Wall Township Public Schools	Board Approval Date: 8/19/2025

Course Title: Grade 2 - STEM

Course Description: This course introduces second-grade students to the foundational concepts of science, technology, engineering, and mathematics through hands-on learning, digital tools, and real-world problem solving. Students will build basic coding skills using Code.org and explore physical computing through interactive SAM Labs projects. Lessons from Mystery Science support natural science investigations, helping students make meaningful connections between technology and the world around them. Throughout the course, students will think like engineers, ask questions like scientists, and collaborate like innovators as they create smart solutions, analyze data, and share their learning with peers. The curriculum aligns with NJSLS and NGSS, fostering creativity, critical thinking, and responsible technology use in a fun, student-centered environment.

New Jersey Student Learning Standards

Disciplinary Concepts and Core Ideas:

Computing Systems: People interact with a wide variety of computing devices that collect, store, analyze, and act upon information in ways that can affect human capabilities both positively and negatively. The physical components (hardware) and instructions (software) that make up a computing system communicate and process information in digital form.

Networks and the Internet: Computing devices typically do not operate in isolation. Networks connect computing devices to share information and resources and are an increasingly integral part of computing. Networks and communication systems provide greater connectivity in the computing world.

Data & Analysis: Computing systems exist to process data. The amount of digital data generated in the world is rapidly expanding, so the need to process data effectively is increasingly important. Data is collected and stored so that it can be analyzed to better understand the world and make more accurate predictions.

Algorithms & Programming: An algorithm is a sequence of steps designed to accomplish a specific task. Algorithms are translated into programs, or code, to provide instructions for computing devices. Algorithms and programming control all computing systems, empowering people to communicInteraction of Technology and Humans Societies influence technological development. Societies are characterized by common elements such as shared values, differentiated roles, and cultural norms, as well as by entities such

as community institutions, organizations, and businesses. Interaction of Technology and Humans concerns the ways society drives the improvement and creation of new technologies, and how technologies both serve and change society.

Engineering Design: People design for enjoyment and to solve problems, extend human capabilities, satisfy needs and wants, and improve the human condition. Engineering Design, a systematic approach to creating solutions to technological problems and finding ways to meet people's needs and desires, allows for the effective and efficient development of products and systems.

Nature of Technology: Human population, patterns and movement focus on the size, composition, distribution, and movement of human populations and how they are fundamental and active features on Earth's surface. This includes understanding that the expansion and redistribution of the human population affects patterns of settlement, environmental changes, and resource use. Patterns and movements of population also relate to physical phenomena including climate variability, landforms, and locations of various natural hazards and their effects on population size, composition, and distribution.

Effects of Technology on the Natural World: Many of engineering and technology's impacts on society and the environment are widely regarded as desirable. However, other impacts are regarded as less desirable. Effects of Technology on the Natural World concerns the positive and negative ways that technologies affect the natural world.

Ethics & Culture: Ethics and Culture concerns the profound effects that technologies have on people, how those effects can widen or narrow disparities, and the responsibility that people have for the societal consequences of their technological decisions.

Course Sequence & Pacing

Unit Title	Lesson:
Unit 1: Introduction to STEM and Computational Thinking	1-4
Unit 2: Exploring the Natural World with Technology	5-8
Unit 3: Designing and Building Smart Solutions	9-13
Unit 4: Innovation, Communication, and Reflection	14-18

Unit 1

Desired Results

Unit 1 Title: Introduction to STEM and Computational Thinking

Unit Summary: This unit introduces students to the foundations of STEM, what a computer is, and how to think like a computer using sequencing, logic, and hands-on coding. Students begin to understand how instructions (algorithms) control digital systems.

Learning Standards

8.1.2.AP.2 - Model the way programs store and manipulate data by using numbers or other symbols to represent information.
8.1.2.AP.3 - Create programs with sequences and simple loops to accomplish tasks.
8.2.2.ED.3 - Communicate the function of a product or device

Interdisciplinary Connections

Career Readiness, Life Literacies, & Key Skills

9.4.2.CI.1: Demonstrate openness to new ideas and perspectives.

9.4.2.CT.2: Identify possible approaches and resources to execute a plan

9.4.2.TL.2: Create a document using a word processing application.

