® KUBO

Lesson Plan 4

LOOPS

Grades:	**K-2**
Group Size:	**Pairs**
Setup Time:	**5 minutes**
Total Time:	**100 minutes**
Activities:	**4**

LESSON PLAN OUTLINE

- Activity 1: Around the Campfire – 25 minutes
  - › 3 tasks

- Activity 2: KUBO Runs – 25 minutes
  - › 3 tasks

- Activity 3: Gathering Treasures – 25 minutes
  - › 3 tasks

- Activity 4: Create a Map and a Play – 25 minutes
  - › 3 tasks

OUTCOMES AND ASSESSMENT

- By the end of this section, students should be able to:
  - › Explain what a loop is.
  - › Make a function that includes a loop.
  - › Design a new map for KUBO.
  - › Write a story.
  - › Program KUBO to do what the story describes.

TEACHER PREPARATION

- Make copies of worksheets for each student.

- Make sure all KUBOs have been fully charged before beginning.

- Find an appropriate place to do the activities. KUBO can be used on a table or the floor, but the surface must be level and clean. If you're using KUBO on a tabletop, make sure KUBO doesn't fall off the table.

- Help students find the TagTiles and activity map they will need. You might want to consider hanging up one activity map in front of the whole class to use for discussions and demonstrations.

- It's helpful to show students how to properly handle and store KUBO and TagTiles. Stress the importance of taking care of both KUBO and TagTiles.

- It's also helpful to let students know it's OK to make mistakes as long as they "debug" and figure out what they did wrong and how to fix it.

- When they create routes and functions, it is important for students to understand that KUBO has the same capabilities humans do. For example, KUBO can't drive through walls, fences, water, fire, and so forth.

- Students will be introduced to loops and parameters in this lesson. Loops enable you to repeat a sequence of actions more than once using the Parameter TagTiles 1 through 10. You might want to demonstrate how to build loops to your class before beginning. Here's the link to the video to show you how: *kubo.education/getting-started-tutorials*.

- Loops can be challenging for students to understand the first time. To make it easier for students, consider letting them lay down their routes on the activity map first. Go around the classroom and help them understand which parts of the route can be repeated using loops and parameters until they are comfortable with the

concept.

- Consider letting the more advanced students combine loops and subroutines for more of a challenge.

- You might find it helpful to review with students what they have already learned before going on to teach the new material.

MANAGEMENT

- It is recommended the students be put in groups of two. Since loops are a very difficult concept, some students might require more guidance than others. Considering pairing students who have similar levels of proficiency.

- You might find it helpful to create roles for students so that each student gets a turn being in charge of KUBO.

- You might find it helpful for students to detach KUBO's head from its body and put the tiles away in between activities or anytime you are giving instruction.

- You might also find it helpful to give students who are new to KUBO some time to free play and discover on their own so they will be more focused when receiving instruction.

- Circulate through the room and provide help as necessary. However, to encourage student-centered active learning, instruct students to follow the "ask three, then me" rule, in which they consult each other before they consult you.

CROSS-CURRICULUM CONNECTIONS

- The following cross-curriculum connections can be done as additional learning opportunities with the students and connections to different subjects.

    › Social Studies:

        · Teach students how to make a map to scale. Then, have students use a blank activity map to create a map to scale of the United States that KUBO can use to travel and visit friends.

    › ELA:

        · Show examples of travel logs, journals, and diaries to students. Then, have students create a travel log in which they can write or draw about KUBO's daily adventures while visiting friends across the United States.

    › Math/Science:

        · Teach students about weather forecasting and using weather maps. Then, have students study weather conditions of different locations in the United States. Use that information to help KUBO know how to prepare for and respond to the different types of weather KUBO will encounter while traveling.

ACTIVITY 1:

Around the Campfire

OUTCOME

- Work with loops.
- Create a route for KUBO to go around the campfire and then turn the route into a function with a loop.

