K-2 Engineering Design		Links
Standards:		Engineering Design (K-2) Children seem to be born with a creative urge to design and build things. Often it takes little more than the presence of raw materials to inspire children to imagine and create forts and dollhouses from cardboard boxes and sandcastles from moist sand near the water's edge. The task for the primary school teacher is to channel this natural tendency by helping students recognize that creative energy can be a means to solve problems and achieve goals through a systematic process, commonly referred to as engineering design. Although engineering design is not a lock-step process, it is helpful to think of it in three stages—defining the problem, developing possible solutions, and determining which best solves the problem. **Defining the problem** begins in kindergarten as students learn that a situation people want to change can be thought of as a problem that can be solved. By the time they leave second grade students should be able to ask questions and make observations to gather information about the problem to they can envision an object or a tool that would solve it. **Developing possible solutions** naturally flows from the problem definition phase. One of the most challenging aspects of this phase is to keep students from immediately implementing the first solution they think of and to think it through before acting. Having students sketch their ideas or make a physical model is a good way to engage them in shaping their ideas to meet the requirements of the problem. **Comparing different solutions** may involve testing each one to see how well it solves a problem or achieves a goal. Consumer product testing is a good model for this capability. Although students in the primary grades should not be held accountable for designing controlled experiments, they should be able to think of ways of comparing two products to determine which is better for a given purpose.
K-2 ETS 1-1	Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.	
K-2-ETS1-2.	Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.	
K-2-ETS1-3.	Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	

	Connections with the other science disciplines help students develop these capabilities in various contexts. In kindergarten students are expected to design and build simple devices. In first grade students are expected to use tools and materials to solve a simple problem and test and compare different solutions. In second grade they are expected to define more complex problems then develop, test, and analyze data to compare different solutions. By the time they leave second grade, students should be able to achieve all three performance expectations (K-2-ETS1-1, K-2-ETS1-2, and K-2-ETS1-3) related to a single problem in order to understand the interrelated processes of engineering design—defining a problem, developing solutions, and comparing solutions by testing them to see which best solves the problem.
21st Century Learning Expectations: • Hinsdale students will communicate through various means • Hinsdale students will be able to solve problems	Link for 21st Century Learning Expectations
Enduring Understandings (cross cutting concepts): • The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2)	

Learning Competencies (engineering practices)	**Essential Questions (core ideas)**

Students will be able to: (NGSS Science and Engineering practices)
 	
• Asking Questions and Defining Problems
 	
Ask questions based on observations to find more information about the natural and/or designed world(s). (K-2-ETS1-1)
 	
Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)
 	
• *Developing and Using Models*
 	
Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2)
 	
• *Analyzing and Interpreting Data*
 	
Analyze data from tests of an object or tool to determine if it works as intended. (K-2-ETS1-3
	How do engineers solve problems?
	
	What is a design for?
	
	What is the process for developing potential design solutions?
	
	How can various design solution be compared and improved?
	
	EQ's above based on these core ideas:
	
	• *ETS1.A: Defining and Delimiting Engineering Problems*
	  ○ A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. (K-2-ETS1-1)
	  ○ Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)
	  ○ Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1)
	
	ETS1.B: Developing Possible Solutions
	
	• Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-2-ETS1-2)
	
	ETS1.C: Optimizing the Design Solution
	
	Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (K-2-ET

EXAMPLE Performance Task (good resource for developing into a Quality Performance Assessment): How Does Your Garden Grow? (link)	