Notebook PC powered by an Intel processor had fewer issues. The Chromebook 2 had more problems, ranging from issues with Java to requirements for workaround apps and more. Teachers need an option that will help students learn, not distract them. Schoolwork can be hard enough without having to fight with a device to show content—students need something for a full experience. The Windows-based HP 210 G1 Notebook PC experienced fewer problems with the kinds of online learning resources that students use today than the Samsung Chromebook 2.

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ABOUT THE COMPONENTS

About the HP 210 G1 Notebook PC

According to HP, "[w]ith a starting weight of just 3.32 lb., this ultraportable notebook helps you stay on top of your game and you'll get reliable performance you can count on with Windows 8.1.5. The HP 210 G1 Notebook PC offers an optional replaceable battery, so you can easily swap it out and get back to work. Clearly see your documents, presentations, and Web pages on the 11.6-inch diagonal HD1display. Plus, you can type comfortably on the 91 percent scale full-size keyboard that doesn't add bulk to your PC. Extensive optional wireless solutions help keep you online without being tied down by cords. Your data stays protected from accidental bumps and bruises. HP 3D DriveGuard senses when your PC moves and locks your hard drive to help protect the data on your HP notebook.

Equipped for education

- The HP 210 G1 Notebook PC offers students and staff an optional touchscreen experience.
- Get enhanced performance and application acceleration from Intel processors to power through assignments and tough deadlines.
- Connect with students worldwide with the HP HD webcam. Thanks to built-in DTS Sound+ and dual speakers, the HP 210 G1 Notebook PC is designed for great sound and rich audio on a PC. Small size. Big sound.
- Extensive optional wireless solutions help keep you online in a mobile world, and you can still enjoy the exceptional bandwidth of a wired Gigabit Ethernet connection when in the classroom or office.
- Present ideas easily when you connect to displays and projectors through the HDMI or VGA port. Kick creative projects into high gear while listening to music or webcasts using the headphone jack.

Battery power in a snap

- Optional HP Notebook Battery Charging Stations charge multiple backup and secondary batteries to help keep faculty, staff, and students up and running longer so that they can get the most out of their day.
- The optional HP 2-Bay Battery Charging Station charges up to two batteries simultaneously.

The optional HP 10-Bay Battery Charging Station charges up to 10 batteries simultaneously. Knock out assignments and enjoy the processing and graphics power of Intel processors. Collaborate virtually with peers using the HD webcam, an 11.6-inch diagonal HD display with optional touchscreen and DTS Sound+."

APPENDIX A – SYSTEM CONFIGURATION INFORMATION

Figure 7 provides detailed configuration information for the test systems.

System	HP 210 G1 Notebook PC	Chromebook 2
Vendor and model	HP 210 G1	Samsung® Chromebook 2
Processor	Intel Core i3-4010U	Samsung Exynos Octa 5420
Processor frequency (GHz)	1.7	1.9 / 1.3
Processor cores	2	4 + 4
Memory	4GB DDR3 RAM	4GB DDR3 RAM
Storage	16GB SSD	16GB SSD
Battery type	Li-Ion	Built-in Li-Polymer
Battery capacity	3,100 mAh	4,080 mAh
Display	11.6" (1,366 × 768)	11.6" (1,366 × 768)
Wireless	802.11 a/b/g/n	802.11 a/b/g/n/ac
Bluetooth®	Bluetooth 4.0 compatible	Bluetooth 4.0 compatible
USB ports	2 × USB 3.0	1 × USB 3.0
	1 × USB 2.0	1 × USB 2.0
System weight	3.2 lbs.	2.4 lbs.
OS	Windows 8.1 Pro	Chrome OS version 35.0.1916.155
Firmware	Insyde F.02	Google_Peach_Pit.4482.94.0

Figure 7: Detailed information for the systems we tested.

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APPENDIX B – HOW WE TESTED

Preparation

1. Create an email account to use for signing up for products.
2. Upgrade the OS on the Windows PC to the latest version of Windows 8.1 and the browser to IE 11.
3. Install Adobe Flash Player on the Windows 8.1 desktop from the following Web site: helpx.adobe.com/flash-player/kb/flash-player-issues-windows-8.html

Middle school math

Pearson Digits

We used the teacher interface to add tasks for students, watched a video, took a student assessment, and read a student text.

Pearson offers Digits on the SuccessNet Plus learning management platform for schools already using the platform. Pearson will continue to use that platform until the 2015-2016 school year. Schools that start using Digits for the first time during the 2014-2015 school year will use the new Realize learning management platform released in early June 2014. We tested with the SuccessNet Plus platform.

