Elementary GATE - Grade K

Unit Title: Kindergarten Unit One (Introduction to Engineering and the Engineering Design Process)

Stage 1: Desired Results

Standards & Indicators:

National Standards in Gifted and Talented Education

- **1.1** - Self-Understanding. Students with gifts and talents recognize their interests, strengths, and needs in cognitive, creative, social, emotional, and psychological areas.
- **2.1** - Identification. All students in Pre-K through grade 12 with gifts and talents have equal access to the identification process and proportionally represent each campus.
- **2.5** - Learning Progress. Students self assess their learning progress.
- **3.2** - Talent Development. Students with gifts and talents demonstrate growth in social and emotional and psychosocial skills necessary for achievement in their domain(s) of talent and/or areas of interest.
- **3.3** - Responsiveness to Diversity. Students with gifts and talents develop knowledge and skills for living in and contributing to a diverse and global society.
- **3.4** - Instructional Strategies. Students with gifts and talents demonstrate their potential or level of achievement in their domain(s) of talent and/or areas of interest.
- **3.5** - Instructional Strategies. Students with gifts and talents become independent investigators
- **4.1** - Personal Competence. Students with gifts and talents demonstrate growth in personal competence and dispositions for exceptional academic and creative productivity. These include self-awareness, self-advocacy, self-efficacy, confidence, motivation, resilience, independence, curiosity, and risk taking.
- **4.2** - Social Competence. Students with gifts and talents develop social competence manifested in positive peer relationships and social interactions.6.1. Talent Development. Students identify and fully develop their talents and gifts as a result of interacting with educators who possess content pedagogical knowledge and meet national teacher preparation standards in gifted education and the Standards for Professional Learning.

Computer Science and Design Thinking

Standard	Performance Expectations	Core Ideas
8.2.2.ED.1	Communicate the function of a product or device.	Engineering design is a creative process for meeting human needs or wants that can result in multiple solutions.
8.2.2.ED.2	Collaborate to solve a simple problem, or to illustrate how to build a product using the design process.	
8.2.2.NT.1	Model and explain how a product works after taking it apart, identifying the relationship of each part, and putting it back together.	Innovation and the improvement of existing technology involves creative thinking.
8.2.2.NT.2	Brainstorm how to build a product, improve a designed product, fix a product that has stopped working, or solve a simple problem.	

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.1.2.CR.1	Recognize ways to volunteer in the classroom, school and community.	There are actions an individual can take to help make this world a better place.
9.1.2.CAP.3	Define entrepreneurship and social entrepreneurship.	There are benefits and drawbacks to being an entrepreneur.
9.4.2.CI.1	Demonstrate openness to new ideas and perspectives.	Brainstorming can create new, innovative ideas.
9.4.2.CI.2	Demonstrate originality and inventiveness in work	

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Central Idea/Enduring Understanding:	**Essential/Guiding Question:**
• The engineering design process emphasizes open-ended problem solving and encourages students to learn from failure.	• How does the engineering design process help solve real world problems?
Content: • Playground Design • Making a Tool • Bridges • Flash Flood	**Skills (Objectives):** • Design and create a playground model using engineering and design building sets. • Observe the given problem of a bear stuck in a well. Create a tool to save it. • Understand how different shapes provide different levels of support in making a bride • Create a dam that models how to save a town from a flood.

Interdisciplinary Connections:

NJSLS - Science

- K-2-ETS1-1.Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
- K-2-ETS1-2.Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- K-2-ETS1-3.Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

NJSLS - Math

- K.M.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.
- K.M.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *For example, directly compare the heights of two children and describe one child as taller/shorter*.

NJSLS - Language Arts

- SL.UM.1.5 Add drawings or other visual displays to descriptions as desired to provide additional detail.
- SL.AS.K.6 Speak audibly and express thoughts, feelings, and ideas clearly.

Stage 2: Assessment Evidence

Performance Task(s):	**Other Evidence:**
• Complete 5 engineering tasks using the playground engineering set. • Students compare and discuss various tool designs and level of success. • Bridge test using four weighted figures to determine successful bridge designs.	• Group discussion of technology • Students reflect on their original plan and how it differed from their final plan. • Students show the ability to improve on their design further.

