Unit 1: Introduction to Future City (4 weeks)

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

UNIT RATIONALE

Students learn about the engineering design process and broaden their understanding of the qualitie and components that define a city. They learn about the functions of a city for its people, infrastructur and zoning. They learn how geography and diversity play into city planning. Additionally, each year th competition incorporates a different challenge - students learn about the challenge and participate in activities that aim to foster a deeper meaning of the challenge.

ESSENTIAL QUESTIONS

What is a city?

What is infrastructure and why is it important?

What is zoning and what role does it play in city planning?

What are the benefits of using the engineering design process?

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.

NEW JERSEY STUDENT LEARNING STANDARDS: CONTENT AREA

SAVED

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

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.5:

Explain the need for optimization in a design process.

8.2.8.ED.6:

Analyze how trade-offs can impact the design of a product.

8.2.8.ITH.1:

Explain how the development and use of technology influences economic, political, social, and cultural issues.

8.2.8.ITH.2:

Compare how technologies have influenced society over time.

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.5	Explain the need for optimization in a design process.
CS.6-8.8.2.8.ED.6	Analyze how trade-offs can impact the design of a product.
CS.6-8.8.2.8.ITH.1	Explain how the development and use of technology influences economic, political, social, and cultural issues.
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

PFL.9.1.8.EG.3	Explain the concept and forms of taxation and evaluate how local, state and federal governments use taxes to fund public activities and initiatives.
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.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.DC.2	Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8).
TECH.9.4.8.TL.2	Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).

NEW JERSEY STUDENT LEARNING STANDARDS: COMPUTER SCIENCE AND DESIGN THINKING

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.5	Explain the need for optimization in a design process.
CS.6-8.8.2.8.ED.6	Analyze how trade-offs can impact the design of a product.
CS.6-8.8.2.8.ITH.1	Explain how the development and use of technology influences economic, political, social, and cultural issues.
CS.6-8.8.2.8.ITH.2	Compare how technologies have influenced society over time.

PRE-ASSESSMENTS

Students answer questions about the qualities of cities individually, then share answers in class discussion.

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

Activity 1 - What is a City?

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning about cities so that I can define what goes into creating a city.
Student Learning Strategies	Research Peer learning Self-reflection Class discussion Cooperative learning
Success Criteria	I can describe a city as a complex set of systems that is dependent upon people, their needs, and a number of other unique goals. I can describe challenges that cities face and how they differ from smaller communities. I can collaborate with classmates to complete an assignment effectively.
Formative Assessment (drives instructional decisions)	Feedback and participation during discussions Review of What is a City research assignment
Activities and Resources	Students will be introduced to the question “What is a city?” Students will view informational videos about city contents, planning, and improvement. (TedXCity, City2.0). Students will work individually to research and answer questions about what makes a city. Students will reconvene as a class to discuss answers.
Suggested Modifications	

MODULE 3

Activity 2 - What is infrastructure?

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning about infrastructure so that I can begin to plan for the needs of a city.
Student Learning Strategies	Research Peer learning Self-reflection Class discussion Cooperative learning
Success Criteria	I can describe infrastructure as the components needed for the operation of society in a city. I can collaborate with classmates to complete an assignment effectively.
Formative Assessment (drives instructional decisions)	Feedback and participation during discussions Review of What Is Infrastructure assignment
Activities and Resources	Introduce Infrastructure: https://www.youtube.com/watch?v=wpvbVyUCi78&t=1s Students will work in randomly assigned groups to research and give examples of different types of infrastructure systems. Students will work with their team to create a working definition of the term “infrastructure.” Students will share their definitions with the class and discuss.
Suggested Modifications	

MODULE 4

Activity 3 - What is zoning?

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning about zoning so that I can understand the importance of dividing up and categorizing different areas

	of a city for specific uses.
Student Learning Strategies	Research Peer learning Self-reflection Class discussion Cooperative learning Visualization through drawing
Success Criteria	I can describe zoning as the way in which land in a city gets divided up and categorized. I can recognize that zoning regulations and laws help ensure that a city can grow and change in a manageable, safe, and attractive way.. I can collaborate with classmates to complete an assignment effectively.
Formative Assessment (drives instructional decisions)	Feedback and participation during discussions Completion of Simple City drawing.
Activities and Resources	Review infrastructure – the components needed for the operation of society in a city. Google Classroom Q: What does a city planner do? Show video about city/town planners. Share with students: • City planners work with city officials, engineers, architects, lawyers, and developers to create specific zones for how land will be used within a city. Zones usually fall into one of the following categories: ◦ Residential - where people live. Can be high-density (apartments, townhomes), or low-density (single-family homes).

