ELOs for STEM---Grades 3-5

Updated May, 2020

Course Description

Students work collaboratively and ethically as they follow the steps of the engineering design process: designing, creating, testing and then improving a model that answers questions or solves a problem.

Big Ideas:

3rd Grade: ***Students will be able to independently use their learning to …***

1. **Apply a step by step process to design and perform investigations to find answers to questions/solve a problem.**
2. **Utilize critical thinking skills to evaluate and solve a problem.**
3. **Apply technology to solve age-appropriate challenges, such as creating digital artifact like games or stories.**
4. **Evaluate a problem in a new and novel situation.**
5. **Identify how forces affect the stability and motion of an object.**
6. **Analyze how traits are passed through generations.**

4th Grade: ***Students will be able to independently use their learning to …***

1. ***Evaluate a problem in a novel situation.***
2. ***Apply a step by step design process to solve a problem.***
3. ***Predict the effects of a collision.***
4. ***Apply general understanding of computer systems to make sense of human-made machines.***
5. ***Apply technology to solve age-appropriate challenges.***
6. ***Develop efficient solutions to computational problems by breaking into sub-problems identifying parts that can be abstracted and modularized.***
7. ***Identify how damage to any part of the nervous system might impact function.***
8. ***Utilize critical thinking skills to solve a problem.***

5th Grade: ***Students will be able to independently use their learning to …***

1. ***Identify behaviors to maintain health and prevent the spread of infection.***
2. ***Apply a step by step process to design and perform investigations to find answers to questions or solve a problem.***
3. ***Utilize critical thinking skills to solve a problem.***
4. ***Evaluate a problem in a novel situation.***
5. ***Apply scientific ideas to address human needs and wants.***

ELO 1 (For all modules, grades 3-5)

ETS1-1 ETS1-2 ETS1-3	• Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. • Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. • Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Additional standards specific to 3rd Grade--Programming Patterns

1B-AP-16 1B-AP-11	• Take on varying roles, with teacher guidance, when collaborating with peers during the design, implementation, and review stages of program development. • Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process.

Additional standards specific to 3rd Grade--Variation of Traits

LS3-1 LS3-2 LS3.A LS3.B	• Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. • Use evidence to support the explanation that traits can be influenced by the environment. • Inheritance of Traits: Many characteristics of organisms are inherited from their parents. Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. • Variation of Traits: Different organisms vary in how they look and function because they have different inherited information. The environment also affects the traits that an organism develops.

Additional standards specific to 3rd Grade--Simple Machines/Forces and Interactions

3-PS2-2 3-PS2-3 3-PS2-4	• Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. • Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. • Define a simple design problem that can be solved by applying scientific ideas about magnets.

ELO 2 (For all modules, grades 4-5)

ETS1.A ETS1.B ETS1.C	• Defining and Delimiting Engineering Problems: Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into accounts. • Developing Possible Solutions: Research on a problem should be carried out before beginning to design a solution. At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. • Optimizing the Design Solution: Because there is always more than one possible solution to a problem, it is useful to compare and test designs.

4th Grade--Energy Collisions
4th Grade--Input/Output: Computer Systems

Additional standards specific to 4th Grade--Input/Output: Human Brain

LS1-2 LS1.A LS1.D	• Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. • Structure and Function: Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. • Information Processing: Different sense receptors are specialized for particular kinds of information, which may then be processed by an animal's brain. Animals are able to use their perceptions and memories to guide their actions.

ELO 3

Specifically for 5th Grade--Infection Detection module

LS2.A	• **Interdependent Relationships in Ecosystems. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or their parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.**

ELO 4

Specifically for 5th Grade--Robotics and Animation module

ESS3-1 **ESS3.C**	• **Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.** • **Human Impacts on Earth Systems: Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. Individuals and communities are also doing things to help protect Earth's resources and environments.**