FROM GAME TO GRID: MINECRAFT AS A PATHWAY TO THE ELECTRICAL TRADES

Main discipline:

Physical Science + inquiry, engineering practices, and real-world career exploration

Objective(s):

By the end of this lesson, students will be able to:

- Describe the basic principles of electricity using examples from Minecraft's "Hall of Power" experience.
- Identify how electricians use their knowledge of circuits, energy transfer, and systems thinking to solve real-world challenges.
- Model energy flow by building and testing powered contraptions or systems within a Minecraft world.
- Evaluate design solutions for efficiency and effectiveness in energy transfer, using Minecraft as a simulation tool.
- Apply science and engineering practices to build and "power" a sturcture of their choice.

NGSS Alignment:

Middle School Standards (Grades 6-8):

PS3.B: Conservation of Energy and Energy Transfer

- MS-PS3-2: Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.
- MS-PS3-3: Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.

ETS1.A: Defining and Delimiting Engineering Problems

- MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution.

ETS1.B: Developing Possible Solutions

- MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

ETS1.C: Optimizing the Design Solution

- MS-ETS1-3: Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each.

POWER UP: EXPLORING ELECTRICITY & FUTURE SOLUTIONS WITH MINECRAFT

Skills & Concepts

Critical Thinking - Problem solving the most efficient circuit path, logic gate usage.

Electricity Principles - Concepts like current, resistance, voltage drop, series circuits, switches, relays (simulated with Redstone torches or repeaters), load balancing and troubleshooting.

Materials Needed:

Computer/internet access, Minecraft Education, and suggest a touch screen iPad or computer with mouse.

Hook/Attention Grabber:

See page 3 - Channel your inner Jack Black from "School of Rock!!"

Grade-Levels:

Grades 3-5
Grades 6-8

HOOK/ATTENTION GRABBER:

Presenter (in a dramatic panic):
"Oh no, oh no, oh no! My phone's DEAD! It's dead, it's dead, it's DEAD!"
[Pretends to collapse on the floor dramatically.]
"What if I missed an important call?! What if the president calls me to tell me I won the lottery?! What if I missed my chance to win free pizza for life?!"
[Jumps up frantically.]
"WHERE. CAN. I. PLUG. THIS?! Where's the nearest plug? I'm losing my mind!"
[Runs around the class in a panic, asking students where to plug in the phone.]
[Finally stops and stares at the class.]
"Okay, okay, you guys helped me out, but hold on—WAIT A MINUTE! How does that plug even work? Where's this power even coming from? I'm about to get answers... and YOU'RE gonna learn how to make sure this NEVER happens to you again!"
[Pauses for dramatic effect.]
"That's right. You're about to become electricity experts—and I'm talking full-on phone-saving heroes!"
[Big smile.]
"You guys ready to get this plugged in?!"

Share QR Code for IEC Minecraft Seed and ask students to wait for instructions.

Hall of Power Tour

Introductory Phase

Game Objective: Students explore a guided Minecraft experience to visualize power sources, circuits, switches, and energy storage. As soon as students enter the game, they will be greeted by Mr. Spark.

There are 6 mini stations to explore. Allow 5-10 min for this portion of the game.

Once the Hall of Power is complete, students can then move on to the seventh station in the game - the Grand Finale!

These are self-guided with help along the way from Mr. Spark and his helper, Sparkbot!

Station 1

🔌 **Moo-t the Circuit** 🔌

Simple circuits, light + sound Build a complete circuit to turn on a lamp and stop the cow from mooing.

Station 2

🔌 **Current Events** 🔌

Direction and flow of current
Decide how current must flow in a set direction by using a single switch to control multiple lights.

Station 3

🌙 **Watt Happens After Dark?** 🌙

Create a light-sensing auto-on system that lights up when the environment is dark.

Station 4

⚡ Shocking Results! ⚡

Capture a lightning strike using a lightning rod and distribute the power to light up a row of lamps.

Students must recognize that power weakens over distance (simulating voltage drop) and use redstone repeaters strategically to carry the energy far enough.
Bonus Challenge: Add a backup path or fail-safe for when lightning is unavailable.

Station 5

🛠️ Spark the Solution: Real-World Design Challenge 🛠️

Observe the flow of electricity on the structure. Determine why the flow of electricity is not working and come up with a solution and test it out!

Station 6

⛏️ Piston Impossible ⛏️

Design a redstone-powered piston system that helps a miner move or lift an obsidian block. Students must correctly wire a circuit to power the piston and trigger it with a lever, pressure plate, or timed system.

