BOTZEES MINI TEACHER'S GUIDE AND LESSON PLANS

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INTRODUCTION

ABOUT BOTZEES MINI

Fun, Open-ended, and Screenless Programming

Botzees Mini introduces the fundamentals of computer programming to young children ages 3 and up. It utilizes a camera sensor in its base to detect and follow any black line and will respond to command cards placed on this path. Students can therefore control the movement of the robot by placing it on a path, either a path on the maps provided, or on a line drawn by the students themselves. Command cards placed on the robot's path control motion, sound, and appearance. These functions can be utilized to teach students the basics of computer programming: cause and effect, if/then logic, sequencing, de-bugging, and more! No screens required!

Project-based and Cross-curricular

This curriculum is designed for the kindergarten classroom, although the lessons could be adapted for older students. It is project-based, with a strong emphasis and collaboration, and connects to content in other subject areas including math and science.

BOTZEES MINI IN THE CLASSROOM

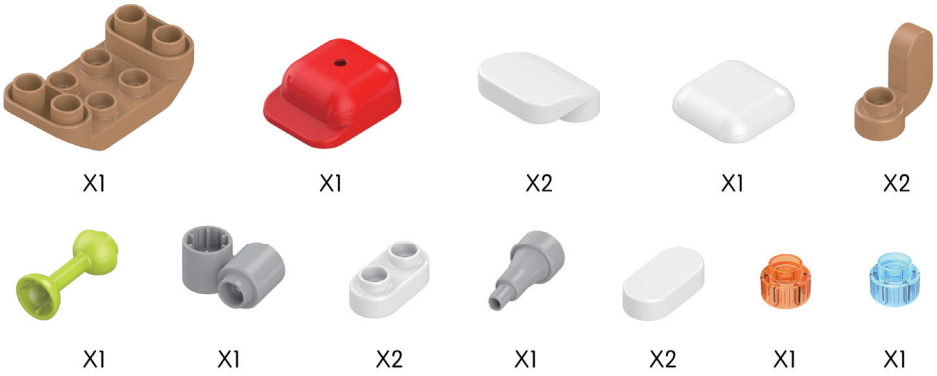
Quick Start

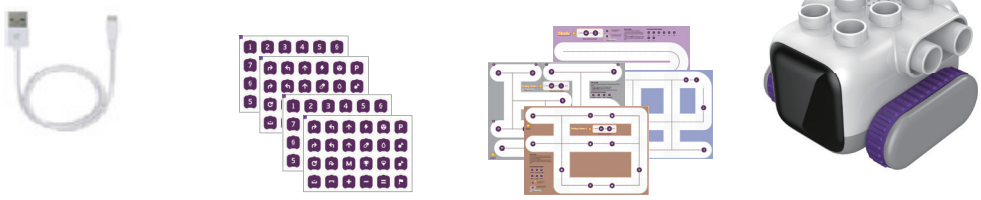
What You Need

- Botzees Mini retail packs (1 per group, pair, or individual depending on your class set-up)

  Each Botzees Mini retail pack comes with:

  - Main control robot
  - Accessory pieces to create different characters
  - Mission maps (lesson maps are separate)
  - Command cards
  - USB cable
  - Instruction manual





USB cable ×1 | Command cards ×4 | Maps ×2 (4 Themes) | Main control ×1

- Lesson Maps (For each project there is a corresponding lesson map. You will need maps for each group, pair, or individual depending on your class set-up. These maps are different than the mission maps that come with the retail pack.)
- *Reindeer: A Day in the Life* by Katie Marsico (for Projects 1, 2, and 3)
- Pencils or black pens (1 per student)
- USB charging station (to help you charge multiple robots at once)
- Plastic bags (at least 1 per kit for storing command cards)
- Replacement command cards (These will be necessary when command cards get lost or damaged. Email cs@pai.technology.com for the digital files to print out replacement command cards.)

Classroom Set-up

We recommend setting this up in the classroom:

- Storage area for Botzees Mini boxes
- Storage area for assembled Botzees Mini
- Word wall
- Workspace that enables collaboration and allows for maps to be spread out
- Number each Botzees Mini in order to keep track of them

Before the Lesson

- Charging: Make sure the Botzees Mini are charged prior to the lesson. Each Botzees Mini comes with a USB cable. There is an indicator light next to the power port—red indicates charging and green indicates charging is complete.
- Command cards: For the kindergarten classroom, we recommend removing the command cards from their sheets ahead of the lesson and storing them in plastic bags. You may also set aside and make available to students only the cards relevant to a given lesson. (See individual lesson plans for the relevant cards.)
- Accessory Pieces: For each project, accessory pieces will transform the Botzees Mini into a particular character. You can set aside and make available to students only the pieces relevant to a given lesson. (See individual lesson plans for the relevant accessory pieces.)