TIME

- 25 minutes

MATERIALS

- Movement TagTiles
- Blue Record and Play Function TagTiles
- Red Record and Play Function TagTiles
- Loop and Parameter TagTiles
- KUBO
- Activity map
- Pencils
- Worksheet 4.1

TEACHER NOTES

- Today, KUBO's class is going on a school excursion. The class starts the day by eating breakfast around the campfire. KUBO wants to go around the campfire to find a good place to sit.

- Students must first lay a route around the campfire and make KUBO follow it.

- Explain to students that KUBO does not need to use eight TagTiles to go around the campfire. KUBO can use two tiles that repeat four times using loops.

- Draw the route on the board and split it into four repeatable parts so students can see what you mean.

- Then, demonstrate how a function with a loop would be made for this route. Encourage students to follow along using their own tiles.

- After KUBO has memorized the function, place a red Play Function tile on an appropriate quadrant and place KUBO on it. It can be hard for students to figure out in which quadrant and in what direction to place KUBO, so make sure they practice this by making different loops.

- Instruct students to try and make a loop for KUBO to go around the swing set and sandbox. Ask them to first draw the route on the worksheet and divide it up into parts that can be repeated. Then, have them draw the function on the worksheet next to the route before they create the function.

- Instruct the students to place a red Play Function tile on the quadrant where KUBO needs to start and remind them to pay close attention to the direction KUBO faces.

ACTIVITY 1:

Around the Campfire

- Finally, instruct the students to make a loop for KUBO to go around the wall with the rainbow. Ask them to first draw the route on the worksheet and divide it into parts that can be repeated. Then, have them draw the function on the worksheet next to the route before they create the function.

- Students might need to debug their code and try again if they make a mistake.

- Make students practice more with creating loops by doing the Extension activities.

DISCUSSION QUESTIONS

- How do you make KUBO go around the campfire?

- Is there a trick to figuring out which part of the function has to repeat?

- Did KUBO do what you wanted?

- When is a good time to use loops?

REFLECTION

- Did the function you built around the swing set and sandbox work? If you had to debug your code, how did you do it?

- Did the function you built around the wall with the rainbow work? If you had to debug your code, how did you do it?

EXTENSION

- Practice using and creating loops by making KUBO go around one of the sets of bushes.

- Practice using and creating loops by making KUBO go around another spot on the map. It must be a location KUBO hasn't been to yet.

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ANSWER KEY

Possible route students could create for Task 1:

Possible function with loop students could create for Task 1:

Possible route students could create for Task 2:

Possible function with loop students could create for Task 2:

ANSWER KEY

Possible route students could create for Task 3:

Possible function students could create for Task 3:

KUBO Runs

OUTCOME

- Work with loops.

- Make a function with a loop using as few tiles as possible to make KUBO run a long stretch without many turns.

TIME

- 25 minutes

MATERIALS

- Movement TagTiles

- Blue Record and Play Function TagTiles

- Red Record and Play Function TagTiles

- Loop and Parameter TagTiles

- KUBO

- Activity map

TEACHER NOTES

- KUBO's class must train for this year's school run.

- Students need to find the longest route on the map where KUBO can run straight ahead. Then, they will make a function for this route.

- Students then need to count the number of Go Forward tiles they will need and find the corresponding parameter to make a loop with only one Go Forward tile.

- Students need to make KUBO memorize the loop and then place KUBO on a Play Function tile.

- Then, students should make another route for KUBO in which KUBO has to turn at least once. Then, students need to try out the route on the map.

- As an added challenge that might be more fun to students, turn this activity into a race. Have pairs or groups of students race against each other to see who can successfully complete the activity and win the race the fastest.

- Make students practice more with longer routes, loops, and parameters by doing the Extension activities.

DISCUSSION QUESTIONS

- Can you make a long route for KUBO without many turns so KUBO doesn't lose speed? KUBO can also run outside school areas.

- Where on the map should KUBO run if you want KUBO to run straight ahead?

- What are loops and how can we use them?

KUBO Runs

- What can we do if we don't have enough Go Forward tiles for a function?

- Did KUBO run far enough, or do you have to debug your code?

- Where on the map should KUBO run if KUBO is good at jumping over high objects?