Stage 3: Learning Plan

Learning Opportunities/Strategies:	**Resources:**
Lesson 1 • Students will work in pairs to sort and identify objects of technology	**Lesson 1** • Various classroom items • Brown paper bags • Lesson worksheet

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Lesson 2 ● Introduce the engineering design process using a graphic organizer and a students STEM challenge log.	**Lesson 2** ● Graphic organizer ● STEM Challenge Log
Lesson 3 ● Introduce students to the engineering and design playground building set challenge cards. Students will use their STEM challenge log to sketch their design for the first challenge before beginning to build.	**Lesson 3** ● Learning Resources STEM Engineering and Design Playground building set ● STEM Challenge Log
Lesson 4 ● Continue to use challenge cards and STEM challenge logs to build playground equipment. Improve as needed.	**Lesson 4** ● Learning Resources STEM Engineering and Design Playground building set ● STEM Challenge Log
Lesson 5 ● Introduce Well Rescue to students. Challenge is to design and build a device that can pick up a toy bear from the bottom of a well. Students use their STEM challenge log to define the problem and sketch a prototype of their device.	**Lesson 5** ● Lakeshore Well Rescue Kit ● STEM Challenge Log
Lesson 6 ● Students use the materials provided from the kit to build a device to rescue the bear from the well. Students reflect on their design and discuss as a group.	**Lesson 6** ● Lakeshore Well Rescue Kit ● STEM Challenge Log
Lesson 7 ● Students are introduced to the Bridge the Gap real world challenge. Whole group discussion on bridge design, weight and stability of structures.	**Lesson 7** ● Lakeshore Bridge the Gap Kit ● Internet pictures of bridges ● STEM Challenge Log
Lesson 8 ● Students will sketch their bridge designs in their STEM challenge logs before building their bridge.	**Lesson 8** ● Lakeshore Bridge the Gap Kit ● Internet pictures of bridges ● STEM Challenge Log
Lesson 9 ● Students will test their bridge's strength by placing weighted figures on the bridge one at a time. Group discussion regarding each bridge and possible improvements. Students will then improve their bridge's strength.	**Lesson 9** ● Lakeshore Bridge the Gap Kit ● Internet pictures of bridges ● STEM Challenge Log
Lesson 10 ● Students are introduced to the Flash Flood real world challenge kit. Teacher led discussion of what flash floods are, how they occur and how humans have prevented flash floods from	**Lesson 10** ● Lakeshore Flash Flood ● Internet pictures of dams and reservoirs ● STEM Challenge Log

destroying towns. Students then observe materials they will use to build. **Lesson 11** ● Students define the problem and sketch dam design in their STEM challenge log. Students then begin to build their dam. **Lesson 12** ● Students complete their dam. Students then present their design to the class by testing their dam's ability to hold flood waters from the town. Reflect and redesign as needed.	 **Lesson 11** ● Lakeshore Flash Flood ● Internet pictures of historic floods ● STEM Challenge Log **Lesson 12** ● Lakeshore Flash Flood ● Internet pictures of historic floods ● STEM Challenge Log

Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to struggling and/or Special Needs Section for differentiation.

High-Achieving Students	On Grade Level Students	Struggling Students	Special Needs/ELL
Students will be provided with more challenging work based on their individual needs.	Students will be provided with more challenging work based on their individual needs.	Student and teacher will make plan to improve in certain areas as needed	Students will be allotted extra time as needed to finish projects Students will have the opportunity to work solo if needed .

