

Virtual FC Tours: Teacher Toolkit

Welcome ECOO Members to Amazon Future Engineer Virtual FC Tours! We can't wait to introduce your students to the incredible technology and people who make Amazon possible. Built for teachers and by teachers, we hope these instructional materials set you and your students up for success before, during, and after the virtual tour. Enjoy and see you soon!

Toolkit coming soon in Canadian French



A virtual field trip for every future engineer:

Computer-science focused tours

Students will discover how algorithms, machine learning, and more power our fulfillment process

Workforce exposure

Interact and ask questions to Fulfillment Center Tour Guides and meet the engineers behind the technology

One-hour learning experience

Use the Teacher Toolkit to provide a real-life, standards-aligned learning opportunity to your class

Amazon Future Engineer is a program that provides equitable access to computer science education to underserved and underrepresented youth.

Learn more about program offerings available in Canada: [Amazon Future Engineer Canada](#)

You can participate in this tour either in-class or remotely.



Educational Computing
Organization of Ontario
Organisation ontarienne pour
la cybernétique en éducation



fair
chance
learning



amazon



A Message from ECOO President:



As a not-for-profit organization, supporting all educators in technology integration, ECOO is pleased to partner with Fair Chance Learning and the Amazon Future Engineer Project to offer this unique learning experience. We are thrilled to be able to provide our educators and students with an inside look at how coding, computational thinking, algorithms, machine learning, and engineering are applied in everyday life.

- Lynn Thomas, President, Educational Computing Organization of Ontario (ECOO)

Coming Soon: Podcast

Join Stephen Hurley, Education Consultant, and Catalyst of voicED Radio, and guests Susan Ibach, Head of Amazon Future Engineer Canada, and President of ECOO, Lynn Thomas, as they discuss the Amazon Future Engineer Program and the value of virtual field trips in the current education climate.

"An honest conversation about technological skills at the forefront of the world at work today and in the future."

- Lynn Thomas



Educational Computing
Organization of Ontario
Organisation ontarienne pour
la cybernétique en éducation



fair
chance
learning



Before:

- 1** **Register** with your students for a tour on our website. See the FAQ section for more details.
***Check your access** (and your students' access) to GoToWebinar [using this system test](#). If there is an issue, send the [Firewall Configurations](#) to your technology department. [See here](#) for more information.
- 2** **Prepare (Recommended)**
Before-the-Tour Slide Deck: Activate students' prior knowledge and set expectations for the tour. We recommend allocating 20 minutes to review these slides the day before the tour. ([PPT file here](#))
- 3** **Distribute unique remote learner links** to students who are watching from home. You should receive these within 24-48 hours after registration. Use the provided template to assign links. ([Excel](#) or [Word file](#) here)

Key Student Learnings

Tour Objective:

Students will be able to learn how computer science, engineering, and people work together to fulfill customer orders at Amazon. Students will also be able to meet and hear about the careers of three engineers who enable this technology.

Key Vocabulary:

The following vocabulary will be introduced in audio and visual format during the tour:

- **Algorithm:** a set of instructions or rules that a computer follows to perform a task.
- **Cloud Computing:** The delivery of technology resources—including computing, storage, databases, networking, and intelligence—through the Internet.
- **Sensor:** a device that detects and responds to its physical environment.
- **Efficiency:** the ability to reduce or eliminate waste in a process.
- **Database:** an organized collection of structured information, or data, typically stored electronically in a computer system.
- **Quality Control:** A process used to ensure that product or service is free from error.
- **Machine Learning:** The science of getting computers to perform or make predictions based on examples or past experience.
- **Hardware:** the physical parts of a computer or device (stuff you can touch).
- **Software:** collection of instructions and data that tell the computer how to work (the code!).



Key Student Learnings by Tour stop:

Below is an outline of the tour’s key learnings by tour stop. Each tour stop starts with an interactive question. The tour guide reveals the answer and explains how it relates to a specific computer science term. The tour guide will then provide real-life context of how this computer science learning shows in the fulfillment process.

