Growing with KIBO - Illinois Computer Science Standards Alignment

Alignment with Illinois Computer Science Standards, Draft 2021*

Growing with KIBO is a complete, sequenced curriculum covering robotics, coding, and computational thinking. Each level of this curriculum— Novice, Intermediate, and Advanced—contains 20 hours of classroom lesson plans (for a total of 60 hours), providing a complete K–2 robotics progression aligned to current and evolving computer science standards. Contextualized STEAM projects and a focus on social-emotional development allow students to develop digital fluency, as they collaborate, connect, and express themselves creatively. Learn more at www.kinderlabrobotics.com.

* Illinois Learning Standards for Computer Science (2021). *Illinois State Board of Education, Notice of Proposed Amendment, 23.A.I.a*
     Retrieved from https://www.isbe.net/Documents/23-1RG-P-20210521.pdf

Level	#	Lesson Title	Learning goals	Scope and Sequence Topics	CSTA Standards Addressed*
All Levels	All	*Growing with KIBO* (entire curriculum)	Although KIBO curriculum does not engage with online work specifically, positive technology use and good digital citizenship are reinforced through the "6 C's" framework of educational practices, drawn from Dr. Marina Bers' research. These practices include: sharing and caretaking of materials; recongition of collaboration through collaboration webs and other artifacts; sharing circles ending each lesson; and more.	SEL, EDP	K-2.IC.17: Work respectfully and responsibly with others online. (P2)
All Levels	All	*Growing with KIBO* (entire curriculum)	The KIBO curriculum uses the framework of Constructionism to position coding and engineering as tools for creative self-expression: coding as a literacy. Children use programming and robotics to tell stories, share meaningful aspects of their personal and cultural histories, model natural and human systems, and more. In each lesson, children use technology to create new and original work that is personally meaningful.	SEL, EDP	K-2.ET.E Create new or original work by applying emerging technologies.
Novice	1	Let's Build KIBO	Learning goals: students will learn what a robot is and that robots are designed by humans to solve problems. They will learn about the mechanical and robotic parts of the KIBO robot and understand that parts have functions.	Parts and Functions	K-2.CS.01: Select and operate appropriate software to perform a variety of tasks, and recognize that users have different needs and preferences for the technology they use. (P1) K-2.CS.02: Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7) 3-5.CS.01: Describe how internal and external parts of computing devices function to form a system. (P7) K-2.ET.B Compare existing and emerging technologies, ideas, and concepts.
Novice	2	What is a Program?	Learning goals: students will learn that a program is a sequence of instructions. They will learn about the symbols that make up KIBO's programming language.	Sequencing Symbols	K-2.AP.09: Model the way programs store and manipulate data by using numbers or other symbols to represent information. (P4) K-2.AP.11: Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (P3) K-2.ET.B Compare existing and emerging technologies, ideas, and concepts.

Novice	3	Let's Program Each Other!	Learning goals: students will continue to learn about the symbols and sequencing of KIBO's programming language, reinforcing the work from lesson 2.	Sequencing Patterns Symbols SEL	K-2.AP.08: Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks. (P4) K-2.AP.09: Model the way programs store and manipulate data by using numbers or other symbols to represent information. (P4) K-2.AP.11: Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (P3)
Novice	4	PB&J Game	Learning goals: students will learn that the sequence of the instructions in their programs matter. They will explore the importance of sequence by breaking down the steps required to make a peanut butter and jelly sandwich.	Sequencing Decomposition EDP	K-2.AP.08: Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks. (P4) K-2.AP.11: Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (P3) K-2.ET.B Compare existing and emerging technologies, ideas, and concepts.
Novice	5	Craft and Build Drop Test	Learning goals: students will learn about the steps of the engineering design process. They will create models out of craft and recycled materials, then they will test the sturdiness of their models by dropping them from ankle height. If the models don't survive, the students can follow the engineering design process to revise their designs.	EDP	K-2.AP.15: Using correct terminology, describe steps taken and choices made during the iterative process of program development. (P7) K-2.IC.16: Compare how people live and work before and after the implementation or adoption of new computing technology. (P7) K-2.ET.A Explain that the field of emerging technologies will be evolving and rapidly growing. K-2.ET.C Describe how emerging technologies are influencing current events at a local and global scale. K-2.ET.D Predict the positive and negative societal, cultural, and economic impacts that emerging and future technologies may generate.
Novice	6	Engineering Challenges	Learning goals: students will learn that robotic parts can be used in new ways to change their functions, through activity centers with "engineering challenges."	Parts and Functions EDP	K-2.CS.01: Select and operate appropriate software to perform a variety of tasks, and recognize that users have different needs and preferences for the technology they use. (P1) K-2.CS.02: Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7) K-2.IC.16: Compare how people live and work before and after the implementation or adoption of new computing technology. (P7) K-2.ET.A Explain that the field of emerging technologies will be evolving and rapidly growing.
Novice	7	Build Dream Cars	Learning goals: students will use the engineering design process to design, build, and test their own robotic vehicles. They will create short sequences for their robots.	Sequencing EDP	K-2.AP.11: Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (P3) K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) K-2.AP.15: Using correct terminology, describe steps taken and choices made during the iterative process of program development. (P7)
Novice	8	New Robot Parts	Learning goals: students will reinforce their understanding of KIBO's parts and how the parts give KIBO the ability to respond to specific commands. Optionally, students learn the operation of a new part (KIBO's Light Bulb).	Parts and Functions	K-2.CS.02: Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7) 3-5.CS.01: Describe how internal and external parts of computing devices function to form a system. (P7)