1. Browse to the following Web site: www.pearsonschool.com/index.cfm?locator=PS14R4
2. Click on Create an online mobile demo account.
3. Follow the instructions on the page to create a demo account using the email address you created above.
4. Add Digits – Grade 7.
5. Close the tab to redisplay the original page.
6. Click on the Math dashboard link at the bottom of the instructions.
7. Click on Enter below digits on SuccessNet Plus
8. Click on Log in to digits
9. Enter the username and password that you created for this account
10. In Add Products, select Digits - Grade 7.
11. When asked Would you like to Create A Class, select Yes Start Class Creation.
12. Give the class a name.
13. Under Select Product, Select the Digits - Grade 7 product.
14. Under Manage Enrollments, click Save Class.
15. Click No, Save, and Exit.
16. Click Cancel.
17. Under Table of Contents, click Ratios and Proportional Relationships.
18. Click Topic 1 Ratios and Rates.
19. Click Lesson 1-1 Equivalent Ratios/Preview.
20. The Introduction screen should show the Digits logo.
21. Click Launch – it should play a video of a game of stickball.
22. Click Examples/Part 2, watch the cat animation, and click on Jay Says to play the video of Jay explaining the ratio of kitten supplies to adult cat supplies.
23. Scroll down to Unit A Enrichment Support
24. Click on Unit A Enrichment Support
25. Click on Topic 1 Project
26. The project document opens in a word processor
27. Scroll to the bottom of the document to verify the entire document displays
28. Close the tab for the lesson.

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29. Click on Lesson 1-1 Homework/Preview/Level G.
30. Answer a few questions, clicking Check Answer after each question.
31. Click on Video to watch an explanatory video.

Pearson TestNav 7

We answered a set of Virginia EOL practice problems.

1. Go to www.doe.virginia.gov/testing/sol/practice_items/index.shtml.
2. Answer some of the questions in the grade 7 practice test.
3. Click Exit.
4. Follow the instructions to Exit and Submit test.
5. Close the Web page.

Additional My Math Universe content -- Pearson Virtual Nerd videos and Manga High games

We watched a video and played a game.

1. Go to mymathuniverse.com/.
2. Click on VirtualNerd in the Channel List.
3. Select Grade 7 Interactive Tutorials.
4. Watch the first video, What is the Percent of Change (you can stop it after the first few sentences).
5. Go back to the main screen.
6. Click on Manga High in the Channel List.
7. Click on Pyramid Panic.
8. Answer at least one of the geometry problems in the game.
9. Close the Web page.

Khan Academy

We watched videos and took assessments.

1. Go to www.khanacademy.org/.
2. Download the Khan Academy App for the Chromebook 2.
3. Do the following with both the App and the Web page.
    a. Click Sign in with Google.
    b. Click Allow to allow Google to share your info with Khan Academy.
    c. Select 7th grade.
    d. Complete the Math Pretest.
    e. Select Learn/Math/Grade 7.
    f. Choose Ratios, Proportions and Rates.
    g. Choose Rate Problems with Fractions 1.
    h. Watch the Video.
    i. Choose Rate Problems 1.
    j. Use the Scratchpad to work out answer to a question.
    k. Click Check hints.
    l. After each answer, click on Check Answer and then Next Question.
    m. After 10 questions, close the Web page.

Minecraft

1. Go to https://minecraft.net.
2. Create an account following the instructions and pay the $29.99 charge.
3. Download the latest version (1.7.9).
4. Launch the app from the desktop.
5. Create a simple model.

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Elementary school language arts

Houghton Mifflin Journeys Common Core

Content is available online via browsers and via apps for tablet devices.

