



NEOM

Ready **Ai**

# UNITS OF INQUIRY

(3-6)

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# Lesson Plans

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## Standards and Guidelines Cited

### ISTE Standards

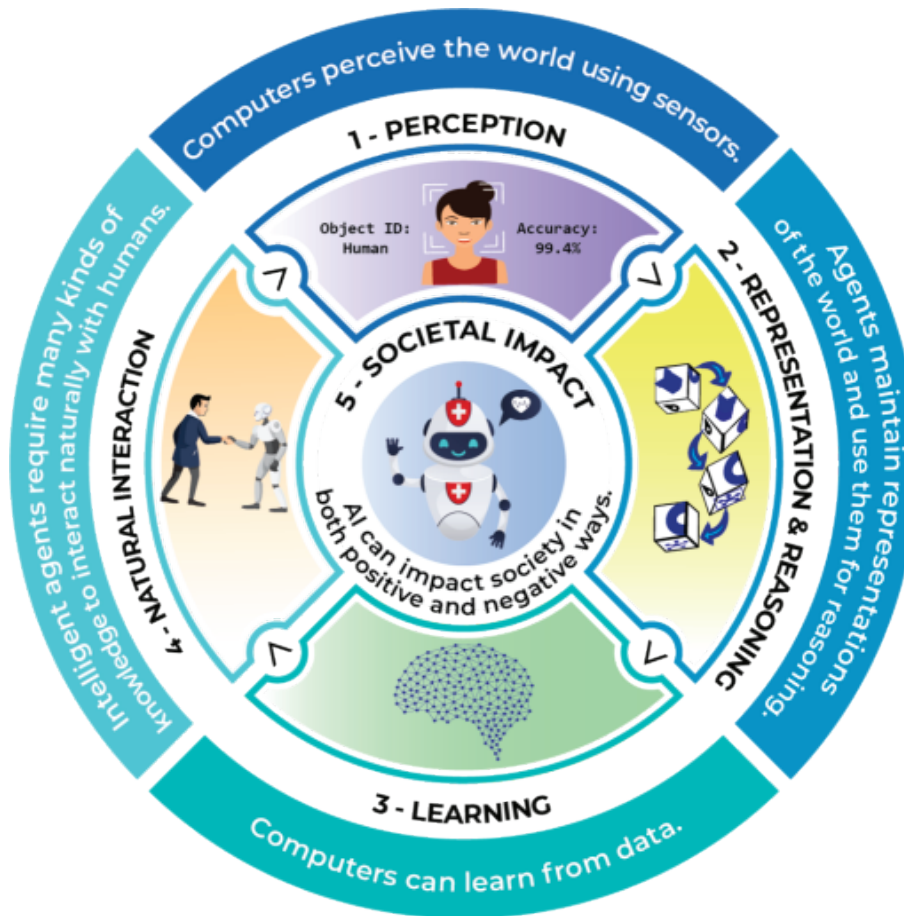
The International Society for Technology in Education (ISTE) produces a series of standards for those involved in education. The lessons in the following curriculum utilize the seven ISTE Student Standards.

- The ISTE Student Standards can be found at <https://www.iste.org/standards/iste-standards-for-students>

### AI4K12 Guidelines

AI4K12.org has released a list of “Five Big Ideas in AI” along with draft grade band progression charts for each of these ideas.

- The five big ideas are summarized on a poster that can be found at <https://ai4k12.org/resources/big-ideas-poster/>.
- The grade band progression charts are available at <https://ai4k12.org/gradeband-progression-charts/>



**Big Idea 1 - Perception:** Computers perceive the world using sensors.

**Big Idea 2 - Representation and Reasoning:** Agents maintain representations of the world and use them for reasoning.

**Big Idea 3 - Learning:** Computers can learn from data.

**Big Idea 4 - Natural Interaction:** Intelligent agents require many kinds of knowledge to interact naturally with humans.

**Big Idea 5 - Societal Impact:** AI can impact society in both positive and negative ways.

# Curriculum Map - G3

**Subject:** Computer Science

**Time Frame:** 2022-2023 School Year

**Grade:** Third Grade

**Essential Question:**

- What is facial recognition and how do ethical considerations of facial recognition impact society?
- How can we use robots to draw geometric shapes and create artwork?
- What animal adaptations can be created using robotics and AI?
- How can motors and sensors be used to create adaptations for animals?

**Objectives:**

- Students will understand how facial recognition identifies human faces and experiment with facial recognition technology
- Students will identify an adaptation useful to a specific animal and create a moving part for that animal.
- Students will program robots to draw geometric shapes
- Students will understand personal privacy and security online

**Standards:**

- **ISTE 1.4 Innovative Designer:** Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.
- **ISTE 1.2 Digital Citizen:** Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
- **ISTE 1.3 Empowered Learner:** Students leverage technology to take an active role in choosing, achieving, and demonstrating competency in their learning goals, informed by the learning sciences.
- **Five Big Ideas of AI:** Idea #4: Natural Interaction: AI Developers strive to create agents that interact naturally with humans

**Skills:**

- Building robotics with motors and sensors
- Programming robots to create artwork
- Identifying technology used in facial recognition
- Designing skyscraper models to scale

**Coding Programs:**

- Makecode Arcade: Tutorials & Live Coding
- CS First: Narration
- Code Monkey: Coding Adventures Part I
- UBTech Robotics Coding

