

Tech Gr 4 Unit 3 - The Nature of Technology: Creativity and Innovation

Content Area: **Technology**
Course(s): **STEM-Technology**
Time Period: **Twelve Weeks**
Length: **3rd Marking Period**
Status: **Published**

Stage 1 - Learning Outcomes

Unit Overview

Standard 8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

Strand C. Design: *The design process is a systematic approach to solving problems.*

Strand D. Abilities for a Technological World: *The designed world is the product of a design process that provides the means to convert resources into products and systems.*

Enduring Understandings

- Manmade products are different from products made by nature.
- Our values affect how technology is used and designed.
- Technologies have changed over time due to human needs.
- Technology systems impact every aspect of the world in which we live.

Essential Questions

- How are products made by man or nature different or the same?
- How do our values affect how technology is used and designed?
- How have technologies changed over time due to human needs?
- What is a technology system?
- When I design a product, how do I know what materials are best?

Interdisciplinary Connections

1. Common Core Literacy

LA.4.CCSS.ELA-Literacy.CCRA.R.7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
LA.4.CCSS.ELA-Literacy.CCRA.W.10	Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.
LA.4.CCSS.ELA-Literacy.CCRA.SL1	Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
LA.4.CCSS.ELA-Literacy.CCRA.SL2	Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
CCSS.ELA-Literacy.W.4.10	Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
CCSS.ELA-Literacy.RF.4.4.a	Read grade-level text with purpose and understanding.
CCSS.ELA-Literacy.SL.4.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.

2. Common Core Math

- CCSS.MATH.PRACTICE.MP3 Construct viable arguments and critique the reasoning of others.
- CCSS.MATH.PRACTICE.MP5 Use appropriate tools strategically.
- CCSS.MATH.PRACTICE.MP6 Attend to precision

3. Career Ready Practices

- CRP1. Act as a responsible and contributing citizen and employee.
- CRP5. Consider the environmental, social and economic impacts of decisions
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

Stage 2 - Assessment

Formative Assessment

Teacher observation of completed projects

Teacher observation of student cooperation and class discussion

End of Unit/Benchmark Assessments

Stage 3 - Learning Plan

Suggested Activities

4th Grade Unit 3

- Select a unit from the Elementary is Engineering curriculum that can be found at EiE.org.
 - For example, use the “No Bones About It: Designing Knee Braces” unit found at <http://www.eie.org/eie-curriculum/curriculum-units/no-bones-about-it-designing-knee-braces> (Corresponds with 4th grade Science unit on the Human Body.)
 - For an example of a teacher teaching this unit, look at <http://blogs.ncs-nj.org/k4stemlab/?p=1335> AND <http://blogs.ncs-nj.org/k4stemlab/?p=1318#more-1318>
 - Engineering is Elementary: <http://www.eie.org/overview/engineering-design-process> and <http://www.eie.org/eie-curriculum/curriculum-units>
 - How EiE Units Correlate to Technology Standards: <http://www.eie.org/sites/default/files/ITEEA.pdf>
- Teacher discussion of the trend of broken iPhone 5 Lightning cables (charger cables) and design flaws.
- Present students with an electrical circuit that is broken. Using their knowledge of circuits, conductors, and insulators, ask them to make the circuit work (For example: [Little Bits](#)).
- Use digital tools to research information for biographies. Share the information and collaborate using a Google document.
- Explore, examine and explain the purpose of trademarks and the impact of trademark infringement on business and ethical considerations in the development and production of the a product from its inception through production, marketing, use, maintenance, and eventual disposal by consumers.
- Create a digital narrative comparing and contrasting the positive and negative effects that a technology product has had on our society.
- Work with peers to redesign an existing product for a different purpose.
 - Example: picture frame repurposed as a vanity tray
 - <http://www.realsimple.com/home-organizing/home-organizing-new-uses-for-old-things/favorite-new-uses>