- Commercial - stores and restaurants
- Industrial - factories and power plants
- Agricultural - farmland (food is grown/raised)
- Mixed use - blend of zones.
- Municipal - government, hospital, schools, etc.

Students work individually to define a zoning vocab word each. Once complete, students share their definitions with the class. Add full list to assignment for student review.

Lead student discussion on zoning:

- What might you expect to find in each of the different zones?
- Why is zoning an important factor to consider when planning a city?
- How is zoning related to a city's infrastructure and services?

	• What happens when thoughtful zoning has not been executed? After discussion, students work to complete a simple city plan, including zones of different densities, and simple representations of infrastructure. When complete, students will walk around the room to see their peers work and give comments and feedback.
Suggested Modifications	

MODULE 5

Activity 4 - Zoning and City Planning

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning about zoning so that I can understand the importance of dividing up and categorizing different uses of areas of a city for specific uses. I am learning how cities grow so that I can better understand their requirements to keep citizens happy.
Student Learning Strategies	KWL Chart Peer learning Self-reflection Class discussion Cooperative learning Visualization through software
Success Criteria	I can describe zoning as the way in which land in a city gets divided up and categorized. I can recognize that zoning regulations and laws help ensure that a city can grow and change in a manageable, safe, and attractive way.. I can collaborate with classmates to complete an assignment effectively.
Formative Assessment (drives instructional	Feedback and participation during discussions

decisions)	Participation in KWL chart and City Simulation software.
Activities and Resources	Review definition of zoning from previous day. Introduce KWL chart for the class and ask students to add info to K and W. Introduce SimCity and web alternative (another) for city planning and simulation. • Simulation will explore zoning, infrastructure, budgets and taxes, and systems thinking. Students will work with city simulator to experience planning a city. Students will reflect on what they learned each day as a class, and add to the KWL chart. After a couple days of trial and learning, we'll see if the class can answer the Ws and discuss the Ls from the KWL chart.
Suggested Modifications	

MODULE 6

Activity 5 - Yearly challenge-specific lesson (changes each year to align with the Future City Competition's challenge)

Student Learning Intentions (SLI) WALT: (We are learning to…)	Challenge - specific SLI
Student Learning Strategies	
Success Criteria	
Formative Assessment (drives instructional decisions)	

Activities and Resources	
Suggested Modifications	

MODULE 7

Activity 6 - 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 guide to help me through complex problems I am learning about group brainstorming so that I can collaborate to come up with ideas and scenarios to complete my Future City.
Student Learning Strategies	Peer learning Self-reflection Class discussion Cooperative learning Group ideation Brainstorming
Success Criteria	I can collaborate with classmates to complete an assignment effectively. I can identify the steps of the Engineering Design Process. I can use a brainstorming technique to imagine and introduce new ideas to solve a design problem.
Formative Assessment (drives instructional decisions)	Feedback and participation during discussions. Successful completion of brainstorming activity.
Activities and Resources	Introduce the EDP and brainstorming strategies with students: • Brainwriting • Webbing/mind maps

	Students work to brainstorm ideas for a topic that was presented to their groups. Students come back as a class to discuss their brainstorming - ideas; what went well; what went poorly; ideas for improvement.
Suggested Modifications	

MODULE 8

Activity 7 - Using the Engineering Design Process (Project Plan 1)

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning about the specifications and requirements o the Future City Competition so that I can complete a project plan, create a work schedule, plan a build schedule, and be prepared to reflect on the challenge.
Student Learning Strategies	Peer learning Self-reflection Class discussion Cooperative learning Group ideation Brainstorming
Success Criteria	I can work collaboratively with a group. I can create a reasonable project plan that meets Future City competition goals.
Formative Assessment (drives instructional decisions)	Feedback and participation during class discussions. Successful completion of project plan 1.
Activities and Resources	Introduce the requirements of the competition and make comparisons to the engineering design process. Review the project plan requirement and students begin to work with their groups to complete it. In the first

	project plan, students brainstorm various ideas on how they will work as a team, and what goals they hope to meet.
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 languag **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 specia 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 wl have accommodations. Teachers want to make sure students understand the concepts being covered in a wa that makes sense to them. **Extra time**: The teacher provides students with special needs extra time to complete work or answer question 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 ma

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 specia needs get overloaded easily, chunking is an effective strategy to use with them.

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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 o 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 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 t assignment or allow for a different mode of delivery. For instance, many students may hand somethin in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you w 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.

REFLECTIONS

Activity 2 - What is a city working well. Will take a little longer than 1 day to complete. Students engaged in discussions and sharing answers. Need to work on Chromebook procedures.

New websites for SimCity have to be found each year; IT has not been helpful with unlocking when given a full month's advance notice

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

LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
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.D	Use precise language and domain-specific vocabulary to inform about or explain the topic.
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.