

 Date:	Topic: Offline_Run_Learning	Time Required: 60 minutes		
<b>🎯 Learning Target/Objectives:</b>				
<ul style="list-style-type: none"><li>• I can differentiate between "online" software control and "offline" hardware execution for a robotic system.</li><li>• I can successfully download and store a specific action sequence into the controller's default offline memory bank (Number 100).</li><li>• I can execute and loop an autonomous robotic program using physical buttons on the hardware controller.</li></ul>				
 Vocabulary:	 Guiding Questions:			
<ul style="list-style-type: none"><li>• Offline Running</li><li>• Tethered</li><li>• Default Slot</li><li>• Autonomous</li><li>• Looping</li><li>• Download Confirmation</li></ul>	<ul style="list-style-type: none"><li>• Why would an engineer want a robot to run "offline" in a factory or home setting rather than keeping it connected to a laptop?</li><li>• Why does the xArm 1S require us to use the specific number "100" for our offline action group?</li><li>• How does the user interface change when you move from software buttons on a screen to physical buttons on a circuit board?</li></ul>			
<b>📚 Lesson Design Details:</b>				
<ul style="list-style-type: none"><li>• <b>Activity 1: The Standalone Challenge</b><ul style="list-style-type: none"><li>◦ <b>Focus:</b> Students select a pre-programmed "Show Action" and follow the steps to download it to Slot 100. They must then unplug the USB and successfully demonstrate the robot running using only the board button.</li></ul></li><li>• <b>Activity 2: The Loop Timing Lab</b><ul style="list-style-type: none"><li>◦ <b>Focus:</b> Students practice the "Long Press" technique. They must time their button hold and verify that the robot executes the "Show Action" at least three times without stopping.</li></ul></li><li>• <b>Activity 3: The "Wait, what happened?" Troubleshooting Lab</b><ul style="list-style-type: none"><li>◦ <b>Focus:</b> Teachers deliberately have students download an action to Slot 1 or Slot 50 and then try the physical button. Students must use their "Diagnostic Skills" to explain why the robot isn't moving based on the "Default Slot" rule.</li></ul></li></ul>				

## Key Points (Vocabulary):

- **Offline Running:** Operating a robot using its internal processor and battery/power adapter without a physical connection to a computer.
- **Tethered:** A state where the robot is physically connected to a PC via a USB wire for programming or debugging.
- **Default Slot:** A pre-programmed memory location (Action Group 100) that the controller is designed to look for when the physical "Run" button is pressed.
- **Autonomous:** The ability of a machine to perform a task without human or computer intervention during the process.
- **Looping:** Setting an action group to be executed repeatedly, triggered by a specific button-press duration (3 seconds).
- **Download Confirmation:** A software prompt that verifies data has been correctly moved from the PC to the robot's hardware.

## Key Points of Instruction

**The Magic Number 100:** This is the most critical technical constraint of the lesson. The controller is hard-wired to execute Action Group 100 when the physical button is pressed. If a student downloads their file to slot 99, the "Run" button will not work.

**The Physical Interface:** Shift student focus from the PC screen to the base of the robot. Point out the "Run" button on the controller board.

- **Timing for Looping:** Teach the difference between a "tap" (runs once) and a "long press" (runs repeatedly). A 3-second hold is the required threshold for repeating the action.

**Safety First:** Remind students that once the robot is in "Offline Mode," it will move as soon as the button is pressed. Ensure the vacuum pads are secure and the area is clear of obstacles before pressing "Run".

## Teacher's Cheat Sheet

Parameter	Data Point / Requirement
Hardware Connection	USB wire for download; disconnect for offline run31.
Software Version	xArm V2.8
Required Slot Number	Number: 100
Download Confirmation	Look for "Download success" prompt

<b>Physical Button</b>	"Run" button located on the controller board
<b>Execution Command</b>	Single tap = Run once; 3-second press = Repeat
<b>Stop Command</b>	Use the "Stop" button on the software if still tethered, or power off

<b>Category</b>	<b>Standard Organization</b>	<b>Standard/Benchmark Code and Description</b>
<b>Computer Science</b>	NCSOS	HS-AP-10: Create procedures with parameters to organize code and make it easier to reuse
<b>Technology</b>	ITEEA	STEL-2R: Follow step-by-step instructions to safely use systems and troubleshoot common problems
<b>Engineering</b>	ITEEA	STEL-3H: Optimize a system by identifying and managing various constraints
<b>Digital Literacy</b>	ISTE	1.5.d: Students understand how automation works and use algorithmic thinking to develop a sequence of steps
<b>Mathematics</b>	NCSOS	NC.M1.G-CO.2: Represent transformations in the plane through coordinate-based servo values