Unit 02: Got Design (CTE U1)

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **FY**
Status: **Published**

Standards Alignment

New Jersey Student Learning Standards

Practice 1. Asking questions (for science) and defining problems (for engineering)
Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.

Define a design problem that involves the development of a process or system with interacting components and criteria and constraints that may include social, technical, and/or environmental considerations.

CCSS.Math.Practice.MP5	Use appropriate tools strategically.
CCSS.Math.Practice.MP6	Attend to precision.
SCI.HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
SCI.HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
3-5-ETS1	Engineering Design

Integration of Career Readiness, Life Literacies and Key Skills

12.9.3.ST	Science, technology, engineering & mathematics
12.9.3.ST.3	Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.
12.9.3.ST-ET	Engineering & Technology Career Pathway
12.9.3.ST-ET.1	Use STEM concepts and processes to solve problems involving design and/or production.
12.9.3.ST-ET.5	Apply the knowledge learned in STEM to solve problems.
CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.

CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technology / Integration of Computer Science and Design Thinking

TECH.8.2.12	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.
TECH.8.2.12.A	The Nature of Technology: Creativity and Innovation: Technology systems impact every aspect of the world in which we live.
TECH.8.2.12.A.2	Analyze a current technology and the resources used, to identify the trade-offs in terms of availability, cost, desirability and waste.
TECH.8.2.12.B	Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.
TECH.8.2.12.B.2	Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation and maintenance of a chosen product.

Interdisciplinary Connections: NJSLS for ELA, Social Studies, Science and/or Math Section

LA.K-12.NJSLSA.W	Writing
LA.K-12.NJSLSA.W7	Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation.
LA.W.9-10.7	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.

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media LiteracyNew Section

see Crosswalks

21st Century Life and Careers

Stage I: Desired Results

Transfer/Overview/Rationale

Transfer / Overview / Rationale

Unit Rationale

The purpose of this unit…

This unit will allow students to apply the concepts of design and begin to gain an understanding the cultural, social, economic and political impacts of technology and innovation. These foundations will be built upon in other units and courses within the framework.

Meaning

Essential Questions

Essential Questions

- **What is technology?**
- **How has technology shaped the world that we live in?**
- **What is an efficient way to develop a viable solution to a problem?**
- **What is the benefit of teamwork?**

Enduring Understanding/Indicators of Understanding

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- **Technology is how people modify the natural world to satisfy human needs and wants.**
- **Technology effects both society and the environment and conversely, the environment and society impact technology.**
- **The Engineering Design Process is an iterative process, and not always followed in a linear path.**
- **Everyone has the ability to be creative and innovative.**
- **There are multiple possible solutions to a problem that often have risks and require trade-offs.**

Acquisition (Student Learning Objectives)

Knowledge

Knowledge

Students will know…

- **The differences between the natural vs. designed world.**
- **Each step of the design process and how it is used to problem solve.**
- **How to communicate our design ideas using proper documentation.**
- **What technology is and how it impacts our society.**
- **How working as a team can benefit our designs.**
- **How the design process can be used on a daily basis.**
- **Importance of constraints and how they impact our designs.**
- **How to use various brainstorming methods(morph chart).**

Skills

Skills

Student will be skilled at …

- **Properly make a detailed final sketch for designs.**
- **Apply the design process when during design projects.**
- **Use the technique of the morph chart when brainstorming as well as other brainstorming methods.**
- **Properly apply personal and lab safety at all times in the classroom.**
- **Apply the design process to create a viable solution to a problem.**
- **Collaborate with teammates and peers effectively.**
- **Identify what technology is and how it impacts our society.**

Stage 3: Learning Plan

Resource and Mentor Texts

Resources and Mentor Texts

- **Tools:** sandpaper, hand tools, hot glue guns, scroll saw, drill, dremel, sander(s)
- **Materials:** Rigid foam, glue, paper, graph project, foamcore, wood, pencils
- **Teacher resource:**
    - http://www.useoftechnology.com/what-is-technology/
    - teachengineering.org