Hint: Electricity (redstone power) is required to activate the piston and make the mining process more efficient.
Bonus Challenge: Add a 2-step automation using delayed repeaters or multiple pistons for continuous motion.

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Final Creative Station

🏗️ Power Trip! 🏗️

Design and build a Minecraft structure of your choice—it could be a house, barn, amusement ride, secret base, or anything you imagine. But here's the twist: your structure must be powered by the distribution power lines. Once connected, your creation should light up the tower to the answer to this riddle:

We help wires shine bright,
We teach you day or night.
With hands-on work, you'll learn with glee,
What are we? The answer is __ __ __.

Bonus Challenge: Add multiple power features (interior + exterior) or connect them to a single power hub with switches or daylight sensors.

Evaluation (Optional)

⚙️ Circuit Construction Accuracy	Student correctly builds functional circuits using redstone and other power tools.	1	2	3
💡 Application of Concepts	Student demonstrates understanding of energy flow, power sources, and electrical logic.	1	2	3
🎨 Creativity & Innovation	Student shows originality in design and adds personal or imaginative touches to builds.	1	2	3
🤝 Collaboration & Communication	Student works well with others, shares ideas, and helps troubleshoot group challenges.	1	2	3
🔄 Problem Solving & Iteration	Student shows persistence by testing, improving, and optimizing their designs.	1	2	3
🧰 Completion & Engagement	Student completes station tasks, stays on task, and engages actively throughout.	1	2	3

Reflection Questions

💡 **Objective 1: Describe the basic principles of electricity using examples from Minecraft's "Hall of Power" experience.**

- What did you learn about how electricity works from the "Hall of Power"?
- Can you explain how energy moves in a simple circuit in Minecraft?
- What surprised you about how electricity is shown in the game?
- How is energy used in Minecraft similar to how we use it in real life?

💡 **Objective 2: Identify how electricians use their knowledge of circuits, energy transfer, and systems thinking to solve real-world challenges.**

- How do you think electricians use circuits in their jobs?
- Why is it important for electricians to understand how energy moves?
- Can you think of a problem in the real world that an electrician might solve using what you learned?
- What does "systems thinking" mean, and how did you use it today?

💡 **Objective 3: Model energy flow by building and testing powered contraptions or systems within a Minecraft world.**

- What did you build, and how does energy flow through it?
- What was the most challenging part of making your contraption work?
- How did testing your build help you understand energy flow better?
- If something didn't work at first, how did you fix it?

💡 **Objective 4: Evaluate design solutions for efficiency and effectiveness in energy transfer, using Minecraft as a simulation tool.**

- How well did your system use energy?
- What could you change to make your design more efficient?
- How did you decide if your design was effective?
- Did someone else have a design you thought worked better? Why?

💡 **Objective 5: Apply science and engineering practices to build and "power" a structure of their choice.**

- What structure did you choose to build, and why?
- What steps did you take to power your structure?
- How did science or engineering help you solve problems while building?
- If you could build it again, what would you do differently?

💡 **Optional Wrap-Up Questions (General Reflection):**

- What was your favorite part of today's lesson and why?
- What new thing did you learn that you didn't know before?
- What skill are you proud of using or improving today?

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Extension & Modifications

1. Real-World Presentation & Collaboration
Have students create a Minecraft-powered contraption and present it to a local apprenticeship school or contractors. They can explain how they built the model, energy transfer principles, and real-world applications.

2. BIM Expert Visit
Schedule a virtual or in-person meeting with a BIM expert or local contractor to discuss how Minecraft parallels real-world design tools. Students can ask questions and gain insight into professional design processes.

3. Hands-on Circuit Building
Students build physical circuits using batteries, light bulbs, and wires to mimic their Minecraft builds and reinforce circuit concepts.

4. Energy Conservation Project
Have students design an energy-efficient building in Minecraft, considering solar panels, wind turbines, or insulation. They then present their findings to the class.

5. Field Trip to Power Plant or Utility Company
Arrange a field trip to a local power plant or utility company to observe how electricity is generated and transferred.

6. ELA Choose Your "Path" Stories
Scan the QR code or navigate to:
https://ieci.org/workforce/emerging-leaders/industry-impact-project/
Scroll to the "Career Quiz - What's Your Path" Section and select the "Choose Your Own Path" link.

7. Explore the IEC Website
Encourage students, parents, and educators to visit the IEC website to learn more about becoming an electrician and the opportunities available through IEC's apprenticeship programs. This is a great way for families to explore the career path, training options, and potential future careers in electrical work.