9.4.2.DC.1: Explain differences between ownership and sharing of information.

9.4.2.GCA:1: Articulate the role of culture in everyday life by describing one's own culture and comparing it to the cultures of other individuals

Interdisciplinary Connections

NJSLS - ELA 2023

W.IW.2.2. - Write informative/explanatory texts to examine a topic and convey ideas and information.

NJSLS - Math 2023

2.OA.A.1 - Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

NJSLS - SCIENCE 2020

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.

<table>
<tr><th colspan="4">Learning Targets</th></tr>
<tr><td colspan="2">Unit Essential Questions:
1. What is STEM, and how does it help us solve problems?
2. How do computers follow instructions to do what we want?
3. Why is it important to work through mistakes when building or coding something?</td><td colspan="2">Unit Enduring Understandings:
1. STEM combines science, technology, engineering, and math to help us think creatively, work together, and find solutions to real-world challenges.
2. Computers follow step-by-step instructions called algorithms. These instructions must be clear and ordered correctly to work properly.
3. Mistakes help us learn. Debugging and trying different approaches are important parts of the problem-solving process.</td></tr>
<tr><td colspan="4">Vocabulary:</td></tr>
<tr><td>STEM
Science
Technology
Engineering</td><td>Math
Computer
Algorithm
Sequence</td><td>Code
Debug
Input
Output</td><td>System
Problem
Solution</td></tr>
<tr><td colspan="4">Students will be able to:
• Define STEM and identify examples of science, technology, engineering, and math in everyday life
• Explain what a computer is and how it follows instructions to complete tasks
• Create and follow simple algorithms using sequence and step-by-step directions
• Identify and fix errors (debug) in a set of instructions or code
• Describe the difference between an input and an output in a system
• Work collaboratively with peers to solve problems and share ideas
• Reflect on their thinking and describe how they improved a design or coding task</td></tr>
<tr><td>Unit 1 Focus: Introduce students to the foundations of STEM, what a computer is, and how to think like a computer using sequencing, logic, and hands-on coding. Students begin to understand how</td><td colspan="3"><u>Week 1:</u>
Lesson Title: What Is a STEM?
Key Activities: STEM scavenger hunt around the classroom, Read-aloud: What Do You Do With an Idea? or a STEM careers video, Create a class anchor chart or personal STEM learner posters
<u>Week 2:</u>
Lesson Title: What Is a Computer?</td></tr>
</table>

instructions (algorithms) control digital systems. **Resources used:** **SAM Labs:** SAM Studio (Intro lighting project) **Code.org:** Course B – Lesson 1	**Key Activities**: Code.org Course B – Lesson 1: "What is a Computer?"; Sort activity: "Is it a computer?" Label parts of a computer and describe inputs/outputs **Week 3:** **Lesson Title:** Building Algorithms and Debugging **Key Activities**: Unplugged activity: "Program a Friend" (movement or drawing task); Build and test algorithms (e.g., brushing teeth, making a sandwich) **Week 4:** **Lesson Title:** Inputs, Outputs, and Simple Systems **Key Activities**: SAM Labs: "Start Simple" lighting project; Identify input and output in the system; STEM journal sketch: label and explain your build

Learning Activities:

Amistad Law Alignment (N.J.S.A. 18A 52:16A-88)

Focus: Contributions of African Americans to STEM and innovation

- Connection: Highlight African American pioneers in STEM such as Katherine Johnson (NASA mathematician), George Washington Carver (agricultural scientist), or Mark Dean (co-inventor of the personal computer).
- Classroom Tie-In: Integrate short biographical STEM spotlights or coding warm-ups honoring diverse innovators during algorithm lessons.

Climate Change Alignment

Focus: Awareness of how technology interacts with the environment

- Connection: Introduce the idea that smart systems (e.g., lights that turn off automatically) help conserve energy
- Instructional Tie-In: During Week 4's SAM Labs lighting project, discuss how automating lights can reduce waste

Diversity & Inclusion Alignment (N.J.S.A. 18A:35-4.36a)

- Emphasize that STEM is for everyone and celebrate different perspectives and problem-solving approaches
- Use books like Ada Twist, Scientist or What Will You Be? by Yamile Saied Méndez

Assessment Evidence

Formative Assessments:

- Exit tickets (e.g., "What is an algorithm?" or "Name one thing a computer needs to work")
- "Thumbs up/down" comprehension checks during vocabulary instruction
- Observation checklists during unplugged coding activities and group discussions
- Think-pair-share: "What did you change when debugging your program?"

