Unit 03: Panther Park - Building and Presenting

Content Area: **Template**
Course(s):
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Standards Alignment

New Jersey Student Learning Standards

Practice 1. Asking questions (for science) and defining problems (for engineering)
Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.

Ask questions to determine relationships between independent and dependent variables and relationships in models.

Ask questions to clarify and/or refine a model, an explanation, or an engineering problem.

Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles.

Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.

Practice 2. Developing and using models
Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

Evaluate limitations of a model for a proposed object or tool.

Use and/or develop a model of simple systems with uncertain and less predictable factors.

Develop and/or use a model to predict and/or describe phenomena.

Develop and/or use a model to generate data to test ideas about phenomena in natural or designed systems, including those representing inputs and outputs, and those at unobservable scales.

Practice 3. Planning and carrying out investigations
Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.

Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation.

Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions.

Practice 4. Analyzing and interpreting data
Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

Use graphical displays (e.g., maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships.

Apply concepts of statistics and probability (including mean, median, mode, and variability) to analyze and characterize data, using digital tools when feasible.

Consider limitations of data analysis (e.g., measurement error), and/or seek to improve precision and accuracy of data with better technological tools and methods (e.g., multiple trials).

Analyze and interpret data to determine similarities and differences in findings.

Analyze data to define an optimal operational range for a proposed object, tool, process or system that best meets criteria for success.

Practice 5. Using mathematics and computational thinking
Mathematical and computational thinking in 6–8 builds on K–5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.

Use digital tools (e.g., computers) to analyze very large data sets for patterns and trends.

Use mathematical representations to describe and/or support scientific conclusions and design solutions.

Apply mathematical concepts and/or processes (e.g., ratio, rate, percent, basic operations, simple algebra) to scientific and engineering questions and problems.

Use digital tools and/or mathematical concepts and arguments to test and compare proposed solutions to an engineering design problem.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)
Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

Construct an explanation using models or representations.

Apply scientific reasoning to show why the data or evidence is adequate for the explanation or conclusion.

Apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system.

Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.

Practice 7. Engaging in argument from evidence
Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

Respectfully provide and receive critiques about one’s explanations, procedures, models, and questions by citing relevant evidence and posing and responding to questions that elicit pertinent elaboration and detail.

Connections to the Nature of Science: Most Closely Associated with Practices
Scientific Investigations Use a Variety of Methods

Science investigations use a variety of methods and tools to make measurements and observations.

Science investigations are guided by a set of values to ensure accuracy of measurements, observations, and objectivity of findings.

Crosscutting Statements
3. Scale, Proportion, and Quantity – In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Connections to Engineering, Technology and Applications of Science
Interdependence of Science, Engineering, and Technology

Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems.

Science and technology drive each other forward.

Influence of Engineering, Technology, and Science and the Natural World

All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment.

The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions.

Technology use varies over time and from region to region.

Connections to the Nature of Science: Most Closely Associated with Crosscutting Concepts
Science is a Way of Knowing

Science is both a body of knowledge and the processes and practices used to add to that body of knowledge.

Science knowledge is cumulative and many people, from many generations and nations, have contributed to science knowledge.

Science is a way of knowing used by many people, not just scientists.

Science is a Human Endeavor

Scientists and engineers rely on human qualities such as persistence, precision, reasoning, logic, imagination and creativity.

Advances in technology influence the progress of science and science has influenced advances in technology.

Science Addresses Questions About the Natural and Material World.

Scientific knowledge is constrained by human capacity, technology, and materials.

Science knowledge can describe consequences of actions but is not responsible for society’s decisions.

Capacities of the Literate Individual
Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

They build strong content knowledge.

They comprehend as well as critique.

They value evidence.

They use technology and digital media strategically and capably.

LA.RH.6-8	Reading History and Social Studies
CCSS.Math.Practice.MP1	Make sense of problems and persevere in solving them.
CCSS.Math.Practice.MP4	Model with mathematics.
	Integration of Knowledge and Ideas
CCSS.Math.Practice.MP6	Attend to precision.
LA.K-12.NJSLSA.R7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
LA.RH.6-8.7	Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.
MA.6.NS	The Number System
LA.K-12.NJSLSA.W	Writing
MA.6.NS.C	Apply and extend previous understandings of numbers to the system of rational numbers.
MA.6.NS.C.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
LA.K-12.NJSLSA.W6	Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
LA.K-12.NJSLSA.W9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
LA.WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.
MA.6.G	Geometry
MA.6.G.A	Solve real-world and mathematical problems involving area, surface area, and volume.
MA.6.G.A.1	Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

Integration of Career Readiness, Life Literacies and Key Skills

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.

CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technology / Integration of Computer Science and Design Thinking

TECH.8.1.8	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.8.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.8.A.1	Demonstrate knowledge of a real world problem using digital tools.
TECH.8.1.8.A.2	Create a document (e.g., newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.
TECH.8.1.8.D	Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
TECH.8.1.8.D.1	Understand and model appropriate online behaviors related to cyber safety, cyber bullying, cyber security, and cyber ethics including appropriate use of social media.
TECH.8.2.8	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.8.A	The Nature of Technology: Creativity and Innovation: Technology systems impact every aspect of the world in which we live.
TECH.8.2.8.A.1	Research a product that was designed for a specific demand and identify how the product has changed to meet new demands (i.e., telephone for communication - smart phone for mobility needs).
TECH.8.2.8.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.8.C.1	Explain how different teams/groups can contribute to the overall design of a product.
TECH.8.2.8.D	Abilities for a Technological World: The designed world is the product of a design process that provides the means to convert resources into products and systems.
TECH.8.2.8.D.1	Design and create a product that addresses a real world problem using a design process under specific constraints.
TECH.8.2.8.D.3	Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution.

Interdisciplinary Connections: NJSLS for ELA, Social Studies, Science and/or Math Section

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media LiteracyNew Section

see Crosswalks

21st Century Life and Careers

Stage I: Desired Results

Transfer/Overview/Rationale

Transfer / Overview / Rationale
Unit Rationale The purpose of this unit… By designing a scale model of a ride, creating a park map with detailed pictures and sharing their work using reports, brochures and presentations, students will understand the crosscutting concepts and disciplinary ideas of science and engineering. The actual doing of science and engineering heightens students' curiosity, captures their interest, and motivates their continued study; the insights gained help students recognize that the work of scientists and engineers is a creative process.

Meaning

Essential Questions

Essential Questions

What attracts consumers to an amusement/theme park?

What mediums are available for advertising?

Enduring Understanding/Indicators of Understanding

Enduring Understanding/Indicators of Understanding

Models are a hands-on projects that allow students to incorporate principles of design, geometry, architecture and physics.

Travel brochures, publications, and commercials are designed to attract visitors to the places advertised.

Acquisition (Student Learning Objectives)

Knowledge

Knowledge

Students will know…

A scale model is a physical representation of a structure built to study aspects of design and communicate a common theme.

Amusement park advertising includes a variety of static, digital, radio, experiential and online marketing.

A well-planned amusement/theme park can generate steady revenues and enormous amounts of capital.

Skills

Skills

Student will be skilled at …

Students will interpret and use realistic numbers in counting and measurement situations.

Students will be able to use logic and reasoning to identify the strengths and weaknesses of engineering designs.

Students will demonstrate their ability to think critically and creativity to develop models that display their understanding

of engineering and design.

Students will use attractive drawings as well as eye-catching designs and lettering to create an advertisement and/or commercial.

Stage 3: Learning Plan

Resource and Mentor Texts

Resources and Mentor Texts

Internet/Videos

PowerPoint/Google Presentations

Google Forms

Smart board/Interactive Websites

Document Camera

Lab Materials

Copies of Worksheets

Smart Notebook Files

Specific resources are linked in Lesson Plans; refer to Learning Activities Link

Formative Assessment Strategies

Formative Assessment Strategies

Observations

Questioning/Polling

Group Discussions

Graphic Organizers

Peer/Self Assessments (Reflection)

Individual Whiteboards

Notebook Checks

Learning Activities/Unit of Study

Learning Activities/Unit of Study

Daily Warm-Ups

Note Taking/Annotations

Performance/Lab Based

Classroom/Small Group Discussions

Modifications and/or Accommodations

Suggested Modifications (ELL, Sp. Ed, GIfted, At-risk of Failure)

English Language Learners

Native language support: The teacher provides auditory or written content to students in their native language.

Adjusted Speech: The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

Visuals: The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subjects at hand.

Front-Loading Vocabulary: The teacher front loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

Special Education Students

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered in a way that makes sense to them.

Extra time: The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

Oral Reading: The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

Timers: The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how much time they have to complete an assignment.

Students with 504 Plans

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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 or directions to ensure understanding occurs. Check back with the student to ensure he/she hasn't forgotten.

Peer Support: Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

Alternate or Modified Assignments: Always ask yourself, "How can I modify this assignment to ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you will need to assign an alternate assignment.

Increase One to One Time: When other students are working, always touch base with your students

at risk and find out if they're on track or needing some additional support. A few minutes here and there will go a long way to intervene as the need presents itself.

Contracts: It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of using contracts is to eventually have the student come to you for completion sign-offs.

Hands On: As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record comprehension activities instead of writing them. A child may have to listen to a story being read instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing or sight issues need to be close to the instruction which often means near the front.