Ages 10 - 14 | Design Thinking | Prototype | Programming & Coding | Problem Solving

Social Studies | 120 min | Educator's Guide

Better Sensing Makes Good Sense

Summary: Learners will understand the needs of visually-challenged and hearing impaired people, empathize with the difficulties they face in their lives and develop a mobile app to improve their quality of life.

Key Concepts

Accessibility
Programming
Prototyping

Software

Thunkable

Instructional Objectives

Learners will be able to:

1. Learn the basics of coding, by designing and building a mobile app
2. Identify problems faced by visually-challenged and hearing-impaired people in their daily lives and develop solutions

Learning Outcomes

- Explain the inconveniences faced by visually-challenged and hearing-impaired people in their daily lives
- Design a mobile app that can enhance their quality of life

Real World Application

An app for the visually-challenged or hearing-impaired community.

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1. Lesson Overview

	Activity	Innovation Skill
Introduction (15 min) **Slides 1 – 2**	Discuss the challenges that learners would face in their daily lives if they suffered from visual impairment, color-blindness, or loss of hearing.	Design Thinking (Empathize)
Development (90 min) **Slides 3 – 14**	Discuss the two case studies of people who are visually-challenged or hearing-impaired.	
	Explore Thunkable to design mobile apps that address the problems.	Programming & Coding (Problem Solving)
	Test the mobile apps as solutions to the case studies.	Design Thinking (Prototype)
Conclusion (15 min) **Slides 15 – 17**	Write a reflection on the experience of designing an app and ways to further improve on app creation. Lesson summary.	Social-Emotional Skills

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2. Session Preparation

Logistics

Items
Laptop, Desktop or Chromebook (Recommended: 2 learners per laptop)
Smartphone

Installation

1. Download "Thunkable" app on smartphone for testing.
2. Other things to note:
    - For hardware requirements, please refer to the minimum hardware requirements from the software provider.

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3. Activity Guide

Introduction (slides 1 – 2)

Duration	Slide	Activity
15 min	1	Introduction to lesson.
	2	Begin the lesson by reviewing the five senses and their importance in carrying out daily activities. Learners reflect on this essential question: ▪ How would your life be affected if you had a hearing or visual impairment? Other guiding questions: ▪ Do you know of any people who cannot see well, who are blind or color-blind, or have hearing issues? ▪ What challenges or inconveniences do you think they experience in their daily lives? Engage learners in a discussion. Expected responses may include: ▪ Unable to read printed information, e.g., text messages, product labels in shops, books. ▪ Unable to distinguish colors, resulting in difficulties crossing the road, matching clothing, describing details to others. ▪ Unable to hear or understand what people are saying. Mindset: Design Thinking | Empathize Learners analyze and understand problems from perspectives that are different from their own, which is critical to identifying problems from other people's points of view.

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3. Activity Guide

Development (slides 3 – 14)		
Duration	**Slide**	**Activity**
90 min	3 - 4	Read the case-studies about two people with visual and hearing impairments. *NB – Case studies are on p6.
	5 - 6	Learners explore how to build a Text-to-Speech Converter or Speech Recognition app using Thunkable by: ▪ Selecting one of the case studies and developing a mobile app to solve the problem. ▪ Following a tutorial to build a text-to-speech converter app or speech-recognizer app with Thunkable. ▪ Working in groups of 2 to 4 to build the app.
	7 - 9	Learners follow the instructions on the slide to design their app. ▪ Log into the website http://x.thunkable.com/. ▪ Download the Thunkable app to their smartphones. Learners can preview their app within Thunkable website if they do not have smartphones.
	10	Learners access the website's built-in tutorials. They have 20 minutes to complete 5 tutorials under Thunkable Basics.
	11 - 13	Remind learners of the task: to design a workable app that assists a color-blind person by translating an image to speech: The app allows someone to take a picture, and the phone tells the user what it is. Learners have 20 minutes to experiment and test their codes. Slide 13 shows a sample screen for reference so learners can ensure the camera shutter button is large enough to be used by someone sight-impaired. If learners need support, let them have the coding for the app (slide 13), which they can improve. Skillset: Programming & Coding | Problem Solving Learners employ computational thinking, alongside experimentation and inquiry-based learning, to solve problems in programming and coding.