REFLECTION

- Where else on the map could KUBO run to?

- Why do you think loops are useful?

EXTENSION

- Disregard any obstacle on the map and create a route to take KUBO from one end of the map and back again. First, make a blue function using one Go Forward tile and the parameter 8. Make KUBO memorize it.

- Build a red function that includes both a loop and the blue Function tiles as subroutines. After KUBO memorizes the red function, place a red tile on any quadrant in Column A to test it out. Debug if necessary. Show your routes and explain to your classmates how you used loops.

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ACTIVITY 3:

Gathering Treasures

OUTCOME

- Work with loops.

- Make functions with loops to program KUBO to gather as many treasures as possible.

TIME

- 25 minutes

MATERIALS

- Movement TagTiles

- Blue Record and Play Function TagTiles

- Red Record and Play Function TagTiles

- Loop and Parameter TagTiles

- KUBO

- Activity map

- Paper or sticky notes

TEACHER NOTES

- In Task 1, students place nine sticky notes on the activity map in quadrants of their choosing. Students then program their KUBO to collect as many treasures, or sticky notes, as possible. The team that collects the most treasures wins!

- When students are programming their KUBOs, they must use both loops and subroutines.

- In Task 2, one team of students must start in quadrant A3 while the other team of students must start in quadrant A8.

- The KUBOs must start moving at the same time. Whichever KUBO reaches a quadrant first claims the treasure for their team.

- Students need to save all the sticky notes they collect.

- After both KUBOs have finished executing the first function, students continue making more functions until all treasures have been collected. Tally the result to declare a winner.

- Sticky notes are the easiest to use for this activity because they stay stuck to the activity map.

- Since the teams are competing against each other, it is a good idea for them to make an agreement with each other about what to do during certain situations. For example, if they see that their KUBOs are on a collision course with each other during the game, they can decide beforehand which team has the rights to the route or whether to quickly redirect their KUBOs to avoid a crash.

- To make the activity more challenging, you can choose to set a time limit on how long teams must make their functions, loops, and subroutines.

ACTIVITY 3:

Gathering Treasures

DISCUSSION QUESTIONS

- What strategy will you choose?

- What do you plan to do if KUBO is on a collision course with another KUBO or might fall off the table or activity map?

- Did you change your strategy along the way?

- Was the game difficult? What made it fun or boring?

REFLECTION

- After playing the game, are there any changes you would like to have done with programming KUBO? Why or why not?

- What things affected the strategy you used while playing the game?

EXTENSION

- Play the game again, but this time use a total of 11 sticky notes. Make sure all the sticky notes are in different locations from the first game.

- Play the game again, this time with nine sticky notes total, and set a time limit. Now you must collect the largest number of treasures in only 15 minutes.

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ACTIVITY 4:

Create a Map and a Play

OUTCOME

- Work with loops.

- Use the blank map to design your own map and create a play.

TIME

- 25 minutes

MATERIALS

- Movement TagTiles

- Blue Record and Play Function TagTiles

- Red Record and Play Function TagTiles

- Loop and Parameter TagTiles

- KUBO

- Activity map

- Blank map

- Pencils

- Scissors

TEACHER NOTES

- KUBO is very excited to play a part in the school play, but KUBO doesn't know what the play is about. Students get to decide. Students will need to use their imagination, make their own map, and use the map as the surroundings in which the play will be set.

- Students need to cut one long edge off their blank map and stick it to the activity map with sticky tack. Students need to make sure the grids line up.

- After the class is done with their maps, let them mingle among themselves and discuss their designs.

- Consider letting students decide their moves for the play during this activity. They can choose where they attach their maps, what elements the maps contain, and what story goes along with them. Since this can be a very time-consuming activity, students don't have to make very detailed maps. They should, however, draw lots of interesting things for KUBO to do.

- If students are struggling with what to draw on their map, it might be helpful to offer them idea starters, themes, or key words. Some examples include friends, the bell ring, the police, soccer, the words watch out, and something dangerous.

