Virtual FC Tours: Teacher Toolkit

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!

Step 1: Register

- **Register** with your students for a tour on our website. See the FAQ section for more details.
- **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)

Step 2: Familiarize Yourself with the Tour:

Want to know what your students will learn? Check out the following resources to familiarize yourself with the tour.

- **Key Student Learnings:** Discover the key vocabulary and learnings covered on the tour by tour stop.
- **Interactive Video Recording:** Preview the tour or use the interactive video for classes that can't make the tour times. You can also share and assign the tour in Edpuzzle to track progress.
- **Standards Alignment:** The tour is aligned to a variety of education standards across US, UK, and Canada.
- **Firewall Check:** 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.

Step 3: Prepare Your Students

Get your students excited and prepared for the tour! These optional resources will set your students up for a great experience. Be sure to distribute graphic organizers this day.

- ****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)
- **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. 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)

Step 4: Attend Your Virtual Tour

During the tour, we recommend providing students with a printed graphic organizer to capture their biggest learnings and wonderings. If students are remote, have students recreate the organizer on paper to avoid toggling between windows. Distribute your favorite one the day before the tour.

- **Tour Stop Organizer:** Students record the coolest fact learned and any questions at each stop. (Word file here)
- **3, 2, 1 Organizer:** A simple organizer to take notes on key questions instead of by tour stop. (Word file here)

Step 5: 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.
- **Student Certificate:** Print and distribute student certificates to celebrate completng the tour!

Step 6: 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)
- **Class Chats (US only; Grades 5–12):** Bring an Amazon employee to your class for a virtual career talk!
- **Amazon Cyber Robotics Challenge (Grades 3–12):** In this free, 3-hour virtual challenge, students learn the basics of computer science while discovering how Amazon delivers customer goods. Create an account, register students using your class code, and enjoy!

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 Learnings by Tour Stop:

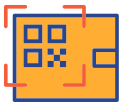
Below is an outline of the tour's key learnings by tour stop. Each tour stop starts with an interactive question. The tour guide reveals the answer and explains how it relates to a specific computer science term. The tour guide will then provide real-life context of how this computer science learning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

Stop:	Interactive Questions:	CS Learnings and FC Context Summary:
Welcome (0-6 min) 	**1) Who's here, and where are you from? Please chat in your location and grade-level!**	The tour guide will give an overview of the tour and set expectations.
Order (6-10 min) 	**2) How long was the fastest recorded Amazon delivery (from order to doorstep)?** **a.** 3 minutes **b. 30 minutes** **c.** 1 hour **d.** 3 hours	**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. Watch the included animated video here.

Key Student Learnings:

Stop:	Interactive Questions:	CS Learnings and FC Context Summary:
Pick (10-20 min) 	**3) How does Amazon organize and store items in each fulfillment center?** **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**	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. 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. 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. Watch the included animated video here.
Pack (20-28 min) 	**4) How does a packer choose the most efficient box for packing?** **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 **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?** **a.** 100,000 **b.** 2,000,000 **c.** 100,000,000 **d. 2,000,000,000**	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! 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.

Key Student Learnings:

Stop:	Interactive Questions:	CS Learnings and FC Context Summary:
SLAM (28-35 min) 	**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?** **a. Weighs the item as it goes over the conveyor belt** **b.** Uses and 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	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.
Shipping & Delivery (35-40 min) 	**7) Packages are sorted by hand, with each address label being read by an associate. What does the future of Amazon delivery look like?** **a.** Electric delivery vehicles **b.** Delivery robots **c.** Drone delivery **d. All of the above**	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 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! 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! Watch the included animated video here.

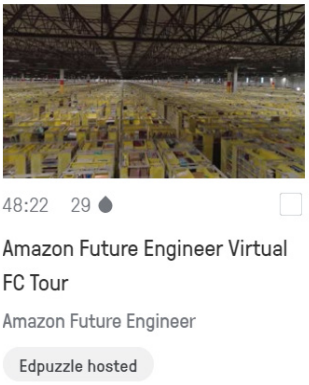
Stop:	CS Learnings and FC Context Summary:
Career Video (40-45 min) 	Students meet three Amazon Robotics employees. One from Hardware, Software, and Solutions. **Hardware** is the physical parts of a computer or device (stuff you can touch) and **software** is a collection of instructions and data that 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. Watch the included video here.
Q&A (45-60 min) 	Students are able to submit questions to the tour guides for live Q&A.

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 interactvie 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 browswer or in Incognito mode.*

Option 2: Edpuzzle account required - If you have an Edpuzzle Teacher account, you can assign our video to your class to track your students' progress. You are also able to edit the questions to match your students' needs. To do so, access our video here and select either "Assign" or "Duplicate" to begin.



Standards Alignment:

The Amazon Future Engineer Virtual FC Tour is aligned to a variety of educational standards:

- CSTA K-12 Standard Alignment
- ISTE Standards
- NGSS (coming soon)
- Ontario Curriculum

CSTA K-12 Standard Alignment (See the **standards here**.)

The following standards are fully or partially addressed during the tour:

1B-AP-08: Compare and refine multiple algorithms for the same task and determine which is the most appropriate

1B-AP-09: Create programs that use variables to store and modify data.

