Unit 3: Construction and Reflection (8 weeks)

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

UNIT RATIONALE

The final unit of the Future City curriculum sees students following up research with practice. Students design, problem solve, and build a scale 3D model city of the future using knowledge gained in previous units. Students will furthermore communicate their progress and understanding through written, electronic, visual, and oral presentations. Finally, students are given the chance to reflect on their designs, effort, and knowledge attained throughout the course.

ESSENTIAL QUESTIONS

How are cities laid out to best provide for their citizens?
What is a model scale and how do I calculate it?
How can a video presentation accurately represent project work?
How do I reflect on the success of a long-term project?

STANDARDS

NEW JERSEY STUDENT LEARNING STANDARDS: 21st CENTURY

CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
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.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.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.CRP9.1	Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals and organizational culture.
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.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.6:

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

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.ETW.1:

Illustrate how a product is upcycled into a new product and analyze the short- and long-term benefits and costs.

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.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.6	Analyze how trade-offs can impact the design of a product.
CS.6-8.8.2.8.ETW.1	Illustrate how a product is upcycled into a new product and analyze the short- and long-term benefits and costs.
CS.6-8.8.2.8.ITH.4	Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact.

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

TECH.9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
TECH.9.4.8.CI.2	Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3).
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.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).
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.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.6	Analyze how trade-offs can impact the design of a product.
CS.6-8.8.2.8.ETW.1	Illustrate how a product is upcycled into a new product and analyze the short- and long-term benefits and costs.
CS.6-8.8.2.8.ITH.4	Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact.

PRE-ASSESSMENTS
Sample Model Rubric Scoring Activity

INSTRUCTIONAL PLAN

MODULE 1

Ongoing Activity: Future City Model Construction

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning about city planning so that I can ideate and flesh out a detailed model of a future city. I am learning about the requirements of the Future City model so that I can reflect and iterate on work to meet rubric goals. I am learning about city construction so that I can create a scale model of my group's vision to meet the Future City competition requirements. I am learning about the engineering design process so that I can resolve problems I run into during a long-term project.
Student Learning Strategies	Peer learning Self-reflection Class discussion Cooperative learning Group ideation Research City planning through hands-on model creation Rubrics Project management

Success Criteria	I can work collaboratively with a group. 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. I can use a rubric to help me reflect on the requirements of a project and make improvements. I can use the engineering design process when creating a technology project to help me resolve problems with my design.
Formative Assessment (drives instructional decisions)	Feedback and participation during class discussions. Daily check-ins Successful completion of a city model that meets the requirements of the Future City competition.
Activities and Resources	Throughout much of this unit, students will be planning and constructing their Future City models. Each activity listed below takes 1-2 days to better explain an important part in the process, and is inserted at appropriate times during the build process. The project takes time and should be considered ongoing until the introduction of the presentation assignment.
Suggested Modifications	

MODULE 2

Activity 2: Model Rubric Review

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning about the requirements of the Future City model so that I can reflect and iterate on work to meet rubric goals.
Student Learning Strategies	Peer learning Self-reflection Class discussion Cooperative learning Group ideation Rubrics Project management
Success Criteria	I can work collaboratively with a group. I can use a rubric to help me reflect on the requirements of a project and make improvements.
Formative Assessment (drives instructional decisions)	Feedback and participation during class discussion. Student group assessments of previous project work based on the model grading rubric
Activities and Resources	Reiterate the requirements of the Future City model, and how the year's challenge should factor into design. Begin discussion of the grading rubric (found each yea on the FC website) by reading through it as a class and

	giving examples. Give each student group a copy of the rubric and have them grade a previous year's model. Once complete, students should swap models with another group to grade again.

Once rubric grading is complete, begin discussion of student scores for the projects. Ask why groups have discrepancies, and why they decided on the scores they gave. After each model, provide the teacher's rubric score, with explanations, if necessary.

Give students time now to reflect on the scores they gave against those the teacher did to note where their plans and expectations may need to be adjusted. Allow students to share their ideas with the class to help everyone. |
| **Suggested Modifications** | |

MODULE 3

Activity 3: Xacto Knife Safety

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning about Xacto (craft) knives so that I can safely use them to make cuts and designs in materials.
Student Learning Strategies	Peer learning
Self-reflection
Class discussion
Safety and tool practice
Teacher and peer modeling
Success Criteria	I can safely use a Xacto knife, ruler, and cutting

	mat to make cuts and designs for projects.
Formative Assessment (drives instructional decisions)	Complete quiz with 100% score and practice Xacto knife use appropriately.
Activities and Resources	Show video on proper X-acto knife use and demonstrate procedures. Discuss Xacto Safety Pledge, allow students to complete and return. Xacto and Hot Glue Gun Safety Quiz. Students will complete X-acto practice worksheet.
Suggested Modifications	

MODULE 4

Activity 4: Scale

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning about scale so that I can choose and calculate a scale appropriate for my model city.
Student Learning Strategies	Peer learning Self-reflection Class discussion Cooperative learning Research
Success Criteria	I can choose and calculate a scale for my mode city that is appropriate for its size and what I am trying to represent.

