Unit 1-4E Design It [STEM Level 2]

Content Area: **Technology**
Course(s): **Technology 6**
Time Period: **MP1-4**
Length: **Once per week**
Status: **Published**

Essential Questions

- What are the resources necessary to identify, describe and explain technological products or systems?
- How can I improve or fix an existing system?
- How can I write/fix an algorithm?

Big Ideas

- Engineering design is a systematic, creative, and iterative process used to address local and global problems.
- The process includes generating ideas, choosing the best solution, and making, testing, and redesigning models or prototypes.
- Engineering design requirements and specifications involve making trade-offs between competing requirements and desired design features.
- Resources need to be utilized wisely to have positive effects on the environment and society.
- Some technological decisions involve tradeoffs between environmental and economic needs, while others have positive effects for both the economy and environment.
- Technology advances through the processes of innovation and invention which relies upon the imaginative and inventive nature of people.
- Technological disparities have consequences for public health and prosperity.

Cross-Curricular Integration

English Language Arts

- RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks

- RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

- RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

- RST.6-8.10 By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.

- SL.6.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.

- SL.6.2. Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.

Science

- MS-ETS1-1 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.
- MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- MS-ETS1-3 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.
- MS-ETS1-4 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.

Career Readiness, Life Literacies and Key Skills Integration

Performance Expectations

- 9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3).
- 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).

- 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries.

- 9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).

- 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1)

- 9.4.8.GCA.1: Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).

- 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.

- 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information.

- 9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b)

- 9.4.8.IML.7: Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8).

- 9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience.

- 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).

- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

- 9.4.8.TL.4: Synthesize and publish information about a local or global issue or event (e.g., MSLS4-5, 6.1.8.CivicsPI.3).

- 9.4.8.TL.5: Compare the process and effectiveness of synchronous collaboration and asynchronous collaboration.

- 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.

Practices

- Act as a responsible and contributing community member and employee.

- Consider the environmental, social and economic impacts of decisions.

- Demonstrate creativity and innovation

- Utilize critical thinking to make sense of problems and persevere in solving them

- Model integrity, ethical leadership and effective management.

- Plan education and career paths aligned to personal goals

- Use technology to enhance productivity, increase collaboration and communicate effectively.

- Work productively in teams while using cultural/global competence.

Enduring Understandings

- 8.2.8.ED.1: Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.
- 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).
- 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team.
- 8.2.8.ED.5: Explain the need for optimization in a design process. **[R]**
- 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product.

- 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches)
- 8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best **[R]**
- 8.2.8.NT.1: Examine a malfunctioning tool, product, or system and propose solutions to the problem.
- 8.2.8.EC.1: Explain ethical issues that may arise from the use of new technologies.
- 8.2.8.EC.2: Examine the effects of ethical and unethical practices in product design and development.

Activities and Assessments

- (Current events) Technology and a Product's history/sustainability; presentation to the class
- (Current Events) Technology and Ethics; presentation to the class
- Activity Resources: National Institute of Environmental Health Sciences: http://kids.niehs.gov/index.htm

Additional Resources

- SciGirls | Mother Nature's Shoes 05: Share and Test Prototypes: https://ny.pbslearningmedia.org/resource/b2fdbb37-278f-4a5d-819b-664b0455cffa/mother-natures-shoes-05-share-and-test-prototypes/ (available in Spanish) **(Diversity, Equity, and Inclusion)**
- Environmental Engineering: Adapting to Rising Sea Levels with Floating Buildings | Sinking Cities: https://ny.pbslearningmedia.org/resource/scities18-sci-float/environmental-engineering-adapting-to-rising-sea-levels-with-floating-buildings/ **(Climate Change)**
- The Design Process: https://ny.pbslearningmedia.org/resource/adptech12.sci.engin.design.idsprocess/the-design-process/