Choose a more responsive Microsoft Windows device for Intel® Skills for Innovation applications to help boost academic performance

An Intel® Core™ i3-1215U processor-powered Windows 11 convertible laptop completed many compute-intensive and productivity tasks faster than another Windows 11 laptop powered by an Intel® Celeron® N5100 processor

Educators using Intel® Skills for Innovation (SFI) in their curricula are utilizing engaging applications to promote higher-order cognitive activities in students. Many of these applications provide immersive and collaborative experiences to build skill sets and mindsets that have the potential to help students succeed in a future technology-driven workforce. More responsive devices can run these applications faster, which could mean more instruction time and more focused learners.

At Principled Technologies, we hand-timed tasks using some applications in the Intel® SFI framework to compare the responsiveness of two Microsoft Windows 11 systems for students:

- An Intel® Core™ i3-1215U processor-powered convertible laptop
- An Intel® Celeron® N5100 processor-powered convertible laptop

In our tests, the Intel® Core™ i3 processor-powered system saved time on tasks in Intel® SFI applications, such as Blender and CoSpaces, and others. In conjunction with these applications, faster, more responsive systems could help keep students engaged and make good use of their time.

51% less time

Loading a module in CoSpaces Edu*

77% less time

Rendering a 3D image in Blender*

60% less time

Loading a module in Labster*

*Intel® Core™ i3-1215U processor-powered Lenovo Flex 5i IdeaPad Windows 11 system vs. Intel® Celeron® N5100 processor-powered Lenovo 500w Gen 3 Windows 11 system.
See the **science behind this report for detailed system configurations and benchmark results.

Bring engaging applications into your curriculum

Applications from Intel® SFI can help educators design technology-based lessons, activities, and projects that engage students in higher-order cognitive activities. According to Intel®, "the Intel® SFI Initiative guides [learners] to build their skills to maximize learning outcomes and prepare students for a changing, technology-dominated world."[1]

Classroom time is critical for teachers and students alike. Running applications from Intel® SFI on slower devices can delay assignment completion, cause frustration, and create periods of unintended "free time" as students wait for devices to finish a task. More responsive systems can enable students to complete Intel® SFI application-based assignments, such as rendering a biology animation or a weather simulation, faster. This could mean easier classroom management, a better learning experience, and better student outcomes. Saving seconds of time may not seem like much on the surface but can really add up over a day of learning. For educators using Intel® SFI in their curriculum, Windows systems powered by faster, more responsive processors, such as the Intel® Core™ i3 processor in the device we evaluated in this study, have the potential to provide a more immersive and collaborative learning experience, which could also help optimize student learning.

Intel Skills for Innovation

Intel Skills for Innovation (SFI) is a framework that helps teachers incorporate technology into an existing curriculum. According to Intel, the "Intel SFI Initiative helps educators integrate technology into their teaching as they foster the development of social, emotional, cognitive, and technological skills, which prepare students for a technology-driven workplace."[3] Many of the apps we tested are part of SFI. For more information, visit https://skillsforinnovation.intel.com/landing/index.html.

How we tested

The devices under test

We compared two Windows-based systems: a convertible laptop with a six-core Intel® Core™ i3-1215U processor and a convertible laptop with a four-core Intel® Celeron® N5100 processor.

In addition to the processors, the systems differed in many ways, such as the operating system version, size, and component upgrades to support the more powerful Intel® Core™ i3-1215U processor. The Intel® Core™ i3 processor-powered Windows 11 system had a bigger (14-inch) screen. In terms of resources, the device had 8 GB of memory, 512 GB of SSD storage, and a 52.5 WHr battery.

The Intel® Celeron® N5100 processor-powered Windows 11 system had an 11.6-inch screen and 4 GB of slower memory, 64 GB of embedded MultiMediaCard storage, and a 47 WHr battery.

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

Our testing

We hand-timed compute-intensive tasks that teachers might have students perform to supplement assignments and projects in five computer graphics-based educational apps:

- CoSpaces Edu
- Blender
- Unity
- Fusion 360
- Labster*

The following sections describe the apps and the way in which students and teachers might use them for educational activities. We ran each test three times and report the median time. To minimize the effect of network performance on testing results, we performed testing on the same day and connected both Windows convertible laptops to the same Wi-Fi network.

