GRADE 5

Unit 0: Engineering and Technology (NGSS)

Overview: Use the Engineering and Technology unit at the beginning of the year to introduce or refresh student learning about Science, Technology, Engineering and Math (STEM) and the design process. This unit also supports the other units throughout the curriculum.

Standards: (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

Instructional Days: Core: 13 days Comprehensive: 22 days

HMH Science Dimensions Program Resources

Unit 1: Engineering and Technology

Unit Video (prototype gear made by a three-dimensional 3D printer); Unit Overview p. 1; Vocabulary p. 3; Making Connections 3H; Unit Project p. 3I; Unit Performance Task pp. 68-69; Unit Review pp. 70-72

Standard for all Units: Interactive Glossary (D); Leveled Readers (D); Beginning-of-Year Test (D/P); Unit Pretest; (D) Lesson Quizzes (D/P); Unit Test (D/P)

Note: Refer to the Curriculum Alignment Common Language (CACL) Guide to decipher acronyms.

Lesson 1: How Are Science and Math Used in Engineering? pp. 4-25

D/P- CYSI (video) Hubble Space Telescope unable to take clear pictures p. 5

P- ENB (prompt) Students explain what they think went wrong with the Hubble Space Telescope and how NASA fixed the problem p. 5 **Lesson 2:** What Is the Design Process? pp. 26-45

D/P- CYSI (digital picture) High Top Hill p. 27

P- ENB (prompt) Using the picture of High Top Hill, students identify a good solution for walking up High Top Hill with a deep trench worn in the path? p. 27
P- ENB (prompt) Students identify background

Lesson 3: How Does Technology Affect Society? pp. 46-67

D/P- CYEI (video) A car designed 50 year ago p. 47

P- ENB (prompt) Why have cars lost their fins and changed in other ways over time? p. 47 D/P- DTM Fuel Efficiency (Students reason abstractly and quantitatively by making

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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.

Objective 1: Explain the purpose of engineering and technology, and give examples of how engineering and math are used in science.

Objective 2: Define problems seen in photographs and maps, using the engineering design process to find good solutions to the problems.

Objective 3: Explain how society affects the evolution and development of technology, describe positive and negative and planned and unintended consequences of technology, and explain tradeoffs.

Topics: Engineering and Technology

Essential Questions: How are science and math used in engineering? What is the Design Process? How does technology affect society?

P- AWYK HO Activity In **Touch with Technology** (With a partner, students take turns describing what the day's breakfast or trip to school would have been like if there were no technology and write down one true statement about technology relating to their description.) p. 6 D/P- Factory Engineering (Students explore technology online to learn more about the machines used to make food.) p. 7 D/P- Tech Knowledge (Students research online one piece of technology and write down the needs or wants that it meets.) p. 10

P- ENB (prompt) Students think about the situation scientists and engineers faced with the Hubble Telescope problem and identify the need or want that the Hubble project had. p. 10 D/P- LS Research Computer Technology

(Students research online

information (that they can collect) that would be useful in deciding how to build the path on the hill? p. 31 D/P- AWYK HO Activity Make a Decision Matrix Students (Students use a table to complete the decision matrix.) p. 33 D/P- LS Background Research (Students use several sources to conduct brief research on the design solutions from the **AWKY HO Activity** brainstorming session.) p. 33 D/P- HO Activity Testing a

Path with a Scale Model (Students collaborate with a team to build a scale model of the problem to get a better understanding of how their solution might work.) pp. 34-37 D/P- Choosing the Best Solution: Zeroing In (Students watch video to discover more about zeroing in on a target and choosing the best solution) pp. 38-39

sense of the quantitative patterns shown in the graph.) p. 50 P- ENB (prompt) Students identify and describe ways in which society has caused changes in the design of cars over time. p. 51 D/P-LS Compare and Contrast (Students select one specific design feature of a car and use print and digital sources to identify ways in which that aspect of car design has changed over time.) p. 51 P- ENB (prompt) Students explain why most technologies have both positive and negative effects. p. 55 D/P- HO Activity Car **Competition (Students** collaborate in teams to design a balloon-powered car.) pp. 56-59 D/P- A Balancing Act (Students watch video to learn more about tradeoffs in automobile design.) p. 61