**Materials:**

- Chromebooks/iPads
- UBTech Intermediate UKits
- Cozmo Robot
- Little Bits: Deluxe Kits
- Codey Rocky
- Lego Bricks
- Finch Robot

**Activities:**

- Identify celebrity photos with Cozmo Robot
- Build animal adaptations with UBTech Kits
- Create art with the Finch Robot
- Use Little Bits to create an amusement park

**Resources:**

- UBTech Education
- Interland: Be Internet Awesome
- Finch Robotics Bird Brain Technologies Site
- Little Bits' Educators Guide

**Assessment:**

- Interland: Be Internet Awesome quizzes
- Skyscraper design grading rubric
- Finch Robot shape assessment
- Code Monkey progress chart

# SCOPE & SEQUENCE

Third Grade | 2023

UNIT 1 | UNIT 2 | UNIT 3 | UNIT 4

INTRO TO CLASS	
WEEK 1:	<b>Title: Say Welcome with Codey Rocky Robot</b> <ol style="list-style-type: none"><li>1. Say hello to students in the class and tell something about yourself</li><li>2. Program Codey Rocky to say "Welcome, Students!"</li></ol>
WEEK 2:	<b>Title: Speak a new language with Codey Rocky Robot</b> <ol style="list-style-type: none"><li>1. Use Google Translate to say hello in a different language</li><li>2. Program Codey to say "Hello. How are you?" in a new language</li></ol>
UNIT 1: Facial Recognition	
WEEK 3:	<b>Title: Cozmo Robot &amp; Facial Recognition</b> <ol style="list-style-type: none"><li>1. Learn how facial recognition identifies works with the eye, nose, and mouth relationship on the face</li><li>2. Use Cozmo Robot in Explorer mode to identify humans in the room</li></ol>
WEEK 4:	<b>Title: Identify the Trolls using Cozmo Robot</b> <ol style="list-style-type: none"><li>1. Choose names for three different troll dolls with different colored hair</li><li>2. Train Cozmo to learn the names and correctly identify the troll dolls</li></ol>
WEEK 5:	<b>Title: CS First - Narration</b> <ol style="list-style-type: none"><li>1. Use CS First and Scratch to complete an activity about narration</li><li>2. Tell a story about school and a lost homework assignment</li></ol>
WEEK 6:	<b>Title: Interview a Music Score Artist who uses AI</b> <ol style="list-style-type: none"><li>1. Create interview questions about how the artist uses AI</li><li>2. Have the musician demonstrate how to create movie scores</li></ol>
WEEK 7:	<b>Title: AI &amp; Music with SemiConductor</b> <ol style="list-style-type: none"><li>1. Learn how to conduct an orchestra using SemiConductor app</li><li>2. Move faster and slower, up and down to change tempo &amp; dynamics</li></ol>

## UNIT 2: Privacy & Security Online

WEEK 8:

**Title: What information should be shared online?**

1. Discuss sharing pictures through text and social media
2. Use FlipGrid to take short videos and how to safely share videos

WEEK 9:

**Title: Interland Be Awesome Online Activity**

1. Play Google's digital citizenship game called Interland
2. Discover how to address online bullying and create safe passwords

WEEK 10:

**Title: Video Games with Makecode Arcade**

1. Complete the "Chase the Pizza" tutorial in Makecode Arcade
2. Write a simple game that chases a new type of food

WEEK 11:

**Title: MakeCode Arcade Scoreboard**

1. Complete the "Save the Forest" skills map in Makecode Arcade
2. Help the pilot to fly the plane and put out fires in the forest

WEEK 12:

**Title: Code Monkey Digital Citizenship**

1. Learn how to search online responsibly and navigate the internet
2. Answer quizzes and online assessments about digital citizenship

## UNIT 3: Animal Adaptations

WEEK 13:

**Title: Moving Parts with UBTech Robotics UKit**

1. Practice building an elephant with UBTech Robotic Kits
2. Program the motor to move the trunk up and down

WEEK 14:

**Title: Animals Adaptations & UBTech Robotics UKit**

1. Select an animal to build using UBTech Robotic Kits
2. Research and build a moving adaptation for the animal

WEEK 15:

**Title: Arrays & Indices with Code Monkey**

1. Begin Coding Adventures Part 1 with arrays of turtles
2. Help the monkey collect the bananas using indices

WEEK 16:

**Title: For Loops with Code Monkey**

1. Continue Coding Adventures using For Loops for repeating actions
2. Learn how to step the distance to a specific banana on the screen

WEEK 17:

**Title: Little Bits: Amusement Park**

1. Use Little Bits to build a Ferris wheel and a merry-go-round!
2. Explore the engineering involved in building a Ferris wheel



## UNIT 4: Robots & Artwork

WEEK 18:

**Title: Finch Robot & Geometric Shapes**

1. Program the Finch Robot to make a triangle and square
2. Make large and small shapes using the robot

WEEK 19:

**Title: Finch Robot & Art Designs with Loops**

1. Program the Finch Robot to make designs using loops
2. Create an art museum with the Finch Robot artwork

WEEK 20:

**Title: Pixel Art Creations**

1. Create a pixel art creation using graph paper
2. Use the online program Piskel to create pixel art

WEEK 21:

**Title: LEGO Skyscraper Builds**

1. Draw a sketch of a skyscraper in a nearby city
2. Build the skyscraper using LEGO blocks

WEEK 22:

