Class activity 6

"The Human Function Chain"

To teach students how functions in programming operate by working with inputs, outputs, and hidden logic. This activity will focus on how inputs are processed through a chain of functions to produce an expected output.

Materials:

- 5 boxes or dividers act as the "black boxes" (one for each of the 5 students playing the role of functions)
- Predefined instruction cards for each function (placed inside each box, only visible to the student behind the box)
- Task instruction cards for the "controller" (the sixth student)
- Inputs and outputs are represented by objects, numbers, or simple commands written on cards (for the function chain to process)

Group Setup:

- Divide the students into groups of 6.
- 5 students will stand behind boxes (dividers), representing individual functions.
- One student will stand outside the function chain (acting as the "controller") and be responsible for directing the input/output process but won't know which specific input needs to be sent to which function.

Instructions:

1. Setup for the Functions:

- Each of the five students behind a box represents a different function. They can only see the input passed to them and must apply a specific rule to generate the output. They do not communicate with anyone but the controller through their input/output actions.

- Inside each black box is an instruction card explaining how that particular function processes the input to produce the output. For example:

    ○ Box 1: Add 2 to any number.
    ○ Box 2: Subtract 1 from any number.
    ○ Box 3: Multiply the input by 2.
    ○ Box 4: Return "Hello" + any word.
    ○ Box 5: Return "Yes" if the number is greater than 10, otherwise return "No."

2. Role of the Controller:

- The sixth student (the controller) has the final task instructions, such as "build the word 'HelloWorld'" or "find if the number 6 will be greater than 10 after being processed."
- The controller is not allowed to know the 5 other box's instructions. Their job is to experiment with sending inputs to different boxes and seeing the outputs until they achieve the desired result.
- The controller will choose inputs (from a set of cards or objects) and pass them to the first black box of their choice. They then observe the output and decide which box to send the next input.

3. How the Process Works:

- The first function receives input from the controller (e.g., the number 5).
- Based on the hidden instruction card (e.g., "Add 2 to any number"), the function will output the result (7) and pass it back to the controller.
- The controller then decides where to send the result next, trying to complete their task by passing inputs through multiple functions if needed.
- The process continues until the controller thinks the desired output has been achieved (e.g., sending 6 to Box 1, then to Box 3, might yield 12, which can be sent to Box 5 to receive a "Yes" or "No").

4. Tasks for the Controller:

- Task 1: Build the word "HelloWorld" using the available boxes.
  The controller might need to discover that Box 4 concatenates "Hello" with any word and Box 3 processes numbers.

- Task 2: Determine if a number greater than 10 can be created starting from 4.

- The controller needs to experiment with sending numbers to various boxes (e.g., Box 1 to add 2, then Box 3 to multiply the result) to achieve a number greater than 10, then pass it to Box 5 for a final "Yes/No" answer.

5. Reflection and Discussion:

A discussion will take place after and explain how they figured out the correct input. Additionally, discuss how this mimics the concept of functions in programming and how inputs are processed according to predefined rules, but those rules are often hidden from the function's user.