Unit 1: Introduction to Technology (2 weeks)

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

UNIT RATIONALE

Technology is a very broad subject, and humans make decisions to use technology in positive and negative ways. In this unit, students learn how to define and recognize technology, science, and engineering as well as their similarities and differences. Students learn how to create accurate technical drawings that convey information through annotations and drafting standards, and how those drawings are a part of a larger Engineering Design Process. This design process is expanded upon and enumerated into its specific steps as an essential part of the course. Finally, students are shown how to measure for accuracy using a ruler.

ESSENTIAL QUESTIONS

What is technology?
What are the differences and similarities between technology, science, and engineering?
How are technical drawings used to convey information about a product?
What are the steps in the Engineering Design Process?
How is the Engineering Design Process used to solve problems?
How are rulers used to measure?

STANDARDS

NEW JERSEY STUDENT LEARNING STANDARDS: 21st CENTURY

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP5.1	Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new

technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.

NEW JERSEY STUDENT LEARNING STANDARDS: CONTENT AREA

New Jersey (NJSLS) - Grades 6-8 - Computer Science and Design Thinking (2020)

8.2.8.ED.2:

Identify the steps in the design process that could be used to solve a problem.

8.2.8.ED.5:

Explain the need for optimization in a design process.

8.2.8.ITH.2:

Compare how technologies have influenced society over time.

8.2.8.ITH.4:

Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact.

8.2.8.ITH.5:

Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another.

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NEW JERSEY STUDENT LEARNING STANDARDS: COMPUTER SCIENCE AND DESIGN THINKING

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NEW JERSEY STUDENT LEARNING STANDARDS: CAREER READINESS, LIFE LITERACIES AND KEY SKILLS

TECH.9.4.8.CI.3	Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).
TECH.9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries.
TECH.9.4.8.IML.7	Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8).

PRE-ASSESSMENTS

Think-pair-share to define and give examples of technology

Engineering Design Process Organization

Measurement pre-assessment

INSTRUCTIONAL PLAN

MODULE 1

Introduction to Tech Ed

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning about the rules and safety procedures of the tech ed classroom so that I can safely work or and complete technology projects using varied tools and materials.
Student Learning Strategies	Peer learning Self-reflection Class discussion Posted rules Syllabus
Success Criteria	I can follow the rules and safety procedures of the tech ed classroom to safely use tools and materials in my technology projects.
Formative Assessment (drives instructional decisions)	Completion of class activities and participation in discussion.
Activities and Resources	Introduce course and grading procedures.

	Students join Google Classroom, and gain access to all posted course resources (syllabus, course outline, rules, safety, etc.). Review all classroom rules and safety procedures with students, allowing discussion where warranted or where students may have questions or need clarification. If time allows, engage students in a groupwork icebreaker design challenge.
Suggested Modifications	

MODULE 2

What is Technology?

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning to define technology so that I can • differentiate between desirable and undesirable outcomes • explain how its use affects humans in various ways • explain that technology is, itself, neither good nor bad.
Student Learning Strategies	Think-pair-share Class discussion Research Writing prompts Self-reflection Peer learning Cooperative learning
Success Criteria	I can define technology as the modification of the natural environment to satisfy human wants and needs. I can describe technology as neither good nor bad - it is how it is used that produces desirable or undesirable outcomes that affect people positively or negatively.

