

**Course Title:** Build & Program Your Own Computer

**Ages:** 4<sup>th</sup> – 8<sup>th</sup> grade

**Teacher:** Tara Joyce

**Overview:** Students will learn about basic electronics components while they build their own Piper computer and use it to build + program their own circuits using Blockly and write + execute programs in Python to manipulate the world of Minecraft.

**Skills/Knowledge Acquired:**

- Circuitry and current flow – including open/closed circuits and how buttons + switches are used to close circuits.
- Debugging broken circuitry (both virtual and concrete circuits).
- Reading and following blueprints and electronics wiring diagrams.
- Electronic components and their uses, including: LEDs, buttons, switches, & buzzers.
- Definition of programming languages and basic overview of how they're executed/interpreted, as well as a brief comparison of some commonly used languages.
- Blockly programming syntax and use.
- Boolean logic and operators (including Venn Diagrams and truth tables – briefly mentioning binary data).
- Two and three-dimensional coordinate systems (including teleporting and building three-dimensional objects)
- Python syntax and use (including the difference between the shell and using a text editor).
- Debugging programs and interpreting errors.
- Programming concepts including:
  - Variables and data storage – including data types (strings, integers, floats, bools, etc.) and lists/dictionaries
  - Libraries and Classes (importing and uses, not defining)
  - Data input/output (reading in, printing, and displaying to Minecraft)
  - Repeating code with loops (for and while loops)
  - Objects, functions and methods – defining and using (including passing in arguments and returning values from functions)
  - If-statements and coded decision-making
  - Events and event handlers
  - Variable scope and naming conventions
  - Multi-threaded programs, timers, and callback functions

**Vocabulary:** will focus primarily on mathematical/logic terms and programming syntax (ex. “coordinate axis,” “logic operator,” and “event handler”)

**Lesson Focus:** learning about electronic components, programming principles, and terminology through interactive projects and immersive work on the computer they build as well as videos and lessons of general concepts/examples. Some projects can be completed semi-autonomously by following instructional video lessons and asking for help when needed. Students are encouraged to follow their interests and experiment with their own programming ideas.

**Resources:**

- Piper Computer Kit
- Hour of Code (Minecraft Designer, Adventurer, and Hero's Journey)
- Learn to Program with Minecraft: Transform Your World with the Power of Python (By Craig Richardson)
- Fun Learning Company Virtual Build & Program Your Own Computer Lessons

**Assessments:** This course includes a 10-question pre-and post-assessment to determine student growth and comprehension over the entire class, as well as a weekly concept-related driving question, accompanying each virtual lesson.