- Many people don't recycle because they don't know what to do or where to bring materials. As a team investigate ways to recycle in your community (For example: [TerraCycle](#)).
- Design an electronic brochure to inform your class and school of what recycling they can do (e.g., paper, garbage, leaves, electronics, etc.), how and where to do it and the impact of recycling on the environment.
- Urge use of green products, reuse and proper disposal of recyclables. Ask your teacher to assist with disseminating the information to local organizations.
- Video conference students in other states/countries to discuss how they collect water and how it impacts their life and how technology has been used to help any problems in their region (For example: [Ryan's Well](#)).
- Design a keychain for a 3D printer using Thingiverse and Tinkercad: <https://www.tinkercad.com/> (3D Design, Classroom Example: <http://blogs.ncs-nj.org/k4stemlab/?p=1494>)
- Use a Makey Makey Kit to design a product
<http://www.makeymakey.com/>
- Hummingbird Robotics Kit
<http://www.hummingbirdkit.com/>
- Use a MAKEDO Cardboard kit to create something from cardboard alone.
<https://mymakedo.com/>
- Design a product using Purple Mash "2 Design and Make" section.
<https://www.2simple.com/purple-mash>
- Book with many STEM integration ideas: The Invent to Learn Guide to Fun by Josh Burkner

Picture Books to discuss with students (Re: STEM and The Design Process):

- The Most Magnificent Thing by Ashley Spires (risk-taking, failure, redesign)
- What Do You Do With an Idea? by Kobi Yamada (risk-taking, creativity, imagination)
- The Girl Who Never Makes Mistakes by Mark Pett (risk-taking, failure)
- Your Fantastic Elastic Brain by JoAnn Deak (risk-taking)
- Rosie Revere, Engineer by Andrea Beaty (engineering, risk-taking, failure)
- Iggy Peck, Architect by Andrea Beaty (building, risk-taking)

The following Journeys Grade 4 Language Arts lessons also correspond with this unit.

- Lesson 4 - The Kids' Guide to Money
- Lesson 6 - History of Radio
- Lesson 15 - Ecology for Kids
- Lesson 25 - Toys! Amazing Stories behind some great inventions

LESSON STRATEGIES:

- Interactive mini lecture/notes – Students take notes, answer questions, turn and talk, participate in class discussions, look up information in text/online.
 - Do Nows – At start of class, students answer questions, reflect on learning, work on typing.com
 - Video Clips- Shown to aid learning by providing a visual, engage the class
 - Demonstrations- To enhance student learning, ignite curiosity, spur discussion, provide a visual, engage the class
 - Research questions- Students are given a broad question to research. Students answer the question and provide evidence for their responses. (Independent or collaborative)
 - Journaling- Responses to various ideas, thoughts, class activities, and content.
 - Reflecting on Learning- Students self reflect on their learning and “rate” themselves on a learning scale.
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 - Reflecting on Learning- Students self reflect on their learning and “rate” themselves on a learning scale.

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Supportive Strategies

1. Special Education

- Employ assistive technology as needed (For example, use of Dyslexie font, high contrast or screen magnification on Chromebook, or spoken text features)
- Graphic Organizers
- Modifications on IEP
- Providing written and oral directions, utilizing visuals and exemplars. (For example, teacher will demonstrate on Activboard and provide written instructions)
- Reduction in workload
- Repetition and Reinforcement of classroom material
- Strategic Grouping for all group work

2. ESL

- Employing assistive technology as needed (For example, online translation or Language text settings on Chromebook)
- For collaborative assignments, appropriate roles will be assigned. (For example, time-keeper, activity starter)
- Making content culturally relevant
- Partner English Learners with Strong English Speakers
- Providing written and oral directions for all lessons, utilizing visuals and exemplars
- Repeating classroom procedure and routines as much as possible to reinforce language learning
- Visual Aids

3. Student at risk of failure

- Employing assistive technology as needed (For example, use of Dyslexia font, high contrast or screen magnification on Chromebook, or spoken text features)
- Flexible acceptance of missing/lost/incomplete assignment
- Strategic Grouping for all group work

4. Gifted and Talented

- Higher level learners will be provided with more intellectually demanding learning activities
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- Higher Order Questioning
- Utilizing different reading levels appropriate for students

Core Instructional Materials/Resources

- Engineering is Elementary Curriculum (Available for Purchase) <http://www.eie.org/eie-curriculum/curriculum-units>
- Kevin Jarrett K4 STEM Lab Blog <http://blogs.ncs-nj.org/k4stemlab/> This blog details many Elementary is Engineering lessons “in action” with elementary students. Book with many STEM integration ideas: The Invent to Learn Guide to Fun by Josh Burkner Websites: PBS.org (PBS Kids DESIGN SQUAD), buildwithchrome.com Resources: digital readers/tablets, MobiGo, V-Tech, hand held devices, Lego online, Legos, K’Nex, Diagrams
- Materials needed for benchmark: Milk/Juice Carton Straws Coffee stirrers Aluminum foil Dowels Felt Tissue paper Foam balls Fishing line Craft sticks Scotch Tape