- STEM journals: reflections, sketches, and simple sequence writing

Summative Assessments:

- Performance task: Design and explain a simple input/output system using physical or digital tools
- Written reflection: “How do computers help us solve problems?”
- Vocabulary quiz or sorting activity (algorithm, input, output, debug, etc.)
- Illustrated flowchart showing the steps of an algorithm or simple system

Common Benchmark Assessments:

- Pre/post checklist of key vocabulary and coding concepts
- Coding fluency tracker: ability to build a sequence, debug, or explain a function
- Hands-on skills rubric (e.g., works collaboratively, identifies problem, applies sequence)
- Digital task using Code.org that can be repeated in a later unit to gauge growth

Alternative Assessments:

- Oral explanation or peer teaching of a code sequence
- Poster or flipbook that explains how a system works
- “STEM Innovator Trading Card” highlighting a diverse STEM leader (Amistad or DEI connection)
  Student-created video or voice recording describing their algorithm or project

Core Instructional & Supplemental Materials

Sam Labs	Code.org	Typing Club	Mystery Science

Accommodations and Modifications: Students with Disabilities, English Language Learners, Students at Risk of Failure, Students with 504s, Gifted & Talented Students

Specific Strategies and Practices that Support Students with Disabilities:

Students receiving Special Education programming have specific goals and objectives, as well as accommodations and modifications outlined within their Individualized Education Plans (IEP) due to an identified disability and/or diagnosis. In addition to exposure to the general education curriculum, the instruction is differentiated based upon the student's needs. The IEP acts as a supplemental curriculum guide inclusive of instructional strategies that support each learner.

- Small group/One to one
- Additional time - Review of directions
- Student restates information
- Space for movement or breaks
- Extra visual and verbal cues and prompts

- Preferential seating
- Follow a routine/schedule
- Rest breaks
- Verbal and visual cues regarding directions and staying on task
- Checklists
- Immediate feedback

Specific Strategies and Practices that Support English Language Learners

English language learner (ELL) is a national-origin-minority student who is limited-English-proficient. This term is often preferred over limited-English-proficient (LEP) as it highlights accomplishments rather than deficits.

- Pre-teaching of vocabulary and concepts
- Personal Glossary
- Extended Time
- Simplified/Verbal Instructions
- Frequent Breaks
- Visual learning- including graphic organizers
- Teacher modeling

Students at Risk of Failure

- Home/School Connection
- Alternative Assessments
- Learning Contracts
- Leveled Rubrics and Tiered Activities
- Work Alone Choice
- Group Work Choice

Students with 504 Plans

- Teachers are responsible for implementing designated services and strategies identified on a student's 504 Plan.
- 504 plans are formal plans that schools develop to give kids the support they need and covers any condition that limits daily activities in a major way.
- Students' accommodations are outlined in their individual 504 plan.

Specific Strategies and Practices that Support Gifted & Talented Students

It is critical that all teachers are able to recognize a high-ability student who may need more depth and complexity in instruction.

- Homogeneous Grouping
- Small Group In-Depth Instruction
- Alternative Assessments, Supplemental Reading, Engaging projects, Differentiated Online Practice
- Pre-Assess to provide Differentiated Instruction to Accelerate Learning

Unit 2

Desired Results

Unit 2 Title: Exploring the Natural World with Technology

Unit Summary: In this unit, students explore how technology helps us better understand and interact with the natural world. Through engaging investigations and hands-on coding, they learn how sensors can detect sound, light, and motion, mimicking the way humans and animals respond to their environment. Students build basic programs using loops and events to create responsive digital systems. The unit encourages curiosity, observation, and early computational thinking while connecting to real-world science.

Learning Standards

8.1.2.AP.3 - Create programs with sequences and simple loops to accomplish tasks.
8.1.2.AP.4 - Break down a task into a sequence of steps.
8.1.2.DA.1 - Collect and present data, including climate change data, in various visual formats.
8.2.2.CS.1 - Select and operate computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences.
8.2.2.ED.1 - Communicate the function of a product or device.
8.2.2.ED.3 - Communicate the function of a product or device
8.2.2.ED.4 - Identify constraints and their role in the engineering 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.

