

# Unit 02: Whats The Problem

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

## Standards Alignment

---

### New Jersey Student Learning Standards

---

SOC.6.1.12.9	Contemporary United States (1970-Today)
SOC.6.1.12.C.16	Economics, Innovation, and Technology
SOC.6.1.12.C.16.a	Evaluate the economic, political, and social impact of new and emerging technologies on individuals and nations.
SOC.6.1.12.C.16.b	Predict the impact of technology on the global workforce and on entrepreneurship.

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

---

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.2	Use technology to acquire, manipulate, analyze and report data.
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.4	Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.
12.9.3.ST.5	Demonstrate an understanding of the breadth of career opportunities and means to those opportunities in each of the Science, Technology, Engineering & Mathematics Career Pathways.
12.9.3.ST-ET	Engineering & Technology Career Pathway
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.
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.
CAEP.9.2.12.C	Career Preparation
CAEP.9.2.12.C.1	Review career goals and determine steps necessary for attainment.

## **Technology / Integration of Computer Science and Design Thinking**

---

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.A.1	Create a personal digital portfolio which reflects personal and academic interests, achievements, and career aspirations by using a variety of digital tools and resources.
TECH.8.1.12.A.3	Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.
TECH.8.1.12.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.

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

---

LA.K-12.NJSLSA.W	Writing
	Production and Distribution of Writing
LA.K-12.NJSLSA.W4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LA.K-12.NJSLSA.W5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
LA.K-12.NJSLSA.W6	Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
	Research to Build and Present Knowledge
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.11-12.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types

are defined in standards 1–3 above.)

LA.W.11-12.5

Develop and strengthen writing as needed by planning, revising, editing, rewriting, trying a new approach, or consulting a style manual (such as MLA or APA Style), focusing on addressing what is most significant for a specific purpose and audience.

LA.W.11-12.6

Use technology, including the Internet, to produce, share, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

LA.W.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.

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

see Crosswalks

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

### **Stage I: Desired Results**

### **Transfer/Overview/Rationale**

#### **Transfer / Overview / Rationale**

##### Unit Rationale

The purpose of this unit...

**The purpose of teaching this unit is to give students insight on the most important first step an engineer or designer goes through. This unit will allow students to establish and fully understand the problem they will be solving through this independent study.**

### **Meaning**

## Essential Questions

---

### Essential Questions

- What constitutes a good technological/engineering problem statement?
- How do human needs and wants impact the design of a solution as well as the initial problem statement?
- How do global issues impact the design of a solution as well as the initial problem statement?

## Enduring Understanding/Indicators of Understanding

---

### Enduring Understanding/Indicators of Understanding

- A good technological/engineering problem statement is imperative for aiding in the idea creation and problem solving that follows.
- Human wants and needs, ethics and morals, and socially responsible thinking all impact the design of a solution as well as the initial problem statement.
- All technological developments have economic, political, and social impacts both on individuals as well as nations.

## Acquisition (Student Learning Objectives)

---

### Knowledge

---

#### Knowledge

Students will know...

- How to properly set up a professional resume.
- How to setup a website to showcase their design process.
- Each step of the design process.
- How to make informed decisions about the path to research for a design project.
- Skills and knowledge necessary for studying engineering at the higher education level.
- What a proper resume looks like for college/job application.
- How to use research properly when figuring out a design project.
- How human needs and wants impact designs.
- Differences between human needs and wants.
- Proper format for a design problem statement.
- How an engineering notebook is used in the real world.
- The importance of a proper problem statement.
- The differences between inventions and innovations.

- how global issues have an impact on design.

## **Skills**

---

### Skills

Student will be skilled at ...

- **Create and maintain an individual Engineering Notebook(Blog) to document design process and provide reflections.**
- **Develop resume using personal information.**
- **Research and practice the proper format for writing a problem statement.**
- **Research and discuss human needs and wants (Maslow’s Hierarchy of Needs) and how they impact the design process.**
- **Research socially responsible problems and opportunities and how they impact the design process.**
- **Research ethics and morals and how they impact the design process.**
- **Analyze the interaction between technology and society and research, discuss, and give examples of how technology impacts society and how society impacts technology.**
- **Research and give examples of the difference between an invention and an innovation and how they impact the problem statement within the design process.**
- **Analyze the interaction between human needs and wants, social responsibility, ethics, and morals.**
- **Research existing technological developments and how they have impacted both individuals and nations.**
- **Generate ideas for multiple problems to solve and consider for design problem while creating a problem statement using the proper technical writing format.**
- **Summarize the research and brainstorming and describe how the problem statement meets the specification and limitations on the Engineering “Blog” Notebook.**
- **Analyze classmate and teacher feedback to create a final version of the problem statement.**
- **Develop and evaluate Problem Statement.**
- **Edit Problem Statement and provide support for problem background through imagery and content. Present Problem Statement through imagery.**

## **Stage 3: Learning Plan**

---

## **Resource and Mentor Texts**

---

### Resources and Mentor Texts

- **TSA Events:** webmaster and career preparations
- **Website Platform** ( google sites, wordpress)

- Chromebooks/desktops
- <http://www.techinsider.io/>
- <https://www.kickstarter.com/>
- <http://makezine.com/>

## **Formative Assessment Strategies**

---

### Formative Assessment Strategies

- Engineering notebooks/websites.
- Notebook/websites checks.
- Possible problem statements.
- Twitter board.
- Teacher lead questions and discussion.
- Peer feedback.
- Scale model.
- What did we learn chart.
- KWL chart.
- Daily Design Logs.
- Feedback meetings with teacher.
- Self evaluations of progress.
- Presentation practice.
- Thumbs up/down/sideways.
- Website posts.

## **Learning Activities/Unit of Study**

---

### Learning Activities/Unit of Study

- Do now- students will come in answer a question, take out, log on to the computers.
- Discussion and lecture on the design process.
- Open lab days- students will be working on different parts of their projects (websites, problem statement, research, resume).
- feedback - students will meet with the teacher to receive feedback on each step of the design process before moving forward.
- Presentations of progress and ideas- students will present their ideas and progress to the class and receive feedback from their peers.

## **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**

**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.

## **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.