**Title: Google Earth and Skyscrapers**

1. Use Google Earth to locate the selected skyscraper and zoom in
2. Learn how Google Earth uses satellites to create images

WEEK 23:

**Title: Graph Paper Programming**

1. Learn about algorithms by drawing a program for graph paper
2. Rotate around the room trying other students' algorithms

## END OF CLASS

WEEK 24:

**Title: Technology Wrap-up**

1. Learn about care for robots and computers
2. Describe sensors used in various robots used over the school year

WEEK 25:

**Title: What we Learned - Lessons for a New 2nd Grader**

1. Review Internet Safety to use over break
2. Write a letter to a 2nd grader about what they'll learn next year

# Curriculum Map - G4

**Subject:** Computer Science

**Time Frame:** 2022-2023 School Year

**Grade:** Fourth Grade

**Essential Question:**

- How can I program an interactive video game?
- What is cyberbullying and how should I handle it if it happens to me?
- How is a flowchart used in computer science?
- What is computational thinking?
- How do AI devices like the Roomba and Alexa make life easier?

**Objectives:**

- Students will discover how video games are made and program their own video game.
- Students will explore the societal impact of AI devices in the home.
- Students will identify parts of a flowchart and use a flowchart to describe a computer algorithm
- Students will discuss the effects of cyberbullying.
- Students will program robots to rotate, change color, and change speed.

**Standards:**

- **ISTE 1.2 Digital Citizenship:** Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
- **ISTE 1.4 Innovative Designer:** Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.
- **ISTE 1.7 Global Collaborator:** Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally.
- **Five Big Ideas of AI:** Idea #5 Societal Impact: AI can impact society in both positive and negative ways

**Skills:**

- Using a flowchart for a computer algorithm
- Identify cyberbullying
- Program a video game
- Build a robot that follows a line
- Program a robot to draw a rainbow

**Coding Programs:**

- Makecode Arcade
- Code Monkey: Digital Use
- LEGO Spike Coding App
- iRobot Coding App
- Finch Snap Block Coding
- Flowgorithm

**Materials:**

- Finch Robot
- LEGO Spike Prime Robot
- Makey Makey
- Root Robot
- Quick, Draw

**Activities:**

- Use Makey Makey to create a game controller
- Program a video game in Makecode Arcade
- Use the line follow sensor on Spike Prime Robot
- Use Root Robot to climb magnetic white board wall

**Resources:**

- Makecode Arcade Tutorials
- LEGO Education Spike Prime Teacher Resources
- Birdbrain Technologies Finch Robot Learning Portal
- iRobot Education
- Quick, Draw's data set

**Assessment:**

- Flowgorithm Flow Chart
- Makecode Arcade Video Game Project
- Working video game controller using Makey Makey
- Spike Prime robot effectively follows line using line sensor
- Ada Lovelace's Life Project

# SCOPE & SEQUENCE

Fourth Grade | 2023

UNIT 1 | UNIT 2 | UNIT 3 | UNIT 4

INTRO TO CLASS	
WEEK 1:	<b>Title: Write Your Name in Pixel Art</b> <ol style="list-style-type: none"><li>1. Welcome students and describe procedures</li><li>2. Practice each others' names using Pixel Art with graph paper</li></ol>
WEEK 2:	<b>Title: All About Me Slideshow</b> <ol style="list-style-type: none"><li>1. Use Google Slides to create a 3-slide slideshow about themselves</li><li>2. Add GIFs and present the slideshows</li></ol>
UNIT 1: Internet Safety	
WEEK 3:	<b>Title: Using the Internet Safely and Responsibly</b> <ol style="list-style-type: none"><li>1. Look at examples and how to avoid phishing and spam emails</li><li>2. Discuss reliable sites to get information and how to cite sites</li></ol>
WEEK 4:	<b>Title: Cyberbullying</b> <ol style="list-style-type: none"><li>1. Identify cyberbullying by reading through many examples as a class</li><li>2. Discuss societal impact of cyberbullying and how to report to adults</li></ol>
WEEK 5:	<b>Title: Spike Prime Robot Driving Base</b> <ol style="list-style-type: none"><li>1. Program Spike Robot to move in a square shape</li><li>2. Experiment with larger and smaller squares on the ground</li></ol>
WEEK 6:	<b>Title: Spike Prime Robot and Sensors</b> <ol style="list-style-type: none"><li>1. Use the Line Follow Sensor to move in triangles, squares, and circles</li><li>2. Try out the color and motion sensor on Spike Prime Robot</li></ol>
WEEK 7:	<b>Title: Quick, Draw</b> <ol style="list-style-type: none"><li>1. Use Quick, Draw to design doodles and discuss machine learning</li><li>2. Look at Quick, Draw's data set with examples of thousands of images</li></ol>

## UNIT 2: Video Games

WEEK 8:

**Title: Makey Makey Controller**

1. Set up Makey Makey to use as a controller for a Pac Man game
2. Discuss how simple circuits are used in video game controllers

WEEK 9:

**Title: Counter with Makey Makey**

1. Use the Makey Makey Counter app to add points to a game
2. Discuss how physical and digital devices are used in video games

WEEK 10:

**Title: Makecode Arcade Happy Flower**

1. Use the Makecode Arcade tutorial to draw sprites and add points
2. Review terms like coordinates, sprites, loops, and conditionals

WEEK 11:

**Title: Make Your Own Video Game in Makecode**

1. Create your own sprites and programming in Makecode Arcade
2. Present the game to the class in an Arcade format

WEEK 12:

**Title: Interview with a Video Game Developer**

1. Students write out questions and interview a Video Game Developer
2. Discussion includes types of programs, use of coding, and animation

## UNIT 3:

WEEK 13:

**Title: Root Robot Draws a Rainbow**

1. Use the iRobot app to program the Root Robot to make a semi circle
2. Discuss how to make a rainbow and then add the correct code

WEEK 14:

**Title: Root Robot Climbs a Wall**

1. Discuss ways that AI robots are being used in society
2. Program the root robot to climb a magnetic wipe board

WEEK 15:

**Title: Flowgorithm**

1. Use Flowgorithm to learn how inputs, outputs, and processes work
2. Create a flowchart to show how to make a ham & cheese sandwich

WEEK 16:

**Title: Flowgorithm**

1. Discuss how flowcharts are used in computer science
2. Create a flowchart to show how to complete a process in your day

WEEK 17:

**Title: MakeCode Arcade: Save the Forest**

1. Complete the Makecode Arcade Save the Forest tutorial
2. Discuss how technology and AI can be used for good

## UNIT 4:

WEEK 18:

**Title: Ada Lovelace Life**

1. Read about the life and career of Ada Lovelace
2. Watch the video and discuss female computer programmers

WEEK 19:

**Title: Ada Lovelace Project**

1. Create a project about Ada Lovelace in Scratch
2. Present Scratch projects to the class and describe the coding used

WEEK 20:

**Title: Finch Robot Number Line**

1. Use the Finch Robot on a number line
2. Select specific spots on the line and have the Finch Robot draw lines

WEEK 21:

**Title: Finch Robot Parade Float**

1. Decorate Finch robot to serve as a parade float
2. Program the parade float to move along the parade route

WEEK 22:

**Title: AI Devices in the Home: Roomba**

1. Use a Roomba in the classroom to show how it works
2. Discuss sensors and machine learning used at iRobot

WEEK 23:

**Title: AI Devices in the Home: Alexa**

1. Use an Alexa in the classroom and show how it can play music
2. Discuss how machine learning is used by Amazon to predict music

## END OF CLASS

WEEK 24:

**Title: Robot Playground**

1. Put Finch Robot, Spike Robot, & Root Robot together in a large space
2. Discuss the sensors and capabilities of each robot

WEEK 25:

**Title: Fifth Grade Sneak Peak**

1. Look ahead at the curriculum and projects in fifth grade
2. Provide projects and coding opportunities to complete during break

# Curriculum Map - G5

**Subject:** Computer Science

**Time Frame:** 2022-2023 School Year

**Grade:** Fifth Grade

**Essential Question:**

- When an image is uploaded to the internet, is it part of my digital footprint?
- What is emotional intelligence and how is it used with robots?
- Can I build a model of a smart house with smart devices?
- How does circuitry in robots work and can I build simple circuits?

**Objectives:**

- Students will identify the impact of their digital footprint
- Students will write code to control a robot through a challenging maze
- Students will learn how circuits work in robotics and build simple circuits
- Using AI-robots, students will discover how emotional intelligence works
- Students will identify devices in a smart house and build a smart house model

**Standards:**

- **ISTE 1.5 Computational Thinker:** Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.
- **ISTE 1.2 Digital Citizenship:** Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
- **ISTE 1.3 Knowledge Constructor:** Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.
- **Five Big Ideas of AI:** Idea #3 Learning: Computers can learn from data

**Skills:**

- Completing a circuit using robotics kits
- Identify types of data bias in data
- Code robots to complete maze challenges
- Program robots using color codes

**Coding Programs:**

- Spike Prime Coding
- Python AutoAuto
- Microsoft MakeCode
- WonderWorkshop

**Materials:**

- AutoAuto
- Finch Robot
- LEGO Spike Prime Robot
- Cue Robot
- Microbits
- Smart House Architecture
- AI Duet
- Machine Learning for Kids

**Activities:**

- Build a Smart House model with smart devices
- Code an AutoAuto car to drive in a virtual & physical world
- Program Cue Robot with emotional intelligence
- Code Spike Robot to complete 3 missions

**Resources:**

- Common Sense Media: Digital Footprint & Identity
- LEGO Spike Prime App
- MakeCode for Microbits
- WonderWorkshop Lesson Plans

**Assessment:**

- LEGO Spike Prime Robot course completion
- Working smart devices in Smart Houses
- Common Sense Media Assessment
- MicroBit Project Rubric