The following sections also include hypothetical situations to help depict how the Intel® Core™ i3-1215U processor-based system can help educators and students. They do not reflect explicit real-world situations and outcomes.

Key findings

CoSpaces Edu

- Loading Pirate Roller Coaster CoSpace:
  17% less time—save 1.2 seconds
- Loading End of Dinosaurs CoSpace:
  51% less time—save 1.8 seconds
- Loading At the Airport CoSpace:
  20% less time—save 2.0 seconds
- Loading Reserve Animal World CoSpace:
  45% less time—save 8.8 seconds

Blender

- Launching application:
  44% less time—save 3.0 seconds
- Baking data for fluid simulation:
  65% less time—save 19.3 seconds
- Baking for a fire simulation:
  51% less time—save 2.8 seconds
- Baking mesh for a fluid simulation:
  59% less time—save 23.9 seconds
- Rendering a 3D image:
  77% less time—save 26 minutes
- Rendering a 2D animation:
  66% less time—save 11 minutes

Labster**

- Loading plate tectonics module:
  56% less time—save 33.6 seconds
- Loading the impact on climate change module:
  60% less time—save 53.0 seconds
- Loading the cell division module:
  51% less time—save 31.7 seconds

Unity

- Playing Ragdoll test:
  47% less time—save 2.3 seconds
- Adding a New Script Component:
  56% less time—save 5.5 seconds
- Building and running a project:
  35% less time—save 5.8 seconds

Fusion 360

- Launching the application:
  47% less time—save 16.2 seconds
- Exporting model a .STL (zipper):
  27% less time—save 0.6 seconds
- Exporting model as .obj (bevel gear):
  26% less time—save 0.6 seconds

*See the **science behind this report** for detailed system configurations and benchmark results.
**At the time of this report, Labster is not in the SFI framework.

The text in the dark blue box below represents a fictional scenario based on the results of PT testing. Though the people aren't real, the scenario represents a lifelike picture of the benefits users may see in the real world.

Mr. Goldstein lamented that older computers caused Mario and other students to become distracted and struggle to finish CoSpaces Edu projects from the Intel® SFI framework on time. Since the district received Intel® Core™ i3-1215U processor-powered Windows devices, Mr. Goldstein has noticed the students seem more engaged with the CoSpaces Edu activities and other apps that are part of Intel® SFI.

Save time in CoSpaces Edu

CoSpaces Edu is a browser-based 3D animation app that allows learners to create, code, and explore their own virtual projects. The Intel® Core™ i3-1215U processor-powered system loaded four animations faster than the Intel® Celeron® N5100 processor-powered system. Figure 1 shows the time that each system needed to load the 3D animations.

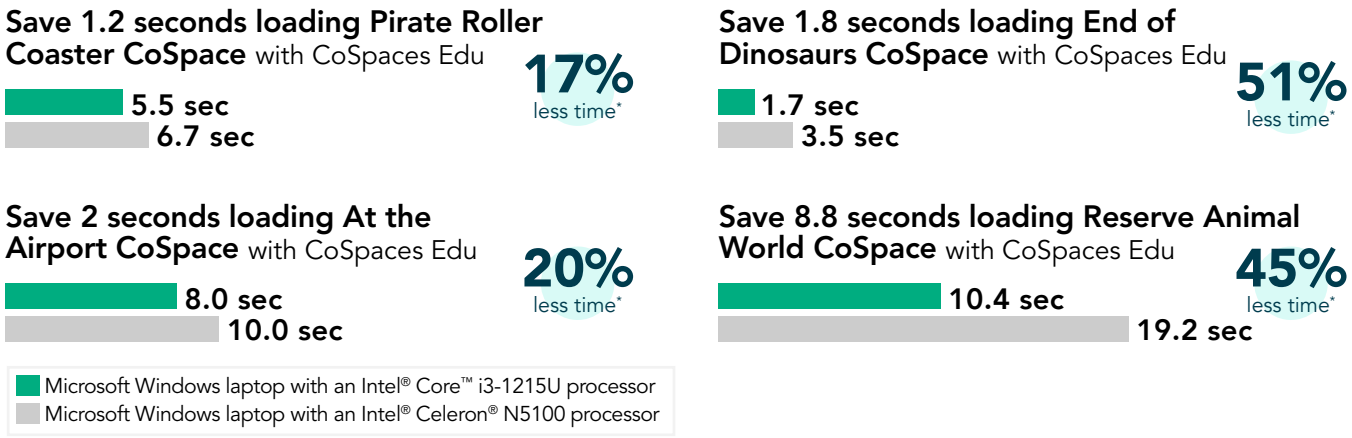


Figure 1: Time (in seconds) to complete tasks in CoSpaces Edu. Less is better. Source: Principled Technologies.