After the Lesson

- Set aside time each lesson for clean-up. Make sure the students:
    - Power down the Botzees Mini
    - Fold maps carefully
    - Return command cards to plastic bags

COLLABORATION

Pairing and Grouping

We encourage you to have students work in pairs for the projects, with each pair getting their own Botzees Mini kit. This promotes collaboration while also allowing easy access to the robot, maps, and command cards. We also encourage teacher assignment of groups rather than letting students pick their groups so that students learn how to work with a variety of students and within a range of social dynamics. For this reason, we also encourage you to change group assignments between projects. You could also use popsicle sticks or pair students by birthdays or favorite animal. Whatever system you choose, we encourage you to make it transparent to the students so that they aren't wondering or presuming why they got paired in a certain way. If you do have to modify groups for any classroom management considerations, consider making that decision transparent too and reference the issue, turning it into an opportunity to coach students on effective collaboration.

Roles

Botzees offer a terrific opportunity to develop collaboration skills. Effective collaboration also ensures that students are able utilize a range of modalities, exercise their strengths, and develop targeted skills. Implementing process-oriented roles creates a structure in which collaboration can be explicitly taught, promoted, and assessed. If you are able to (we realize on-line teaching will inhibit collaboration), we recommend utilizing the following process-oriented roles that develop collaboration while not limiting or dictating student access to tasks or resources.

» Task Master: This student helps to ensure that progress is being made towards the goal.

Questions they'll ask:

- What are we supposed to be doing?
- Are we on task?

» Team Keeper: This student helps to ensure that the group is an effective team.

Questions they'll ask:

- Are group members participating?
- Are we talking to each other respectfully?

» Robot Wrangler: (Optional—in the event you have a three-person group) This student helps to ensure the group has the resources they need to work effectively.

Questions they'll ask:

- Do we have the right equipment?
- Are we taking care of it?

During the group-work portion of the lessons, encourage students to coach their group according to their role. Lesson plans will also engage these roles in particular ways. You may find it helpful to make a class set of tags identifying what role each student has, so that both teacher and students an easily identify student roles for the day. This might also make it easier to assign roles quickly during the lesson.

ASSESSMENTS AND RUBRICS

This curriculum was designed with formative and summative, informal and formal assessments in mind. You will find rubrics for formal assessments in the lesson plans. We hope they will be helpful in teaching your students and in communicating to students the goals of the lessons as well as feedback on their performance.

Unit Objectives

Computer Science

- Students will utilize awareness of cause and effect and if/then thinking to program a robot to move and perform a task.
- Students will practice trouble shooting and de-bugging while programming their robot.
- Students will practice handling hardware components appropriately.
- Students will power-on and power-off their robots.

Science

- Students will understand that animals are adapted to particular habitats.
- Students will understand that animals need food and water and that specific animals eat specific things.
- Students will understand that certain animals have certain predators.

Math

- Students will practice adding numbers between 1 and 10.
- Students will understand the significance of “at least” and “no more than.”

Design

- Students will engage in a design process that adheres to contraints.
- Students will engage in an iterative design process, testing and revising.
- Students will take on open-ended problems and persevere to find solutions.

Collaboration

- Students will practice speaking respectfully to group members.
- Students will practice “step up/step back,” i.e. they will practice both participating and letting others participate.
- Students will collaborate using appropriate body language, i.e., facing each other and the task.
- Students will practice “yes, and...” while engaging in the brainstorming process.
- Students will provide positive feedback.

Communication

- Students will present their projects with appropriate body language, vocabulary, and voice.

STANDARDS

Botzees Mini will foster the development of core computer science practices in your early elementary classroom. Botzees Mini lessons are designed to support Computer Science Teachers of America (CSTA) Standards.