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and summarize one scientific discovery that faster, more powerful computers made possible.) p. 12 P- ENB (prompt) How did scientists and engineers work together on Hubble? p. 14 D/P- HO Activity Testing Straw Beams (Students collaborate with a partner to see how different bundles of straws can support or not support different weights.) pp. 15-18 D/P- DTM The Eyes Have It (Students generate two

numerical patterns using

P- ENB (prompt) Students

two given rules.) p. 20

record how eyeglasses

improved the vision of

three different people

they know. p. 20

D/P- TIF (enrich) Careers in Science and Engineering: Computer Science p. 20-21 D- Music and Math; Moore's Law D/P- AWYK HO Activity Collaborating and Communicating (Using the brainstorming solutions from the park erosion problem, pairs of students meet with each other to present and discuss their results.) p. 39 P- ENB (prompt) Students explain why testing different solutions to the problem of erosion on the park path would help improve the final design solution. p. 39

D/P- TIF (enrich) People in Science and Engineering: Wangari Maathai p. 41-42 D- Appalachian Trail Maintenance; A Trail Erosion Problem

D/P- Lesson Self Check pp.
43-44
D/P- Lesson Roundup p.
45
D- Lesson Quiz

P- DI (ELL/RTI) p. 3G P- Extension p. 3G P- COLLAB p. 3H P- AWKY HO Activity Make That Sale (Students work in teams of two to create a sketch of a car and design an ad.) p. 62
P- ENB (prompt) Students think how cars have changed since the 1950s and describe how tradeoffs have played a role in changing car designs. p. 62

D/P- TIF (enrich) Careers in Science and Engineering: Safety Engineer pp. 63-64 D- Go Further: Self-Driving Cars; Safety Survey

D/P- Lesson Self Check pp. 65-66 D/P- Lesson Roundup p. 67

D- Lesson Quiz

P- DI (ELL/RTI) p. 3G P- Extension p. 3G P- COLLAB p. 3H P- Connections to Science p. 3H

D- Science Safety HB D- ELA-HB

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P- ENGIT Space Exploration (Students identify how computer models can be used to expand space exploration.) p. 22 D/P- Lesson Self Check pp. 23-24 D/P- Lesson Roundup p. 25 D- Lesson Quiz P- DI (ELL/RTI) p. 3G P- Extension p. 3G P- COLLAB p. 3H P- Connections to Science p. 3H D- Science Safety HB D- CCC-HB D- ELA-HB D- Math-HB D- SEP-HB D- ScienceSaurus Reference HB D- VBP A Cut Above D- YSI Simulation Engineering and Technology: Cat Tree	P- Connections to Science p. 3H D- Science Safety HB D- CCC-HB D- ELA-HB D- Math-HB D- SEP-HB D- ScienceSaurus Reference HB	D- Math-HB D- ScienceSaurus Reference HB

Curriculum Alignment Common Language (CACL) Guide K-5

Acronym	Word/Phrase	Description
AWYK	Apply What You Know	Hands on opportunities for students to apply learning
CER	Claims Evidence Reasoning	Students make a claim and gather evidence along the way (during EXPLORATORY activities) to support claim
CYEI	Can You Explain It	Lesson phenomenon used to ENGAGE students in learning at the beginning of the lesson.
CYSI	Can You Solve It	Lesson phenomenon used to ENGAGE students in learning at the beginning of the lesson.
D	Digital	Program resources and features in interactive digita form.
DI (ELL/RTI) Extension COLLAB Connections to Science	Differentiated Instruction (English Language Learner/Response to Intervention) Collaboration Connections to Science	A page that lists all learning activities used to differentiate learning, engage students in collaborative activities and connect learning to other subjects.
DTM	Do the Math	Integrated subject learning.

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ENB	Evidence Notebook (prompt)	Student notebook or journal used to gather evidence during EXPLORATORY learning activities to support their claims.
ENGIT	Engineer It	Integrated subject learning.
НВ	Handbooks	
ССС-НВ	Crosscutting Concepts	Students who need extra support in grasping concepts or to refresh student knowledge of skills.
ELA-HB	English Language Arts	
М-НВ	Math	
SEP-HB	Science and Engineering Practices	
НО	Hands-On (Activity)	Student collaboration activities.
LS	Language Smarts	Integrated subject learning.
Р	Print	Program resources and features in print form.
TIF	Take It Further (enrich)	Enrichment activities for students in print or digital.
YSI	You Solve It (Simulation)	Open-ended simulation-based learning with multiple answer options.