1 Day Design Challenge Activities

Content Area: **Business**
Course(s): **Introduction to Engineering Design**
Time Period: **Third Marking Period**
Length: **Year**
Status: **Published**

Unit Overview

Students will perform a functional analysis through non-destructive methods of observation – the product under investigation will remain intact. As part of the functional analysis students will then generate hypotheses of the sequential operations of their products, and identify the inputs and outputs that are indicative of those systems.

STAGE 1- DESIRED RESULTS

2014 NJCCCS - 21st Century Life and Careers

Career Ready Practices

9.1 Personal Financial Literacy

9.2 Career Awareness, Exploration, and Preparation

CAEP.9.2.12.C.1	Review career goals and determine steps necessary for attainment.
CAEP.9.2.12.C.2	Modify Personalized Student Learning Plans to support declared career goals.
CAEP.9.2.12.C.4	Analyze how economic conditions and societal changes influence employment trends and future education.
CAEP.9.2.12.C.6	Investigate entrepreneurship opportunities as options for career planning and identify the knowledge, skills, abilities, and resources required for owning and managing a business.
CAEP.9.2.12.C.7	Examine the professional, legal, and ethical responsibilities for both employers and employees in the global workplace.

9.3 Career & Technical Education

12.9.3.HU.3	Use effective communication with human services clients and their families.
12.9.3.HU.4	Demonstrate ethical and legal conduct in human services settings.
12.9.3.HU.5	Evaluate career opportunities in each of the Human Services Career Pathways.
12.9.3.HU-CSM.1	Summarize necessary credentials, licensures or state-specific requirements to prepare for a career in consumer services.
12.9.3.HU-CSM.2	Communicate product or equipment features that meet the needs of clients and consumers.
12.9.3.HU-CSM.3	Make consumer services recommendations meeting the needs of clients or customers.
12.9.3.HU-CSM.7	Demonstrate knowledge of ethical and legal responsibilities associated with providing consumer services.
12.9.3.HU-CSM.8	Apply business procedures and utilize equipment and facilities to produce satisfying client outcomes.

CCSS- Writing in Introduction to Engineering Design

Text Types and Purposes

LA.11-12.CCSS.ELA-Literacy.CCRA.W.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
LA.11-12.CCSS.ELA-Literacy.CCRA.W.2	Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
LA.11-12.CCSS.ELA-Literacy.CCRA.W.3	Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.
LA.11-12.CCSS.ELA-Literacy.WHST.11-12.1	Write arguments focused on discipline-specific content.
LA.11-12.CCSS.ELA-Literacy.WHST.11-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
LA.11-12.CCSS.ELA-Literacy.WHST.11-12.1a	Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
LA.11-12.CCSS.ELA-Literacy.WHST.11-12.1b	Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.
LA.11-12.CCSS.ELA-Literacy.WHST.11-12.1c	Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
LA.11-12.CCSS.ELA-Literacy.WHST.11-12.1d	Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
LA.11-12.CCSS.ELA-	Provide a concluding statement or section that follows from or supports the argument

Literacy.WHST.11-12.1e	presented.
LA.11-12.CCSS.ELA-Literacy.WHST.11-12.2a	Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
LA.11-12.CCSS.ELA-Literacy.WHST.11-12.2b	Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
LA.11-12.CCSS.ELA-Literacy.WHST.11-12.2c	Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
LA.11-12.CCSS.ELA-Literacy.WHST.11-12.2d	Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
LA.11-12.CCSS.ELA-Literacy.WHST.11-12.2e	Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

Production and Distribution of Writing

LA.11-12.CCSS.ELA-Literacy.CCRA.W.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LA.11-12.CCSS.ELA-Literacy.CCRA.W.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
LA.11-12.CCSS.ELA-Literacy.CCRA.W.6	Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
LA.11-12.CCSS.ELA-Literacy.WHST.11-12.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LA.11-12.CCSS.ELA-Literacy.WHST.11-12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
LA.11-12.CCSS.ELA-Literacy.WHST.11-12.6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge

LA.11-12.CCSS.ELA-Literacy.CCRA.W.7	Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
LA.11-12.CCSS.ELA-Literacy.CCRA.W.8	Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
LA.11-12.CCSS.ELA-Literacy.CCRA.W.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
LA.11-12.CCSS.ELA-Literacy.WHST.11-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
LA.11-12.CCSS.ELA-	Gather relevant information from multiple authoritative print and digital sources, using

Literacy.WHST.11-12.8	advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and over-reliance on any one source and following a standard format for citation.
LA.11-12.CCSS.ELA-Literacy.WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.

