

LESSON PLAN

Soldering Brizzlebots as a Making Add-on

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MAKE U IN Lesson Plan

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Lesson Plan

Title of the Lesson	Soldering Brizzlebots as a Making Add-on
Duration	1,5 h
Teaching methods and strategies	 Demonstration of safe soldering techniques Hands-on experiments and guided making Group discussion and creative variation of Brizzlebots Peer collaboration and support
Learning Outcomes	 Understand the concept of energy conversion (electrical to mechanical) Learn safe soldering techniques Construct a functioning Brizzlebot
Steps to be Followed	1 Introduction (10 minutos)
 [Each lesson could be divided into 3 sections: 1. Introduction (5-10 mins) 2. Main Content (30-40 mins) 3. Wrap-Up/Review (5 mins)] 	 Start with a brief explanation of energy conversion: how electrical energy from a battery becomes mechanical movement in the Brizzlebot Show and explain key components: motor, wires, coin cell battery, and vibration brush Demonstrate safe and basic soldering techniques, with a strong emphasis on tool safety and proper handling
	Adaptation for Inclusivity:
	 Provide visual aids or a video demonstration for students who need repeated or non-verbal instruction Use labelled, large-format diagrams of components for students with visual or learning differences

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 Offer tactile models of a Brizzlebot for students who are blind or low vision Use simplified language and printed vocabulary sheets for multilingual learners Allow students with auditory processing difficulties to follow along with captions or written instructions Make available adaptive safety gear (e.g., heat-resistant gloves, larger soldering handles) for students with physical disabilities
2. Main Content (60 minutes)
Step 1: Guided Assembly (15–20 mins)
 Walk students through connecting motor leads and preparing wires. Pre-cut wires may be available for easier handling.
Step 2: Safe Soldering (15–20 mins)
 Under direct supervision, students solder connections between the battery, motor, and wires.
Step 3: Final Assembly and Testing (10–15 mins)
 Attach brushes or vibration elements. Place the battery, test connections, and adjust for balance or function.
Step 4: Creative Variations (Optional / Ongoing)
 Encourage students to personalize their Brizzlebots with materials like pipe cleaners, googly eyes, or colored tape.
Adaptation for Inclusivity:

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Assembly:

•	Use color-coded wires and large print
	guides

- Provide guided hand-over-hand support if needed for wiring
- Allow pairing for students who benefit from peer support

Soldering:

•	Offer optional solderless alternatives (e.g.,
	battery clips or conductive tape) for
	students who are unable or uncomfortable
	using a soldering iron

- Ensure close adult supervision and use of low-heat soldering stations for safety
- Set up a quiet, well-ventilated, distractionfree work zone for students with sensory sensitivities

Testing and Adjusting:

- Offer verbal or visual troubleshooting guides
- Allow different ways of observing success (e.g., tactile vibration, visual movement)
- Provide timers or checklists for students who need help with pacing

Creative Variation:

- Let students choose whether or not to decorate
- Provide a range of materials that accommodate motor or sensory needs (e.g., textured vs. smooth decorations)
- Offer voice-to-text tools for students who wish to name or describe their bots digitally
- 3. Wrap-Up / Review (10 minutes)

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	 Invite students to present their Brizzlebots, either by showing them in action or describing their design choices Facilitate a discussion on energy conversion and how the motor made the bot move Ask reflective questions: What was easy? What was challenging? What would they change next time?
	Adaptation for Inclusivity:
	 Allow students to share in their preferred format—verbally, through drawings, or a short video clip Provide reflection prompts or sentence starters to support those with language or cognitive challenges Create a group board (physical or digital) to showcase all Brizzlebots equally, regardless of how they function Celebrate effort and creativity, not just technical success
Required material and resources	 Small vibrating motors Coin cell batteries Wires (pre-stripped and color-coded, if possible) Soldering irons and lead-free solder Heat-resistant mats and safety goggles Brushes or vibration components (e.g., toothbrush heads) Optional: pipe cleaners, googly eyes, markers for decoration Printed or visual assembly guides Accessible work surfaces and tools for students with mobility challenges

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	 How to Make a Bristlebot – Science Buddies: This guide provides step-by-step instructions on building a simple bristlebot using a toothbrush head, a small motor, and a battery. Intro to Soldering for Kids – Instructables: This tutorial introduces children to the basics of soldering, including vocabulary, safety precautions, and hands-on techniques. <u>Instructables</u>
	 Accessible Making & Inclusive STEM – FabLearn: This resource discusses principles for creating inclusive and accessible making experiences in STEM education. <u>cucfablab.web.illinois.edu</u>
	 Video: Bristlebot Build Tutorial – YouTube: This video demonstrates how to assemble a bristlebot, providing a visual guide to complement written instructions.
	 Soldering Safety Guide for Educators – MakerEd: This PDF outlines safety guidelines for soldering in educational settings, emphasizing best practices to ensure a safe learning environment. <u>Video: Bristlebot Build Tutorial – YouTube</u>
Assessment or evaluation techniques [e.g., Participation in discussions, worksheet completion, group presentations.]	Safe Practice: Observe how students handle tools and follow safety protocols during soldering
	Functionality: Evaluate whether the Brizzlebots move and how well students troubleshoot issues
	Participation: Assess engagement, collaboration, and perseverance during hands-on work

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	Creativity and Reflection: Consider how students
	personalize their bots and reflect on their learning
	experience
Ethical Considerations (if needed)	Safety and Supervision
	 Direct supervision is mandatory during all soldering activities Clear, repeated safety instructions in multiple formats (visual, verbal, tactile) Ensure tools are age-appropriate and cleaned between uses
	Inclusivity and Fair Participation
	 Offer alternatives to soldering for students who cannot or prefer not to use hot tools Ensure every student has access to the necessary materials and time to complete the project Provide optional pair or group work to support collaboration and social inclusion Respect for Diverse Abilities Value all levels of participation—functioning bots, creative effort, or thoughtful reflections Promote peer support and inclusive teamwork throughout the activity
	Environmental Awareness
	 Use rechargeable or recyclable batteries when possible Encourage reuse of materials (e.g., old brushes for bot bases, extra wires for decoration) Discuss responsible disposal of electronics and safe solder waste handling

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