# SCOPE & SEQUENCE

Fifth Grade | 2023

UNIT 1 | UNIT 2 | UNIT 3 | UNIT 4

INTRO TO CLASS	
WEEK 1:	<b>Title: Introduce Yourself with an Avatar</b> <ol style="list-style-type: none"><li>1. Use the Voki app to create an Avatar of yourself</li><li>2. Record an introduction of your voice with the selected avatar</li></ol>
WEEK 2:	<b>Title: AI Duet, Play a Duet with a Computer</b> <ol style="list-style-type: none"><li>1. Students create a melody using AI Duet and then listen to the duet</li><li>2. Discuss how AI adds a duet with pitch, rhythm, and tempo</li></ol>
UNIT 1: Digital Footprint	
WEEK 3:	<b>Title: Private vs. Public Information</b> <ol style="list-style-type: none"><li>1. Use Flipgrid to practice posting public information and evaluating</li><li>2. Discuss what information to keep private, especially on social media</li></ol>
WEEK 4:	<b>Title: Digital Footprint and Safety Online</b> <ol style="list-style-type: none"><li>1. Play the online Share Jumper game to review online safety</li><li>2. Identify how social media and online sites store your digital images</li></ol>
WEEK 5:	<b>Title: Code Monkey Banana Tales Part I Python Fundamentals</b> <ol style="list-style-type: none"><li>1. Begin coding in Python with Banana Tales</li><li>2. Help the monkey beat the dragon using line based code</li></ol>
WEEK 6:	<b>Title: Build a mini Smart House</b> <ol style="list-style-type: none"><li>1. Use the ArcKit set to build a mini Smart House</li><li>2. Students add in working wind turbines with motor and wires</li></ol>
WEEK 7:	<b>Title: Design features for the Smart House</b> <ol style="list-style-type: none"><li>1. Students add design and furniture to the miniature Smart House</li><li>2. Studets add features like LED lights, solar panels, and rooftop gardens</li></ol>

## UNIT 2: MicroBit Controllers

WEEK 8:

**Title: Microsoft Makecode & MicroBit Controllers**

1. Complete the tutorial for Rock, Paper, Scissors game
2. Connect the MicroBit, download the program, and play the game

WEEK 9:

**Title: Soil Microbit Sensor**

1. Use a small potted plant and connect the Microbit sensor
2. Complete the programming to identify the moisture levels in the soil

WEEK 10:

**Title: Biography Project about Bill Gates**

1. Research the life and accomplishments of Bill Gates
2. Discuss the Bill Gates Foundation and lasting legacy of Microsoft

WEEK 11:

**Title: Code Monkey Banana Tales Part I Python Fundamentals**

1. Program Sequences and For Loops in Python to help the monkey
2. Students develop confidence using Python syntax

WEEK 12:

**Title: Banana Tales Part I Python Fundamentals**

1. Program Lists and Range while changing the height of the giraffe
2. Students help the monkey beat the dragon while learning Python

## UNIT 3: Emotional Intelligence

WEEK 13:

**Title: Cue Robot & Emotional Intelligence**

1. Discuss the concept of emotional intelligence in robots
2. Use Wonder Workshop to test out the four avatars on Cue Robot

WEEK 14:

**Title: Program the Cue Robot to switch personalities**

1. Create a program that changes Cue Robot to different personalities
2. Create faces with the LED lights on the robot to accompany the EI

WEEK 15:

**Title: Slideshow about Alan Turing**

1. Research Alan Turing's life and create three slides in Google Slides
2. In your own words, explain the Turing Test and give an example

WEEK 16:

**Title: Code Monkey Banana Tales Part II Advanced Topics**

1. Students use Banana Tales to learn classes, inputs, and integers
2. Students help the monkey to go on adventures and drill new building

WEEK 17:

**Title: Code Monkey Banana Tales Part II Advanced Topics**

1. Students use Banana Tales to learn strings, dictionary, set and tuples
2. Students continue to program in Python and help to save the monkey



## UNIT 4: AutoAuto Cars

WEEK 18:

**Title: Introduction Coding in Python with AutoAuto**

1. Students learn Python programming with AutoAuto
2. Students work in an online environment to race their cars

WEEK 19:

**Title: Use AutoAuto Cars**

1. Students connect the physical cars and learn to race the cars
2. Students train the cars to avoid obstacles like cats and people

WEEK 20:

**Title: Finch Robots**

1. Create a parade float with the Finch Robot including flashing lights
2. Add straws, plastic cups, and spoons to the robot

WEEK 21:

**Title: Finch Robots - Parade**

1. Create a parade route across the room with masking tape
2. Program the robot to follow the parade route & turn at specific spots

WEEK 22:

**Title: LEGO Spike Prime**

1. Add the ultrasonic sensor to the Spike Prime Robot
2. Program the robot to move to a nearby wall, sense it and return

WEEK 23:

**Title: LEGO Spike Prime**

1. Program the Spike Prime Robot to use the line follow sensor
2. Draw lines with branches and program the robot to follow the lines

## END OF CLASS

WEEK 24:

**Title: Machine Learning for Kids**

1. Use Machine Learning for Kids to categorize words from the year
2. Students walk around the room to see what concepts others selected

WEEK 25:

**Title: FlipGrid Videos**

1. Students create one minute video about their favorite robot
2. Students share the video with the classmates and share memories

# Curriculum Map - G6

**Subject:** Computer Science

**Time Frame:** 2022-2023 School Year

**Grade:** Sixth Grade

**Essential Question:**

- How can we utilize the Engineering Design Process to create an invention?
- How can we use a microcomputer as a fitness device in the real world?
- How are video games created and who designs the games?
- How does 3D printing work and how is it useful in today's society?
- What types of sensors do self-driving cars use?