1. Go to www. www.hmhco.com/shop/education-curriculum/reading/core-reading-programs/journeys.
2. Click Sample Now.
3. Click National 2014.
4. Follow the instructions to register for ThinkCentral Evaluation.
5. The ThinkCentral Site opens. Log in as a teacher.
6. Click Start to view the Dashboard introduction. Click through the introduction and click Done at the end of the introduction.
7. Click Assignments.
8. Click Classes.
9. Click Class/Add.
10. Name the class.
11. Click grade 5.
12. In the Define your library section, select each of the listed resources.
13. Click Save.
14. Click Assign your students.
15. Click Add All to assign the two default students to the class.
16. Click Done.
17. Click Users/Add.
18. On main page, select Planner/My Smart Planner.
19. On the Welcome screen, set the school year to start 09/05/2014 and end 06/19/2015, and click Save.
20. Move planner to display August and click on 8:30 AM on the first day of school, 09/05/2014.
21. Create and name a new block with a daily recurrence, set to end at the end of the school year; leave 10:00 AM as the default end time.
22. Click Create.
23. At top right of screen, select Auto Schedule.
24. Select Schedule default HMH Lesson Plan Set, for Program, select the Journeys Grade 5 program; for Teaching Block, select the teaching block you just created.
25. Click Continue.
26. Click Schedule.
27. On the first day of school in the calendar, click Journeys, Lesson 1, Day 1.
28. Click Details.
29. Look under Whole Group Instructions/Skills and Strategies.
30. Locate and open Student Book: A Package for Mrs Jewls.
31. Scroll through the first few pages.
32. Click the Resources tab.
33. Scroll down to Journeys myWriteSmart G5, NA, 2014.
34. Click the eBook icon.
35. Select the Journey's Student Magazine.
36. Change Page View at left to 1 Page.
37. Scroll through the first few pages.
38. Exit the Web site.

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Quick Earth

1. Open Chrome browser.
2. Go to https://chrome.google.com/webstore/detail/quick-earth/khodocggeplgfhppgagfdpbjkniadmdh?hl=en.
3. Download the app.
4. Launch the app.

McGraw-Hill Reading Wonders

We signed into ConnectEd, read an eBook, and viewed three vocabulary word definitions.

1. Go to https://www.mheonline.com.
2. Click the Reading Wonders icon.
3. Browse down to the Featuring… section.
4. Click Sample the Program Online.
5. Click on the ConnectED icon and follow the instructions to Register as a first time user
6. Log in with the name and password you created.
7. In the Select a Subject menu in the upper right of the screen, select Reading.
8. Just below the ConnectEd Log In Now! Icon, there should be a UserName and Password that is not filled with x's. If it is x's, click on the icon and it should refresh with a ConnectEd username and password.
9. Click the ConnectEd Log in Now! icon.
10. Log in with the ConnectEd username and password.
11. Click the ReadingWonders Grade 2 icon.
12. On the Select a Class dialog, click _Exhibit Sample Class.
13. Click Resources.
14. Click My Books.
15. Click Reading/Writing Workshop.
16. Scroll to page 5.
17. Click Time for Kids.
18. Scroll to page 95.
19. Next to the label that says Go Digital! Write online in Writer's Workspace, click the book icon.
20. Type something on the workspace that displays.
21. Click Submit.
22. Press on a word in the text on the page and select the Highlighter to highlight a word.
23. Close the book.
24. Click the ABC Glossary icon.
25. Select Amused and play the example video.
26. Select Amusement and play the example video.
27. Select Appeared and view the example picture.
28. Exit the Web site.

Middle school science

McGraw Hill Life iScience 2012

We viewed and interacted with the eBook, took an assessment, and opened a worksheet

1. Go to https://www.mheonline.com/onlinesamples/program.php?subject=3&program=38&p=1Tasks.
2. Click ConnectEd Sample the Program Online for 30 Days.
3. Click Register and fill in the form, selecting Individual and using the email account you created during the Preparation steps.
4. Log in with the email address and the password you created.
5. Open your email account and the email they sent. Click the link to activate the trial.
6. Go back to the McGraw-Hill registration screen and log in using your email address and password.

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7. From the Select a subject pull-down menu in upper right, select Science.
8. Choose the Life iScience 2012 icon.
9. Note the username and password below the ConnectEd icon.
10. Click ConnectEd Log In Now!
11. Sign in with that username and password.
12. Close the ConnectEd tab.
13. Click View the Sampler and use that same ConnectEd password.
14. Click Middle School.
15. Click Life iScience.
16. Click Student Materials.
17. Click Student Edition.
18. Click StudentWorks Plus Online.
19. Click The Solar System.
20. Open the Resources tab.
21. Click Assessment.
22. Click Online Standardized Test Practice.
23. Answer the questions on the test.
24. Click Grade the Test.
25. Click OK on the message box.
26. Close the Standardized Test Practice tab.
27. Click Lesson 2 Resources.
28. Click Video.
29. Click on the What's Science Got to Do with It video to play it.
30. Stop it at any point after you verify it runs.
31. Close all browser windows.

NASA fun and games

We took the Ocean quiz and viewed its certificate of completion, played the Satellite insight game, and assembled a weather-related jigsaw puzzle.

