MA Science Technology/Engineering Curriculum Framework Relating to Robots

Physical Sciences Grades PK-2

3. Describe the various ways that objects can move, such as in a straight line, zigzag, back-and-forth, round-and-round, fast, and slow.
4. Demonstrate that the way to change the motion of an object is to apply a force (give it a push or a pull). The greater the force, the greater the change in the motion of the object.
5. Recognize that under some conditions, objects can be balanced.

Physical Sciences Grades 3-5

4. Identify the basic forms of energy (light, sound, heat, electrical, and magnetic). Recognize that energy is the ability to cause motion or create change.
5. Give examples of how energy can be transferred from one form to another.
6. Recognize that electricity in circuits requires a complete loop through which an electrical current can pass, and that electricity can produce light, heat, and sound.

Physical Sciences Grades 6-8

11. Explain and give examples of how the motion of an object can be described by its position, direction of motion, and speed.
12. Graph and interpret distance vs. time graphs for constant speed. Forms of Energy
13. Differentiate between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.

Technology/Engineering PK-2

2.1 Identify tools and simple machines used for a specific purpose, e.g., ramp, wheel, pulley, lever. 2.2 Describe

Technology/Engineering 3-5

1.3 Identify and explain the difference between simple and complex machines, e.g., hand can opener that includes multiple gears, wheel, wedge, gear, and lever.

2.2 Describe different ways in which a problem can be represented, e.g., sketches, diagrams, graphic organizers, and lists.

2.3 Identify relevant design features (e.g., size, shape, weight) for building a prototype of a solution to a given problem.

2.4 Compare natural systems with mechanical systems that are designed to serve similar purposes, e.g., a bird's wings as compared to an airplane's wings.

Grade 6-8

Engineering Design

Central Concept: Engineering design is an iterative process that involves modeling and optimizing to develop technological solutions to problems within given constraints.

2.1 Identify and explain the steps of the engineering design process, i.e., identify the need or problem, research the problem, develop possible solutions, select the best possible

solution(s), construct a prototype, test and evaluate, communicate the solution(s), and redesign.

2.2 Demonstrate methods of representing solutions to a design problem, e.g., sketches, orthographic projections, and multiview drawings.

2.3 Describe and explain the purpose of a given prototype.

2.4 Identify appropriate materials, tools, and machines needed to construct a prototype of a given engineering design.

2.5 Explain how such design features as size, shape, weight, function, and cost limitations would affect the construction of a given prototype.

2.6 Identify the five elements of a universal systems model: goal, inputs, processes, outputs, and feedback.

4.2 Explain and give examples of the impacts of interchangeable parts, components of mass-produced products, and the use of automation, e.g., robotics.

6.1 Identify and compare examples of transportation systems and devices that operate on or in each of the following: land, air, water, and space.

6.2 Given a transportation problem, explain a possible solution using the universal systems model.
6.3 Identify and describe three subsystems of a transportation vehicle or device, i.e., structural, propulsion, guidance, suspension, control, and support
6.4 Identify and explain lift, drag, friction, thrust, and gravity in a vehicle or device, e.g., cars, boats, airplanes, rockets.