Formative Assessment (drives instructional decisions)	Think-pair-share Feedback and participation during discussions Completion of research activities
Activities and Resources	1. Pre-assessment: Think-pair-share - teacher writes “Technology” on the board and students are instructed to think of a definition and come up with 3 examples. Students pair up with a neighbor to share their definitions and examples and come up with a consensus definition. After, pairs share their definitions and examples with the class - teacher categorizes the types of definitions on the board (computers, electronics, communication, etc.). 2. Give students definition of **technology** - the modification of the natural environment, through human designed products, systems, and processes, to satisfy needs and wants. Discuss this new definition, and make connections with students’ definitions and examples. 3. Write “Science” and “Engineering” on the board. Students research and locate 2-3 different definitions for each, using a variety of sources. Students will discuss what they found and compare teacher-provided topics to technology, science, and engineering fields to see how they are similar and different. 4. Give students definitions for **Science** (the study of the natural world), and **engineering** (a process that combines science, math, and technology to solve practical problems). 5. Teacher explains how the use of technology can affect humans in various ways - including safety, comfort, choices, and attitudes about its development and use. Class gives some good/bad examples to discuss. Discuss how in all these examples the technology is neither good nor bad, but decisions made by humans that use it can have desirable or undesirable outcomes (intended or unintended). Class gives examples of how technology viewed as “bad” can be good, that viewed as “good” can be bad, and how the technology is not to blame - the outcomes are either desirable or undesirable; planned or unplanned. 6. Students are given the assignment to think of how technological products impact their daily lives - list 10

	technological products that they encountered between waking up and arriving at school. For each, identify its desirable or undesirable outcomes. Students share their lists and discuss how technology is neither good nor bad, but its outcomes can be desirable or undesirable based on user intentions. (can be related to post-use products/landfills/recycling)
Suggested Modifications	

MODULE 3

Technical Sketching

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning about technical sketching so that I can create detailed, labeled blueprints that represent my design ideas.
Student Learning Strategies	Class discussion Research Sketching prompts Self-reflection Peer learning Cooperative learning Visual models
Success Criteria	I can accurately represent a design with a technical sketch. I can label a drawing to show important details in a technical sketch.
Formative Assessment (drives instructional decisions)	Feedback and participation during discussions Completion of research and technical sketching/annotating activities Completion of design process journal
Activities and Resources	1. Students are asked to draw one of a variety of items provided by the teacher to the best of their ability on ¼" graph paper (items should have a variety of parts with different functions - ex pipe wrench, tape measure, etc.).

2. Once sketches are made, students compare theirs with a partner and together point out important parts or features that are part of the sketches. Ask if there were any parts that a partner saw that they did not.

3. Students now work in pairs to:

- Give each sketch a title
- Label important parts with an arrowed leader line
- Write the date
- Sign their name

4. Students evaluate the sketching process in class discussion (guiding questions):

- What was easy?
- What was hard?
- How do you feel you did?
- What is the difference between sketching technically and artistically?
- Did you pay close attention to details?
- Why were notes written on the sketches?
- Why did you sign and date it?
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	How do engineers document their work? 5. Blueprint research activity - students search McMaster-Carr's website to view blueprints for various products and make a list of similarities between the technical drawings. After research, discuss with the class and come up with a standardized list of things technical drawings in the class should have. (7 things: Dates, artist/creator, labels, measurements, title, drawings, materials) 6. After creating the list as a class, students make note of the requirements and construct the engineering design process journals they'll be using in the class. Teacher walks students through labeling a two-pocket folder with name, class, period, teacher, and room number. The blueprint "legend" and initial labeled sketch are stored in the new journal. Any new sketches, brainstorming, notes, etc. will be recorded, labeled, and stored in the journal, as well. 7. The teacher discuss and demonstrates for students: • the purpose of sketching • Sketching lines, shapes, forms • Orthographic drawings • Isometric drawings After the demonstration, students find an object in the room and test their new technical sketching skills, making sure to include the elements of the technical drawing list created previously, annotating to provide clarity of purpose of the object. When complete, students can share their drawings with neighbors or the class.
Suggested Modifications	

MODULE 4

Rulers and Measurement

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning about rulers and measurement so that I can create accurate technical sketches for projects.
Student Learning Strategies	Peer learning Self-reflection Class discussion Safety and tool practice Visual models Teacher and peer modeling
Success Criteria	I can use a ruler to read an object's measurement. I can divide inches into fractions for precise measurement.
Formative Assessment (drives instructional decisions)	Students will be assessed on understanding of safety procedures and accuracy through measuring activities.
Activities and Resources	Introduce ruler measurement and get class baseline through a pre-test. As they complete the pre-test, students read through a short handout explaining how rulers are used to find measurements. Begin class discussion on measurement - invite students to the board to help draw a large ruler - breaking up into 1/2s, 1/4s, 1/8s, 1/16s, and 1/32s. Explain that this is how rulers are divided, and that in some careers, it's even more specific. For our purposes, we shouldn't need to worry about anything more precise than 1/16s. After discussion, give students a measuring activity to complete. Lay out a number of objects throughout the shop, and have students record the length and width of each. Next day: Review measurement info from previous day.

