



 Date:	Topic: Setup Development Environment Part II	Time Required: 90 minutes
<p> Learning Target/Objectives:</p> <ul style="list-style-type: none"> • I can successfully install and configure an Integrated Development Environment (IDE) to communicate with robotic hardware . • I can import external software libraries to expand the functional capabilities of a robotic controller . • I can execute a full program lifecycle, including compilation, hardware port verification, and binary data uploading . 		
<p> Vocabulary:</p> <ul style="list-style-type: none"> • IDE (Integrated Development Environment) • Library • COM Port • Compile • Driver • Sketch 	<p> Guiding Questions:</p> <ul style="list-style-type: none"> • Why is it necessary to install a "driver" before the computer can send information to the robotic arm ? • How do software libraries make the job of a robotics engineer easier and more efficient? • What is the difference between "Compiling" a program and "Uploading" a program to the hardware ? 	
<p> Lesson Design Details:</p> <ul style="list-style-type: none"> • Activity 1: The IDE Scavenger Hunt <ul style="list-style-type: none"> ○ Focus: Students navigate the main interface to identify the five primary functional areas: Toolbar, Project Preference, Serial Monitor, Code Editing, and Debugging Prompt. • Activity 2: Library Integration Lab <ul style="list-style-type: none"> ○ Focus: Students follow the step-by-step process to import the "U8g2" zip library. They must verify success by checking the "Include Library" menu . • Activity 3: The "DiDi" Diagnostic (Hardware Verification) <ul style="list-style-type: none"> ○ Focus: Students plug the UNO board into the computer and observe the low-voltage alarm ("DiDi" sound). They must use the Device Manager to identify their specific COM port number . 		

Key Points (Vocabulary):

- **IDE (Integrated Development Environment):** A comprehensive software application (Arduino IDE) used by programmers for software development.
- **Library:** A collection of pre-written code (like "U8g2") that adds specific features to a program, such as controlling an OLED screen .
- **COM Port:** A specific communication interface on a computer used to connect external hardware.
- **Compile:** The process of converting human-readable code into a format that the robotic chip can understand.
- **Driver:** A specialized piece of software that allows the computer's operating system to communicate with the robotic hardware.
- **Sketch:** The term used in the Arduino environment to describe a single program file (.ino format).

Key Points of Instruction

- **Administrative Permissions:** Ensure students have the necessary rights to install drivers. Without the "Adafruit Industries" or chip drivers, the hardware will not be recognized by the software .
- **The Handshake Protocol:** Before uploading, students must always verify the "Board" and "Port" in the Tools menu. Selecting "COM1" (a system port) is a common mistake that will cause an error .
- **Visual Status Checks:** Teach students to watch the "Debugging Prompt Area" at the bottom of the screen. Phrases like "Done compiling" or "Upload successful" are the only ways to verify the hardware received the instructions.
- **Safety During Upload:** Remind students that when a program is "burned" into the controller, the robot may move immediately. Keep fingers and eyes away from the movement zone during this process.
- **Pro-Tip for Educators:** If a student hears a "DiDi" sound when plugging in the USB, explain it is a normal low-voltage alarm triggered because the computer's 5V port is slightly below the robot's 5.6V threshold.

Teacher's Cheat Sheet

Category	Instruction / Data Point
Technical Constraint	Data Point / Requirement

Software Version	Arduino IDE 1.8.12 (Example version)
Space Required	535.3 MB
Default Board	Arduino/Genuino Uno
Alarm Threshold	Activated when voltage is lower than 5.6V
File Format	.ino (Check "File name extension" in View settings)
Toolbar Icons	Checkmark = Compile/Verify; Arrow = Upload.
Serial Connection	5V via USB cable

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-01: Explain how computing systems are designed to exchange information .
Engineering	ITEEA	STEL-2P: Select and use appropriate tools and skills to help do work and achieve a desired outcome .
Digital Literacy	ISTE	1.1 Empowered Learner: Students demonstrate a sound understanding of technology concepts, systems, and operations .
Computer Science	NCSOS	HS-AP-10: Create procedures with parameters to organize code and make it easier to reuse .