MISSION 7: Personal Billboard	Time: 90 minutes (mission 7) extensions & group notes

Overview:

Have you ever made a sign to post on a door or wall? How about a name badge to wear? Or a cap or t-shirt with a message or slogan on it? In this project, students will build a device that lets them display images or text, and even use the CodeX's buttons to select what is displayed to suit a particular occasion or mood.

Objectives:
- I can create a list to make my code more efficient.
- I can distinguish between string and image data types.
- I can apply an if/else conditional statement to a new program.

Standards:
2-AP-11, 2-AP-16, 2-AP-19
2-CS-03 Systematically identify and fix problems with computing devices and their components

2-AP-12 Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals.

3A-AP-14 Use lists to simplify solutions, generalizing computational problems instead of repeatedly using simple variables.

CSP Framework:
Computational Thinking Practices:

2.B Implement and apply an algorithm

3.C Explain how abstraction manages complexity

4.C Identify and correct errors in algorithms and programs, including error discovery through testing.

6.A Collaborate in the development of solutions.

Key Concepts:
- An infinite loop is a good way to continuously check for button presses, which lets the CodeX act on events as they occur.
- You can use a number variable to track the **state** of the program
- In python, the **==** is used to compare an equality.
- Codespace lets you **inspect variables in the debugger**.
- Python's list is a powerful way to hold a collection of objects.
- You can check the **type** of a variable, and deal with it accordingly.

Preparation:

Make a copy of the assignment or put it in the LMS.
Prepare meaningful notes examples
Prepare formative assessments
Prepare, if time permits, for an extended review

Links:
- Codespace: https://sim.firialabs.com/ Assignment
- Meaningful notes slide deck
- Daily reflection form

Agenda:
- Warm-up (5 minutes)
- Mission 7 (40 minutes)
- Extensions (20 minutes)
- Meaningful notes or extended review (20 minutes)
- Wrap-up (5 minutes)

Vocabulary:
- **Index:** A number that keeps track of what choice should be displayed.
- **Nested Condition:** Another if statement that is part of (embedded in) the block of code in an if statement (an if statement within an if statement).
- **List:** A sequence of items you can access with an index.
- **Comparison Operators**: Operators that let you compare two values; the result is True or False. Comparison operators include: ==, <, >, <=, >=, !=

Assessment:
- Daily reflection form
- Meaningful notes (or notes to your future forgetful self)
- More suggestions listed below in the Walk-Through Wrap-up

Teaching Guide

Warm-up (5 minutes)

The actual coding part of this Mission is about one normal class period. The extensions extend the learning and also incorporate thinking, flowcharts and functions.

👫 **Discuss** – Use a discussion strategy, like journaling, working at boards, selecting random students, or a form of think-pair-share.
- **Topic:** This is a project with *practical* applications. Imagine if everyone at a party or meeting wore CodeX badges like this, to show their name and interests. Or you make this into a cap for a sports team, to give out to all the fans before a big game.

Activity – Mission #7 (40 minutes)

💻 Randomly group students into pairs for pair programming.

Students log in to one computer. Two computers can be used if they want to see instructions on one computer and work on the other computer. However, the assignment document requires snippets, so it will need to be open on the same computer as CodeSpace.

💡 **Teaching tip – Before they start:**
> Review the Mission Reminders slides.
>
> Remind students that they need to document their errors and how they fixed them. There is a table at the end of the document for this.

Students go to sims.firialabs.com and should be at the beginning of Mission 7

💡 **Teaching tip – Objective 1:**
> CodeTrek will give students most of the code, but it includes a comment. Students must create code on their own that accomplishes the task in the comment.

💡 **Teaching tip – Objective 2:**
> Students can use CodeTrek if needed. Still, they will need to add new code on their own. They should have 4 if statements with choice and another if statement for a button press to complete the objective..

💡 **Teaching tip – Objective 3:**
>
> Students will add another if statement for a button push.
>
> Students will open the CONSOLE. There is an animation in the instructions that show them where to find the console. You should be familiar with this so you can assist as needed. They are also asked to use the debugger. They may need a reminder about what to do with the debugger.

💡 **Teaching tip – Objective 8:**
>
> The code will result in an error! Students should be reading the instructions and expecting the error.

💻 **Teaching tip – Extensions:**

The extensions are included in the lesson and should be completed by the students to solidify their learning and practice flowcharts and functions.

💡 **Teaching tip – Extension #1:**

Add a kill switch. Students should have done this several times by now and shouldn't need assistance.

💡 **Teaching tip – Extension #2:**

Students create a flowchart of their program. This can be done by hand, or digitally.

💡 **Teaching tip – Extension #3:**

Students create at least one function and call it in the code. We haven't discussed local and global variables yet, but if they use the if statements with button presses as their function, they include global variables. In Python, a programmer still needs to designate the variable as global in a function. Be prepared to help students with this:

```python
def buttons_push():
    global choice
```

✅ Assignment is complete and ready to turn in. Both students should include their names on the document.

✅ Determine how you want to check-off the student program (turn in text file, submit through LMS, observe on student computer, etc.)

Wrap-Up (5 minutes)

🧑‍🏫 **Vocabulary** – Review the vocabulary for today's lesson:
- **Index:** A number that keeps track of what choice should be displayed.
- **Nested Condition:** Another if statement that is part of (embedded in) the block of code in an if statement (an if statement within an if statement).
- **List:** A sequence of items you can access with an index.

👫 **Discuss** – Use a discussion strategy, like journaling, working at boards, selecting random students, or a form of think-pair-share.

👫 **REVIEW the TOPIC:** This is a project with *practical* applications. Imagine if everyone at a party or meeting wore CodeX badges like this, to show their name and interests. Or you make this into a cap for a sports team, to give out to all the fans before a big game.

✅ **IMPORTANT!!**

Students should clear their CodeX by running their ClearCodeX program.

🎶 **MEANINGFUL NOTES.**

If time permits, this is an excellent time to start (or add to) meaningful notes – or notes to their future forgetful selves (note making). This can be done in groups of three at white boards, or however you choose for the most student engagement. I don't recommend leaving this as homework (lower engagement and less participation).

If you have students work collaboratively, standing at white boards, you can take pictures of their notes and assemble them into a shared Google Doc for the students to use and reference as needed.

Also, if you have time, students can return to their seats and write their own notes. I suggest having them do only Quadrant C and D (their own example and things to remember). All groups are doing Quadrant A and B, and it should be the same for everyone. If you are taking pictures of their notes, you can pick the best A and B to post, and then everyone else's C and D.

You can refer to the slide deck for a suggest Quad A and Quad B

Formative Assessment:
- Daily reflection form
- Completion of assignment and/or mission
- Exit ticket on vocabulary
- Group review on vocabulary
- Students create a vocabulary canvas with vocabulary words.

SUCCESS CRITERIA:
- ❏ Program the buttons to select from a series of images to show.
- ❏ Change the code to make it easy to add lots more images.
- ❏ Mix text messages with a selection of images and color.