COMPUTER SCIENCE TEACHERS ASSOCIATION (CSTA) K-2 COMPUTER SCIENCE STANDARDS

Algorithms and Programming

- Develop programs with sequences and simple loops, to express ideas or address a problem. (1A-AP-10)
- Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (1A-AP-11)
- Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops. (1A-AP-14)
- Using correct terminology, describe steps taken and choices made during the iterative process of program development. (1A-AP-15)

Computing Systems

- Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (1A-CS-02)

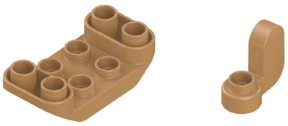
PROJECT 1 - WHERE DO REINDEER LIVE?

MATERIALS

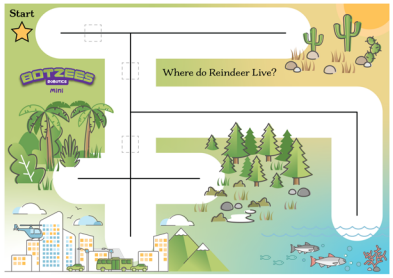
- Botzees Mini robot (1 for each group, check that their batteries are charged)
- Command cards (1 set for each group)
    - At least 2 “turn left” cards
    - At least 2 “turn right” cards
- Project 1 map, “Where Do Reindeer Live?” (1 for each group)
- Reindeer accessory pieces (1 set for each group)
- *Reindeer: A Day in the Life* by Katie Marsico
- Word wall in the classroom
- Rubric (provided in lesson plan)
- Checklist (optional, provided in lesson plan)

Botzees Mini Robot

Command Cards



Reindeer Pieces



Project 1 Map

LESSON OBJECTIVES

Computer Science

- Students will be able to understand that coding tells robots what to do and will code their robot to perform a simple task.
- Students understand what hardware is and how to handle it appropriately.
- Students will understand that robots need power and will be able to power on and off their robot.
- Students will understand what debugging is and will have opportunities to practice it.

Collaboration

- Students will practice both participating and letting others participate ("Step Up and Step Back").

Science

- Students will learn that certain animals need certain types of food and are adapted to certain environments. They will identify the appropriate habitat for a reindeer.

CSTA STANDARDS

Algorithms and Programming

- Develop programs with sequences and simple loops, to express ideas or address a problem. (1A-AP-10)
- Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (1A-AP-11)

PREPARATION

- Charge Botzees Mini robots if needed.
- Set aside accessory pieces for the reindeer.
- Set aside command cards.

VOCABULARY

- Robot: A machine that can be controlled
- Code: Make a robot do what you want
- Habitat: A place that has what an animal needs
- The Arctic: A very cold and windy habitat
- Collaborate: Work with others
- Debug: Fix code
- Hardware: The parts of a robot you can touch

LESSON PLANS: WHERE DO REINDEER LIVE?

Part 1 (45 min)

I. Intro to Robots and Coding (8 min)
   A. Show students the Botzees Mini as a reindeer.
   B. Explain to students that we are going to learn how to make robots, machines that can be controlled, do what we want them to do. Tell students that they are going to learn to code robots. Put the definition of "robot" and "code" on the word wall. **Robot**: A *machine that can be controlled.* **Code**: *Make a robot do what you want*
   C. Show students the Botzees Mini robot. Turn it on. Show that it doesn't do anything when placed on a table.
   D. Explain that these robots have already been coded to follow a line. Demonstrate how the robot follows the line on the map called *Where Do Reindeer Live?*
   E. Then show what happens when the robot comes to a juncture—it will continue to go straight. Explain that in order to make the robot go where we want it to, we will need to do some additional coding. Asks students, "What is coding again?" Call on students and guide them to the definition.
   F. Explain that we are going to code the robot reindeer to guide them home. Say, "But where do reindeer live? Let's first learn about reindeer so that we know where reindeer live."

II. Read *Reindeer: A Day in the Life* by Katie Marsico (10 min)
   A. As you read the book to your students, emphasize aspects of the reindeer's habitat (snowy, windy, cold) and adaptations to the habitat (hooves, fur, nose).
   B. You can revisit this information on the last page, "Reindeer Body Map." Consider asking students the following questions:
      i. Why do reindeer need fur? (Answer: To keep them warm in the cold environment.)
      ii. What was special about a reindeer's nose? (It warms the air as they breathe.)
      iii. What do reindeer use their hooves for? (They use them to walk on snow dig through the snow for lichen.)