Interdisciplinary Connections

Career Readiness, Life Literacies, & Key Skills 9.4.5.CT.2 - Identify a problem and list the types of individuals and resources (e.g., school, community agencies, governmental, online) that can aid in solving the problem.

9.4.2.C.1 - Demonstrate openness to new ideas and perspectives
9.4.2.CT.2 - Identify possible approaches and resources to execute a plan
9.4.2.IML.1 - Identify a simple search term to find information in a search engine or digital resource.
9.4.2TL.2 - Create a document using a word processing application.

Interdisciplinary Connections

NJSLS - SCIENCE 2020

K-2-ETS1-1 - Ask questions, make observations, and gather information about a situation people want to change (e.g., climate 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.

Learning Targets

Unit Essential Questions:

1. How do sensors help us understand and respond to the world around us?
2. What happens when we use loops or events in our code?
3. How can we use technology to solve real-world problems in nature and daily life?

Unit Enduring Understandings:

1. Sensors detect changes in the environment, such as light or sound, and allow technology to respond in useful ways.
2. Loops and events help make programs more efficient and responsive by repeating actions and reacting to changes automatically.
3. Technology can be used to design smart systems that improve our lives and help us solve problems in our environment.

Vocabulary:

Sensor Input Output Code	Loop Event Sequence Algorithm	System Program Light Sound	Detect Response Debug

Students will be able to:

- Identify and describe how sensors detect changes in the environment
- Create simple programs that use loops and events to control outputs
- Observe and explain how technology mimics natural responses using inputs and outputs
- Build a working system that responds to light or sound using digital tools
- Debug a program by identifying and fixing errors in sequences or events
- Collaborate with peers to design and test a responsive digital project
- Reflect on how technology helps people solve everyday problems in nature and daily life

Unit 2 Focus: *Students explore how technology can sense and respond to the world around them. By using sensors, code, and hands-on design, students build simple systems that react to light, sound, or motion. They begin to use loops and events in*	**<u>Week 5:</u>** **Lesson Title:** What Is a Sensor? **Key Activities**: Classroom objects with built-in sensors (e.g., motion-activated lights, smart speakers, hand dryers); Visuals or video clips of real-world sensor use (e.g., SciShow Kids or BrainPOP Jr.); STEM journals for recording observations; Anchor chart: “What is a sensor?”; Unplugged sorting activity: Input vs. Output

programming while connecting technology to natural systems and real-world uses. Resources used: **Code.org:** Course B – Lessons 2-3 **SAM Labs (SAM Studio):** Light or Motion Triggered Outputs **Mystery Science** - Weather Watching & Animal Needs Lessons	**Week 6:** **Lesson Title:** Technology That Listens and Sees **Key Activities**: SAM Labs with sound or light sensor setup; Code.org Course B – Events and Responses lessons; Printed vocabulary cards: sensor, input, output, detect, response; STEM journals with labeled diagrams and reflection prompts **Week 7:** **Lesson Title:** Loops Make Things Repeat **Key Activities**: Code.org lessons introducing loops (Course B), Unplugged activity: "Repeat the Move" with loop cards, SAM Labs or basic coding platform to create blinking lights or repeated sound patterns, Chart paper for drawing repeated sequences **Week 8:** **Lesson Title:** Events Make Things Happen **Key Activities**:Code.org: Event-driven coding lessons, SAM Labs for hands-on event triggers (e.g., button press activates buzzer or light); If/Then card game or anchor chart

Learning Activities:

Diversity & Inclusion Alignment (N.J.S.A. 18A:35-4.36a)

- Acknowledge economic diversity through design challenges: Pose scenarios that require designing affordable, low-resource sensor systems, highlighting that not all communities have equal access to technology and prompting empathy in student design.
- Explore biases in data and sensors: Introduce age-appropriate discussions about how social or cultural biases (e.g., race, gender norms) can affect sensor effectiveness (like skin tone detection or voice recognition) and why inclusive design matters.

