

AP[®] Computer Science Principles

ACCESSIBILITY

Student Workbook



AP[®] with WE Service



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Getting to Know the Topic

Accessibility: Globally

Approximately 15 percent of the world’s population lives with some form of disability. Creating an inclusive and accessible society is important to making sure everyone, no matter their ability, has the same opportunities to live a healthy and productive life. Globally, people with disabilities are more likely to face barriers to social integration. Those living in less-developed countries are more heavily impacted because they do not have the same protections and resources as those in many of the world’s wealthiest countries. Technological innovations have the potential to improve the lives of people with disabilities who live in areas that lack accessible social infrastructure.

Computer science is the engine that powers the technology, productivity, and innovation that will positively impact the world around us. It plays a key role in developing affordable and scalable solutions that can be deployed to people with disabilities and countries in need. Advocating for these solutions is also a vital component of creating a more accessible world.

Fast Facts

- ▶ According to the World Bank, one billion people live with some form of disability.
- ▶ The UN Convention on the Rights of Persons with Disabilities was adopted in 2006 to protect the human rights and freedoms of persons with disabilities, with more than 170 countries having signed on. Nonetheless, comparative studies on disability legislation shows that only 45 countries have anti-discrimination and other disability-specific laws, according to the United Nations.
- ▶ According to UNESCO, students with disabilities in developing countries are at higher risk of being excluded from primary and secondary education — up to 50 percent of students with disabilities may be missing school in some nations.

Taking Action Globally

There are a number of ways that students can take action in their school and community to help developing communities around the world to support accessibility. Some ideas include:

- ▶ Identify globally available applications that are inaccessible to people with disabilities and advocate to those companies for more inclusive products.
- ▶ Develop computational solutions to broaden access and remove barriers for people with disabilities.
- ▶ Creating apps or web pages to raise awareness for global organizations that support inclusive and accessible spaces for all.



According to the World Health Organization, 80 percent of people with disabilities around the world live in developing countries.

Getting to Know the Topic

Accessibility: Locally

Nearly one in four Americans lives with some form of disability. In the United States, the Americans with Disabilities Act (ADA) was created in 1990 to protect the rights of individuals with disabilities and support accessible resources, services, accommodations, employment, and more.

Universally designed technology, accessible transportation, and access to educational supports, play an important role in achieving the full participation of people with disabilities in America. Designing with accessibility in mind helps to ensure that people with disabilities are given equal opportunities. Additionally, technology can be used to develop tools specifically for people with disabilities with the aim of enhancing independence and making daily living easier. When more citizens are able to achieve full participation, we all benefit and can achieve a more productive society.

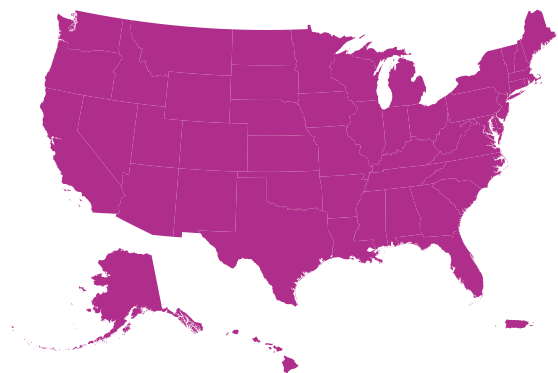
Fast Facts

- ▶ In the United States, almost 61 million people have a disability.
- ▶ According to the Institute on Disability, “If people with disabilities were a formally recognized minority group, at 19% of the population, they would be the largest minority group in the United States.”
- ▶ In 1990, the Americans with Disabilities Act was implemented, prohibiting discrimination against people with disabilities.
- ▶ According to the National Center for Education Statistics, “In 2018–19, the number of students ages 3–21 who received special education services under the Individuals with Disabilities Education Act (IDEA) was 7.1 million, or 14 percent of all public school students.”

