

ACTIVITY 4: Measure Our Town

(2 hour activity)

Powerful Ideas: *Representation, Debugging*

Overview: Where will KIBO go when it explores our town? Today we will draw or build a town (our real town, or one we imagine), then program KIBO to explore it by traveling from place to place. As KIBO moves around the town with a marker attached, the lines it draws become a record of KIBO's adventures as well as measurements of the distances in our town. The time dedicated to this lesson can be reduced by limiting the time allowed for free building and drawing of the town.

Learning Goals

After this lesson, students will be able to:

- program KIBO to move between points on a drawn or built map
- measure distances with measuring tape

Materials / resources:

Required materials/resources:

- One KIBO 10 Kit or higher per group. *This lesson requires only:*
 - KIBO body
 - Motors and wheels
 - All motion blocks
 - REPEAT and number parameters (2, 3, 4, FOREVER)
- One Marker Extension Set per group. *Note: It may be helpful to limit each group to one marker for this lesson. Multiple markers can be distracting in a more precise activity like today's lesson.*
- Large sheets of paper taped to the floor, on which KIBO will drive and draw (poster board, rolls of butcher paper, or similar


large surfaces). For this lesson, all students will share one central space.


- Engineering Design Journals, notebooks, or loose paper, for students to plan with.
- Kid-friendly measuring tape (paper or cloth)
- Extra markers for drawing the town
- Recycle-craft building supplies (boxes, plastic pieces, cardboard, masking + Scotch tape) to construct the town and decorate KIBO vehicles

Optional materials/resources:

- KIBO light bulbs and LIGHT ON blocks
- KIBO Sound Record / Playback Module and PLAY blocks
- KIBO art stage platforms and extra motors
- Recommended reading: *Harold and the Purple Crayon* by Crockett Johnson

Activity Description

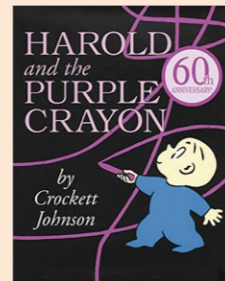
 **Warm-up: Measuring Walk!** Have the students walk a short, set distance (across the classroom, down the hall, across the playground), counting the number of steps they take. Have each student say how many steps they took.

 **Introduce the concepts and the task (10 minutes):** Lead the students in a discussion about traveling and distance. In the warm up walk, did everyone get the same number? If not, why not? When they are traveling around town, what are different ways they get around? How long does it take to get from home to school?

“Today we will create a town for KIBO to explore. It might be our town, or an imaginary town. We will draw (or build) buildings, playgrounds, schools — anything we’d like to make our town fun for KIBO to explore. Then we will program KIBO to move from one building to another, drawing a line behind to show where it explored. We can measure the lines to find out how far it is from one place to another in our town.”

In the circle, you may want to demonstrate how to use measuring tape, if this is a new tool for students. The students will use the measuring tape at the end of this lesson.

Recommended Reading: *Harold and the Purple Crayon* by Crockett Johnson. This classic story about the power of imagination and the possibilities in a single line will help get kids in the mood for creating their imaginary town. This is a fairly long book, so you may want to just read part of the book, or save part for the next lesson.




Activity 1

 **Build and Draw the Town (30 minutes):** Allow children to construct an imaginary town on the central drawing surface you’ve laid out. In order to reduce collisions for space, you can encourage students to build recycle-craft structures on separate work tables, then bring them to the town when they are complete (and sturdy). Similarly, students who are contributing by drawing can do so on separate pieces of paper, which can be taped into the town area. Allow students to build, draw, and decorate in whatever way they see fit: making buildings, designing streets, drawing people, pets, and more. This is an open-ended and free-form activity.



Activity 2

 **Program KIBO to Explore (30 minutes):** Distribute the KIBOs and programming blocks, along with the Marker Extension Sets, but ask students not to attach markers yet. Each group should choose a path from one part of the city to another. This is the route they will program their KIBO to travel. Encourage students to plan the program for their route in their journals/notebooks. Also encourage them to test their programs as they develop them.

If students do not have enough FORWARD and BACKWARD blocks to move the full distance, remind students about the use of REPEAT blocks to make KIBO travel farther.


Classroom tip: While developing and testing their programs, students should have the Marker Extension Set attached to their KIBOs but should not have markers in the arms. Otherwise, their testing will create many extra marks on the city which may confuse things for the final activity.


If students have completed and tested their travel program and have additional time, they can decorate their KIBO as a city vehicle like a fire truck or school bus, or as a person who lives in the town. Students may want to use additional modules like the light bulb, Sound Record/Playback Module, or art stages to enhance their KIBOs and their programs.



As needed during the work time, hold an informal Technology Circle to ask students to reflect on the process so far. Did any groups run into problems when programming their travel paths? How did they resolve them? Ask each group to say what path their KIBO is going to take in the town.

Activity 3

 **Measure the paths (15 minutes):** Taking turns, each group should attach a single marker to their Marker Extension Set, and run their KIBO travel program. Their KIBO will draw a path from their starting point to their ending point. The group should then measure the path (with teacher help, as needed) using the measuring tape. Have them write the distance on the map, next to the line they measured. After each group has measured their path, assist the students in adding up all their numbers to learn the total distance all the KIBOs have traveled today!

 **Closing Technology Circle (10 minutes):** Ask students to share one thing about the route planning or distance measuring that was challenging for them. Congratulate the students on all the work they've completed today.

As always, you may want to ask students to help clean up any stray marks on the floor.