Lesson/Unit Title: Art Bots & Kinetic Toys

Grade Level(s): Secondary (9th-12th grade)

Duration: Multi-day (multi-week) Unit

Big Idea/Unit Overview:
To create the art bots, robots would be constructed as a collaborative project with groups of 2-3 students working to build a robot that would become the armature for a kinetic sculpture. After each group completes construction of their robot, all groups would come together for a design challenge. With an hour time frame, students will work under a set of engineering constraints to include a like set of building materials to enhance the outer appearance. Students would record sound effects on the sound chip to complete the project. They would then use the cameras to record the movement and sound of their project to be evaluated for the effects of the outer design and whether the design enhances the movement of the robot. Final recordings would be shared with classmates, parents, and community through various formats such as YouTube, while photographs would serve as documentation in their journals building on 21st century communication skills. Individually, students would study the movement of the art bot to help design their individual kinetic toy using a 3D printer and software.

Essential Questions:
- What is a robot? Does it have to look like a human?
- Why do engineers design and build robots?
- Where do the ideas for how robots work come from?
- Can you think of a situation in which a robot would be necessary or at least helpful?

Objectives/Outcomes:
- Plan and carry out an investigation. Students will obtain, evaluate, and communicate information.
- Work in collaborative groups to build a robot to serve as the armature for a kinetic sculpture.
- Individually engineer a 3D kinetic toy using 3D software and printer.
- Increase in their awareness of robots and the application of robotic technology.
- Understand what makes something a robot.
- Identify several different robots and the tasks that they do.
- Understand that engineers design robots to do specific tasks.
- Design a robot that performs a basic kinetic movement.

Vocabulary: Robotics**,** Engineering

Materials: Robots, Cameras, SD card

Resources (websites, videos, images, books, etc.):
- PBS What is a Robot
- Lego Robots
- Engineering the Red Planet
- Anatomy of a Rover
- Kismet

Procedure:.

Introduction: What Is a Robot?

1. Have students do the following in their notebooks.
    a. Describe a robot.
    b. Draw a picture of a robot.
    c. List the tasks that the robot they drew is capable of performing.
2. Introduce the definition of a robot.
3. Show the LEGO® Robots Video and the Engineering for the Red Planet Video. Discuss why engineers design robots and brainstorm some tasks robots can do.
4. Have students explore a Mars rover in detail using the Anatomy of a Rover Interactive. Have students observe and record the different types of tasks it is capable of performing.
5. Have students identify and observe robots around them, noting the specific functions that they are designed to do.
6. Have students share their results. How has their definition changed?

Demonstration:

7. Discuss where engineers get their ideas for different kinds of robots. Show the RoboSnail Video and the Robofly Video and discuss the different approaches engineers take in designing robots to perform certain functions.
8. Show the Kismet Video and discuss how the idea for this robot was to model how humans interact with one another.
9. End with a discussion about what a robot is. Students should write in their sketchbooks how their ideas have changed and what influenced the change

Process:

10. Have students start a new entry in their sketchbook titled "My Art Bot." Have them write a description of what the robot can do.
11. Ask students to list other design features that are important for their robot.
12. Have students draw at least one picture of what their robot invention might look like.
13. Have students present their robot invention ideas to the class or in small groups.
14. Invite the engineering instructor as a guest speaker.
15. Create their working robot and present.

Assessment:

Student may demonstrate the knowledge in myriad ways, including:

1. Observation, informal note keeping, and formulation of formal written responses, including essays;
2. Maintaining scientific journals, including the creation of artwork alongside written observations to form a digital portfolio with accompanying artist statements; or
3. Evaluation of objectives will be completed with rubrics, journals, digital portfolios and teacher observation

Standards:

	Grades 9-12
NATIONAL CORE ARTS STANDARDS (NCAS): *Visual Art*	**VA:Cr2.1.Ia**. Engage in making a work of art or design without having a preconceived plan. **VA:Cr2.2.IIIa**. Demonstrate understanding of the importance of balancing freedom and responsibility in the use of images, materials, tools, and equipment in the creation and circulation of creative work. **VA:Cr3.1.Ia**. Apply relevant criteria from traditional and contemporary cultural contexts to examine, reflect on, and plan revisions for works of art and design in progress. **VA:Pr5.1.IIa**. Evaluate, select, and apply methods or processes appropriate to display artwork in a specific place. **VA:Cn10.1.Ia**. Document the process of developing ideas from early stages to fully elaborated ideas.
ENGLISH LANGUAGE ARTS COMMON CORE STANDARDS (CCSS):	**CCSS.ELA-LITERACY.WHST.9-10.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
NEXTGEN SCIENCE STANDARDS (NGSS): *(list crosscutting concept)*	**Planning and Carrying Out Investigations Plan** Test a design individually and collaboratively to produce data to serve as the basis for evidence as part of building and revising models, or testing solutions to problems. Consider possible confounding variables or effects and evaluate the investigation's design to ensure variables are controlled. **Obtaining, Evaluating, and Communicating Information** Evaluate the validity and reliability of designs that appear in scientific and technical texts or media reports, verifying the data when possible. Communicate technical information or ideas, the design and performance of a process or system in multiple formats (i.e., orally, graphically, texturally, and mathematically.