Taking Action Locally

Within their local or national community, students can:

- ▶ Develop a campaign to advocate for more accessible solutions in your local community.
- ▶ Create a website or application that showcases inclusive spaces in your neighborhood and educates others on how to make spaces more inclusive.
- ▶ Volunteer with a local organization that serves individuals with disabilities, and possibly work directly with these individuals.
- ▶ Develop an educational game to teach others about disabilities and the importance of access for all people.



Sixty-one million adults in the United States live with a disability, according to the CDC.



NAME: _____

TEAM MEMBERS: _____

Understanding Disabilities

Consider one of the people highlighted in the “What’s Disability to Me” videos.

- ▶ Feliza’s story: <https://youtu.be/wu-f1FEFNMY> (This video is in Spanish — you may need to turn on subtitles.)
- ▶ Rachael’s story: <https://youtu.be/nwBzb7m2n64>
- ▶ Faustina’s story: <https://youtu.be/w5QXcFk4kvA>
- ▶ Mia’s story: https://youtu.be/E_2ZEwhh9WQ

Whose story did you choose: _____

Which category(ies) of disability seem to impact this person and how? _____

Disability Barriers to Inclusion: Read the Common Barriers to Participation Experienced by People with Disabilities on this web page: <https://www.cdc.gov/ncbddd/disabilityandhealth/disability-barriers.html>

With your group, discuss how each barrier to inclusion might impact the person in the video that you chose.

Write down your group’s conclusions here: _____

Disability Inclusion Strategies: Using the Disability and Health Inclusion Strategies web page, <https://www.cdc.gov/ncbddd/disabilityandhealth/disability-strategies.html>, answer the following questions:

How could Accessibility, Universal Design, and Assistive Technologies benefit the person in your video? Make sure to assess each inclusion strategy individually and also note connections showing how they build upon each other.

STRATEGY	BENEFITS
Accessibility	
Universal Design	
Assistive Technologies	

List some important tips about how to communicate with and about people with disabilities. How could you use these tips for communicating with the person in the video you chose? Make sure to include any tips that are new to you!



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Using a Screen Reader

- Download or turn on a screen reader for your computer:
 - ▶ NVDA: Non Visual Desktop Access (free)
 - ▶ Apple VoiceOver: Mac OSX Screen Reader (free) To turn on Apple VoiceOver, go to System Preferences -> Accessibility » VoiceOver » Enable Voiceover
 - ▶ Chrome Vox: Chrome (OS) Screen Reader (free)
- Test your screen reader to make sure it is enabled and practice navigating using only your keyboard.
- Go to this website, which was designed to be fully accessible: [Accessible University Demo Site - Accessible Version](#). Navigate it using only your keyboard. If you have the ability to see, consider navigating the site with your eyes closed.
- Now that you have spent some time using the screen reader on that site, go to this inaccessible version of the same website: [Accessible University Demo Site - Inaccessible Version](#). Attempt to navigate it using only your keyboard. If you have the ability to see, consider navigating the site with your eyes closed.
- Describe your experience using the screen reader. Have you used one previously? Were you able to navigate without using the mouse or looking at the screen? Was it easier to navigate the accessible site? How did the accessible site compare to the inaccessible site? What challenges did you face and did you notice any unforeseen consequences?



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Problem Tree

Students will learn more about the issue they are tackling as they apply what they have learned, along with their critical thinking skills, to consider the causes and effects of the problem presented through the issue.

Leaves/branches: Effects

These are the results created by the problem. At first, this part of the issue appears easy to tackle, but when leaves and branches are trimmed, they grow back quickly. Consider the multi-layered effects, or “effects of effects,” that can arise when a problem goes unaddressed. Always ask: “Then what happens?”

Ex. People with disabilities are more likely to face attitudinal, physical, policy, social, and transportation barriers in day to day life.

Trunk: Problem

This is the key issue that is being studied. Because it is not as apparent as the leaves, the core problem itself sometimes takes a little longer to identify.

