3-5. Engineering Design

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A Performance Expectations 3-5.ETS1.ED

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.ETS1.1
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.ETS1.2
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. 3-5.ETS1.3

B Science and Engineering Practices 3-5.ED.SEP

1. Asking Questions and Defining Problems 3-5.ED.SEP.1
   - a Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. (3-5- ETS1-1) 3-5.ED.SEP.1A
2. Planning and Carrying Out Investigations 3-5.ED.SEP.2
   - a Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-5-ETS1-3) 3-5.ED.SEP.2A
3. Constructing Explanations and Designing Solutions 3-5.ED.SEP.3
   - a Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. (3-5-ETS1- 2) 3-5.ED.SEP.3A

C Disciplinary Core Ideas 3-5.ED.DCI

1. ETS1.A: Defining and Delimiting Engineering Problems 3-5.ED.DCI.ETS1.A
   - a 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) 3-5.ED.DCI.ETS1.A.1

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2 ETS1.B: Developing Possible Solutions 3-5.ED.DCI.ETS1.B

a 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) 3-5.ED.DCI.ETS1.B.1

b 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) 3-5.ED.DCI.ETS1.B.2

c 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) 3-5.ED.DCI.ETS1.B.3

3 ETS1.C: Optimizing the Design Solution 3-5.ED.DCI.ETS1.C

a 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) 3-5.ED.DCI.ETS1.C.1

D Crosscutting Concepts 3-5.ED.CC

1 Influence of Science, Engineering, and Technology on Society and the Natural World 3-5.ED.CC.1

a People's needs and wants change over time, as do their demands for new and improved technologies. (3-5-ETS1-1) 3-5.ED.CC.1A

b Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2) 3-5.ED.CC.1B