Formative Assessment Strategies

Formative Assessment Strategies

- **Exit ticket.**
- **Engineering notebooks.**
- **Notebook checks.**
- **Design sketches.**
- **Twitter board.**
- **Teacher lead questions and discussion.**
- **Morph chart.**
- **Peer feedback.**
- **What is technology worksheet.**
- **Scale model.**
- **What did we learn chart.**
- **KWL chart.**
- **Daily Design Logs.**
- **Feedback meetings with teacher.**
- **Self rating on cleanup/organization.**
- **Presentation practice.**
- **Thumbs up/down/sideways.**

Learning Activities/Unit of Study

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- **Do Now--Review questions, take out materials from the previous day, log on to computers and open up documents, small activity to recap the day before**
- **Review - recap on material that has been covered (questions, discussion, whiteboard)**
- **Lecture on the design process.**
- **Demos- teacher will show student new skills by going through them step by step (illustrator skills, machine demos, brainstorming techniques, tutorials)**
- **Partners/teams - students will work in teams for projects, receive feedback, and complete other assignments.**
- **Review and practice skills using a variety of materials - (machines, programs, brainstorming techniques, work through design challenges/projects)**
- **Student led instruction**
- **Thumbs up/down/sideways - quick formative assessment to gauge students level of understanding.**
- **Jeopardy style review games.**

- **Student presentations- students will present their ideas to the class to receive feedback from their classmates.**
- **Feedback meetings- students will meet with teacher at the conclusion of each step in order to get the teachers approval before moving forward.**
- **Open lab days- students will work on design projects or assignments(students/teams may be at different steps of the project).**
- **Testing and evaluation- students along with the teacher will test student projects and evaluate the projects success.**

Morph Chart.docx
Innovative Phone Stand.pdf
Eng Notebook.pdf
Design Process.ppt
TSA_2015-2016-HS_Structural-Design.pdf
EngineeringDesignProcess.doc

Modifications and/or Accommodations

Suggested Modifications (ELL, Sp. Ed, GIfted, At-risk of Failure)

English Language Learners

Native language support: The teacher provides auditory or written content to students in their native language.

Adjusted Speech: The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

Visuals: The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subjects at hand.

Front-Loading Vocabulary: The teacher front loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

Special Education Students

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the

concepts being covered in a way that makes sense to them.

Extra time: The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

Oral Reading: The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

Timers: The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how much time they have to complete an assignment.

Students with 504 Plans

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Gifted & Talented Strategies

Extensions/Enrichments: Teachers will provide gifted and talented students with extension/enrichment projects. Students will be challenged to further their understanding, to apply acquired knowledge, and/or to produce something in reference to acquired knowledge.

Modify/Change Activities: Teachers will monitor and modify activities to accommodate those students who need to be challenged further. Additional reading, problem-solving, writing, or project work is necessary for those students who are ready to move on at a rate more accelerated than their peers. In this way, G & T students are provided the same opportunity for support as special needs students.

Students at Risk of School Failure

Directions or Instructions: Make sure directions and/or instructions are given in limited numbers. Give directions/instructions verbally and in simple written format. Ask students to repeat the instructions or directions to ensure understanding occurs. Check back with the student to ensure

he/she hasn't forgotten.

Peer Support: Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

Alternate or Modified Assignments: Always ask yourself, "How can I modify this assignment to ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you will need to assign an alternate assignment.

Increase One to One Time: When other students are working, always touch base with your students at risk and find out if they're on track or needing some additional support. A few minutes here and there will go a long way to intervene as the need presents itself.

Contracts: It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of using contracts is to eventually have the student come to you for completion sign-offs.

Hands On: As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record comprehension activities instead of writing them. A child may have to listen to a story being read instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing or sight issues need to be close to the instruction which often means near the front.