- If students have never heard of a play or theater, you could show them a small or short video example so they understand how to do the activity better.

Create a Map and a Play

- When students are creating their play, they need to use at least one loop.

- Students should rehearse their play and stage it for their classmates. If there's time, students may put on their play for the whole class.

DISCUSSION QUESTIONS

- What places would make a good setting for your play?

- Choose a place and decide all the elements you want to include. Draw them on your map.

- What does it take to make a good map?

- Where does your play take place and what have you drawn on your map?

- How do you create a good play?

- How will you include KUBO in your play? What role will KUBO play and what will KUBO do?

REFLECTION

- How do you feel about your play now that you've performed it?

- What would you change about your play if you were to go back and redo it?

EXTENSION

- KUBO wants to take a bow at the end of the play. Create a route for KUBO to take on your map. Turn your route into a function and have KUBO execute it.

- Add a subroutine to your function and have KUBO execute it. Turn this function into a loop and have KUBO execute it.

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Appendix

PRINTABLE PAGES

- Student worksheets
  - › In order by lesson plan and then activity
  - › Printable large images of the TagTiles on paper. Allowing younger students to more easily do Task 1 in Lesson Plan 1 and also Task 2 in Lesson Plan 3.

- Coding certificate diploma

- Activity map

- Blank activity map

All printable material can be downloaded from *kubo.education/coding-license*

Standards Addressed

US ISTE CURRICULUM STANDARDS

Learning Outcome	KUBO CODING				KUBO CODING+		
	LP 1: Routes	LP 2: Functions	LP 3: Subroutines	LP 4: Loops	LP 1: Refresher course	LP 2: Advancing programming	LP 3: Challenge master
1a Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes.	●	●	●	●	●	●	●
1b Students build networks and customize their learning environments in ways that support the learning process.	●	●	●	●	●	●	●
1c Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways.	●	●	●	●	●	●	●
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.	●	●	●	●	●	●	●
2a Students cultivate and manage their digital identity and reputation and are aware of the permanence of their actions in the digital world.							
2b Students engage in positive, safe, legal, and ethical behavior when using technology, including social interactions online or when using networked devices.							
2c Students demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property.							
2d Students manage their personal data to maintain digital privacy and security and are aware of data-collection technology used to track their navigation online.							
3a Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.							
3b Students evaluate the accuracy, perspective, credibility, and relevance of information, media, data, or other resources.							
3c Students curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions.							
3d Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories, and pursuing answers and solutions.					●	●	●
4a Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.	●	●	●	●	●	●	●
4b Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.	●	●	●	●	●	●	●

Standards Addressed

US ISTE CURRICULUM STANDARDS

Learning Outcome	KUBO CODING				KUBO CODING+		
	LP 1: Routes	LP 2: Functions	LP 3: Subroutines	LP 4: Loops	LP 1: Refresher course	LP 2: Advancing programming	LP 3: Challenge master
4c Students develop, test and refine prototypes as part of a cyclical design process.	●	●	●	●	●	●	●
4d Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.	●	●	●	●	●	●	●
5a Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions.	●	●	●	●	●	●	●
5b Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.	●	●	●	●	●	●	●
5c Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.	●	●	●	●	●	●	●
5d Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.	●	●	●	●	●	●	●
6a Students choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication.	●	●	●	●	●	●	●
6b Students create original works or responsibly repurpose or remix digital resources into new creations.	●	●	●	●	●	●	●
6c Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.	●	●	●	●	●	●	●
6d Students publish or present content that customizes the message and medium for their intended audiences.	●	●	●	●	●	●	●
7a Students use digital tools to connect with learners from a variety of backgrounds and cultures, engaging with them in ways that broaden mutual understanding and learning.							
7b Students use collaborative technologies to work with others, including peers, experts, or community members, to examine issues and problems from multiple viewpoints.							
7c Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.					●	●	●
7d Students explore local and global issues and use collaborative technologies to work with others to investigate solutions.							●