Ex. Because of attitudinal, physical, policy, social, and transportation barriers to inclusion, people with disabilities more often experience unemployment, poverty, lack of health care, and lack of education.

Roots: Causes

These are the situations or factors that have led to the problem. When exploring the root causes of a problem, ask yourself “Why does this problem exist?” Dig deeper to consider the “causes of causes”—the multiple layers of factors that contribute to a problem.

Ex. People with disabilities experience barriers because society is not designed using inclusive principles that ensure all people have equal access, regardless of ability.



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Did You Know?

<p>Did you know our school district:</p> <p>1. _____ _____</p> <p>2. _____ _____</p> <p>3. _____ _____</p>	<p>Questions:</p> <p>1. _____ _____</p> <p>2. _____ _____</p> <p>3. _____ _____</p>	<p>Answers:</p> <p>1. _____ _____</p> <p>2. _____ _____</p> <p>3. _____ _____</p>
<p>Did you know our city:</p> <p>1. _____ _____</p> <p>2. _____ _____</p> <p>3. _____ _____</p>	<p>Questions:</p> <p>1. _____ _____</p> <p>2. _____ _____</p> <p>3. _____ _____</p>	<p>Answers:</p> <p>1. _____ _____</p> <p>2. _____ _____</p> <p>3. _____ _____</p>
<p>Did you know our state:</p> <p>1. _____ _____</p> <p>2. _____ _____</p> <p>3. _____ _____</p>	<p>Questions:</p> <p>1. _____ _____</p> <p>2. _____ _____</p> <p>3. _____ _____</p>	<p>Answers:</p> <p>1. _____ _____</p> <p>2. _____ _____</p> <p>3. _____ _____</p>
<p>Did you know our country:</p> <p>1. _____ _____</p> <p>2. _____ _____</p> <p>3. _____ _____</p>	<p>Questions:</p> <p>1. _____ _____</p> <p>2. _____ _____</p> <p>3. _____ _____</p>	<p>Answers:</p> <p>1. _____ _____</p> <p>2. _____ _____</p> <p>3. _____ _____</p>



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Innovative Solutions

In a group of 2–3 people, explore the links below, which contain one or more innovative solutions that have been designed and developed to support the needs of people with disabilities. After looking through the titles and a few of the ideas on the websites, choose a solution that interests you or find one on your own.

- ▶ **Eyespeak:** Standalone communication glasses
- ▶ **AccessNow:** Crowdsourcing accessible places
- ▶ **“A group of Google employees spent their '20% time' making Google Maps wheelchair-friendly”**
- ▶ **Global Accessibility News:** Stories about current research on accessibility
- ▶ **Information and Communication Technologies (ICTs) from the European Disability Forum**
- ▶ **13 Disability Resources on the Web You May Not Know About**
- ▶ **Walleye Tank Past Competitions** (The Walleye Tank is Minnesota’s Life Science Pitch Competition providing an educational and promotional opportunity for emerging and established medical and life science companies. Often the projects work to solve issues for people with disabilities.)

Answer the following questions about the project that you choose.

1. What is the solution and what category of disability impact does it target?

2. How might this solution have a beneficial effect on the people for whom it was designed?

3. Explain a beneficial and a harmful effect to society, economy, or culture that could happen as a result of this solution.

4. Do you think that this solution will work? Are there any unintended consequences that you might be able to predict?

Make sure to include the language from the first two activities regarding barriers and inclusion tools when you are presenting your work.



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Needs Assessment

The following series of questions helps you to analyze and identify ongoing areas of need within organizations addressing your issue.

1. Identify 3-5 organizations, with at least two of them using technology, working on issues related to the issue your team is working on.