Climate Change Alignment

Smart System Design with Environmental Purpose

- Lesson Tie-In: *Smart Thermostat Challenge*
- Integration: Have students design a thermostat that conserves energy in a school or home setting. Discuss how regulating temperature saves electricity and reduces greenhouse gas emissions.
- STEM Concept: Energy efficiency through automation
- Connection to Sustainability: Emphasizes the role of programmable systems in reducing energy waste.

Sensor-Based Conservation Projects

- Sensor lessons (light, sound, motion): frame these technologies as tools used in clean tech—like systems that reduce energy waste or monitor environments.
- Loop and event coding activities: relate to systems that automate smart responses (e.g., lights turning off automatically, conserving electricity).
- Reflection prompts: Encourage students to think and journal about how sensor-based systems can help the environment.

Assessment Evidence

Formative Assessments:

- Exit slips: “What does a sensor do?” or “What’s an example of a loop?”
- STEM journal reflections after builds (e.g., “What input triggered your system?”)
- Teacher observation checklists during coding and sensor activities
- Think-pair-share: Students explain how their loop or event works
- Mini whiteboard challenges: Draw or label an input/output system

Summative Assessments:

- Performance Task: Design and explain a system that uses a sensor (e.g., light sensor turns on a buzzer)
- Vocabulary sort and match (loop, event, sensor, input, output, etc.)
- Drawing and labeling activity: "My smart system" with written explanation
- Oral presentation or demonstration of a working system that uses input and output

Common Benchmark Assessments:

- Pre/post assessment with multiple-choice and open-response questions
- Coding fluency rubric (e.g., Can the student use a loop? Can they debug?)
- Common task: Use the same sensor and coding blocks across classrooms for comparison
- Teacher rating scale: collaboration, accuracy, creativity, and problem-solving

Alternative Assessments:

- Student video or voice recording explaining how their code works
- STEM story: "How my system helps people" (written or drawn)
- Build a model using craft materials to represent a system (e.g., smart light in a greenhouse)
- Create a mini “tech ad” for their system that explains what it does and how it helps

Core Instructional & Supplemental Materials

Sam Labs	Code.org	Typing Club	Mystery Science

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- Preferential seating
- Follow a routine/schedule, Rest breaks
- Checklists, Immediate feedback

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- Pre-teaching of vocabulary and concepts, Teacher modeling
- Personal Glossary
- Extended Time
- Simplified/Verbal Instructions
- Visual learning- including graphic organizers

Students at Risk of Failure

- Home/School Connection
- Alternative Assessments, Learning Contracts, Leveled Rubrics and Tiered Activities
- Work Alone Choice, Group Work Choice

Students with 504 Plans

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It is critical that all teachers are able to recognize a high-ability student who may need more depth and complexity in instruction.

- Homogeneous Grouping, Small Group In-Depth Instruction
- Alternative Assessments, Differentiated Online Practice
- Pre-Assess to provide Differentiated Instruction to Accelerate Learning
- Supplemental Reading, Engaging projects

Unit 3

Desired Results

Unit 3 Title: Designing and Building Smart Solutions

Unit Summary: In this unit, students dive into the engineering design process by identifying real-world problems and building smart systems to solve them. Using loops, conditionals, and sensors, they create and refine projects like night lights and doorbells that respond to environmental inputs. Through hands-on coding and testing, students learn how technology can be designed to improve everyday life.

Learning Standards

8.1.2.AP.3 - Create programs with sequences and simple loops to accomplish tasks.
8.1.2.AP.4 - Break down a task into a sequence of steps.
8.1.2.AP.5 - Describe a program's sequence of events, goals, and expected outcomes.
8.1.2.DA.1 - Collect and present data, including climate change data, in various visual formats.
8.2.2.CS.1 - Select and operate computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences.
8.2.2.ED.1 - Communicate the function of a product or device.
8.2.2.ED.4 - Identify constraints and their role in the engineering design process
8.2.2.ITH.3 - Identify how technology impacts or improves life.

Interdisciplinary Connections

Career Readiness, Life Literacies, & Key Skills

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9.4.2.CT.2 - Identify possible approaches and resources to execute a plan
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Interdisciplinary Connections

NJSLS - SCIENCE 2020

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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 to compare the strengths and weaknesses of how each performs.

2-LS4-1 - Make observations of plants and animals to compare the diversity of life in different habitats.