Standards Addressed

KUBO

UK NATIONAL CURRICULUM COMPUTER SCIENCE STANDARDS

	Learning Outcome	Curriculum Aspect	KUBO CODING				KUBO CODING+		
			LP 1: Routes	LP 2: Functions	LP 3: Subroutines	LP 4: Loops	LP 1: Refresher course	LP 2: Advancing programming	LP 3: Challenge master
AIMS	**The national curriculum for computing aims to ensure that all pupils:**								
	can understand and apply the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation	CS	•	•	•	•	•	•	•
	can analyse problems in computational terms, and have repeated practical experience of writing computer programs in order to solve such problems	CS	•	•	•	•	•	•	•
	can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems	IT	•	•	•	•	•	•	•
	are responsible, competent, confident and creative users of information and communication technology	DL	•	•	•	•	•	•	•
KEY STAGE 1	Understand what algorithms are	CS	•	•			•	•	•
	Understand that algorithms are implemented as programs on digital devices	CS	•	•				•	•
	Understand that programs execute by following precise and unambiguous instructions	CS	•	•			•	•	•
	Create simple programs	CS	•	•			•	•	•
	Debug simple programs	CS	•	•			•	•	•
	Use logical reasoning	CS	•	•			•	•	•
	Predict the behaviour of simple programs	CS	•	•			•	•	•
	Use technology purposefully to create, organise, store, manipulate and retrieve digital content	IT	•	•			•	•	•
	Recognise common uses of information technology beyond school	DL							

Standards Addressed

UK NATIONAL CURRICULUM COMPUTER SCIENCE STANDARDS

	Learning Outcome	Curriculum Aspect	KUBO CODING				KUBO CODING+		
			LP 1: Routes	LP 2: Functions	LP 3: Subroutines	LP 4: Loops	LP 1: Refresher course	LP 2: Advancing programming	LP 3: Challenge master
KEY STAGE 1	Use technology safely and respectfully	DL	●	●			●	●	●
	Keep personal information private	DL							
	Identify where to go for help and support when they have concerns about content or contact on the internet or other online technologies.	DL							
KEY STAGE 2	Design programs that accomplish specific goals	CS	●	●	●	●	●	●	●
	Write programs that accomplish specific goals	CS	●	●	●	●	●	●	●
	Debug programs that accomplish specific goals	CS	●	●	●	●	●	●	●
	Control or simulate physical systems	CS	●	●	●	●	●	●	●
	Solve problems by decomposing them into smaller parts	CS			●	●	●	●	●
	Use sequence in programs	CS	●	●	●	●	●	●	●
	Use selection in programs	CS							
	Use repetition in programs	CS				●	●	●	●
	Work with variables	CS							
	Work with inputs	CS	●	●	●	●	●	●	●

Standards Addressed

UK NATIONAL CURRICULUM COMPUTER SCIENCE STANDARDS

		KUBO CODING				KUBO CODING+		
Learning Outcome	Curriculum Aspect	LP 1: Routes	LP 2: Functions	LP 3: Subroutines	LP 4: Loops	LP 1: Refresher course	LP 2: Advancing programming	LP 3: Challenge master
Work with outputs	CS	●	●	●	●	●	●	●
Use logical reasoning to explain how some simple algorithms work	CS	●	●	●	●	●	●	●
Use logical reasoning to detect and correct errors in algorithms and programs	CS	●	●	●	●	●	●	●
Understand computer networks including the internet	CS							
Understand they can provide multiple services, such as the world wide web	CS							
Understand the opportunities they offer for communication and collaboration	DL							
Use search technologies effectively	IT							
Appreciate how results are selected and ranked	CS	●	●	●	●	●	●	●
Be descerning in evaluating digital content	DL							
Select, use and combine a variety of software (including internet services) on a range of digital devices to design and create a range of programs, systems and content that accomplish given goals, including collecting, analysing, evaluating and presenting data and information	IT							
Use technology safely, respectfully and responsibly	DL	●	●	●	●	●	●	●
Recognise acceptable/unacceptable behaviour	DL							
Identify a range of ways to report concerns about content and contact	DL							

KEY STAGE 2