2. What does each organization do well in response to the issue and/or related issues?

3. What could each organization do better in its response?

4. What areas of need related to access to your issue have you learned about that each organization is NOT addressing?

5. Considering all 3-5 organizations, where are there ongoing needs that are not being adequately addressed?

6. Considering all 3-5 organizations, where are there ongoing needs that are being addressed successfully, and to which you can add further efforts to support the issue?



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Solution Tree

(1 of 1)

In your Solution Tree graphic organizer, start by rewriting the problem from your Problem Tree, and reframing it as a goal at the trunk of the tree. Then consider the different solutions (the roots) and possible outcomes of the solutions (the branches).

Leaves/branches: Outcomes

These are the results created by the solution. Results may appear as straightforward as having achieved goals, but when you consider the ripple effects and outcomes of sustainable results, the impact is far-reaching and long-lasting. Always ask: "Then what happens?" Ex. People who are deaf or hard of hearing will be able to fully participate in a video conferencing call on any platform, without need for an expensive translator, even if they cannot see the video stream well enough to speech read. This will enable people who are deaf or hard of hearing to more fully participate in their community and to work virtually.

Trunk: Problem

There is not yet technology that allows people who are deaf or hard of hearing to participate in video conferencing on any platform.

Trunk: Goal

Part of the accessibility module on every device will include a more robust software package that allows the captions to work effectively, even when there is background noise.

Roots: Solutions

These are the actions needed to solve the problem and achieve the goal stated at the center of the Solution Tree. When exploring solutions, ask yourself "How will this solve the problem?" Dig deeper to think holistically, so that you are looking beyond the short-term and addressing not only the symptoms of the problem but the root causes as well. Part of the accessibility module on every device will include a more robust software package that allows the captions to work effectively, even when there is background noise.



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How to Be an Ally for People with Disabilities

Create a quiz to share what we have learned about accessibility and inclusion with others.

Part 1: Using the same App Inventor login you created for the Translator App and in pairs, complete the QuizMe App Inventor Tutorial here: <https://appinventor.mit.edu/explore/ai2/quizme>

Part 2: After you have completed the tutorial, make a list of 5–8 questions and answers related to accessibility and inclusion.

QUESTIONS	ANSWERS

Modify the QuizMe App to share your knowledge of accessibility and inclusion with others by replacing the questions and answers related to baseball with your list of questions related to accessibility and inclusion.

Part 3: Share your modified QuizMe App with two people outside of class and gather their feedback on your app.

NAME	RELATIONSHIP (FRIEND, FAMILY, TEACHER)	FEEDBACK: ANSWER ONE OF THE FOLLOWING: <ul style="list-style-type: none"> • What did you like about the app? • What did you learn about accessibility and inclusion? • What would you suggest I change to improve the app?

Part 4: Explain how the use of lists manages complexity in your program code by explaining why your program code could not be written, or how it would be written differently, if you did not use the list.



Approaches to Taking Action Information Sheet

DIRECT SERVICE

WHAT IS IT?	Personally engaging with and providing hands-on service to those in need (usually in conjunction with an organization).	
EXAMPLE GOAL	By the end of the semester, we will support a local food bank and shelter by packing and serving food to people in the community. We will also visit our neighboring elementary school and teach a lesson on food insecurity in our community.	
ACTIONS	<ul style="list-style-type: none"> Reach out to local shelters and food banks to arrange a day for the class to visit and provide hands-on support Once a date has been decided, make sure students all have permission to travel to the food bank (if during school hours) 	<ul style="list-style-type: none"> Connect with teachers/administration at local elementary school and arrange to visit a classroom to teach a lesson to young students on food insecurity Create and print worksheets to use with younger students