**Objectives:**

- Students will create a prototype of an invention that will improve day-to-day life in some way
- Using Auto Auto cars, students will program a self-driving car to run in a physical and virtual environment
- Students will design 3D objects using TinkerCad
- Students will program video games with sprites and multi level challenges
- Students will design fitness equipment using microcomputers that monitor steps and heart rate

**Standards:**

- **ISTE 1.4 Innovative Design:** Students develop, test and refine prototypes as part of a cyclical design process.
- **ISTE 1.7 Global Collaborator:** Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally.
- **ISTE 1.1 Empowered Learner:** Students leverage technology to take an active role in choosing, achieving, and demonstrating competency in their learning goals, informed by the learning sciences.
- **Five Big Ideas of AI: Idea #2:** Representation & Reasoning: Agents maintain representation of the world and use them for reasoning.

**Skills:**

- Engaging in Engineering Design Process
- Programming a Microbit with Makecode
- Designing a Video Game with characters and levels

**Coding Programs:**

- Python with AutoAuto
- Makecode Arcade
- Makecode Microbit
- Lego Spike Prime Coding

**Materials:**

- Chromebooks/iPads
- Microbit
- AutoAuto Cars
- LEGO Spike Prime robot
- TinkerCad
- 3D Printers

**Activities:**

- Make a functional pedometer with a Microbit
- Create a video game with Makecode Arcade
- Create an Invention using Engineering Design
- Design and 3D print keychains

**Resources:**

- LEGO Spike Prime App
- TinkerCad 3D Printing Tutorials
- AutoAuto Python program with virtual and physical cars
- Common Sense Media: Digital Connections
- Engineering Design Process for inventions

**Assessment:**

- AutoAuto online assessments
- 3D printed object grading rubric
- Common Sense Media progress grid
- Makecode Arcade video game assessment

# SCOPE & SEQUENCE

Sixth Grade | 2023

UNIT 1 | UNIT 2 | UNIT 3 | UNIT 4

INTRO TO CLASS	
WEEK 1:	<b>Title: Write a program to say “Hello, World”!</b> <ol style="list-style-type: none"><li>1. Write a program in Python to print “Hello, World!”</li><li>2. Write a program to say “Hello!” to another student &amp; and an interesting fact</li></ol>
WEEK 2:	<b>Title: Create a FlipGrid to Explain a Sensor</b> <ol style="list-style-type: none"><li>1. Research how a specific sensor works (touch, ultrasonic, light)</li><li>2. Create a 1 minute video on Flipgrid describing how the sensor works</li></ol>
UNIT 1: Micro:Bit Pedometer	
WEEK 3:	<b>Title: Micro:bit Coding</b> <ol style="list-style-type: none"><li>1. Follow the tutorials to light up the Micro:bit and add sound</li><li>2. Practice adding the step counter feature</li></ol>
WEEK 4:	<b>Title: Pedometers with Micro:bits</b> <ol style="list-style-type: none"><li>1. Research sensors on pedometers and heart monitors</li><li>2. Create a functioning pedometer using a Micro:bit</li></ol>
WEEK 5:	<b>Title: Digital Connections</b> <ol style="list-style-type: none"><li>1. Watch the video about Online Misinformation</li><li>2. Discuss how misinformation is shared and complete worksheet</li></ol>
WEEK 6:	<b>Title: Exploring ChatGPT</b> <ol style="list-style-type: none"><li>1. Model how to use ChatGpT on the screen and provide examples</li><li>2. Experiment with students, writing haikus</li></ol>
WEEK 7:	<b>Title: Writing Essays and Evaluating ChatGPT</b> <ol style="list-style-type: none"><li>1. Students write in essay in English class about the book Tom Sawyer</li><li>2. Students use ChatGPT to write the essay and grade using rubric</li></ol>

## UNIT 2: Create an Invention

WEEK 8:

**Title: Engineering Design Process**

1. Introduce the Engineering Design Process and explain steps
2. Together, work through creating a new type of broom for a classroom

WEEK 9:

**Title: Identify and Research a Problem to Help the World**

1. Each student identifies a problem in the real world
2. Use the internet and resources to research possible solutions

WEEK 10:

**Title: Create a Prototype and test Prototype**

1. Sketch a picture of an invention then make a cardboard prototype
2. Identify materials and costs and build the prototype. Test & Improve.

WEEK 11:

**Title: Present Invention Project with Slideshow**

1. Create a Google Slideshow describing the steps of your invention
2. Present the invention and prototype to the class with the slideshow

WEEK 12:

**Title: Semantris**

1. Play Semantris, a word association game that uses machine learning
2. Discuss how algorithms work in machine learning

## UNIT 3: Video Game Design

WEEK 13:

**Title: Code a Video Game**

1. Using Makecode arcade, follow the Chase the Pizza tutorial
2. Add different sprites and add in a changing score

WEEK 14:

**Title: Create your own Video Game**

1. Create your own game in Makecode Arcade
2. Select a background, sprites, and scoreboard with at least 2 levels

WEEK 15:

**Title: LEGO Spike and Distance Sensors**

1. Build the driving base and add a distance sensor to LEGO spike
2. Program the robot to drive to the wall and then turn using the sensor

WEEK 16:

**Title: LEGO Spike Walking robot**

1. Build the walking robot with the LEGO Spike
2. Program the walking robot to move forward and try dance moves

WEEK 17:

**Title: Interview with a Video Game Designer**

1. As a class, create questions to ask a video game designer
2. Interview the designer to find out about sprites, game design, and changing levels. Explore the life and opportunities of game designers

## UNIT 4: AutoAuto Python Cars

WEEK 18:

**Title: Auto Auto Python**

1. Start the lessons in AutoAuto python programming to move a car
2. Drive the car in the virtual world, moving up and down the ramps