Learning Targets

Unit Essential Questions:

1. How can we use technology to solve real-world problems?
2. Why is it important to test and improve our designs?
3. How do loops and conditionals help smart systems make decisions?

Unit Enduring Understandings:

1. Technology and engineering help people design solutions that make life easier, safer, or more efficient.
2. Testing helps us find problems in our designs so we can improve how well they work.
3. Loops repeat actions, and conditionals help systems make choices based on input, allowing technology to respond in useful ways.

Vocabulary:

Design Engineer Problem Solution	Sensor Input Output System	Loop Conditional If Then	Debug Model Test

Students will be able to:

- Identify a real-world problem and describe how technology could help solve it
- Design and build a model of a smart system using sensors, loops, and conditionals
- Test and refine a system based on how well it responds to input
- Explain how conditionals allow a program to make decisions
- Debug a code sequence to improve system performancE
- Collaborate with peers to plan, build, and evaluate a working solution

Unit 3 Focus: *Apply the engineering design process to build smart systems that solve everyday problems. Through hands-on coding and hardware exploration, students use loops, conditionals, and sensors to create responsive models. They collaborate, test, and refine their ideas while exploring how*	**Week 9:** **Lesson Title:** What Is a Smart Solution? **Key Activities**: Introduce real-world problems solved by technology (e.g., automatic lights, smart doorbells); Brainstorm problems students want to solve; Explore examples through teacher-led discussion and short videos; Code.org Course B warm-up activities **Week 10:** **Lesson Title:** Learning to Use Conditionals **Key Activities**: Unplugged activity: “If/Then Sorting”; Build simple condition-based behavior in Code.org or with classroom cards

technology connects to the natural world and improves daily life.. **Resources used:** **SAM Labs:** SAM studio - Smart Door Bell, Sensor Night Light **Code.org:** Course B (4-5) **Mystery Science** - Bug Habitats	**Week 11:** **Lesson Title:** Build a Smart Night Light **Key Activities**: Use SAM Labs to design and build a night light that turns on when it gets dark; Apply loops and conditionals to manage brightness; Partner testing and peer feedback **Week 12:** **Lesson Title:** Design a Smart Doorbell **Key Activities**: Revisit conditionals using Code.org for practice; Build a smart doorbell using SAM Labs: input = button, output = light/sound; Focus on system design and sequencing; Student sketches and model plans **Week 13:** **Lesson Title:** Smart Systems Showcase and Reflection **Key Activities**: Final testing and debugging of smart systems; STEM gallery walk: students present their models to peers; Mystery Science "Bug Habitats" – explore how smart sensors could help monitor natural environments

Learning Activities:

Diversity & Inclusion Alignment (N.J.S.A. 18A:35-4.36a)

- **Lesson Tie-In:** Unit-wide collaborative design and testing phases
- **Connection:** Encourage teams to recognize and value each other's ideas and working styles when planning and testing smart solutions. Use discussion reminders like "Everyone's approach is valuable" and share how diverse teams lead to better design outcomes.

Climate Change Alignment

- **Lesson Tie-In:** Smart Thermostat Challenge & Automated Plant Watering Project
- **Connection:** Frame smart systems as clean-technology tools: thermostat systems that conserve energy, watering systems that reduce water waste. Students reflect on how their designs can address environmental challenges like energy use and resource efficiency.

Assessment Evidence

Formative Assessments:

- STEM journal entries after each design phase ("What is my system supposed to do?")
- Daily exit tickets (e.g., "What is a conditional?" "How did your system use input today?")
- Peer-to-peer design check-ins with sentence starters ("I noticed..." "Have you tried...?")
- Teacher observation checklists during coding, building, and group collaboration
- Mini-quizzes or vocabulary card sorts focused on key terms like loop, input, output, and conditional

Summative Assessments:

- Final Smart System Showcase (Night Light or Doorbell) with rubric assessing design, function, and explanation
- Written reflection or explanation of how their code works, including use of loops and conditionals
- Vocabulary assessment (multiple choice, matching, or write-to-define)
- Oral presentation describing the problem they solved and how they applied the engineering design process

Common Benchmark Assessments:

- Pre/post assessment with coding scenarios and vocabulary
- Common engineering challenge (e.g., everyone builds a smart light, and performance is compared using a rubric)
- Debugging task scored using a rubric (identify and fix errors in sample code)

