STEM Week	I'd Like to Be an AI Designer	Biomedical Engineering
Topic	Coding the Brain	
Learning Outcomes	Through completing the coding the brain activity, students will demonstrate their ability to translate basic body movements and responses to inputs into "code".	
ISTE Student Standards	**1.4 Innovative Designer** - Students use a variety of technologies within a design process to identify and solve problems by creating new, useful, or imaginative solutions *1.4a* Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems. *1.4b* Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks. *1.4c* Students develop, test and refine prototypes as part of a cyclical design process. *1.4d* Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems. **1.5 Computational Thinker** - Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions. *1.5a* Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models, and algorithmic thinking in exploring and finding solutions. *1.5b* Students collect data or identify relevant data sets, using digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making. *1.5c* Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving. *1.5d* Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.	
MA STE Frameworks	**The Science and Engineering Practices** 1. Asking questions and defining problems 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematical and computational thinking 6. Constructing explanation and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information ***ETS1. Engineering Design***	

	4.3-5-ETS1-3. Plan and carry out tests of one or more design features of a given model or prototype in which variables are controlled and failure points are considered to identify which features need to be improved. Apply the results of the tests to redesign a model or prototype. **4.3-5-ETS1-5(MA)** Evaluate relevant design features that must be considered in building a model or prototype of a solution to a given design problem. **6.MS-ETS1-1.** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution. Include potential impacts on people and the natural environment that may limit possible solutions. **6.MS-ETS1-5(MA)** Create visual representations of solutions to a design problem. Accurately interpret and apply scale and proportion to visual representations. **6.MS-ETS1-6(MA)**. Communicate a design solution to an intended user, including design features and limitations of the solution. **7.MS-ETS1-2.** Evaluate competing solutions to a given design problem using a decision matrix to determine how well each meets the criteria and constraints of the problem. Use a model of each solution to evaluate how variations in one or more design features, including size, shape, weight, or cost, may affect the function or effectiveness of the solution. **7.MS-ETS1-4**. Generate and analyze data from interactive testing and modifications of a proposed object, tool, or process to optimize the object, tool, or process for its intended purpose. **7.MS-ETS1-7(MA)** Construct a prototype of a solution to a given design problem. ***ETS2. Materials, Tools, and Manufacturing*** **6.MS-ETS2-1(MA)** Analyze and compare properties of metals, plastics, wood, and ceramics, including flexibility, ductility, hardness, thermal conductivity, electrical conductivity, and melting point. **6.MS-ETS2-2(MA)**. Given a design task, select appropriate materials based on specific properties needed in the construction of a solution. **6.MS-ETS2-3(MA).** Choose and safely use appropriate measuring tools, hand tools, fasteners, and common hand-held power tools used to construct a prototype.
Targeted Academic Language (vocabulary)	artificial intelligence (AI) - the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings Robot - any automatically operated machine that replaces human effort, though it may not resemble human beings in appearance or perform functions in a humanlike manner. Coding or programming - involves writing instructions to communicate with machines
Materials	Paper Pencil Classroom materials such as books, puzzles, games, math manipulatives
Resources	What is AI? Design Sheet

Essential Question	What is AI?
Pre Guiding Questions	What can computers and machines do for us? What can't computers and machines do? How do we teach machines and computers to "think"? Should we teach machines and computers to "think"? Why or Why not?
Instructional Procedure	**Introduction (30 minutes)** ● Begin the lesson by having a class discussion using the Pre-Guiding questions. No correct answers are needed at this time - students should simply be sharing their current knowledge. Questions will be answered throughout the lesson. ● Use the [What is AI Deck](#) to introduce students to the basics of AI. **Lesson Development (60 minutes)** ● Working in pairs students will attempt to write "code" to have an advanced robot complete a task. In this case, code is simply detailed step by step directions on how the body should move to complete a task. ● As we don't have AI robots available, the students will act as each other's robot. ● The tasks should be simple things from the classroom. Examples would include writing a student's name, shuffling a deck of cards, sorting math manipulatives, or putting together a puzzle. ● Have students write the code for their task and when they think it is ready the partner can attempt to carry it out. The robot partner should attempt not to think and strictly carry out the process as written on the paper. ● Have students repeat the process of testing and debugging the code so that they have an understanding of the coding process. ● To make it even more challenging you can have them try to add "thinking" into the code. Example for writing a name, what should the robot do if the pencil breaks? **Wrap Up/Closing (10 minutes)** ● Have students discuss the challenges of coding a robot to complete human tasks. ● What should we teach machines to do? Where would it be helpful to reduce human error? ● What shouldn't we teach machines to do? What tasks require judgment or the ability to adapt to incoming information in the moment? ● Do you think it will someday be possible to have a robot that can act like a human?
Assessment	Final written robot instructions
Accommodations/ Differentiation	● Read-aloud ● Scribing ● Peer support

	● Google Translate
Reflection/Next Steps	How will you know if the students retained any of the information presented today? Were the students engaged? If not, what could you do differently next session? If they were engaged, what specific parts of today's lesson worked well? Did you provide enough differentiation so that all students were able to work at their l
Instructional Tips/ Strategies/	Do the activity yourself, before trying it with students. Keep the supplies organized throughout the activity Provide students with time checks throughout the activity
Notes	