Lesson Planning Template **Teacher: DeSIRE**

📆**Date:**	**Topic: Manual Button Programming**	**Time Required: 90 minutes**

🎯Learning Target/Objectives:

- **I can** enter and exit manual programming mode on a robotic controller using specific button-press durations.
- **I can** create a multi-action robotic sequence by physically adjusting servo positions and recording them as individual steps .
- **I can** demonstrate the difference between single-execution and continuous-loop playback on robotic hardware.

📜Vocabulary:

- **Manual Programming**
- **Postures**
- **Program Mode**
- **Beep Feedback**
- **End Mode**
- **Continuous Circulation**

❓Guiding Questions:

- Why might a technician in a factory prefer manual button programming over writing code on a laptop?
- How does the robot "remember" where you moved it if you aren't typing in coordinates?
- What are the potential safety risks of running a robot in "continuous circulation" mode versus "run once" mode?

📚Lesson Design Details:

- **Activity 1: The Human-Robot Recording Studio**
  - **Focus:** Students work in pairs. One student is the "Programmer" (pressing buttons) and the other is the "Guide" (moving the arm). They must record a 3-step sequence: Wave, Bow, and Grip.
- **Activity 2: The Loop Timing Lab**
  - **Focus:** Students practice the 3-second long press to trigger continuous running. They must time how long it takes the robot to complete 5 full loops of their programmed action.
- **Activity 3: Troubleshooting the "Silent" Program**
  - **Focus:** Teachers deliberately give students a robot that is powered off. Students must discover why the robot "forgot" their movements, leading to a discussion on how servos need power to maintain a stance.

Key Points (Vocabulary):

-

Key Points of Instruction

- **Feedback Loops:** Teach students to listen for the "beep." This is the only way they will know if the robot has successfully moved from "Operating" to "Programming" mode.
- **Gentle Handling:** Emphasize the word "gently" when rotating servos. Students must understand that forcing a motor can damage the internal gears.
- **Button Timing:** This lesson is a great way to teach "User Experience" (UX) design. Short presses and long presses (3 seconds) trigger different logic in the controller.
- **The "Zero" State:** Before starting, ensure the robotic arm is powered on so the servos have enough holding torque to stay in place once they are positioned.

Teacher’s Cheat Sheet		
Command	**Action Required**	**Resulting Hardware Feedback**
Enter Programming	Long Press **Program** (3s)	Single Beep sound
Save Single Step	Short Press **Program**	Records current servo positions
Exit Programming	Long Press **Program** (3s)	Ends recording mode
Run Once	Short Press **Run**	Executes sequence one time
Continuous Loop	Long Press **Run** (3s)	Repeated execution
Stop Loop	Short Press **Run**	Returns to "Run Once" state
Debugging	Click specific row on the left to modify or delete that step	

Category	Standard Organization	Standard/Benchmark Code and Description
Technology	ITEEA	**STEL-2R:** Follow step-by-step instructions to safely use systems and troubleshoot common problems.
Computer Science	NCSOS	**HS-CS-03:** Illustrate the ways computing systems implement logic, input, and output through hardware components.
Engineering	ITEEA	**STEL-3H:** Optimize a system by identifying and managing various constraints.
Digital Literacy	ISTE	**1.1 Empowered Learner:** Students demonstrate a sound understanding of technology concepts, systems, and operations.
Mathematics	NCSOS	**NC.M1.G-CO.2:** Represent transformations in the plane through physical manipulation of joints.