Alternative Assessments:

- Flipgrid or video explanation of their project's logic and function
- Digital poster or visual model of their system, labeled with inputs/outputs/conditionals
- Student-created "How-To" booklet or comic strip showing how someone could build their system
- Design journal or slide deck documenting each step of the design process with pictures and captions

Core Instructional & Supplemental Materials

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- Differentiated Online Practice
- Alternative Assessments
- Pre-Assess to provide Differentiated Instruction to Accelerate Learning
- Supplemental Reading
- Engaging projects

Unit 4

Desired Results

Unit 4 Title: Innovation, Communication, and Reflection

Unit Summary: In this unit, students bring together everything they've learned by designing and sharing a simple STEM solution to a real-world problem. They plan, build, and test their own projects using basic coding concepts, then practice communication by presenting their work to classmates. Through discussion and reflection, students develop confidence in problem-solving and learn how to improve their designs based on feedback.

Learning Standards

8.1.2.AP.4 - Break down a task into a sequence of steps.
8.1.2.AP.5 - Describe a program's sequence of events, goals, and expected outcomes.
8.1.2.DA.1 - Collect and present data, including climate change data, in various visual formats.
8.1.2.IC.1 - Compare how individuals live and work before and after the implementation of new computing technology.
8.2.2.ED.1 - Communicate the function of a product or device.
8.2.2.ED.4 - Identify constraints and their role in the engineering design process
8.2.2.ITH.3 - Identify how technology impacts or improves life.

Interdisciplinary Connections

Career Readiness, Life Literacies, & Key Skills

9.4.2.CT.2 - Identify possible approaches and resources to execute a plan
9.4.2.CT.3 - Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
9.4.2.DC.1 - Explain differences between ownership and sharing of information.
9.4.2.IML.2 - Represent data in a visual format to tell a story about the data
9.4.2TL.2 - Create a document using a word processing application.

Interdisciplinary Connections

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K-2-ETS1-1 - Ask questions, make observations, and gather information about a situation people want to change (e.g., climate 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 to compare the strengths and weaknesses of how each performs.

Learning Targets

Unit Essential Questions:

1. How can we use technology and creativity to solve everyday problems?
2. Why is it important to test and improve our ideas?
3. How can we share our ideas clearly with others??
4. What can we learn from reflecting on our work and the work of others?

Unit Enduring Understandings:

1. Innovative solutions often begin with identifying a problem and thinking creatively about how technology can help.
2. Testing and revising helps us make better, stronger solutions that work more effectively.
3. Communicating ideas through speaking, writing, and visuals helps others understand and learn from our work.
4. Reflection helps us grow as learners, recognize challenges, and improve our thinking and solutions over time.

Vocabulary:

Innovation Design Problem	Solution Plan Create	Test Improve Reflect	Share Presentation Feedback	Sequence Debug Technology

Students will be able to:

- Identify a real-world problem and explain how technology can help solve it
- Plan and design a simple solution using digital tools and hands-on materials
- Create and test a working model that includes basic coding concepts
- Improve a design based on feedback and testing results
- Present a final project using clear communication and digital visual
- Reflect on the design process and describe what was learned

Unit 4 Focus: *Combine creativity, problem-solving, and communication to design and share a STEM project that applies what they've learned throughout the year. They follow the design process to plan,*	**<u>Week 14:</u>** **Lesson Title:** Identifying Problems and Brainstorming Solutions **Key Activities**: Class discussion on everyday problems technology can help solve, Brainstorm session: "What could we invent or improve?", Review past projects and skills (loops, sensors, conditionals), Begin planning innovation project using design journal or template **<u>Week 15:</u>** **Lesson Title:** Planning and Designing Our Smart Solutions **Key Activities**: Students sketch or map out their project idea; Introduce project criteria and constraints; Peer and teacher feedback on initial plans; Begin simple prototyping with SAM Labs or unplugged models