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

Save time in Blender

Visual-spatial skills enable students to apply creative problem-solving to other areas. Blender allows learners to work extensively on computer graphics-based projects, including performing tasks for modeling, animation, rendering, motion tracking, video editing, and more. The tasks we timed provide a glimpse of how well the Windows laptops can handle some of the compute-intensive components of these assignments. For example, baking, a task we timed in different simulations, requires significant compute resources because the system is storing or caching the results of a complex calculation.

In all six of our Blender tests, the Intel® Core™ i3-1215U processor-powered device completed the tasks faster than the Intel® Celeron® N5100 processor-powered device. Figure 2 shows the results of the Blender tests that did not involve rendering.

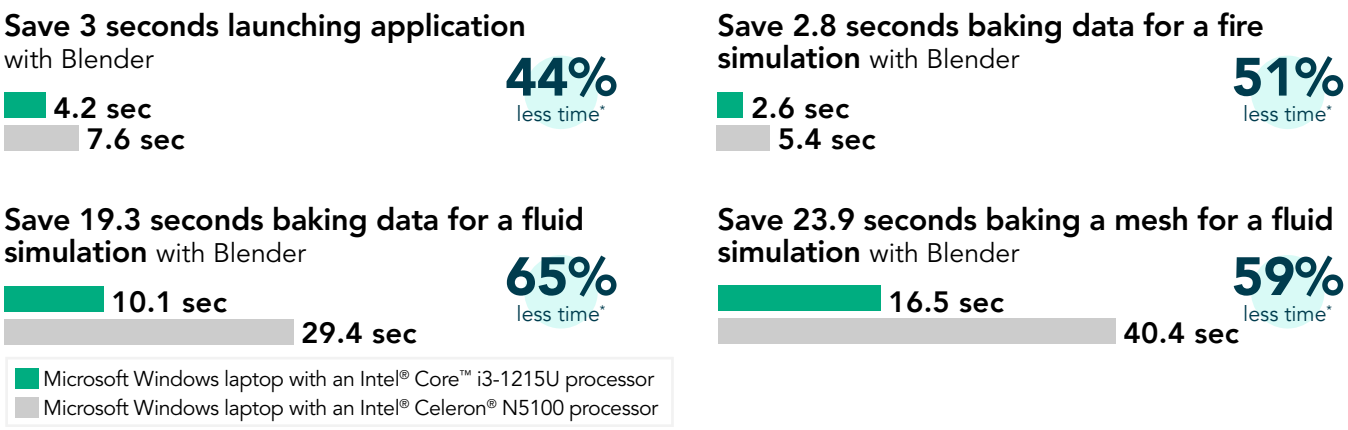


Figure 2: Time (in seconds) to complete tasks in Blender. Less is better. Source: Principled Technologies.

Figure 3 shows the results of the Blender tests involving rendering. Compared to the Intel® Celeron® N5100 processor-powered system, the Intel® Core™ i3-1215U processor-powered system saved the most time on any of the Blender tasks when rendering a 3D image—over 26 minutes.

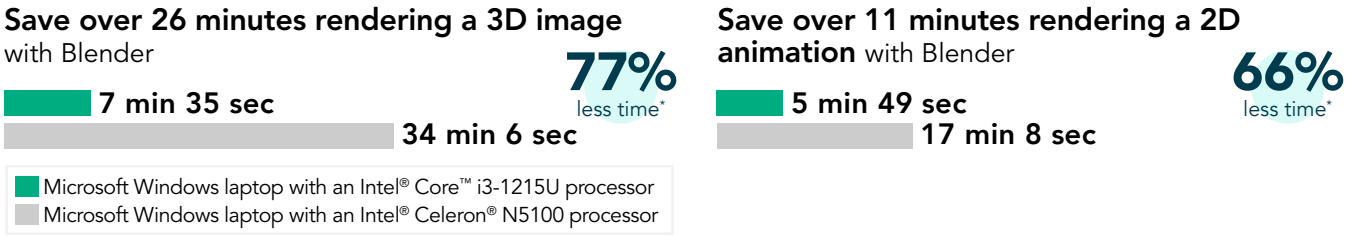


Figure 3: Time (in minutes) to render a 3D image and a 2D animation in Blender. Less is better. Source: Principled Technologies.

