

MEEA's "Not the Standards" Guides to the Missouri Learning Standards – Engineering, Technology and Applications of Science (ETS)

1 Core Idea; 3 Components; 26 Learning Standards

| Core Idea | ETS 1 Engineering Design | | |
|---------------------|--|--|--|
| Components > Grades | A Defining and Delimiting Engineering Problems (9) | B Developing Possible Solutions (11) | C Optimizing the Solution Process (6) |
| K, 1, 2, 4, 5 (3) | 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. | 1. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. | 1. Analyze data from tests of two objects designed to solve the same problem to compare the strength and weaknesses of how each performs. |
| 3 (3) | 1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. | 1. 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. | 1. 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. |
| 6-8 (4) | 1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. | 1. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. 2. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. 3. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. | |
| 9-12 (4) | 1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. 2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. | 1. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. 2. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between System relevant to the problem. | |

Goals of the MEEA NtS Guides

- To help narrow the search for a specific standard with which a lesson aligns,
- to make connections and guide curriculum development for standards covered in the same grade,
- and to provide a map for the development of a concept from Kindergarten to High School so educators know how a concept fits into the big picture, and when might be the best time to teach it based on students' developmental ages.

How to Use the MEEA NtS Guides

- If you have a lesson to teach, scan for the core idea, the component and then the learning standard that fits best – then look up the full standard description at <https://dese.mo.gov/college-career-readiness/curriculum/missouri-learning-standards>

- If you have an audience to teach, scan across its grade level to see which standards might line up with a lesson you have or would like to create – then look it up

NGSS Science and Engineering practices

- ask questions and define problems
- develop and use models
- plan and carry out investigations/fair tests
- analyze and interpret data
- use mathematics and computational thinking
- construct explanations and design solutions CEDS
- engage in argument from evidence
- obtain, evaluate and communicate information

NGSS Cross Cutting Concepts

- Patterns
- Cause and Effect: Mechanism and explanation
- Scale, Proportion and Quantity

- Systems and System Models
 - Energy and Matter: Flows, cycles and conservation
 - Structure and Function
 - Stability and Change
- <https://www.nextgenscience.org>

Socio-scientific Issues

SSI are complex, contested social questions with a scientific component. They provide an authentic opportunity to dig into science concepts. All environmental issues are SSI.

<https://serc.carleton.edu/sp/library/issues/what.html>

5 E Model – Engage, Explore, Explain, Elaborate, Evaluate - <https://bscs.org/bscs-5e-instructional-model>