build, test, and improve their solution, then use digital tools to present their final product and reflect on their learning journey. **Resources used:** **SAM Labs:** Sam's Studio **Code.org:** Course B Review lessons **Mystery Science** - Animal Survival	**Week 16:** **Lesson Title:** Building and Testing Our Projects **Key Activities**: Hands-on building with SAM Labs and/or Code.org tools; Use of sensors, loops, or conditionals as appropriate; Conduct test runs of projects and document results; Reflect in journals: "What worked? What needs to change?" **Week 17:** **Lesson Title:** Improving and Finalizing Our Designs **Key Activities**: Make revisions based on testing and peer input; Add finishing touches and prepare presentations; Create visuals (posters, slides, digital drawings) to explain how projects work; Practice explaining coding and design choices **Week 18:** **Lesson Title:** Presenting and Reflecting on Our Learning **Key Activities**: STEM Showcase: students present projects to classmates or visitors; Peer feedback forms and discussion; Reflective writing or video: "What I learned about solving problems with technology"

Learning Activities:

Climate Change Alignment

- **Connection:** Encourage students to consider how their project could help reduce resource use or respond to environmental challenges—such as energy-efficient tools or systems that sense and act to conserve water or electricity.
- **Alignment:** This connects to New Jersey's integrated climate change mandate, which requires teaching climate solutions across subjects—including technology and engineering systems that support sustainability

Assessment Evidence

Formative Assessments:

- Design journal entries tracking progress, changes, and ideas
- Peer-to-peer feedback using sentence starters ("I noticed..." "You could try...")
- Teacher check-ins during planning, coding, and building
- Sketches or diagrams with labeled inputs/outputs
- Vocabulary card sorts or matching games

Summative Assessments:

- Final STEM project presentation with rubric (design clarity, function, explanation)
- Oral explanation of how their project works and the problem it solves
- Written reflection: "What I learned during this project"

- Digital or physical showcase with Q&A

Common Benchmark Assessments:

- Common performance task: “Design a smart solution to help someone at home or school”
- Rubric-based evaluation of problem-solving process and final product
- Pre/post coding vocabulary check

Alternative Assessments:

- “Innovation Journal” booklet or mini-comic showing the journey from problem to solution
- Digital poster with labeled parts and inputs/outputs
- Group podcast-style recording explaining their collaborative process

Core Instructional & Supplemental Materials

Sam Labs	Code.org	Typing Club	Mystery Science

Accommodations and Modifications: Students with Disabilities, English Language Learners, Students at Risk of Failure, Students with 504s, Gifted & Talented Students

Specific Strategies and Practices that Support Students with Disabilities:

Students receiving Special Education programming have specific goals and objectives, as well as accommodations and modifications outlined within their Individualized Education Plans (IEP) due to an identified disability and/or diagnosis. In addition to exposure to the general education curriculum, the instruction is differentiated based upon the student's needs. The IEP acts as a supplemental curriculum guide inclusive of instructional strategies that support each learner.

- Small group/One to one
- Additional time - Review of directions
- Student restates information
- Space for movement or breaks
- Extra visual and verbal cues and prompts, Verbal and visual cues regarding directions and staying on task
- Preferential seating
- Follow a routine/schedule, Rest breaks
- Checklists, Immediate feedback

Specific Strategies and Practices that Support English Language Learners

English language learner (ELL) is a national-origin-minority student who is limited-English-proficient. This term is often preferred over limited-English-proficient (LEP) as it highlights accomplishments rather than deficits.

- Pre-teaching of vocabulary and concepts, Teacher modeling

- Personal Glossary
- Extended Time
- Simplified/Verbal Instructions
- Visual learning- including graphic organizers

Students at Risk of Failure

- Home/School Connection
- Alternative Assessments
- Learning Contracts
- Leveled Rubrics and Tiered Activities
- Work Alone Choice, Group Work Choice

Students with 504 Plans

- Teachers are responsible for implementing designated services and strategies identified on a student's 504 Plan.
- 504 plans are formal plans that schools develop to give kids the support they need and covers any condition that limits daily activities in a major way.
- Students' accommodations are outlined in their individual 504 plan.

Specific Strategies and Practices that Support Gifted & Talented Students

It is critical that all teachers are able to recognize a high-ability student who may need more depth and complexity in instruction.

- Homogeneous Grouping
- Small Group In-Depth Instruction
- Differentiated Online Practice
- Alternative Assessments
- Pre-Assess to provide Differentiated Instruction to Accelerate Learning
- Supplemental Reading
- Engaging projects