INDIRECT SERVICE

WHAT IS IT?	Channeling resources to the needs of a community—locally, nationally, or internationally.	
EXAMPLE GOAL	By the end of the year, we will create a storage and donation system for local families in need, where they can access furniture and other household items. We will develop a system for donations, pick-ups, and inventory.	
ACTIONS	<ul style="list-style-type: none"> Conduct research into which items are most needed by community members (e.g., bed frames, dining tables, household goods, etc.) Reach out to local businesses to try to get a storage space donated Connect with school social workers/administration to gain their support Put up flyers around school and in the community, asking for donations (list specific items needed), including instructions on how/where to donate 	<ul style="list-style-type: none"> Develop an online database for tracking donations and pick-ups, and maintaining inventory Share pick-up information with local shelters, churches, community centers, etc. Share the donation system with school social workers, so that they can maintain the project in future years

ADVOCACY

WHAT IS IT?	Educating others about an issue to increase visibility and following up with an action that focuses on enacting change. Actions around advocacy often look like raising awareness, but without a strong call to action within the initiative as a whole. Educating others is not considered service in and of itself.	
EXAMPLE GOAL	Through an informative art piece, we will educate our school community about the waste created by single-use plastic water bottles, and the impact they have on the environment. Then, we will sell reusable water bottles at school, and the proceeds from the sale will go toward clean water projects in developing countries.	
ACTIONS	<ul style="list-style-type: none"> Research the impact of single-use plastic water bottles around the school and in the local community Plan out and create a 3D sculpture that incorporates informative text on the issue of single-use plastics Seek permission from school administration to display the piece in a common area of the school 	<ul style="list-style-type: none"> Design and order water bottles to sell at school Research and select an international organization that focuses on clean water projects Organize a selling schedule for the water bottles, donate profits



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Creating the Action Plan

This outline serves as a basic template for your action plan. Use additional space and resources to help you build out each part with the right amount of detail and flow to ensure you have the strongest action plan that you and your team can implement with ease. Remember, this is your road map for your service project!

TEAM GOAL:

MEASURES OF SUCCESS:

Required Network and Resources

In order to complete this goal, our team will need to develop the following network and access the following resources:

NETWORK:

RESOURCES:

ROLES AND RESPONSIBILITIES

Each team member will take on the following roles and associated responsibilities:

TIMELINE

Our team will use the following timeline to complete tasks and successfully carry out the action to meet our goal(s):



NAME: _____

TEAM MEMBERS: _____

Five Action Planning Pitfalls Tip Sheet

Once your team has completed the major components of your action plan (creating your teams and setting goals, timeline, and network), review the five action planning pitfalls provided below to ensure these have been avoided. Review your plans—individually first, then together as a team. After the review, rework your action plans, if necessary.

Setting an unclear goal

The first and most important part of any action plan is defining the goal, or what you want to achieve. It should be clear and easy to understand, for example, “we want to collect 500 cans of food,” or “we want 200 people to learn about WE Villages.” If the goal is not clearly defined, proper planning will be difficult if not impossible. As a best practice, have a peer from another team review your goal to ensure it is as clear as you hope.

Planning unrealistic actions

After the goal is set, begin planning the actions necessary to achieve it. It is important that the steps make sense and are achievable. Do not plan unrealistic actions, such as working at times that will interfere with schoolwork, overestimating how many people can help out, or planning to go to places that would be difficult for you to reach. Consider each team member’s school and community schedule, such as work and extracurricular activities. Before planning an action, ask yourself, “Is this action realistic?”

Rushing the process

Do not be too hasty in planning actions. While you may be excited to start, proper planning takes time. The better the planning and organization, the more success you will achieve. Even if it means slowing down to figure out details, do not rush and leave out important steps.

Not asking for help

Do not be afraid to ask for help. When a network is created, bigger goals can be achieved faster. Reach out to friends, parents, and mentors. People generally enjoy helping, especially if it is for a worthy cause.

Not learning from mistakes and giving up too quickly

We all make mistakes—it is normal and healthy. Mistakes allow us an opportunity to learn and grow. So, learn from the mistakes. Ask, “Why did this happen?” and “How can I avoid this problem next time?” Actively think about the mistakes and how it will be better the second time around. If something does not go as planned, do not stop!

Notes

Notes

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