Unit Title: Kindergarten Unit Two (Picture Perfect STEM)

Stage 1: Desired Results

Standards & Indicators:

National Standards in Gifted and Talented Education

- **1.1** - Self-Understanding. Students with gifts and talents recognize their interests, strengths, and needs in cognitive, creative, social, emotional, and psychological areas.
- **2.1** - Identification. All students in Pre-K through grade 12 with gifts and talents have equal access to the identification process and proportionally represent each campus.
- **2.5** - Learning Progress. Students self assess their learning progress.
- **3.2** - Talent Development. Students with gifts and talents demonstrate growth in social and emotional and psychosocial skills necessary for achievement in their domain(s) of talent and/or areas of interest.
- **3.3** - Responsiveness to Diversity. Students with gifts and talents develop knowledge and skills for living in and contributing to a diverse and global society.
- **3.4** - Instructional Strategies. Students with gifts and talents demonstrate their potential or level of achievement in their domain(s) of talent and/or areas of interest.
- **3.5** - Instructional Strategies. Students with gifts and talents become independent investigators
- **4.1** - Personal Competence. Students with gifts and talents demonstrate growth in personal competence and dispositions for exceptional academic and creative productivity. These include self-awareness, self-advocacy, self-efficacy, confidence, motivation, resilience, independence, curiosity, and risk taking.
- **4.2** - Social Competence. Students with gifts and talents develop social competence manifested in positive peer relationships and social interactions.6.1. Talent Development. Students identify and fully develop their talents and gifts as a result of interacting with educators who possess content pedagogical knowledge and meet national teacher preparation standards in gifted education and the Standards for Professional Learning.

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Computer Science and Design Thinking		
Standard	**Performance Expectations**	**Core Ideas**
8.2.2.ED.3	Select and use appropriate tools and materials to build a product using the design process.	Engineering design is a creative process for meeting human needs or wants that can result in multiple solutions.
8.2.2.ED.4	Identify constraints and their role in the engineering design process.	Limitations (constraints) must be considered when engineering designs.
8.2.2.ETW.3	Describe or model the system used for recycling technology.	The use of technology developed for the human designed world can affect the environment, including land, water, air, plants, and animals. Technologies that use natural sources can have negative effects on the environment, its quality, and inhabitants. Reusing and recycling materials can save money while preserving natural resources and avoiding damage to the environment.
8.2.2.ETW.4	Explain how the disposal of or reusing a product affects the local and global environment.	

Career Readiness, Life Literacies and Key Skills		
Standard	**Performance Expectations**	**Core Ideas**
9.4.2.CI.1	Demonstrate openness to new ideas and perspectives	Brainstorming can create new, innovative ideas.
9.4.2.CI.2	Demonstrate originality and inventiveness in work.	
9.4.5.CI.3	Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity.	Curiosity and a willingness to try new ideas (intellectual risk-taking) contributes to the development of creativity and innovation skills.
9.4.5.CI.4	Research the development process of a product and identify the role of failure as a part of the creative process.	
9.4.5.CT.1	Identify and gather relevant data that will aid in the problem-solving process.	The ability to solve problems effectively begins with gathering data, seeking resources, and applying critical thinking skills.
9.4.5.CT.2	Identify a problem and list the types of individuals and resources	
9.4.5.CT.3	Describe how digital tools and technology may be used to solve problems.	
9.4.5.CT.4	Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global.	

Central Idea/Enduring Understanding:	**Essential/Guiding Question:**
● The engineering design process is involved in the creation and production of many items in our everyday lives.	● How does engineering and the engineering design process improve our lives?

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Content:	**Skills (Objectives):**
• The Handiest Thing • Robots Everywhere • Making Crayons	• Students will take the role of engineer to explore ways to improve a backpack. • Students will develop a model of a robot to perform a simple task to practice design solutions. • Students will plan and carry out an investigation using recycled crayons.

Interdisciplinary Connections:

NJSLS - Science•

- K-2-ETS1-1.Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
- K-2-ETS1-2.Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- K-2-ETS1-3.Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
- 2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

NJSLS - Math

- K.M.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.
- K.M.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *For example, directly compare the heights of two children and describe one child as taller/shorter*.

NJSLS - Language Arts

- SL.UM.1.5 Add drawings or other visual displays to descriptions as desired to provide additional detail.
- SL.AS.K.6 Speak audibly and express thoughts, feelings, and ideas clearly.

