The 12 engineering design steps as they are applied in this unit are as follows:

1. Defining a problem
2. Brainstorming
3. Researching and generating ideas
4. Identifying criteria and specifying constraints
5. Exploring possibilities
6. Selecting an approach
7. Developing a design proposal
8. Making a model or prototype
9. Testing and evaluating the design using specifications
10. Refining the design
11. Creating or making the final solution
12. Communicating the processes and results

5E Instructional Model

The "5E Instructional Model" developed through Biological Sciences Curriculum Study (BSCS) was intended to help students construct their understanding of science concepts through a structured sequence of learning experiences. The five "E"s—Engagement, Exploration, Explanation, Extension, and Evaluation—are used as a guide for lesson planning. Instruction first Engages students with the items under study. They are guided through the Exploration of the items through structured activities, during which they build their understanding of the items. In the Explanation phase, concepts are clarified as learners articulate their observations and experiences. Students are then asked to Extend their understanding of the concepts by applying them to new situations. The students and their teachers then Evaluate their understandings of the concepts. Enrichment is a sixth step used by the International Technology Education Association (ITEA) to include activities that may be included if time and resources allow to further enhance student understanding.

Engineering Design Model and 5E Instructional Model Combined

The process of designing products, processes, and services, as a lesson planning model, can be correlated to the 5E Instructional Model used in ITEA's Engineering byDesign™ program (Fig.1). This correlation transforms the engineering design process into a lesson-planning model that is supported by the 5E Instructional Model. The 12 steps of engineering design are used as a lesson-planning model in the two lessons of this unit.

Twelve Steps of Engineering Design	Five "E"s
Defining a problem	Engagement
Brainstorming	
Researching and generating ideas	Exploration
Identifying criteria and specifying constraints	
Exploring possibilities	
Selecting an approach	Explanation
Developing a design proposal	
Making a model or prototype	Extension
Specification-based testing and evaluation	
Refining the design	
Creating or making the final solution	Evaluation
Communicating the processes and results	

Figure 1: Model Correlation