Unit 2: Research and Design (6 weeks)

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

UNIT RATIONALE

Once background information has been covered (cities, infrastructure, zoning, the engineering design process, and the Future City competition focus of the year), it is time to put that knowledge to work. Students learn how to perform an extended, cooperative research project using a planner as a framework to write a cohesive essay that describes a future city imagined by each student group. Students learn to prioritize and compress information in a creative way and make proper MLA citations to stay within the parameters of the Future City competition. The information researched and included in the essay helps to set up the city footprint/blueprint and future projects throughout the course.

ESSENTIAL QUESTIONS

What is project management?
What are goals, milestones, and deliverables?
What is city planning?

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.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
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.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an 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.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
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.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

NEW JERSEY STUDENT LEARNING STANDARDS: CONTENT AREA

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

8.1.8.DA.1:

Organize and transform data collected using computational tools to make it usable for a specific purpose.

8.2.8.ED.1:

Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.

8.2.8.ED.2:

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

8.2.8.ED.3:

Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).

8.2.8.ED.7:

Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches).

8.2.8.ITH.2:

Compare how technologies have influenced society over time.

CS.6-8.8.1.8.DA.1	Organize and transform data collected using computational tools to make it usable for a specific purpose.
CS.6-8.8.2.8.ED.1	Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.
CS.6-8.8.2.8.ED.2	Identify the steps in the design process that could be used to solve a problem.
CS.6-8.8.2.8.ED.3	Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).
CS.6-8.8.2.8.ED.7	Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches).
CS.6-8.8.2.8.ITH.2	Compare how technologies have influenced society over time.

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

TECH.9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
TECH.9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).
TECH.9.4.8.CT.3	Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.
TECH.9.4.8.DC.1	Analyze the resource citations in online materials for proper use.
TECH.9.4.8.DC.2	Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8).
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).
TECH.9.4.8.IML.12	Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience.

NEW JERSEY STUDENT LEARNING STANDARDS: COMPUTER SCIENCE AND DESIGN THINKING

CS.6-8.8.1.8.DA.1	Organize and transform data collected using computational tools to make it usable for a specific purpose.
CS.6-8.8.2.8.ED.1	Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.
CS.6-8.8.2.8.ED.2	Identify the steps in the design process that could be used to solve a problem.
CS.6-8.8.2.8.ED.3	Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).
CS.6-8.8.2.8.ED.7	Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches).
CS.6-8.8.2.8.ITH.2	Compare how technologies have influenced society over time.

PRE-ASSESSMENTS

Project Plan Part 2

INSTRUCTIONAL PLAN

MODULE 1

SAVED

Activity 1 - Project Management

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning about the specifications and requirem of the Future City Competition so that I can comple project plan, create a work schedule, plan a build schedule, and be prepared to reflect on the challen I am learning about project management so that I c set realistic goals and milestones for a long-term pr
Student Learning Strategies	Peer learning Self-reflection Class discussion Cooperative learning Group ideation Project management
Success Criteria	I can work collaboratively with a group. I can create a reasonable project plan that meets F City competition goals in a realistic way.
Formative Assessment (drives instructional decisions)	Feedback and participation during class discussion Successful completion of the second part of the pro plan.

Activities and Resources	Reiterate the requirements of the competition and t importance of scheduling work for the semester. Introduce the concept of project management and p of the Project Plan, wherein students will begin taki project responsibilities. Each group member will wo with their teammates to determine the best course action to complete all project deliverables by their required goal dates. Reiterate/provide students with a course schedule hard due dates for deliverables. Relate Project Plar the engineering design process. Students finish any brainstorming and begin workin through their preliminary schedule.
Suggested Modifications	

MODULE 2

Activity 2 - Essay Research and Planning

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning about cities so that I can ideate and flesh out a detailed description of a future city. I am learning to conduct research so that I can develop realistic ideas for my city's infrastructure, zoning, services, and features.
Student Learning Strategies	Peer learning Self-reflection Class discussion Cooperative learning Group ideation Research Project management
Success Criteria	I can work collaboratively with a group. I can perform research to better understand a subject.