1. Go to www.nasa.gov/audience/forstudents/5-8/multimedia/funandgames_archive_1.htm.
2. From within the list of games and activities, click Satellite Insight.
3. Click Click here to start the game.
4. Click Instructions.
5. Follow the instructions to play the game, clicking on groups of three or more of one object and then clicking on the GOES-R Satellite image. Repeat at least 10 times and note responsiveness.
6. Go back to the list of games and activities.
7. Click Ocean Quiz.
8. Enter a name and state, and click Take the Quiz.
9. Answer the quiz questions, and click Check answers.
10. Correct any wrong answers, and click Check answers again.
11. Click on one of the certificates that displays to show it in PDF form.
12. Go back to the list of games and activities.
13. Click Gallery of Oceans.
14. From the list on the left, click Games.
15. Scroll down to Weather Jigsaw Puzzles and click on it.
16. Click Click here to play.
17. Click on the first puzzle.
18. Assemble the puzzle by dragging the pieces.

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19. Close the Web page.

Brain Pop Science

We watched a video, took a quiz, and played a round of a game.

1. Go to www.brainpop.com/science/seeall/.
2. Scroll down to the Mars icon and select it.
3. Click Click here to play the movie.
4. Stop the movie after verifying it will play, and select Quiz.
5. Click Review Quiz.
6. Answer the questions in the quiz, giving an assortment of correct and incorrect answers.
7. Go back to the screen that displayed the video, and click Gameup.
8. Click Go and then play a round of the Fly to Mars game.
9. Close the Web page.
10. Install the BrainPop app on the Chromebook 2 device at www.brainpop.com/about/mobile.
11. Click Science.
12. Click Space.
13. Scroll through the Space topics to Mars.
14. Click Mars.
15. Click Click here to play the movie.
16. Stop the movie after verifying it will play, and select Quiz.
17. Click Review Quiz.
18. Answer the questions in the quiz, giving and assortment of correct and incorrect answers.
19. Go back to the Main Menu.
20. Note that it does not include the Gameup option that the Web site does.
21. Close the app.

NASA Curiosity Rover

We looked at still images, a news article, and a video.

1. Go to http://mars.jpl.nasa.gov/msl/
2. Click the Recent Videos icon.
3. In the scroll area in the middle of the screen, click the arrows until you see the Rover 5K Run item.
4. Below the description of the item, click More….
5. Start the video, and stop it after you've verified it will play.
6. From the menu at the top of the page, select Multimedia/Raw Images.
7. Under Left Navigation Camera (Navcams), select the Sol 655 (90 img) item.
8. Click on the first image to display it in full resolution.
9. From the menu at the top of the page, select News/What's New.
10. Under the first article, click Read more.
11. Scroll through the article.
12. Close the Web page.

Anatronica – 3D Interactive Anatomy

We tested two of the ways to run the free version on Windows: the online version with Flash and the Chrome app. We downloaded the app from the Chrome Store and tested its compatibility by launching the app. We launched the Flash version.

1. Go to www.anatronica.com/anatronica-flash.html.
2. Click Start.
3. Install and open the Chrome browser on the Windows PC.

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4. Download the app from the Chrome Store.
5. Click Start.
6. Click on the neck to view the vertebrae.

High school social studies

HMH's The Americans curriculum

HMH offers online programs that contain digital replicas of the print edition of the student textbook as well as additional resources and features. HMH also provides an HMH eTextbooks app for multiple platforms and an iBooks Textbook app for iPad. We looked at several pages of the eTextbooks.

1. Go to www.hmhco.com/shop/education-curriculum/social-studies/secondary-social-studies/the-americans.
2. Click on Virtual Sampling.
3. Fill out the registration form – include Home School as your role.
4. Click on the Student Edition.
5. Page through the first 20 pages.
6. Close the Web page.

US Library of Congress

We looked at a map, listened to a civil war recording of band music, looked at its original score, played MP3 file to listen to it, viewed a slide show of samples of Matthew Brady Civil War photos, and watched a Webcast.

1. Go to www.loc.gov/rr/main/uscw_rec_links/civilwarlinks.html
2. Click on the links for maps here and on the next page and then view the first map.
3. Go back to the first page, click on the link for Band Music from the Civil War era.
4. Click the link for a Concert for brass band, voice, and piano
5. Click the link for the Original full score.
6. Close the score.
7. Click on the link to play the MP3 File.
8. Close that and return to original page.
9. Click on the link for Civil War photographs, most attributed to Matthew Brady Click on View a slideshow of samples.
10. Start the slideshow and view several slides.
11. Close the Web page.