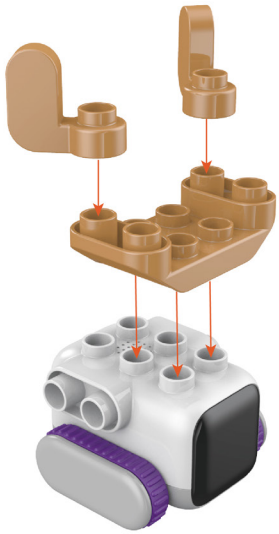
III. Discuss and Define Habitat (5 min)
   A. Ask students, "Where do reindeer live?"
   B. Guide student responses towards this statement: "The Arctic is their habitat."
   C. Define habitat and post the definition on a word wall. **Habitat**: *a place that has what an animal needs.*

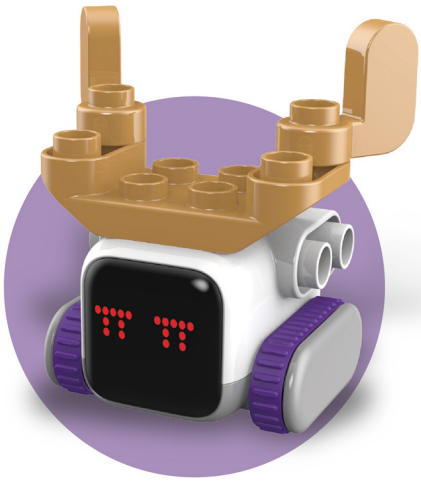
IV. Make Reindeer (20 min)
   A. Explain to students that now we will make the robot reindeer.
   B. Care for Hardware
      i. Prepare to distribute robots. Explain to students that they are hardware and breakable.
      ii. Define hardware and post on word wall. **Hardware:** *The parts of a robot you can touch.*
      iii. Explain that we need to show "Care for Hardware." Have students repeat "Care for Hardware."

iv. Have a student volunteer demonstrate how to handle the robot carefully and point out appropriate behavior. Point how to hold them, how to move with them. Also point out the purple tracks and instruct students to be careful with them and to leave the tracks on the wheels. Tell the students to ask for help if the tracks come off. You can also point out what not to do when handling the robot, for example they shouldn't put pieces in their mouths, they shouldn't throw the robots, they shouldn't stretch the bands, etc.

C. Collaboration
   i. Pair students: Pair students and assign roles for the current project. To do this, consider having students line up in two lines with the lines facing each other. Students are paired with the person they are facing.
   ii. Assign roles: Have students on the right raise their hands. Tell these students that they are the Team Keepers, and that they need to keep their team together. Have students on the left raise their hands. Tell those students that they are the Task Masters and need to keep their team on task. Ask the Task Masters to come up and receive their Botzees Mini kits showing "Care for Hardware." If there is a group or three, the third member of the group will have the role of Robot Wrangler. They are to make sure the team shows "Care for Hardware."

D. Make Reindeer
   i. Have students watch you make the reindeer.
   ii. Guide students step-by-step through attaching the antler pieces to the robot.
   iii. Point out groups and pairs that have their teams together and are on task. If a group is not together, ask the Team Keeper to gather their group. If a group is not on task, ask the Task Master to refocus their group.





Reindeer

V. Clean up (2 min)
   A. Have Task Masters return their reindeer Botzees Mini to a storing area. Have Team Keepers return the rest of the kits to the storing area.
   B. Point out students showing "Care for Hardware."

Part 2 (45 min)

I. Demo Task (5 min)
   A. Show students the Botzees Mini as a reindeer and the "Where do Reindeer Live?" map. Explain that we need to code the reindeer to get to its habitat. Show how the robot will follow line on the map until it comes to a juncture. Explain that we need to somehow make the do robot what we want it to do. Ask students, "What do we call it when we make a robot do what we want?" Students will hopefully respond with, "Code," and if not, remind them and utilize the word wall for emphasis.
   B. Explain that we code these robots with code cards. Place a code card on the map and show how the robot responds.

II. Collaboration (5 min)
   A. Define: We are going to get into groups and collaborate. Define collaborate and post on word wall. **Collaborate**: *Work together*.
   B. Ask students for a volunteer. Quickly pull student volunteer aside and whisper to them to not let you hold the robot. Then act this out in front of the class with the student volunteer.
   C. Ask students what did not work well in this demo. Hopefully they will identify that it was not ideal for the student to not let you hold the robot. Explain to students that now you and the volunteer will try again.
   D. Pull volunteer aside again, and quickly tell them to let you hold the robot this time, and to offer to lay the map out. Act this out in front of the students.
   E. Ask the students what went well during the second demo. Guide students towards pointing out how the volunteer both participated and also let you participate. Use the phrase "Step Up and Step Back."
   F. Ask students, "Why is it a good idea to 'Step Up' and 'Step Back' when working together?"
   G. Put students in pairs.