WEEK 19:

**Title: Auto Auto Physical Cars**

1. Connect the physical cars and drive them on the course
2. Race the cars and adjust the speed and angles to decrease timeDiscover how artificial intelligence is used to track animals

WEEK 20:

**Title: Scratch Coding with AI Extentions**

1. Use the hand detector extension in Scratch programming to explore how cameras work as sensors
2. Write a program to move the cat every time you raise your hand to the screen

WEEK 21:

**Title: Sensors in the Real World for Safety Doors**

1. Discuss how sensors in safety doors and security doors work
2. Using Scratch programming, build a sensor for a new safety door at the school

WEEK 22:

**Title: 3D printing key chains with Tinkercad**

1. Use Tinkercad to design key chains using basic shapes and a hole
2. Print the key chains with student names and add a key ring to each

WEEK 23:

**Title: 3D printing in the Real World**

1. Explore 3D printed houses in the real world and discuss the benefits.
2. Design and 3D print mini gingerbread houses

## END OF CLASS

WEEK 24:

**Title: Build a Bristle Bot**

1. Use a toothbrush, vibrating motor, and battery pack to make a bot
2. Add pipe cleaner legs and googly eyes to make the bot travel and fight other bristle bots

WEEK 25:

**Title: Large Language Model haiku reflection**

1. Use ChatGPT or another LLM to create a haiku reflecting on the year
2. Practice adding descriptive words to the prompt to improve the haiku

# 01

## AI & Facial Recognition (3-6)

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# TEACHING GUIDE

## Lesson Overview:

In this lesson, students will learn about AI and facial recognition. To engage all learners, students will create masks and test the capabilities of Artificial Intelligence. Additionally, students will classify mouth shapes in order to demonstrate how AI determines facial expressions.

## Lesson Objectives:

By the end of this lesson, students will be able to

- Explain in age appropriate terms how facial recognition works
- Test the limits of industry AI apps
- Demonstrate AI facial expressions

## Alignment with Big Ideas:

Big Idea #1: Computers perceive the world using sensors.

## ISTE Standards for Students:

### 1.1 Empowered Learner

- 1.1d - Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.

### 1.3 Knowledge Constructor

- 1.3d - Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.

## ISTE Computational Thinking Competencies:

### 5.1 Computational Thinking (Learner)

- Recognize how computing and society interact to create opportunities, inequities, responsibilities and threats for individuals and organizations.

## Equipment

Student iPads, computer connected to a projector. Paper large enough to cover students faces, rubber bands, paper clips, drawing and art utensils.

- [AI & Facial Recognition PPT Grades 3-6<sup>1</sup>](#)

## Preparation

Ensure the following websites are accessible:

- <https://calypso-robotics.com/>
- <https://www.visagetechologies.com/HTML5/latest/Samples/ShowcaseDemo/ShowcaseDemo.html>

Ensure student iPads are properly charged.

<sup>1</sup> [https://docs.google.com/presentation/d/1tWRgkcfiNIOcmGuuJ\\_Z6WhC1pVMI7e3O/edit?usp=sharing&oid=111724821344470190729&rtpof=true&sd=true](https://docs.google.com/presentation/d/1tWRgkcfiNIOcmGuuJ_Z6WhC1pVMI7e3O/edit?usp=sharing&oid=111724821344470190729&rtpof=true&sd=true)

# Lesson Orientation

<p><b>Warm-Up</b> Open Cloud Calypso on iPads. Students may do this by going to <a href="https://calypso-robotics.com/">https://calypso-robotics.com/</a></p> <p>Alternatively, students may be trained to use a QR code on the screen to open the Cloud Calypso website.</p> <p>Demonstrate the facial emotion recognition feature of Cloud Calypso. Ask students what emotions the teacher is demonstrating. Then, ask students if the Cloud Calypso software is accurately identifying the emotion.</p> <p>Allow students a moment to play with the facial recognition feature themselves.</p> <p>To close this portion of the work, ask students where they have seen facial recognition in their lives. Some answers may include:</p> <ul style="list-style-type: none"><li>• Entry to Neom</li><li>• Unlocking phones or other devices</li></ul>	5 minutes
<p><b>Presentation</b> Tell students that AI can do more than just recognize a face and identify it. Explain that AI can identify emotions as well.</p> <p>We can tell by looking at someone’s face whether they are happy, sad, surprised, scared, or angry. We show these emotions mainly with our mouth, eyes, eyebrows, and nose. If someone is smiling they are probably happy. If someone is angry their eyes may be partly closed and their nostrils flared, while if they’re surprised their eyes might be wide open and their eyebrows raised. Computers recognize emotion the same way. First they look at the image and measure the shapes of the mouth, eyes, eyebrows, and nose. Then, they choose which emotion most closely matches those shapes.</p> <p>Present the slide deck that reviews how computers have this ability. Ask for student involvement using the questions prepared in the slide deck.</p>	10 minutes
<p><b>Practice</b> Introduce students to the Visage Technologies demo. Explain that this is a more powerful facial recognition tool and that students are now going to test its capacity.</p> <p>To test the technology, however, students will play with facial features printed out for them. Students can cut out the eyebrows, eyes, noses, and mouths and glue them to a paper face.</p>	10 minutes



Students should then show their created faces to the AI system. What emotion does the system attribute to the face?

