

# Unit 06: Got Efficiency? (CTE)

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

## Standards Alignment

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### New Jersey Student Learning Standards

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#### Capacities of the Literate Individual

#### Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

They demonstrate independence.

They use technology and digital media strategically and capably.

CCSS.Math.Practice.MP5	Use appropriate tools strategically.
CCSS.Math.Practice.MP6	Attend to precision.
SCI.HS-PS3	Energy
SCI.HS-PS3-3	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

### Integration of Career Readiness, Life Literacies and Key Skills

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12.9.3.ST	Science, technology, engineering & mathematics
12.9.3.ST.1	Apply engineering skills in a project that requires project management, process control and quality assurance.
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.2	Display and communicate STEM information.
12.9.3.ST-ET.3	Apply processes and concepts for the use of technological tools in STEM.
12.9.3.ST-ET.4	Apply the elements of the design process.
12.9.3.ST-ET.5	Apply the knowledge learned in STEM to solve problems.
12.9.3.ST-SM.4	Apply critical thinking skills to review information, explain statistical analysis, and to translate, interpret and summarize research and statistical data.
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.

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## **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.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.
TECH.8.2.12.D.1	Design and create a prototype to solve a real world problem using a design process, identify constraints addressed during the creation of the prototype, identify trade-offs made, and present the solution for peer review.
TECH.8.2.12.D.4	Assess the impacts of emerging technologies on developing countries.

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## **Interdisciplinary Connections: NJSLs for ELA, Social Studies, Science and/or Math Section**

LA.K-12.NJLSA.W	Writing
LA.K-12.NJLSA.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.

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## **Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media Literacy**

see Crosswalks

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## **21st Century Life and Careers**

## Stage I: Desired Results

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### Transfer/Overview/Rationale

#### Transfer / Overview / Rationale

##### Unit Rationale

The purpose of this unit...

**The purpose of teaching this unit is for students to understand how energy is used and applied in the world around them.**

## Meaning

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### Essential Questions

Essential Questions

- In what ways is energy used in modern society?
- How does the energy that we use affect the environment?
- What social and ethical responsibilities to individuals and organizations have to limit their utilization of energy?
- What are the scientific principles that govern the use and transformation of energy?

### Enduring Understanding/Indicators of Understanding

Enduring Understanding/Indicators of Understanding

- It is possible for energy usage to surpass energy production.

- Energy usage has an impact on the world that we live in.
- Energy is used in the production, transport, use, maintenance, and disposal of products.
- There are natural limitations to how energy can be created and transformed.

## **Acquisition (Student Learning Objectives)**

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### **Knowledge**

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Knowledge

Students will know...

- **Alternative energy sources.**
  - solar, wind, hydroelectric
- **Common sources of energy.**
- **how energy is used.**
- **how companies are innovating products to meet energy concerns.**
- **Differentiate between renewable and non-renewable energy sources.**
- **How to research and document the rate at which they are using energy in their current lifestyle.**
- **How to research and document the carbon footprint that is created based on their energy consumption.**

### **Skills**

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Skills

Student will be skilled at ...

- **Compare and contrast their energy consumption/carbon footprint to those of individuals in other parts of the world in order to create more energy efficient systems.**
- **Create a Public Service Announcement related to alternative energy.**
- **Identify the interfacing of systems in the production and use of energy, and ways in which these systems could be improved.**
- **Demonstrate an understanding of the Engineering Design Process by using it to create a solution to a proposed problem, and document the process.**
- **Safely and accurately use tools to process materials in generating a solution to a problem.**
- **Document the use of the engineering design process to develop a solution to a problem.**
- **Present evidence of a solution to a problem using the data gathered in the testing process.**

## **Stage 3: Learning Plan**

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## **Resource and Mentor Texts**

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### Resources and Mentor Texts

#### **Materials:**

**Wood, plastic, metal or existing case to house the device. Adhesives to hold parts together. Batteries, if needed to power a device. Such as:**

#### **Electronics**

**Insulated 24ga stranded wire in different colors**

**Insulated 24ga solid wire in different colors**

#### **Breadboards**

**Electronic components**

**Construction/Prototyping**

**Wire strippers**

**Electrical tape**

**Wood**

#### **Tools:**

**Basic material processing and electronics tools. Such as:**

Woodworking hand tools

Power tools

Soldering irons

Woodworking power tools

## **Formative Assessment Strategies**

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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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Learning Activities/Unit of Study

- **Do Now-** 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 alternative energies.

- Demos- Teacher will demo how to set up electronics components.
- Students will work in teams to complete a design project.
- Students will review through questions and discussion.
- **Student led instruction**
- Thumbs up/down/sideways - quick formative assessment to gauge students level of understanding.
- 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).
- Students will work on step by step design tutorials.
- Testing and evaluation- students along with the teacher will test student projects and evaluate the projects success.

## **Modifications and/or Accommodations**

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### **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.