Stop:	Interactive Questions:	CS Learnings and FC Context Summary:
<p>Welcome (0-5 min)</p> 	<p>1) Who’s here, and where are you from? Please chat in your location and grade-level!</p>	<p>The tour guide will give an overview of the tour and set expectations.</p>
<p>Order (6-10 min)</p> 	<p>2) How long was the fastest recorded Amazon delivery (from order to doorstep)?</p> <p>a. 3 minutes b. 13 minutes c. 33 minutes d. 53 minutes</p>	<p>Algorithms are a set of instructions or rules that a computer follows to perform a task. Algorithms decide what fulfillment center should process your order. The algorithm first looks at which fulfillment centers have your item(s) and then selects the one that is closest.</p>
<p>Pick (10-20 min)</p> 	<p>3) How does Amazon organize and store items in each fulfillment center?</p> <p>a. Alphabetically by name b. By their purpose (cleaning supplies, art supplies, sports items, clothes, etc). c. By their color (orange items, green items, blue items). d. Randomly — no organization method</p>	<p>After a customer completes their purchase, the order is processed in the Amazon Web Services Cloud Computing Network. Cloud computing allows us to deliver technology resources – like computing, data storage, networking, and intelligence – through the Internet. We simply call it “the Cloud” for short.</p> <p>After assigning a customer order to a fulfillment center, we need to determine where the item is stored. Inside the FC, items are stored in tall, moveable shelves called pods. Since items are stored randomly, the item may be stored in more than one pod. A drive unit will eventually deliver one of these pods to a picking station where an associate will pick the item off for packing. An algorithm in the Cloud calculates the most efficient combination of picker, pod and drive unit to process each customer order.</p> <p>But how do we keep track of all the robots? The FC floor is a grid system and each square has a unique QR code. As the drive unit moves, the robot uses a camera sensor underneath it to constantly scan and update its new location in the Cloud. A sensor is a device that detects and responds to its physical environment. This combination of real-time sensing and cloud processing allows the drive units to work together to clear paths for each other and fulfill orders as efficiently as possible.</p>



Key Student Learnings by Tour stop:

Stop:	Interactive Questions:	CS Learnings and FC Context Summary:
<p>Pack (20-28 min)</p> 	<p>4) How does a packer choose the most efficient box for packing?</p> <p>a. Years of training with the experts at our Packing Dojo b. Following on screen commands based on previously recorded item measurements c. Using rulers and tape measures on each item and working out the math for each order d. Pick the box which simply looks big enough</p> <p>5) Amazon’s Frustration-Free Packaging Program works with sellers to package their products in packages that are 100% recyclable and ready to ship without additional Amazon boxes. Since 2015 this program has eliminated the equivalent of how many cardboard boxes?</p> <p>a. 100,000 b. 2,000,000 c. 100,000,000 d. 2,000,000,000</p>	<p>Amazon ships a lot of items. We try to be as efficient as possible and use as little time, electricity, cardboard, gasoline, etc. to deliver this item. Efficiency is the ability to accomplish something with the least waste of time, energy, effort, or material. Amazon’s Sustainability team founded the Climate Pledge and has a goal to be completely carbon neutral by 2040. Many more companies have signed on to join us!</p> <p>How do we practice efficiency when choosing a box to ship an item? We need to pick the smallest box possible while also protecting the items. When an item arrives at Amazon to be sold, we record many facts about it like its height, width, and weight. These facts are stored in a database. A database is an organized collection of structured information, or data, typically stored electronically in a computer system. When an item is ordered, the cloud pulls the item’s dimensions and weight for the database and automatically calculates (using an algorithm!) which box will be best (even when combined with other items!). Using a database to estimate package size helps us stay more efficient with shipping.</p>
<p>SLAM (28-35 min)</p> 	<p>6) This final station performs one final check to ensure the item is correct, what does it do to make sure the order is correct?</p> <p>a. Weighs the item as it goes over the conveyor belt b. Uses an X-Ray to check the item inside is correct c. Uses the robotic arm to rattle the box and microphones to listen for the correct sound d. It doesn’t perform any more checks, you are trying to trick us</p>	<p>The SLAM station addresses the customer order and completes quality control — checking to make sure every order is correct. At the SLAM station, the customer address label is applied and a sensor weighs the box. The system references the database to calculate how much the items in the box should weigh and compares that to how much it does weigh. An algorithm decides if the weight is accurate or not. If it is not accurate, the box is pulled off, inspected, and corrected by an associate. If it is correct, it heads onto shipping.</p>