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

Save time in Labster

Labster provides over 300 virtual science lab simulations that enable students to learn and apply their understanding of important STEM topics. Labster virtual labs can serve as standalone assignments or as supplemental activities to reinforce important concepts or lab techniques.

In our Labster testing, the Intel® Core™ i3-1215U processor-powered system loaded three labs faster than the Intel® Celeron® N5100 processor-powered system (see Figure 4).

Save time in Unity

Unity is a game engine that allows developers and students to test and edit their interactive applications. The Intel® Core™ i3-1215U processor-powered system completed three common tasks in less time than the Intel® Celeron® N5100 processor-powered system. Figure 5 shows the times that each system needed to complete these tasks.

Mrs. Jenkins gave her computer science students an in-class assignment that used the Intel® SFI framework. Her student Lawana unfortunately was out sick that day. Thankfully, Lawana uses an Intel® Core™ i3-1215U processor-powered Windows device that can run Intel® SFI apps faster, which could help her turn in the missed assignment to Mrs. Jenkins quickly and get back up to speed with the class.

Save 33.6 seconds loading plate tectonics module with Labster

56% less time*

26.0 sec

59.6 sec

Save 53 seconds loading impact on climate change module with Labster

60% less time*

35.2 sec

88.2 sec

Save 31.7 seconds loading cell division module with Labster

51% less time*

29.9 sec

61.6 sec

Microsoft Windows laptop with an Intel® Core™ i3-1215U processor

Microsoft Windows laptop with an Intel® Celeron® N5100 processor

Figure 4: Time (in seconds) to complete tasks in Labster. Less is better. Source: Principled Technologies.