Historic Moments

View material in the Inspired by the Gettysburg Address collection.

1. Go to www.google.com/culturalinstitute/browse/slavery?projectId=historic-moments&hl=en.
2. Click on the Inspired by the Gettysburg Address collection.
3. Scroll through the materials.
4. Go back to the original page.
5. Search for "Gettysburg Address."
6. Play the Close reading of the Gettysburg Address video.
7. Close the Web page.

Google Maps

20. Open the Chrome browser.
21. Go to maps.google.com.
22. Search for "Gettysburg National Military Park."
23. Adjust zoom level.

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APPENDIX C – DETAILED TEST RESULTS

Middle school math

Figure 8 shows our detailed findings for the middle school math scenario.

Programs/platforms	HP 210 G1 with Windows 8.1 Pro 64-bit	Samsung Chromebook 2
Key packages		
Pearson Digits successnetplus.com/programs/digits	✓	✓
We used the teacher interface to add tasks for students, took a student assessment, and read a student text.	No problems	The videos play, but the one of Jay shows inside a black box rather than integrated into the screen. Word processing documents are not formatted well in the QuickOffice Beta version that displays them.
Pearson TestNav 7	✓	✗
We ran the system check and answered a set of practice problems.	No problems	The Practice problems don't launch – a message reports Java is not installed
Supplementary sites		
My Math Universe portal www.virtualnerd.com/middle-math/alV	✓	✓
We watched a Virtual Nerd video and played a Mangahigh.com game in the myMath Universe portal	No problems	
Khan Academy www.khanacademy.org/.	✓	✓
We watched videos and took assessments	No problems	
Minecraft https://minecraft.net	✓	✗
We downloaded the desktop application from Mojang and created a simple model.	No problems	No supported app

Figure 8: Detailed results from accessing math-related Web sites.

Elementary school language arts

Figure 9 shows our detailed findings for the elementary school language arts scenario.

Programs/platforms	HP 210 G1 with Windows 8.1 Pro 64-bit	Samsung Chromebook 2
Key packages		
McGraw-Hill Reading Wonders mhreadingwonders.com	✓	✓
We signed into ConnectEd, read an eBook, and viewed two vocabulary word definitions. We downloaded the ConnectEd app for the supported iPad and Android platforms and read an e-book with it.	No problems	

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Programs/platforms	HP 210 G1 with Windows 8.1 Pro 64-bit	Samsung Chromebook 2
Houghton Mifflin Journeys Common Core www.hmhco.com/shop/education-curriculum/reading/core-reading-programs/journeys	✓	✓
Content was available online via browsers and via apps for tablet devices. HMH online edition, available through Thinkcentral.com, included both student edition and teacher resources for all platforms. Students can read e-textbooks and take assessments with it. Teacher tools included interactive whiteboard lessons, lesson planning and scheduling tools, and student performance tracking tools. Teachers and students can access the online edition through ThinkCentral.com In addition, HMH offered the HMH e-textbooks app for iPad and Android, and the HMH Reader App for Windows, Android, and iPad platforms.	No problems	
Supplementary sites		
Quick Earth https://chrome.google.com/webstore/detail/quick-earth/khodocggeplgfhppgagfdpbjkniadmdh?hl=en	✓	✗
We downloaded the app from the Chrome Store and tested its compatibility by launching the app.	No problems	The app installed and launched but displayed an error message that the browser was not compatible. The app needed the Google Maps plug-in that was not supported on Chromebook 2.

Figure 9: Detailed results from accessing language arts-related Web sites.

Educational content compatibility: HP 210 G1 Notebook PC vs. Samsung Chromebook 2

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Middle school science

Figure 10 shows our detailed findings for the middle school science scenario.