Key Student Learnings by Tour stop:

Stop:	Interactive Questions:	CS Learnings and FC Context Summary:
<p>Shipping & Delivery (35-40 min)</p> 	<p>7) Packages are sorted by hand, with each address label being read by an associate. What does the future of Amazon delivery look like?</p> <p>a. Electric delivery vehicles b. Delivery robots c. Drone delivery d. All of the above</p>	<p>All around the world, humans are constantly constructing new buildings and roads. So, how does Amazon keep its maps updated to deliver to even the newest locations? The answer: machine learning. Machine learning is the science of teaching computers to perform or make predictions based on examples or past experience. To keep our maps up to date, we train computers to use satellite images to detect new roads and buildings on their own!</p> <p>Computers can learn? Yes, but it depends on how well they are trained. To train a computer to detect new roads, we show it thousands of examples of satellite images to compare to existing maps. The computer learns what roads and houses usually look like and then creates its own “road detection” algorithm. It uses this algorithm to find and predict roads on new satellite images. Machine learning enables us to process infinitely more data than would ever be possible on our own. Thank you, computer science!</p>

Stop:	CS Learnings and FC Context Summary:
<p>Career Video (40-45 min)</p> 	<p>Students meet three Amazon Robotics employees. One from Hardware, Software, and Solutions. Hardware is the physical parts of a computer or device (stuff you can touch) and software is a collection of instructions and data that tell the computer how to work (the code!). Students learn how hardware and software must work together to make the best Amazon Robotics Solution possible.</p>
<p>Q&A (45-60 min)</p> 	<p>Students are able to submit questions to the tour guides for live Q&A.</p>



Interactive Video Recording:

If you'd like to preview the tour, or if your class schedules don't work with our public tour times, you can use our interactive video recording as a strong substitute for the live experience. Our video recording is hosted on [Edpuzzle](#) to allow for student interactivity. We offer two options for our video recording:

Option 1: No login required - Share [this link](#) directly to students or use it to project the video on your big screen. After pressing "Join Class", anyone can immediately begin watching. Students can answer trivia questions and leave feedback as they go. We recommend using this option if you are previewing on your own, too. *Note: If you are currently logged into Edpuzzle as teacher, this link won't work. Open in a new browser or in Incognito mode.*



48:22 29

Amazon Future Engineer Virtual
FC Tour

Amazon Future Engineer

Edpuzzle hosted

Option 2: Edpuzzle account required - If you have an Edpuzzle Teacher account, you can duplicate our video and assign it to your class to track your students' progress and edit/add questions. To find the tour, search for "Amazon Future Engineer" in the content library and select "Copy", "Edit", or "Duplicate". Be sure to select the video hosted by "Amazon Future Engineer" to start with the official version.