Formative Assessment (drives instructional decisions)	Feedback and participation during class discussion. Student group decisions for an appropriate model scale.
Activities and Resources	Introduce the concept of scale models to students - Developing scale models involves taking full-scale objects or designs and (most commonly) reducing all of their dimensions by a common factor. To create a model of a city, it can't be made full-size; it must be shrunk down to a more manageable size. To keep everything proportional, all measurements should be scaled down equally. The teacher gives several examples of how tall real structures might be in real life (1-story house 40ft x 35ft x 20ft; oak tree 100ft; skyscraper about 500 ft tall). As a class, students give input to choose a good size for each in their model. From these, the teacher shows students how to calculate how much it was scaled (ratio). Students should be instructed to choose ten structures noted in their essays and city maps to calculate the scaled measurements. For the first five, students will research the structures' full dimensions and calculate the scale size if 1 in = 25ft. The last five will be calculated at 1in = 50ft. For each, students should choose whether the scaled size would be appropriate for their Future City model, or if they believe a different scale should be used. Reinforce that a consistent scale should be used when possible, but each model may have several different scales if they are localized in

	specific areas.
Suggested Modifications	

MODULE 5

Activity 5: Project Plan 3 - Check-in

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning about project management so that I can set and keep realistic goals and milestones for a long-term project. I am learning to reflect on my learning so that I can recognize my strengths and weaknesses and attempt to be better in the future.
Student Learning Strategies	Peer learning Self-reflection Small group discussion Teacher modeling Project management
Success Criteria	I can work collaboratively with a group. I can keep on task with realistic goals and milestones for a long-term project. I can reflect on my learning and performance and make adjustments to be better in the future.
Formative Assessment (drives instructional decisions)	Feedback and participation during small group discussion.
Activities and Resources	Introduce students to Project Plan 3 - a formal

	group check-in reflection. Students meet as a group with the teacher during the period to sit down and go through the Project Plan 3 Check-In questions: What have you completed recently? What are you working on now? When do you think the current task(s) will be done? What do you need to keep your work on track? Beyond the task(s) you're working on now, are you on track to meet your milestone goals? Students reflect on their answers and receive written notes to help with their group's progress.
Suggested Modifications	

MODULE 6

Activity 6: Future City Presentation

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning to create a video presentation so that I can communicate complex ideas about a project to an audience.
Student Learning Strategies	Peer learning Self-reflection Class discussion Cooperative learning Group ideation Rubrics Project management

Success Criteria	I can work collaboratively with a group. I can communicate complex ideas about my Future City project through a multimedia presentation.
Formative Assessment (drives instructional decisions)	Feedback and participation during class discussion. Completion of a script, props, recordings, and editing of a Future City presentation video
Activities and Resources	As students begin to complete their models, introduce the Future City Presentation deliverable. "Students record an up-to-7-minute video presentation about their future city, discussing its features and their solution to the annual challenge." - from the FC website. To complete the assignment, outline these steps: All students in the group work to create an outline of the main points your team wants to make - the essay you made and City Presentation Rubric are a good place to start. Work out each team member's role. Everyone should brainstorm and help with ideas throughout the whole project, but you'll need 2-3 script writers, 3 presenters, and 1-2 editors. Some students may need to create props in addition to another role. Write a script based on your outline. The script is what team members will say during the presentation. Decide which team presenter will say which part of the script. Write out your lines, and get comfortable saying them. Be creative - tell a story; make an advertisement; create props! Record a video that makes viewers want to live in your city!

	Use your models, or at least photos of your models. You can use other visual aides while recording, as well Record your parts simultaneously or individually, and then edit your video together! Encourage students to be creative with their video ideas - the rubric is an excellent guide to keep them on track, but they should put their own original touches into the video to make it fun! Students will likely take more than a week to complete this project, so the teacher will conduct daily check-ins to keep everyone on track and working toward the project goals. When each stage is complete, detailed feedback should be given as well as guidance for the next actions (script -> props -> filming -> editing). When complete, students will submit their videos to the teacher for grading, sharing with the class, and archival.
Suggested Modifications	

MODULE 7

Activity 7: Expense Form and Course Reflection

Student Learning Intentions (SLI) WALT: (We are learning to…)	I am learning to reflect on my learning so that I can recognize my strengths and weaknesses and attempt to be better in the future.
Student Learning Strategies	Self-reflection Class discussion Cooperative learning Project management
Success Criteria	I can work collaboratively with a group.

	I can keep on task with realistic goals and milestones for a long-term project. I can reflect on my learning and performance and make adjustments to be better in the future.
Formative Assessment (drives instructional decisions)	Successful completion of a group expense form Successful completion of a personal course reflection.
Activities and Resources	In the final activities for the course, students are introduced to and complete the competition expense form and course reflection. For the competition expense form, students are given access to a list of items they likely used to create their projects as well as a blank spreadsheet on which to add those items. The teacher walks the class through examples of how to fill out the form, then instructs students to review their models and presentation videos thoroughly to determine all those materials that were used and account for them. Students work as a group to complete the expense form, then turn it in for credit. When students complete the expense form, each completes their own personal course reflection through Google Classroom. Students are prompted to answer questions such as: Look back at your original project goals from the Define stage. Did you team fully meet your stated goals for the project? Were there some goals that were met more completely than others? Look back at your original ideas for your city. Did any

of the ideas change as you went through the process of creating your final city? Describe one way your city changed and why.

Consider your team. How well did your Future City team work together? What do you know now about being part of a team that you didn't know before?

What was the most valuable experience you gained from the Future City Competition?

Students are encouraged to be honest and thorough, and to genuinely look back at previous assignments to reflect on their progress. When complete, students are encouraged to share some of their views and engage in a productive discussion to improve the course for future classes (teacher takes notes)!

Suggested Modifications

SUGGESTED MODIFICATION

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 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 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 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 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.6-8.7	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.6-8.5	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.6-8.10	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.