Novice	9	Hokey Pokey	Learning goals: students decompose and sequence a dance as individual commands as they program their robots to dance the Hokey Pokey.	Sequencing Decomposition Patterns	K-2.AP.08: Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks. (P4) K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.AP.11: Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (P3)
Novice	10,11	KIBO Dance Party	Let's have a KIBO dance party! Students will decorate their KIBO as a dancer to represent a chosen culture or community; then they will create a program to teach their KIBO to dance to the music of that community. Students build on the decomposition and sequencing work they did in the Hokey Pokey lesson. They'll use those new skills to explore and express what they learn about dancers from their own or other cultures. Allow two meetings for this integration project.	Integration (Social Studies)	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) K-2.AP.13: Give attribution when using the ideas and creations of others while developing programs. (P7) K-2.AP.15: Using correct terminology, describe steps taken and choices made during the iterative process of program development. (P7) 3-5.AP.16: Take on varying roles, with teacher guidance, when collaborating with peers during the design, implementation, and review stages of program development. (P2)
Novice	12	Navigate Tape Paths	Learning goals: students will use sequencing and decomposition to create programs for KIBO to navigate simple and complex paths.	Sequencing Decomposition Patterns	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.AP.11: Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (P3)
Novice	13	KIBO Bowling	Learning goals: students use estimation and measurement along with sequencing to create a program to travel the length of the bowling lane in an effort to knock down all the pins.	Sequencing Patterns	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.AP.11: Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (P3)
Novice	14	Silly Animal Robot	Learning goals: students will create an algorithm with output to express an idea. They will use KIBO's movement, sound, and optionally the light bulb to express themselves.	Expressiveness Parts & Functions Input and Output	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.CS.02: Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7) 3-5.CS.01: Describe how internal and external parts of computing devices function to form a system. (P7)
Novice	15	How Far to the Star?	Learning goals: students will create algorithms with sequencing and decomposition. Students will measure using standard and non-standard units and scientific tools like rulers and measuring tape.	Sequencing Decomposition Patterns	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.AP.11: Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (P3)
Novice	16	Debugging	Learning goals: students will debug programs. Students will work collaboratively to create "debugging challenges" for each other. This activity emphasizes the test and improve step of the Engineering Design Process, while reinforcing the idea that a mistake is always fixable and can sometimes be inspiring!	EDP SEL	K-2.AP.14: Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops. (P6) K-2.CS.03: Describe basic hardware and software problems using accurate terminology. (P6, P7)