III. Coding and Debugging (20 min)
   A. Demo the thought process for the first turn and what happens once the card is placed on the map.
   B. Ask students, "How do we know if we coded our robot correctly?" Then ask students, "What do we do if it doesn't do what we want?" Explain that this process in called debugging. Define and place on word wall. **Debug**: *Fix code.*
   C. Explain to students that debugging is an important part of the process, so it is OK if the robot doesn't do what we want it to do right away. Explain that it's just a problem to solve and an opportunity to debug!
   D. Have students retrieve their reindeer robots and kits. Give students time to code in pairs. Remind them about "Care for Hardware" and "Step Up and Step Back."
   E. As students work, point out examples of "Care for Hardware," Step Up and Step Back" and efforts to debug.

IV. Presentation (7 min)
   A. Have students demo their Botzees Mini and determine if "Success" or "Time to Debug."
   B. Use the rubrics to assess students if you wish.
   C. Ask students to explain why they picked the habitat they picked.

V. Clean Up (5 min)
   A. Have students power down the robot.
   B. Have students dismantle the reindeer Botzees Mini and pack up their kit boxes, placing command cards in plastic bags. (You may choose to keep the reindeer assembled for use in the next lesson.)
   C. Have students fold maps.
   D. Have students return Botzees Mini kit boxes to the storage area.

VI. Reflect (3 min)
   A. Ask students to reflect on what they learned and accomplished. Guide them towards the following:
      - We learned to code.
      - We learned to debug.
      - We learned about hardware and power and “Care for Hardware.”
      - We learned about reindeers’ habitat.
      - We learned to collaborate.

WORKSHEETS

You will find a rubric and checklist on the following pages to use with this lesson.

Name_____ Date_____

PROJECT 1 RUBRIC - WHERE DO REINDEER LIVE?

	Not Yet	Almost	Yes
I showed "Care for Hardware."	☆	☆☆	☆☆☆
I understand what a habitat is.	☆	☆☆	☆☆☆
I coded my robot.	☆	☆☆	☆☆☆
I stepped up and stepped back.	☆	☆☆	☆☆☆

Name_____ Date_____

PROJECT 1 CHECKLIST - WHERE DO REINDEER LIVE?

Task	Completed?	Reflection
I assembled the reindeer.	☐	☐ I enjoyed this. ☐ I worked hard on this.
I powered on and off my robot.	☐	
I coded my robot to turn right and left.	☐	☐ I enjoyed this. ☐ I worked hard on this. ☐ I need more help to complete this task. ☐ I have questions.
I coded my robot to arrive at its habitat.	☐	Draw a picture of the reindeer's habitat.

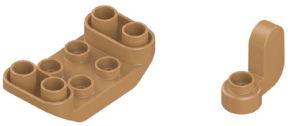
PROJECT 2 – WHAT DO REINDEER NEED?

MATERIALS

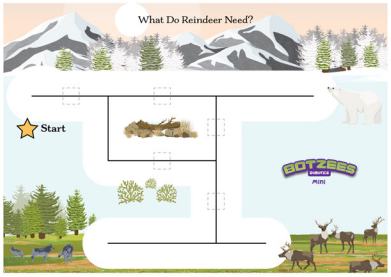
- Botzees Mini robot (1 for each group)
- Command cards (1 set for each group)
    - At least 3 “turn left” cards
    - At least 3 “turn right” cards
    - At least 2 “go straight” cards
- Project 2 map, “What Do Reindeer Need?” (1 for each group)
- Reindeer pieces (1 set for each group)
- *Reindeer: A Day in the Life* by Katie Marsico
- Word wall in the classroom
- Rubric (provided in lesson plan)

Botzees Mini Robot

Command Cards



Reindeer Pieces



Project 2 Map

LESSON OBJECTIVES

Computer Science

- Students utilize awareness of cause and effect and if/then thinking to program a robot to move and perform a task.
- Students practice trouble shooting and de-bugging while programming their robot.
- Students will practice handling hardware components appropriately.
- Students will power-on and power-off their robots.

