3-5-ETS1 Engineering Design

Students who demonstrate understanding can:

3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2. 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.

3-5-ETS1-3. 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.

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

ETS1.A: 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 account. (3-5-ETS1-1)

ETS1.B: Developing Possible Solutions
- Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2)
- 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. (3-5-ETS1-2)
- Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3)

ETS1.C: Optimizing the Design Solution
- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3)

Connections to 3-5-ETS1.A: Defining and Delimiting Engineering Problems include:
- Fourth Grade: 4-ESS3-4
- Fourth Grade: 4-PS3-4

Connections to 3-5-ETS1.B: Designing Solutions to Engineering Problems include:
- Fourth Grade: 4-ESS3-2
- Fourth Grade: 4-PS3-3

Connections to 3-5-ETS1.C: Optimizing the Design Solution include:
- Fourth Grade: 4-PS3-3

Articulation of DCIs across grade-bands:
- K-2.ETS1.A (3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3); K-2.ETS1.B (3-5-ETS1-2); K-2.ETS1.C (3-5-ETS1-2),(3-5-ETS1-3); MS.ETS1.A (3-5-ETS1-1); MS.ETS1.B (3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3); MS.ETS1.C (3-5-ETS1-2),(3-5-ETS1-3)

Common Core State Standards Connections:

ELA/Literacy –
- RI.1.5 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (3-5-ETS1-2)
- RI.1.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (3-5-ETS1-2)
- RI.1.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (3-5-ETS1-2)
- W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3-5-ETS1-1),(3-5-ETS1-3)
- W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (3-5-ETS1-1),(3-5-ETS1-3)
- W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (3-5-ETS1-1),(3-5-ETS1-3)

Mathematics –
- MP.2 Reason abstractly and quantitatively. (3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3)
- MP.4 Model with mathematics. (3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3)
- MP.5 Use appropriate tools strategically. (3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3)
- 3-5.OA Operations and Algebraic Thinking (3-5-ETS1-1),(3-5-ETS1-2)

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