Level	#	Lesson Title	Learning goals	Scope and Sequence Topics	CSTA Standards Addressed*
Novice	17	Act Out Feelings	Learning goals: students will create expressive programs and decorations for KIBO to express a feeling or emotion. This open-ended lesson allows students to draw on many of the skills they've developed in this curriculum and sets the stage for the culminating project beginning in the next lesson.	Expressiveness Input and Output SEL	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) 3-5.CS.01: Describe how internal and external parts of computing devices function to form a system. (P7)
Novice	18-20	Community Robot	In this culminating project, students will draw on all their foundational robotics and programming knowledge to create KIBOs that help to welcome new friends into their community. Allow three meetings for this integration project.	Integration (Community and SEL)	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) K-2.AP.13: Give attribution when using the ideas and creations of others while developing programs. (P7) K-2.AP.15: Using correct terminology, describe steps taken and choices made during the iterative process of program development. (P7) 3-5.AP.16: Take on varying roles, with teacher guidance, when collaborating with peers during the design, implementation, and review stages of program development. (P2)
Level	#	Lesson Title	Learning goals	Scope and Sequence Topics	CSTA Standards Addressed*
Intermed.	1	Hello Again KIBO!	Learning goals: students will understand the concept of a repeat loop. Students will also engage freely with KIBO's parts and commands to review their prior work. They will share what they remember from the Novice curriculum.	Repeat Loops EDP	3-5.AP.10: Create programs that include sequences, events, loops, and conditionals. (P5)
Intermed.	2	Navigate With Repeat	Learning goals: students will use repeat loops to solve a program design problem. They will program KIBO to follow paths, using repeat loops to simplify their programs.	Sequencing Decomposition Program Design Patterns Repeat Loops Variables	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) 3-5.AP.09: Model the way programs store and manipulate data by using numbers or other symbols to represent information. (P4) 3-5.AP.11: Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process. (P3)
Intermed.	3	Bowling With Repeat	Learning goals: students will simplify an algorithm using repeat loops. They revisit the KIBO Bowling activity from the Novice curriculum, but now they include repeat loops.	Program Design Repeat Loops	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) 3-5.AP.10: Create programs that include sequences, events, loops, and conditionals. (P5) 3-5.AP.11: Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process. (P3)

Intermed.	4	Listening KIBO	Learning goals: students learn about KIBO's sensor parts. They understand that sensors let KIBO take in information about the world. They will learn the operation of KIBO's sound sensor. They will create an expressive algorithm using the sensor to modify KIBO's behavior in response to input.	Expressiveness Conditionals Input and Output	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.CS.02: Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7) 3-5.AP.10: Create programs that include sequences, events, loops, and conditionals. (P5) 3-5.CS.01: Describe how internal and external parts of computing devices function to form a system. (P7)
Intermed.	5	Happy and You Know It	Learning goals: students learn that output parts allows robots to put information out into the world. Students collaboratively create an expressive algorithm including both input and output. They learn the function of KIBO's Light Bulb output module.	Expressiveness Conditionals Input and Output SEL	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.CS.02: Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7) 3-5.AP.10: Create programs that include sequences, events, loops, and conditionals. (P5) 3-5.CS.01: Describe how internal and external parts of computing devices function to form a system. (P7)
Intermed.	6,7	Retell a Story	KIBO can become a character in a favorite storybook! Students will create "storytelling robots" to act out a scene. This literacy-based activity builds on the idea of outputs and involves lots of arts-and-crafts building.	Integration (Literacy)	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) K-2.AP.13: Give attribution when using the ideas and creations of others while developing programs. (P7) K-2.AP.15: Using correct terminology, describe steps taken and choices made during the iterative process of program development. (P7) 3-5.AP.16: Take on varying roles, with teacher guidance, when collaborating with peers during the design, implementation, and review stages of program development. (P2)
Intermed.	8	KIBO Carousel	Learning goals: students will create an algorithm with a repeat loop that goes "forever." This powerful concept opens the door to automation - robotic systems that continue to perform their function over and over again.	Repeat Loops Variables	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) 3-5.AP.09: Model the way programs store and manipulate data by using numbers or other symbols to represent information. (P4) 3-5.AP.10: Create programs that include sequences, events, loops, and conditionals. (P5)
Intermed.	9	What Is My Program?	Learning goals: students will learn that robots can store and recall information from memory. They will watch KIBOs run unknown programs and make hypotheses about what those programs are.	Program Design Store and Recall EDP	K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) K-2.DA.05: Store, copy, search, retrieve, modify, and delete information using a computing device and define the information stored as data. (P4)