Students can experiment with changing out the mouth with a different mouth shape and/or changing the eyebrow positioning to see how this affects the emotion the AI program detects. For example, an open mouth and wide eyes are indications of surprise, while a smiling mouth is an indication of happiness. Pursued lips might indicate anger, but the eyebrow positions and eye shape might also be important in discriminating anger vs. fear or sadness.

Allow students time to practice with the app. Ask students how they might be able to test the app's abilities in determining faces and emotions.

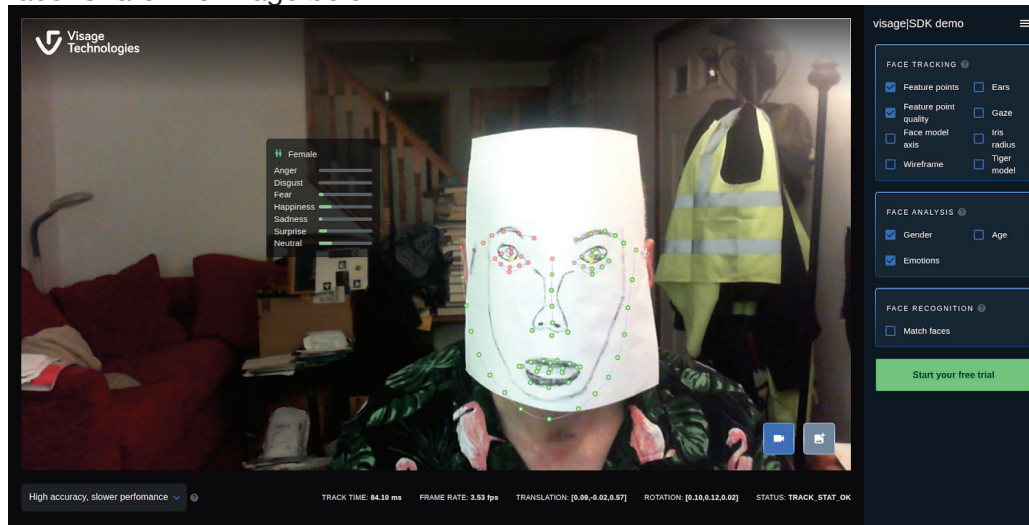
Encourage students to think about how they could test the abilities of the app by making a mask. Tell them they will now do this.

## Production

Explain that the computer knows where the eyes, nose, mouth, and so forth should be on a normal human being.

Explain that students will now test the limits of the AI system. For instance, what happens if only part of the face is showing? Students should cover half the face and see if the AI still recognizes the face. Ask students to share what happened.

Tell students they will now create masks and test what AI needs to determine a face. Share this image below:



Students can attach the mask to their face by tying some rubber bands together and using a paper clip at each end.

Students should try to create a variety of masks to meet the different emotions recognizable by Visage:

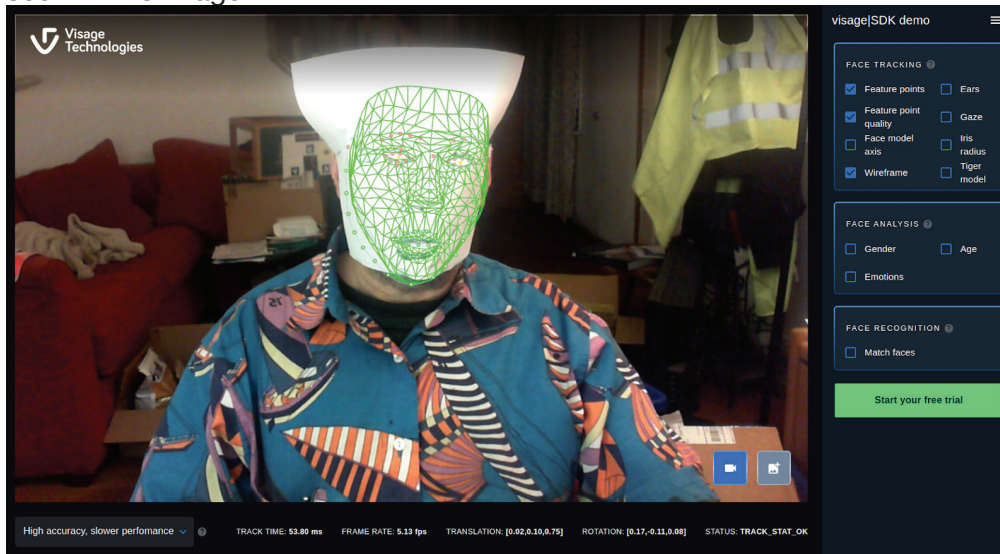
20 minutes

- anger
- disgust
- fear
- happiness
- sadness
- surprise
- neutral

Allow students to present their most successful ones. Explain the bars next to the emotions indicate how confident the AI system is in the emotion it is seeing. Ask students to identify what facial features helped obtain higher confidence levels.

### Enrichment for Older Grades

Students can turn on face mesh in order to get a glimpse into what the software is doing in the background. Students can enable the “Wiremesh” function as seen in this image:



Ask students to pay attention to what the wiremesh is determining about the shape of the

- eyebrows,
- eyes
- nose
- mouth

Explain that the wiremesh function is proof of what the computer is doing. Note how the masks allow for the wiremesh to be clearer than using a human face.

### Extension

Ask students to identify a moment in their lives where AI facial recognition would be useful.