	I can use research to help me create a project with realistic goals.
Formative Assessment (drives instructional decisions)	Feedback and participation during class discussions. Daily check-ins Successful completion of the essay Planning Google Slides template, with noted citations and design ideas.
Activities and Resources	Introduce students to the Planning Google Slides template for the essay deliverable. Students finish any previous incomplete work. When complete, students begin research to design and describe their cities. Reiterate the importance of citations (record the web address of any information found to be expanded later in the essay references). Encourage students to use the resources available to them through previous assignments as well as new ones found when researching topics. As ideas are generated, students should be sketching out examples of how they might be implemented in their city model in the next unit. Relate the current assignment to the engineering design process.
Suggested Modifications	

MODULE 3

Activity 3 - Essay Writing

Student Learning Intentions (SLI) WALT:	I am learning about cities so that I can ideate and flesh out a detailed description of a future city. I am learning to conduct research so that I can develop realistic ideas for my city's infrastructure, zoning, services, and features. I am learning to research and write a descriptive essay so that I can fully describe the important

(We are learning to…)	aspects of a city of my group's design.
Student Learning Strategies	Peer learning Self-reflection Class discussion Cooperative learning Group ideation Research Essay writing Project management
Success Criteria	I can work collaboratively with a group. I can perform research to better understand a subject. I can use research to help me create a project with realistic goals. I can use a narrative, descriptive essay as the format to convey detailed information about a project.
Formative Assessment (drives instructional decisions)	Feedback and participation during class discussions. Daily check-ins Successful completion of a city essay that meets rubric requirements. Successful application of MLA formatting for references.
Activities and Resources	Reiterate specifics of the competition essay. Students continue research into circular economy principles, cities, and urban planning. Students begin to write first drafts of their Future City Essays using their ideas and research. Frequent feedback should be given to students each class period, as well as between periods when requested to ensure students are keeping up with the project and getting over any hurdles that may appear. As students come up with ideas, they should be encouraged to again sketch them out for their model. Additionally, students can continue using the virtual city simulator to test out any ideas long-term to see if they are viable.

	When students near completion of their first drafts, demonstrate how to create a properly formatted MLA citation for any and all information used from resources. A great way to help with this is https://www.citationmachine.net/ and https://owl.purdue.edu/owl/research_and_citation/mla_style/mla_style_introduction.html Students turn in their first drafts for grading against the competition rubric. Teacher provides detailed feedback in the form of the fully detailed rubric as well as descriptive comments highlighting parts of the essay (in Google Docs). After initial grading, students have until a week before the competition due date for the essay deliverable to make changes and request more feedback.
Suggested Modifications	

MODULE 4

Activity 4- City Planning Footprint/Blueprint

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning about cities so that I can ideate and flesh out a detailed map and model of a future city. I am learning to conduct research so that I can develop realistic ideas for my city's infrastructure, zoning, services, and features. I am learning to create a city plan map so that I can ensure all important aspects of my city design are included thoughtfully in my city model.
Student Learning Strategies	Peer learning Self-reflection Class discussion Cooperative learning Group ideation Research City planning through map design

	Project management
Success Criteria	I can work collaboratively with a group. I can perform research to better understand a subject. I can use research to help me create a project with realistic goals. I can use research and practice to help me create a model of a sector of my group's future city.
Formative Assessment (drives instructional decisions)	Feedback and participation during class discussions. Daily check-ins Successful completion of a city blueprint and creative style.
Activities and Resources	Introduce the model/slideshow. Some student groups will reach this activity before others - make sure students know that this is fine, as long as each group continues on its track from Project Plan 2. Introduce exemplar slideshows, and review map/blueprint drawing. Have students begin planning the construction of their cities by researching existing city plans and creating an initial labeled blueprint of the full city footprint. When the footprint/blueprint is complete, students should endeavor to create an artistic and aesthetic style for the structures and features of their city. Give examples from previous years' cities and demonstrate how this can be accomplished with a couple current designs. Relate these steps to the engineering design process, and the engineering profession.
Suggested Modifications	

SUGGESTED MODIFICATIONS

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

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.

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.

REFLECTIONS

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.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
LA.RST.6-8.10	By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
LA.WHST.6-8.2.A	Introduce a topic and organize ideas, concepts, and information using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia) when useful to aiding comprehension.
LA.WHST.6-8.2.B	Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
LA.WHST.6-8.2.C	Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

LA.WHST.6-8.2.D	Use precise language and domain-specific vocabulary to inform about or explain the topic.
LA.WHST.6-8.2.E	Establish and maintain a formal/academic style, approach, and form.
LA.WHST.6-8.2.F	Provide a concluding statement or section that follows from and supports the information or explanation presented.
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.6-8.5	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
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.6-8.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
LA.WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.
LA.WHST.6-8.10	Write routinely over extended time frames (time for research, reflection, metacognition/self correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.