Intermed.	10	The Helpful Bot (Part 1)	Learning goals: students will use advanced sensor parts to control program behavior with conditional repeat loops. In this lesson and the next, students will create a "helpful robot" able to sense its surroundings so it can know how to help.	Repeat Loops Conditionals Variables Input and Output Advanced Sensors SEL	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) 3-5.AP.09: Model the way programs store and manipulate data by using numbers or other symbols to represent information. (P4) 3-5.AP.10: Create programs that include sequences, events, loops, and conditionals. (P5) 3-5.CS.01: Describe how internal and external parts of computing devices function to form a system. (P7) 3-5.CS.02: Model how computer hardware and software work together as a system to accomplish tasks. (P4)
Intermed.	11	The Helpful Bot (Part 2)	Learning goals: this lesson continues the work from the previous lesson, allowing students time to build and share their "helpful robots."	Expressiveness Repeat Loops Conditionals Input and Output Advanced Sensors SEL	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) 3-5.AP.09: Model the way programs store and manipulate data by using numbers or other symbols to represent information. (P4) 3-5.AP.10: Create programs that include sequences, events, loops, and conditionals. (P5) 3-5.CS.01: Describe how internal and external parts of computing devices function to form a system. (P7) 3-5.CS.02: Model how computer hardware and software work together as a system to accomplish tasks. (P4)
Intermed.	12	Drawing Bot	Learning goals: students explore how robots can create visualizations as a form of output. Students will use code to draw by connecting markers to KIBO.	Program Design Models and Visualization Input and Output	K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) K-2.CS.02: Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7) K-2.DA.07: Identify and describe patterns in data visualizations, such as charts or graphs, to make predictions. (P4) 3-5.AP.11: Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process. (P3)
Intermed.	13	Predict the Drawing	Learning goals: students continue exploration of visualization with markers. Students closely observe the output of a drawing program to determine what program KIBO ran to create it.	Program Design Store and Recall Models and Visualization Input and Output	K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) K-2.CS.02: Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7) K-2.DA.05: Store, copy, search, retrieve, modify, and delete information using a computing device and define the information stored as data. (P4) K-2.DA.07: Identify and describe patterns in data visualizations, such as charts or graphs, to make predictions. (P4) 3-5.AP.11: Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process. (P3)
Intermed.	14	Eng. Challenges I	Learning goals: students will engage with KIBO's parts in new ways through activity centers with "engineering challenges." In part 1, students will explore the effect of using multiple inputs and outputs on one KIBO.	Parts and Functions Input and Output EDP	K-2.CS.02: Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7) K-2.CS.03: Describe basic hardware and software problems using accurate terminology. (P6, P7) 3-5.CS.01: Describe how internal and external parts of computing devices function to form a system. (P7)

Level	#	Lesson Title	Learning goals	Scope and Sequence Topics	CSTA Standards Addressed*
Intermed.	15	Eng. Challenges II	Learning goals: students will engage with KIBO's parts in new ways through activity centers with "engineering challenges." In part 2, students will explore ways to modify KIBO's wheels to change its movement.	Parts and Functions EDP	K-2.CS.02: Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7) K-2.CS.03: Describe basic hardware and software problems using accurate terminology. (P6, P7)
Intermed.	16	Eng. Challenges III	Learning goals: students will engage with KIBO's parts in new ways through activity centers with "engineering challenges." In part 3, students will use craft materials to build the tallest sturdy structure they can onto KIBO.	Parts and Functions EDP	K-2.CS.02: Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7) K-2.CS.03: Describe basic hardware and software problems using accurate terminology. (P6, P7)
Intermed.	17	KIBO Snowplow	Learning goals: students will design a robot and an algorithm to solve a problem. They will engage with the "test and improve" step of the Engineering Design Process, as they build KIBO snowplows to help clean up the town after a cotton-ball snowstorm.	Problem Solving EDP	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) 3-5.AP.15: Test and debug (identify and fix errors) a program or algorithm to ensure it runs as intended. (P6, P6)
Intermed.	18-20	Nature Guide Robot	In this final project, children will draw on all of their intermediate robotics and programming knowledge in order to create KIBOs that can navigate and guide humans through a natural environment.	Integration (Science)	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) K-2.AP.13: Give attribution when using the ideas and creations of others while developing programs. (P7) K-2.AP.15: Using correct terminology, describe steps taken and choices made during the iterative process of program development. (P7) 3-5.AP.16: Take on varying roles, with teacher guidance, when collaborating with peers during the design, implementation, and review stages of program development. (P2)
Level	#	Lesson Title	Learning goals	Scope and Sequence Topics	CSTA Standards Addressed*
Advanced	1	Hello Again, KIBO!	Learning goals: students will review and reconnect with KIBO in a range of open- ended stations. They will reinforce the steps of the Engineering Design Process. They will share what they remember from the Novice and Intermediate curricula.	EDP	K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) K-2.CS.02: Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7)