	Hand out rulers and give students a measurement assessment. They will have to measure lines on a page as well as length and width of scrap lumber in the shop. When complete, students should go back to previous technical sketches to add measurements, if needed.
Suggested Modifications	If needed to help demonstrate creating fractions: Hand ou sheets of paper about 2”x8 ½”. Walk students through folding it in half over and over to replicate 1/2s, 1/4s, 1/8s etc. Students can use this to help in their practice in the future.

MODULE 5

The Engineering Design Process

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning about the engineering design process so that I have a model to follow to solve problems like an engineer.
Student Learning Strategies	Class discussion Research Self-reflection Peer learning Cooperative learning Visual models
Success Criteria	I can describe the engineering design process as a series of steps which can be performed in different sequences o repeated as needed. I can explain each step of the engineering design process and how it is important to the whole. I can use the engineering design process to describe how a design problem could be solved.
Formative Assessment (drives instructional decisions)	Feedback and participation during discussions Completion of research and analysis activities

	Completion of design process journal adjustments
Activities and Resources	1. Break students into groups of 3-4 and hand out index cards. Groups are tasked to write down the steps of the engineering design process (ask, imagine, plan, create, improve, communicate - one on each card) and organize them into some kind of order (open-ended). While students work, teacher moves around room, asking students to defend their decisions. When groups have made their sequences, they are called on to explain and justify why. 2. Once students have made their arguments, review proper sequence and clarify student understanding. The engineering design process is typically followed in a certain order, but it can bounce around. Ask, imagine, plan, create, improve, communicate is typical, but engineers will often repeat steps and bounce forward/backward as new knowledge is gained. Compare to scientific methods and explain that while there's no standard that all of STEM follows, all typically involve collecting evidence, using logical reasoning, and the application of imagination in creating hypotheses and explanations that make sense of the collected evidence. 3. Full explanation of each of the steps in the design process, using an example relevant to students (ex. Developing a cell phone or new phone app). Each studen uses a sheet of paper or the back of one of the index cards previously to record the EDP and notes. When complete, students will put this (and their technical drawing) legend in the left side of their EDP journal folder and all sketches and design notes in the right. 4. Following this discussion, students are put into groups of 3 to research and put together an analysis of how each step may have been completed in the development of a product (ex. A video game, board game, sports equipment, food, etc. - each group should choose something different). When complete, student groups share their analysis and get feedback from peers and the teacher.
Suggested Modifications	

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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 t 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 t 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 l 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. Studer will be challenged to further their understanding, to apply acquired knowledge, and/or to produce something in reference 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 direction 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 us the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or tw 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 assignmen or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk studen 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 t

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, a 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 o 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 issue need to be close to the instruction which often means near the front.

INTERDISCIPLINARY CONNECTIONS: NEW JERSEY STUDENT LEARNING STANDARDS FOR ELA, SOCIAL STUDIES, SCIENCE AND/OR MATHEMATICS

LA.RST.6-8.4	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 6-8 texts and topics.
LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
LA.WHST.6-8.4	Produce clear and coherent writing in which the development, organization, voice, and style are appropriate to task, purpose, and audience.
LA.WHST.6-8.6	Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
LA.WHST.6-8.7	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

REFLECTIONS

Activity 2 - Taking a little longer than a day. Suspect it will take 2 start to finish. Students engaged in discussions, but many have difficulty coming up with a definition and instead just give examples. - took 3 start to finish

Technical sketching - 7 elements of a blueprint:

- labels
- measurements
- drawings
- title
- author
- date
- materials