Range of Writing

LA.11-12.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.11-12.CCSS.ELA-Literacy.WHST.11-12.10	Write routinely over extended time frames (time for 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- Literacy in Introduction to Engineering Design

Key Ideas and Details

LA.11-12.CCSS.ELA-Literacy.CCRA.R.1	Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
LA.11-12.CCSS.ELA-Literacy.CCRA.R.2	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
LA.11-12.CCSS.ELA-Literacy.CCRA.R.3	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
CCSS.ELA-Literacy.RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
CCSS.ELA-Literacy.RST.11-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
CCSS.ELA-Literacy.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure

LA.11-12.CCSS.ELA-Literacy.CCRA.R.4	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
LA.11-12.CCSS.ELA-Literacy.CCRA.R.5	Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the

	whole.
LA.11-12.CCSS.ELA-Literacy.CCRA.R.6	Assess how point of view or purpose shapes the content and style of a text.
CCSS.ELA-Literacy.RST.11-12.4	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 11–12 texts and topics.
CCSS.ELA-Literacy.RST.11-12.5	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
CCSS.ELA-Literacy.RST.11-12.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integration of Knowledge and Ideas

LA.11-12.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.11-12.CCSS.ELA-Literacy.CCRA.R.8	Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
LA.11-12.CCSS.ELA-Literacy.CCRA.R.9	Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.
CCSS.ELA-Literacy.RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
CCSS.ELA-Literacy.RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
CCSS.ELA-Literacy.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Range of Reading and Level of Text Complexity

LA.11-12.CCSS.ELA-Literacy.CCRA.R.10	Read and comprehend complex literary and informational texts independently and proficiently.
CCSS.ELA-Literacy.RST.11-12.10	By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

Essential Questions

- What is reverse Engineering?

Enduring Understanding

1. Reverse engineering involves disassembling and analyzing a product or system in order to understand

and document the visual, functional, and/or structural aspects of its design.

Students will know...

- Describe the process of reverse engineering, justify the use of reverse engineering and explain the various reasons to employ reverse engineering, including discovery, documentation, investigation, and product improvement, Perform a functional analysis of a product in order to determine the purpose, inputs and outputs, and the operation of a product or system.

Students will be able to...

- Reinforce content learned in class
- Work independently in order to practice modeling skills and concepts
- Communicate ideas using sketching and writing
- Keep a log of activities in an Engineering Notebook.

STAGE 2- EVIDENCE OF LEARNING

Formative Assessment During Lesson

- 3- Minute Pause
- A-B-C Summaries
- Analogy Prompt
- Choral Response
- Debriefing
- Exit Card / Ticket
- Hand Signals
- Idea Spinner
- Index Card Summaries
- Inside-Outside Circle Discussion (Fishbowl)
- Journal Entry
- Misconception Check
- Observation

- One Minute Essay
- One Word Summary
- Portfolio Check
- Questions & Answers
- Quiz
- Self-Assessment
- Student Conference
- Think-Pair-Share
- Web or Concept Map

Authentic Assessments- Suggested

- Students work will be graded according to the PLTW rubrics.

- Daily question and response as we go along in the topic
- Students will be asked to provide examples of certain ideas, or to apply ideas to samples of their own choosing.

Benchmark Assessments

STAGE 3- LEARNING PLAN

Instructional Map

- Students will participate in hands-on design challenges, working as a part of a group
- Each hands-on program is selected to demonstrate an aspect of the engineering design process
- Students will document their work with Engineering Notebooks

Modifications/Differentiation of Instruction

Modification Strategies

- Extended Time
- Frequent Breaks
- Highlighted Text
- Interactive Notebook
- Modified Test
- Oral Directions
- Peer Tutoring
- Preferential Seating
- Re-Direct
- Repeated Drill / Practice
- Shortened Assignments
- Teacher Notes
- Tutorials
- Use of Additional Reference Material
- Use of Audio Resources

Differentiation Strategies

High Preparation Differentiation

- Alternative Assessments
- Choice Boards
- Games and Tournaments
- Group Investigations
- Guided Reading
- Independent Research / Project
- Interest Groups
- Learning Contracts
- Leveled Rubrics
- Literature Circles
- Multiple Intelligence Options
- Multiple Texts
- Personal Agendas
- Project Based Learning (PBL)
- Stations / Centers
- Think-Tac-Toe

- Tiered Activities / Assignments
- Varying Graphic Organizers

Low Preparation Differentiation

- Choice of Book / Activity
- Cubing Activities
- Exploration by Interest (using interest inventories)
- Flexible Grouping
- Goal Setting With Student
- Homework Options
- Jigsaw
- Mini Workshops to Re-teach or Extend Skills
- Open-ended Activities
- Think-Pair-Share by Readiness, Interest, or Learning Style
- Use of Collaboration
- Use of Reading Buddies
- Varied Journal Prompts
- Varied Product Choice
- Varied Supplemental Materials
- Work Alone / Together

Horizontal Integration- Interdisciplinary Connections

Vertical Integration- Discipline Mapping

Additional Materials