Advanced	2	Robot Relay Race	Learning goals: students will design an algorithm to solve a problem using KIBO's sensors, repeat loops, and conditionals. They will collaborate on a robotic relay race.	Problem Solving Program Design Repeat Loops Conditionals Advanced Sensors	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) K-2.CS.02: Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7) 3-5.AP.10: Create programs that include sequences, events, loops, and conditionals. (P5) 3-5.AP.11: Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process. (P3) 3-5.CS.02: Model how computer hardware and software work together as a system to accomplish tasks. (P4)
Advanced	3	Drive Around Town (Introducing IF)	Learning goals: students will learn the that the IF statement allows algorithms to include conditional behavior. Using a conditional statement, students will design an algorithm to cause KIBO to drive to different places depending on the input from KIBO's light sensor.	Problem Solving Program Design Conditionals Advanced Sensors	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) 3-5.AP.10: Create programs that include sequences, events, loops, and conditionals. (P5) 3-5.AP.11: Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process. (P3) 3-5.CS.02: Model how computer hardware and software work together as a system to accomplish tasks. (P4)
Advanced	4	Night and Day Animals	Learning goals: students will create algorithms using KIBO's sensors to model aspects of a natural system (nocturnal and diurnal animals).	Expressiveness Conditionals Models and Visualization Advanced Sensors	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.DA.07: Identify and describe patterns in data visualizations, such as charts or graphs, to make predictions. (P4) 3-5.AP.10: Create programs that include sequences, events, loops, and conditionals. (P5) 3-5.CS.02: Model how computer hardware and software work together as a system to accomplish tasks. (P4) 3-5.DA.06: Collect and present the same data in various visual formats. (P7, P4)
Advanced	5	KIBO Flower	Learning goals: students will create algorithms that include nested conditionals within repeat loops. Students will again create algorithms using KIBO's sensors to model aspects of a natural system (flowers responding to sunlight).	Expressiveness Nesting Models and Visualization Input and Output	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.DA.07: Identify and describe patterns in data visualizations, such as charts or graphs, to make predictions. (P4) 3-5.CS.01: Describe how internal and external parts of computing devices function to form a system. (P7) 3-5.CS.02: Model how computer hardware and software work together as a system to accomplish tasks. (P4) 3-5.DA.06: Organize and present collected data visually to highlight relationships and support a claim. (P7, P4) 2-AP-12: Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals. (P5, P5)

Advanced	6	KIBO Alarm	Learning goals: students will create algorithms with nested conditionals and loops using sensor input. Students use these algorithms to solve a design problem: creating robotic alarm systems to protect an environment or object.	Problem Solving Program Design Nesting Models and Visualization Advanced Sensors	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) K-2.DA.07: Identify and describe patterns in data visualizations, such as charts or graphs, to make predictions. (P4) 3-5.AP.10: Create programs that include sequences, events, loops, and conditionals. (P5) 3-5.AP.11: Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process. (P3) 3-5.CS.01: Describe how internal and external parts of computing devices function to form a system. (P7) 3-5.CS.02: Model how computer hardware and software work together as a system to accomplish tasks. (P4) 3-5.DA.06: Organize and present collected data visually to highlight relationships and support a claim. (P7, P4) 2-AP-12: Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals. (P5, P5)
Advanced	7,8	Superhero Robots	In this integration project, children will draw on all of their advanced robotics and programming knowledge in order to create superhero KIBOs that use sensors and outputs to help people.	Integration (Community and SEL)	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) K-2.AP.13: Give attribution when using the ideas and creations of others while developing programs. (P7) K-2.AP.15: Using correct terminology, describe steps taken and choices made during the iterative process of program development. (P7) 3-5.AP.16: Take on varying roles, with teacher guidance, when collaborating with peers during the design, implementation, and review stages of program development. (P2)
Advanced	9	Engineering Challenges I	Learning goals: students will engage with KIBO's parts in new ways through activity centers with "engineering challenges." In part 1, students will modify KIBO's wheels to cause KIBO to drive in curved paths.	Problem Solving Parts and Functions EDP	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.CS.02: Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7) K-2.CS.03: Describe basic hardware and software problems using accurate terminology. (P6, P7)
Advanced	10	Engineering Challenges II	Learning goals: students will engage with KIBO's parts in new ways through activity centers with "engineering challenges." In part 2, students will attach explore the idea of simple machines by extending KIBO's mechanisms.	Problem Solving Parts and Functions EDP	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.CS.02: Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7) K-2.CS.03: Describe basic hardware and software problems using accurate terminology. (P6, P7)