1B-AP-11: Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process.

1B-CS-01: Describe how internal and external parts of computing devices function to form a system

1B-NI-04: Model how information is broken down into smaller pieces, transmitted as packets through multiple devices over networks and the Internet, and reassembled at the destination.

1B-NI-05: Discuss real-world cybersecurity problems and how personal information can be protected.

1B-IC-18: Discuss computing technologies that have changed the world, and express how those technologies influence, and are influenced by, cultural practices.

2-AP-10: Use flowcharts and/or pseudocode to address complex problems as algorithms.

2-CS-02: Design projects that combine hardware and software components to collect and exchange data

2-NI-05: Explain how physical and digital security measures protect electronic information.

2-IC-20: Compare tradeoffs associated with computing technologies that affect people's everyday activities and career options

3A-IC-24: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.

3A-IC-29: Explain the privacy concerns related to the collection and generation of data through automated processes that may not be evident to users.

3B-IC-25: Evaluate computational artifacts to maximize their beneficial effects and minimize harmful effects on society.

3B-IC-27: Predict how computational innovations that have revolutionized aspects of our culture might evolve.

ISTE Standards Alignment (See the **standards here.**)

The following standards are fully or partially addressed during the tour:

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 behavior 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.

Ontario Curriculum (See the **curriculum here.**)

The following standards are fully or partially addressed during the tour:

Oral Communication -1: Listen in order to understand and respond appropriately in a variety of situations for a variety of purposes

Media - 1: Demonstrate an understanding of a variety of media texts.

Media - 4: 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.

FAQs:

1. How can I register?

Anyone can register to attend a tour. We offer morning and afternoon tours throughout the week. Pick the one-hour time slot that works best for you or your class. Once you have decided on a tour time, pick the type of tour that best suits your needs:

- **In-class learning:** If students are learning in-person, only teachers need to register. Teachers should project the tour to their class and use a mouse on the large screen to answer interactive questions. You can have students vote on the correct interactive question answer using their hands to signal 1=A, 2=B, 3=C, 4=D.
- **Remote learning:** Teachers can reserve seats for any remote learners during registration. Teachers can request up to 100 remote tickets during regstration and will receivie an email with unique links for all remote learners to distribute as they best see fit. Each remote learner will need to access the tour from their unique link. Each link works on up to 3 devices at a time. If desired, remote students can register on their own for the tour using the registration link.

2. When will in-person tours resume?

The safety of our employees and guests is our top priority. At this moment there is no set date for when public tours will resume. As the global health situation develops, please check back for more information.

3. What will my class see on the tour?

On the tour, you will see what happens behind the scenes when you shop on Amazon. This includes how our amazing employees support customer fulfillment through the pick, pack, and ship processes.

4. What computer science topics will be covered on the tour?

The following computer science topics will be introduced and explained in real-life context during the tour: algorithm, cloud computing, sensor, efficiency, database, quality control, machine learning, hardware, and software. See the Teacher Toolkit for more information.

5. Can I just register and share the link to my class?

Unfortunately, our current tech platform requires each remote attendee to access the tour through a provided unique link. Teachers should request links for their remote learners during registraton. Teachers will recieve all links via email upon registration confirmation and can distribute the links to their students however they see best. Each link only works on up to 3 devices, so you cannot share one link to the whole class.

6. How much does this cost?

The tour, and all materials included in the accompanying Teacher Toolkit, are provided to teachers at no cost.

7. What programs do I need to install to access the tour?

You will not need to install any programs to access the tour- the tour will run on your browser. GoToWebinar works on Google Chrome or Mozilla Firefox browsers and on any of the following operating systems (Windows 7 - Windows 10, Mac OS X 10.9 (Mavericks) - macOS Big Sur (11), Linux, Google Chrome OS, Android OS 5 (Lollipop) - Android 10, iOS 10 - iOS 12). See here for **all system requirements**.

8. What grade-levels can attend?

We recommend the tour for any grades 3 and above. The tour includes content accessible to each grade and teachers can use the Teacher Toolkit to adjust learning how they see fit.

FAQs:

9. Who can I contact to schedule a tour for my whole district (thousands of students)?

For education leaders who seek to bring thousands of students at once, please complete this **Private District Tour Request Form**, and our team will contact you. We have a 1,200 student minimum for all private tours. We will do our best to accommodate all large district requests and prioritize districts serving large proportions of students from underserved and underrepresented communities in tech.

10. How can I share my feedback on the tour?

We'd love your feedback. Please complete this survey (and share it to students!) after the tour - **amazon.com/afetoursurvey**.

11. How long is the tour?

One hour total (45 minute live tour + 15 minutes live Q&A).

12. Can individual students sign up by themselves, independent of a class?

Yes, absolutely. Anyone can sign up using the same link as classes if they desire a computer science themed tour.

13. Where can I go for a regular FC tour?

Head to **amazonfctours.com/virtualtours** to join a non-AFE Amazon Virtual FC Tour.

14. Who can I contact for questions?

Please reach out to **afe-contact@amazon.com** for any questions.