Automata in Curriculum

Curriculum

- Math (Measurement, geometry, Algebra)
- Science(Physics, Simple Machines)
- Reading: Technical specifications
- Art: draw out the specifications
- Writing: Describe what the Automata will be able to do and its purpose. Write out the technical specifications with drawings, document processes, instructions for how you put it together and reflections. Document failures and successes. Document creating prototype.

Assessment:

Design Conceptualization.

- Here students have to identify the design objectives and constraints. Making young children as the end users creates a number of Processes
- Creating prototype.
- Objectives to be analyzed. At least three alternative concepts have to be reported. Each member develops and presents a design concept to the team, these are discussed and a method of selection is conducted.
- The creative use of mechanisms and storytelling is also assessed.

Problem Solving

- document problems/failures and how they were resolved

Final Design

- Here students have to demonstrate the effectiveness of transmitting motion, the ease of operational use, complexity of the design (the range of complexity of all projects is significant), robustness, appearance and signs of testing and troubleshooting.

Documentation and Reflection.

- Here students are assessed for the analysis of their design, drawings and sketches, general documentation, and the reflection of how they would improve their automata.

Teamwork.

- Since the teams are formed randomly, there is potential for friction between the members of a team. Thus, individual students are self and peer assessed

Standards:

Grades k/8 Standard Set Investigation and Experimentation:

Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other strands, students should develop their own questions and perform investigations.

Grades k/12 Mathematical Reasoning:

1.0 Students make decisions about how to approach problems:

1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.

1.2 Determine when and how to break a problem into simpler parts.

2.0 Students use strategies, skills, and concepts in finding solutions:

2.1 Use estimation to verify the reasonableness of calculated results.

2.2 Apply strategies and results from simpler problems to more complex problems.

2.3 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.

2.5 Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
3.0 Students move beyond a particular problem by generalizing to other situations:
3.1 Evaluate the reasonableness of the solution in the context of the original situation.
3.2 Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.
3.3 Develop generalizations of the results obtained and apply them in other circumstances.

Grade 2 Standard Set 1.
Physical Sciences: The motion of objects can be observed and measured.
1.c Students know the way to change how something is moving by giving it a push or a pull. The size of the change is related to the strength or the amount of force or the push or pull.
1.d Students know tools and machines are used to apply pushes and pulls (forces) to make things move.

Grade 3 Standard Set 1.
Physical Sciences (Energy and Matter):
1.c Students know machines and living things convert stored energy to motion and heat.
1.d Students know energy can be carried from one place to another by waves, such as water waves and sound waves, by electric current, and by moving objects.

Grade 8 Standard Set 2.
Forces: 2.a Students know a force has both direction and magnitude.

National Academy of Sciences
The National Science Education Standards provide guidelines for teaching science as well as a coherent vision of what it means to be scientifically literate for students in grades K-12. To view the standards, visit this Web site: http://books.nap.edu/html/nses/html/overview.html#content.
This lesson plan addresses the following national standards:

- Unifying Concepts and Processes: Change, constancy, and measurement
- Science as Inquiry: Abilities necessary to do scientific inquiry; Understanding about scientific inquiry
- Physical Science: Motions and forces; Position and motion of objects

Mid-continent Research for Education and Learning (McREL)
McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education addresses 14 content areas. To view the standards and benchmarks, visit http://www.mcrel.org/compendium/browse.asp
This lesson plan addresses the following national standards:

- Science: Physical Science — Understands forces and motion
- Science: Nature of Science — Understands the nature of scientific knowledge; Understands the nature of scientific inquiry
- Mathematics — Understands and applies basic and advanced properties of the concepts of measurement