Advanced	11	Engineering Challenges III	Learning goals: students will engage with KIBO's parts in new ways through activity centers with "engineering challenges." In part 3, students will design a KIBO robot and program to push the most "prizes" out of a ring.	Problem Solving Program Design Parts and Functions EDP	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) K-2.CS.02: Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7) K-2.CS.03: Describe basic hardware and software problems using accurate terminology. (P6, P7) 3-5.AP.11: Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process. (P3)
Advanced	12,13	KIBO Explorer	In this integration project, children will build a large-scale relief map for KIBO to explore, gaining experience in how slopes, friction, and surfaces affect KIBO's movement.	Integration (Geography)	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) K-2.AP.13: Give attribution when using the ideas and creations of others while developing programs. (P7) K-2.AP.15: Using correct terminology, describe steps taken and choices made during the iterative process of program development. (P7) 3-5.AP.16: Take on varying roles, with teacher guidance, when collaborating with peers during the design, implementation, and review stages of program development. (P2)
Advanced	14	Programming Design Challenges I	Learning goals: in a series of "programming design challenges," students will draw on a variety of computational thinking and programming techniques. In part 1, students devise a program to make KIBO continually move around the classroom on its own.	Problem Solving Program Design Nesting Advanced Sensors	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) K-2.CS.02: Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7) 3-5.AP.10: Create programs that include sequences, events, loops, and conditionals. (P5) 3-5.AP.11: Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process. (P3) 3-5.CS.02: Model how computer hardware and software work together as a system to accomplish tasks. (P4) 2-AP-12: Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals. (P5, P5)
Advanced	15	Programming Design Challenges II	Learning goals: in a series of "programming design challenges," students will draw on a variety of computational thinking and programming techniques. In part 2, students will synchronize the movements of multiple KIBOs to create a group of dancing robots.	Expressiveness Program Design SEL	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) 3-5.AP.11: Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process. (P3)

Advanced	16	Programming Design Challenges III	Learning goals: in a series of "programming design challenges," students will draw on a variety of computational thinking and programming techniques. In part 3, students will experiment with creating programs using multiple sensors.	Program Design Conditionals Nesting Advanced Sensors	K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) K-2.CS.02: Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7) 3-5.AP.10: Create programs that include sequences, events, loops, and conditionals. (P5) 3-5.AP.11: Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process. (P3) 3-5.CS.02: Model how computer hardware and software work together as a system to accomplish tasks. (P4) 2-AP-12: Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals. (P5, P5)
Advanced	17	KIBO Number Line	Learning goals: students use algorithms and moving robotic systems to model mathematical concepts. KIBO will travel along a physical number line to model counting, addition, and subtraction. Students will create algorithms including repeat loops to solve problems.	Problem Solving Repeat Loops Variables Store and Recall Models and Visualization	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.DA.05: Store, copy, search, retrieve, modify, and delete information using a computing device and define the information stored as data. (P4) K-2.DA.07: Identify and describe patterns in data visualizations, such as charts or graphs, to make predictions. (P4) 3-5.AP.09: Model the way programs store and manipulate data by using numbers or other symbols to represent information. (P4) 3-5.AP.10: Create programs that include sequences, events, loops, and conditionals. (P5) 3-5.DA.06: Organize and present collected data visually to highlight relationships and support a claim. (P7, P4)
Advanced	18-20	My Story	In this final project, children will draw on all of their advanced robotics and programming knowledge in order to create KIBOs that represent their own experience at important moments in their lives. They will use concepts of input and output to create expressive robotic designs that share and communicate feelings and ideas.	Integration (Community and SEL)	K-2.AP.10: Develop programs with sequences and simple loops, to express ideas or address a problem. (P5) K-2.AP.12: Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5, P7) K-2.AP.13: Give attribution when using the ideas and creations of others while developing programs. (P7) K-2.AP.15: Using correct terminology, describe steps taken and choices made during the iterative process of program development. (P7) 3-5.AP.16: Take on varying roles, with teacher guidance, when collaborating with peers during the design, implementation, and review stages of program development. (P2)