Programs/platforms	HP 210 G1 with Windows 8.1 Pro 64-bit	Samsung Chromebook 2
Key packages		
McGraw-Hill iScience (via ConnectEd trial) https://www.mheonline.com/onlinesamples/program.php?subject=3&program=38&p=1Tasks	✓	✓
We viewed and interacted with the online e-book and took an assessment within it. McGraw Hill's ConnectEd app does not yet include these e-books.	No problems	
Supplementary sites		
NASA fun and games www.nasa.gov/audience/forstudents/5-8/multimedia/funandgames_archive_1.html	✓	✓
We took the Ocean quiz and viewed its certificate of completion, played the Satellite Insight game, and assembled a space and weather-related jigsaw puzzle.	No problems	
Brain Pop science www.brainpop.com/science/seeall/	✓	✓
We looked at a Mars video, took a quiz, and played the Fly to Mars game.	No problems	
NASA Curiosity Rover mars.jpl.nasa.gov/msl/	✓	✓
We looked at still images, a news article, and a video.	No problems	
Anatronica – 3D Interactive Anatomy https://chrome.google.com/webstore/detail/anatronica-3d-interactive/nalpooddpdnhjicpjgnhaihnnfnmbpee?hl=en	✓	✗
Anatronica Free had an online Unity 3D version, which was a simplified version with Flash at lower quality graphics, a Windows desktop application, and apps for various platforms. We tested two of the many ways to run the free version on Windows: the online version with Flash and the Chrome app. We downloaded the app from the Chrome Store and tested its compatibility by launching the app. We launched the Flash version. We downloaded and launched the Chrome app on the Chromebook 2.	No problems with simplified Flash or Chrome versions	The app installed and launched, but reported that it was incompatible with the browser version on the Chromebook 2.

Figure 10: Detailed results from accessing science-related Web sites.

Educational content compatibility: HP 210 G1 Notebook PC vs. Samsung Chromebook 2

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High school social studies

Figure 11 shows our detailed findings for the high school social studies scenario.

Programs/platforms	HP 210 G1 with Windows 8.1 Pro 64-bit	Samsung Chromebook 2
Key packages		
HMH's The Americans curriculum www.hmhinternational.com/index.php/education-curriculum/social-studies/americans/	✓	✓
HMH offered online programs that contain digital copies of the print edition of the student textbook and additional resources and features. HMH also provided an HMH eTextbooks app for multiple platforms and an iBooks Textbook app for iPad. The eTextbooks app added multimedia content such as the video in the section we tested. We read a short assignment online and in the apps, and played a video from the iBooks textbook.	We viewed the HMH online textbook available in the virtual sample. Its text was hard to read on a small screen. We could also view the book via Windows 8 HMH Reader app, which offered better formatting.	
Supplemental sites		
US Library of Congress www.loc.gov/rr/main/uscw_rec_links/civilwarlinks.html	✓	✓
We looked at a map, listened to a Civil War recording of music, looked at its original score, played MP3 file to listen to the score, viewed a slide show of samples of Matthew Brady Civil War photos, and watched a Webcast.	No problems	
National Archives www.digitalvaults.org/#/detail/5663/	✓	✓
We looked at the photo of a slave.	No problems	
Historic Moments www.google.com/culturalinstitute/browse/slavery?projectId=historic-moments&hl=en	✓	✓
We looked at a view inspired by the Gettysburg Address collection.	No problems	
Google Maps www.google.com/earth/	✓	✗
We opened Google Maps for a 3D view of the Gettysburg National Military Park.	No problems	The Chromebook 2 runs Google Maps in "Lite Mode," which does not offer a 3D Earth View.

Figure 11: Detailed results from accessing social studies-related Web sites.

Educational content compatibility: HP 210 G1 Notebook PC vs. Samsung Chromebook 2

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ABOUT PRINCIPLED TECHNOLOGIES

![Principled Technologies logo]

Principled Technologies, Inc.
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We provide industry-leading technology assessment and fact-based marketing services. We bring to every assignment extensive experience with and expertise in all aspects of technology testing and analysis, from researching new technologies, to developing new methodologies, to testing with existing and new tools.

When the assessment is complete, we know how to present the results to a broad range of target audiences. We provide our clients with the materials they need, from market-focused data to use in their own collateral to custom sales aids, such as test reports, performance assessments, and white papers. Every document reflects the results of our trusted independent analysis.

We provide customized services that focus on our clients' individual requirements. Whether the technology involves hardware, software, Web sites, or services, we offer the experience, expertise, and tools to help our clients assess how it will fare against its competition, its performance, its market readiness, and its quality and reliability.

Our founders, Mark L. Van Name and Bill Catchings, have worked together in technology assessment for over 20 years. As journalists, they published over a thousand articles on a wide array of technology subjects. They created and led the Ziff-Davis Benchmark Operation, which developed such industry-standard benchmarks as Ziff Davis Media's Winstone and WebBench. They founded and led eTesting Labs, and after the acquisition of that company by Lionbridge Technologies were the head and CTO of VeriTest.

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