Stage 2: Assessment Evidence

Performance Task(s):	**Other Evidence:**
• Students will draw and label new structures on a backpack to improve its function. • Students build and test a pick-and-place robot to serve a function. • Students observe changes that occur when crayons are melted and reform.	• Group discussion of improved backpack designs. • Students reflect on their original robot plan and how it differed from their final plan. • Students completed an observation sheet of crayon changes.

Stage 3: Learning Plan

Learning Opportunities/Strategies:	**Resources:**
Lesson 1 • Engage students with the book, *The Handiest Things in the World,* Read-Aloud and explore with one handy thing. Students identify and discuss classroom objects that make life easier. **Lesson 2** • Introduce and read, *Engineering in Our Everyday Lives.* Students sort picture cards into two	**Lesson 1** • *The Handiest Things in the World* • Classroom objects that make lives easier **Lesson 2** • *Engineering in Our Everyday Lives.* • Picture cards

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categories; technology items and non-technology items. Whole group word web - build a better backpack.	● Word web Graphic organizer
Lesson 3 ● Students design and draw a backpack that has special features to make life easier using a backpack template. Discuss structures and functions as a whole group.	**Lesson 3** ● Backpack template ● Crayons
Lesson 4 ● Begin Robots chapter. Engage students with the book, *Beep! Beep! Go to Sleep!* Group discussion of robots and what they do. Show chocolate factory video and discuss.	**Lesson 4** ● *Beep! Beep! Go to Sleep!* ● Chocolate factory video
Lesson 5 ● In pairs, students complete robot jobs card sort. Students then create their own robot to do a job at home or in the classroom.	**Lesson 5** ● Robot jobs picture sort ● My Robot worksheet.
Lesson 6 ● Students create a robot advertisement. Advertisements must show robots function and descriptions of abilities. Color with crayons.	**Lesson 6** ● My Robot Advertisement worksheet ● Crayons
Lesson 7 ● Read *National Geographic Kids: Robots*. Discuss as a whole group. In pairs, students build a pair of robot arms. Test arms with small pieces of pasta.	**Lesson 7** ● Book - *National Geographic Kids: Robots* ● Materials listed in Picture Perfect STEM Book
Lesson 8 ● Engage with mystery objects and *The Day the Crayons Came Home.* Explore with Crayon Observations and Crayon Questions.	**Lesson 8** ● Various mystery objects ● Book - *The Day the Crayons Came Home.*
Lesson 9 ● Explain card sequencing with book, *From Wax to Crayon,* and melting crayons demonstration.	**Lesson 9** ● Book, *From Wax to Crayon* ● Crayons and bakeware ● Oven or microwave
Lesson 10 ● Show video, “How People Make Crayons”. Students complete Favorite Crayon Colors Graph.	**Lesson 10** ● Video ● Crayon colors graph
Lesson 11 ● Crayon Recycling Design Challenge	**Lesson 11** ● Materials listed in Picture Perfect STEM book
Lesson 12 ● Postcard from a crayon	**Lesson 12** ● Postcard template ● Crayons

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Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to the Struggling and/or Special Needs Section for differentiation.			
High-Achieving Students	**On Grade Level Students**	**Struggling Students**	**Special Needs/ELL**
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Pacing Guide

Course Name	Resource	Standards
UNIT 1 Introduction to Engineering and the Engineering Design Process 12 days 1 day per the 6 day cycle 12 weeks	A .Learning Resources STEM Engineering and Design Playground building set B. Lakeshore Real-World STEM Challenge Kit C. Lakeshore Real-World STEM Challenge Kit.	**National Standards in Gifted and Talented Education** 1.1, 2.1, 2.5, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 6.1 **NJSLS - Science** K-2-ETS1-1, K-2-ETS1-2, K-2-ETS1-3
UNIT 2 Picture Perfect STEM 12 Days 1 day per the 6 day cycle 12 weeks	Picture Perfect STEM Book Chapter 6 Chapter 8 Chapter 14	**National Standards in Gifted and Talented Education** 1.1, 2.1, 2.5, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 6.1 **NJSLS - Science** K-2-ETS1-1, K-2-ETS1-2, K-2-ETS1-3, 2-PS1-1