Save 2.3 seconds playing Ragdoll test with Unity

47% less time*

2.5 sec

4.8 sec

Save 5.5 seconds adding a New Script Component with Unity

56% less time*

4.3 sec

9.8 sec

Save 5.8 seconds building and running a project with Unity

35% less time*

10.4 sec

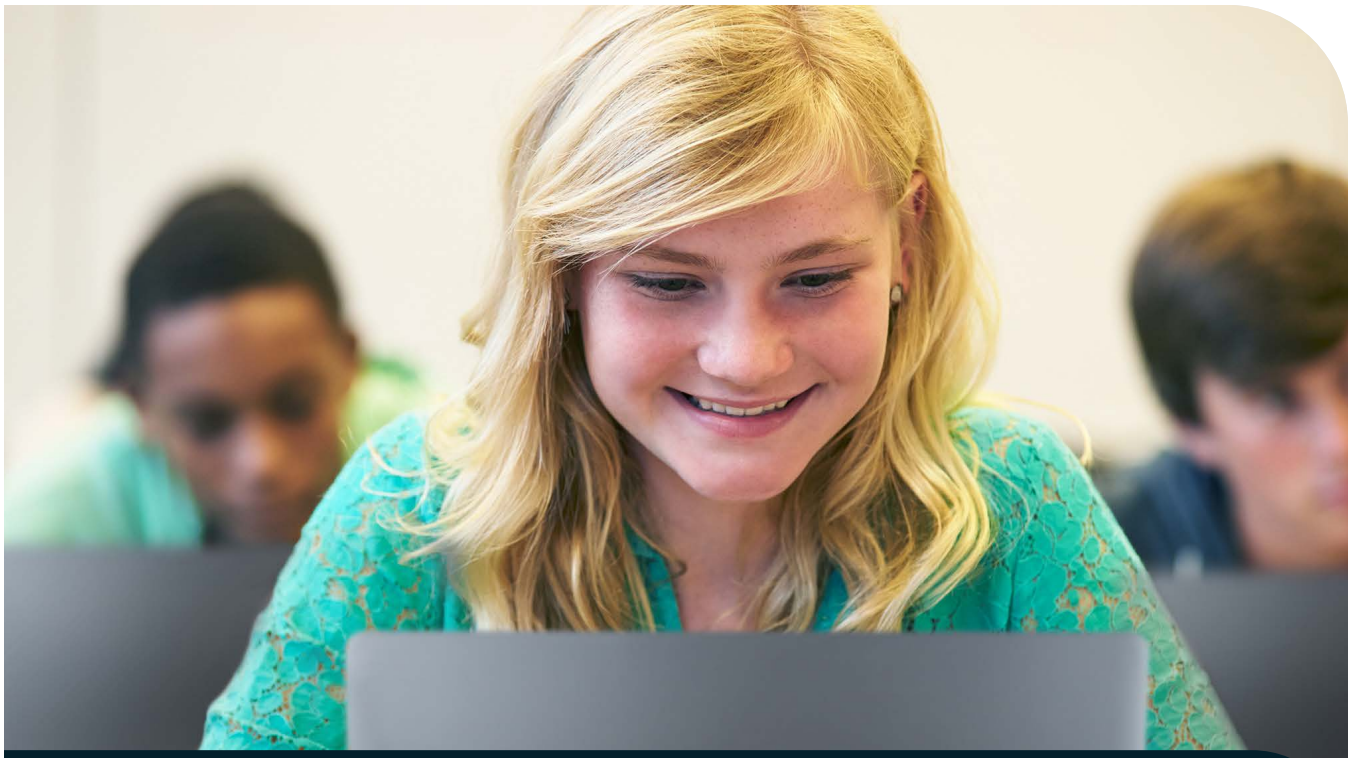
16.2 sec

Microsoft Windows laptop with an Intel® Core™ i3-1215U processor

Microsoft Windows laptop with an Intel® Celeron® N5100 processor

Figure 5: Time (in seconds) to complete tasks in Unity. Less is better. Source: Principled Technologies.

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



One day in the middle of first semester, Mr. Kim got a new ninth grader, Rebekah, in one of his graphic design courses. He quickly gave her a crash course on Fusion 360, and Rebekah eagerly jumped right into an activity from Intel® SFI with her time-saving Intel® Core™ i3-1215U processor-powered Windows device.

Save time in Fusion 360

Autodesk® Fusion 360® is a popular 3D CAD platform. The Fusion 360 model we used for testing is part of the Intel® SFI framework. Figure 6 shows the times that each system needed to export a 3D model two ways.

Save 16.2 seconds launching the application with Fusion 360

47% less time*

18.0 sec

34.2 sec

Save 0.6 seconds exporting model as .STL (zipper) with Fusion 360

27% less time*

1.6 sec

2.2 sec

Save 0.6 seconds exporting model as .obj (bevel gear) with Fusion 360

26% less time*

1.7 sec

2.3 sec

Microsoft Windows laptop with an Intel® Core™ i3-1215U processor

Microsoft Windows laptop with an Intel® Celeron® N5100 processor

Figure 6: Time (in seconds) to complete tasks in Fusion 360. Less is better. Source: Principled Technologies.

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

Conclusion

Providing students with faster, more responsive systems for Intel® Skills for Innovation assignments could help deliver better learning experiences, optimize instructional time, and prioritize higher-order cognitive skill development. We found that some applications within the Intel® Skills for Innovation framework, as well as other applications, run faster on Intel® Core™ i3-1215U processor-based Windows 11 laptops compared to Intel® Celeron® N5100 processor-based ones. Faster, more responsive devices enable educators to include more engaging, skill-building activities in their Intel® Skills for Innovation-based lessons.

1. Intel®, "Intel® Skills for Innovation is Reinventing Technology's Role in Education to Empower Students to Become the Next Generation of Innovators," accessed January 9, 2023, https://skillsforinnovation.intel.com/landing/index.html.
2. Intel®, "Introducing Intel® Skills for Innovation," accessed December 14, 2022, https://skillsforinnovation.intel.com/landing/index.html#what_is_intel.
3. Labster, "Explore our Growing Catalog of Virtual Labs," accessed December 15, 2022, https://www.labster.com/simulations.

Read the science behind this report at https://facts.pt/L6fbTel ▶

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This project was commissioned by Intel.