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3. Activity Guide

Development (slides 3 – 14)

Duration	Slide	Activity
	14	Learners will test the workability of the mobile apps that they have developed and to gather data (a key process for prototyping a product or service): One of the learners tests the app by taking photos wearing a blindfold. Learners listen to feedback from the testing and discuss ideas on improvements to the app. Mindset: Design Thinking | Prototype Learners develop and test scaled-down models of a solution as part of the continuous, iterative process of problem solving while understanding more about the constraints of the problem and the required features of a solution.

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3. Activity Guide

Conclusion (slides 15 – 17)

Duration	Slide	Activity
15 min	15	Learners write a journal entry about their experience developing a mobile app. Remind learners to: ▪ Support their answer with reasons. ▪ Include any problems they encountered and how they solved them. ▪ Say if they would recommend this activity to a friend, and why (not). Mindset: Social-Emotional Skills | Persistence Learners develop their ability to persevere by overcoming challenges and setbacks when accomplishing long-term or higher-order goals.
	16	Educator concludes the lesson with a summary of what was learned: ▪ Understood the needs and problems of people with visual and hearing impairments. ▪ Developed and evaluated a solution. ▪ Learned basic programming. ▪ Learned to collaborate with others.
	17	End of lesson.

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2. Session Preparation

Case Studies

Case Study A

Mark is color-blind and encounters obstacles when shopping online. He has one of the most common visual disabilities affecting men: red and green color-blindness. Mark frequently shops online and sometimes faces problems on websites and with apps where the color contrast of text and images is not adequate and where color alone indicates required fields and sale prices. When red and green color combinations are used, Mark cannot distinguish between the two since both look brown. It is also very difficult for him to make product choices when color swatches are not labeled with the word.

1) Identify the problem.
2) Design an app that will customize font and/or color for people with color-blindness.

Case Study B

Martine is 62 years old and has been hard of hearing since birth. She can hear some sounds, but not enough to understand speech. As a child, she learned sign language and, during her early school years, learned to read and write. She is currently a learner again, taking online college courses.

The university she attends provides sign language interpreters and Communication Access Realtime Translation (CART) writers who provide written verbatim text interpreting of spoken language for her courses. However, Martine has encountered barriers when video and other media content are not captioned.

1) Identify the problem.
2) Design an app that will turn speech into captioned media and transcripts.

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4. Troubleshooting Tips

Common Mistakes & Issues

	Issue	Possible Reasons	Resolution
1	The code doesn't work.	Web didn't sync with the phone app.	Perform a live test and ensure both devices are connected to the internet.
		Code block may not be linked properly or correctly.	Check the tutorial and working file to ensure the codes are written and linked correctly.

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5. Assessment Rubric

Focus	Learning Outcome	Approaching Expectation	Meeting Expectation	Exceeding Expectation
 Design Thinking (Empathize)	Empathy for people with disabilities.	Unable to correctly understand the common difficulties faced by people with disabilities when using the web or an app.	Able to understand the common difficulties that people with disabilities face when using the web or an app.	Able to point out alternative or optimal solutions for managing the various difficulties faced by people with disabilities.
 Design Thinking (Prototype)	Design an app that assists people who are visually- or hearing-impaired in daily activities.	App is not able to address any of the identified problem.	App is able to address the identified problem and can perform basic functions.	App is able to address the problems and is equipped with additional features which value-add to the functionality of the program.
 Programming & Coding (Problem Solving)	Familiarity with Thunkable basics.	Had difficulty understanding the principles and completing the tutorials.	Able to follow instructions and complete the tutorials with some support.	Able to apply creativity in design or improve an app based on skills learned during the tutorial.
	Create an app.	Unable to create a workable app.	Able to make a working app.	Able to improve on the code and create a user-friendly app.