Curriculum Connections

The Amazon Future Engineer Virtual FC Tour is aligned to a variety of grade 4-8 educational connections:

- Ontario Curriculum
- Saskatchewan Curriculum
- New Brunswick Curriculum
- British Columbia Curriculum
- Manitoba Curriculum
- PEI Curriculum
- Alberta Curriculum
- Nova Scotia Curriculum
- New Brunswick Curriculum
- ISTE Standards

Ontario Curriculum:

Political and Physical Regions of Canada

- **B2.** Inquiry: use the social studies inquiry process to investigate some issues and challenges associated with balancing human needs/wants and activities with environmental stewardship in one or more of the political and/or physical regions of Canada

Physical Patterns in a Changing World

- **A1.** Application: analyse some challenges and opportunities presented by the physical environment and ways in which people have responded to them

Media Literacy

- Demonstrate an understanding of a variety of media texts;
- Identify some media forms and explain how the conventions and techniques associated with them are used to create meaning;
- Reflect on and identify their strengths as media interpreters and creators, areas for improvement, and the strategies they found most helpful in understanding and creating media texts

The Role of Government and Responsible Citizenship

- **B1.** Explain the importance of international cooperation in addressing global issues, and evaluate the effectiveness of selected actions by Canada and Canadian citizens in the international arena



ISTE:

Empowered Learner

Students leverage technology to take an active role in choosing, achieving, and demonstrating competency in their learning goals, informed by the learning sciences.

- **1a** Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes.
- **1d** Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.

Digital Citizen

Students recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world, and they act and model in ways that are safe, legal and ethical.

- **2b** Students engage in positive, safe, legal and ethical behaviour when using technology, including social interactions online or when using networked devices.
- **2c** Students demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property.

Knowledge Constructor

Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.

- **3d** Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.

Innovative Designer

Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.

- **4a** Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
- **4d** Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.

Computational Thinker

Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.

- **5a** Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions.
- **5d** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.

Global Collaborator

Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally.

- **7c** Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.
- **7d** Students explore local and global issues and use collaborative technologies to work with others to investigate solutions.



During:

- 4 Attend Your Virtual Tour and use these resources**
During the tour, we recommend students complete the below organizer to capture their biggest learnings and wonderings. If students are remote, have students recreate the organizer on paper to avoid toggling between windows.

Amazon Future Engineer FC Tours Note Catcher ([word file here](#))

Stop:	Coollest fact I learned:	Questions and Wonderings I have:
Order 		
Pick 		
Pack 		
SLAM 		
Shipping & Delivery 		
Careers 		

Thank you for joining us on an Amazon Future Engineer Virtual FC Tour! Let us know how you enjoyed it by completing this quick [survey](#).

FC Tours: 3-2-1 Organizer ([word file here](#))

Directions: As you virtually tour the Amazon Fulfillment Centre, answer the key questions below. We will go over these as a class after the tour to discuss what you learned! Have fun!

3	2	1
<p>What are three ways that computer science and robotics are used to help fulfill customer orders at Amazon?</p>	<p>Record two new vocabulary terms you learned and what they mean (in your own words) below.</p>	<p>If you could ask Amazon one question, what would it be? Feel free to put this into the chat, too!</p>
<p>1)</p>	<p>1)</p>	<p>1)</p>
<p>2)</p>	<p>2)</p>	
<p>3)</p>		

Thank you for joining us on an **Amazon Future Engineer Virtual FC Tour!** Let us know how you enjoyed it by completing this **[quick survey](#)**.

Next Steps:

- 6 Celebrate and Submit Feedback**
Tour Survey: Teachers and students are encouraged to submit feedback on your tour experience. Your input will help us how we can improve tours in the future.
- 7 [Print your Student Certificate](#)**

Extend Student Learning

- **[Class Discussion Questions:](#)** Reflect with your students using these discussion questions. (Word file here)
- **[Dissect the SLAM Algorithm \(Grades 6–12\):](#)** Use flowcharts or pseudocode to try to break down the SLAM algorithm as a class. (Word file here)
- **Optional — [Amazon Cyber Robotics Challenge \(Grades 3-12\):](#)** In this 3-hour virtual challenge, students learn the basics of computer science while discovering how Amazon delivers goods. It's a perfect way to prepare for the virtual tour! Create an account and register students using your class code.
- **Optional — [Build Your Own Lexicon \(Grades 6–12\):](#)** Allow your students to preview the vocabulary that will be introduced by researching new terms on their own before the tour. (Word file here)

These will also soon be available in Canadian French