Science

- Students will understand that animals need food and water and that specific animals eat specific things.
- Students will understand that certain animals have certain predators.

Collaboration

- Students will practice “step up/step back,” i.e., they will participate and will also allow others to participate.
- Students will collaborate using appropriate body language, i.e., facing each other and the task.

CSTA STANDARDS

Algorithms and Programming

- Develop programs with sequences and simple loops, to express ideas or address a problem. (1A-AP-10)
- Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (1A-AP-11)
- Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops. (1A-AP-14)
- Using correct terminology, describe steps taken and choices made during the iterative process of program development. (1A-AP-15)

Computing Systems

- Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (1A-CS-02)

PREPARATION

- Charge Botzees Mini robots if needed.
- Set aside accessory pieces for the reindeer.
- Set aside command cards.

VOCABULARY

- Lichen: Food for reindeer. It looks like a tiny plant but has no leaves or roots.
- Predator: Animals that attack other animals.

LESSON PLANS: WHAT DO REINDEER NEED?

Part 1 (35 min)

I. Introduction: What Do Reindeer Need? (12 min)

A. Show students the map and read the title, "What Do Reindeer Need?" Explain to students that they are going to code the reindeer robot so that it is able to get what it needs on its way back to the herd.

B. Explain to students that we are going to re-read *Reinder: A Day in the Life*, and that this time, we are going to pay close attention to what reindeer need to live. Re-read the book to students. Pause between pages 12 and 13 (right after the book mentions lichen) and ask students, "Has anyone heard something that reindeer need?" Encourage students to identify "lichen." Explain that lichen looks like a tiny plant, but that it has no leaves or roots, and that many animals eat it for food. Put the definition of lichen on the word wall. *Lichen: Food for reindeer. It looks like a tiny plant but has no leaves or roots.*

C. Continue reading. At the end of the book, ask students again, "What do reindeer need?" Call on a few students and guide them to specifically mention the foods reindeer indeed including lichen as well as leaves and grasses.

D. If students haven't mentioned the herd, or something like safety or protection, ask students, "Do you think reindeer need protection?" Guide students toward the idea that yes, reindeer do need protection. Ask students, "What do they need protection from?" Refer back to pages 14 and 15 and point out the predators that are listed on those pages (wolves, bears, eagles, wolverines, and humans). You may choose to teach them the word "predator" and put it on the word wall. *Predator: Animals that attack other animals.*

II. Collaboration (6 min)

A. Explain to students that they are now going to work in groups again to code their reindeer robot. Remind students that they are going to "step up and step back." Ask students, "What does that look like and sound like?" Guide students towards responses such as these:

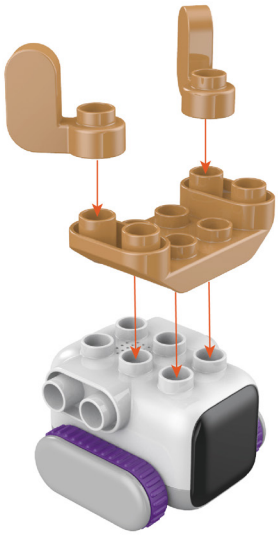
- Group members face each other.
- Group members face the map or robot or pieces.
- Group members hold the robot, pieces, command cards and/or map.
- Different group members at different times are holding different things.
- One group member speaks at a time while the others listen.
- Different group members speak throughout the work time.

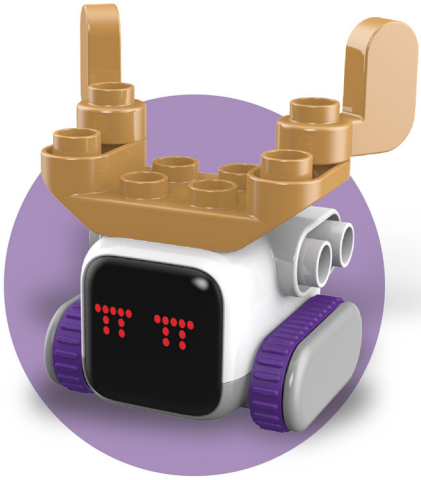
Ask for a pair to demonstrate this with the map and robot. Explain to students that during collaboration, you (the teacher) should see this happening and that today, the Team Keepers are going to help make sure group members look like and sound like collaborators.

B. Pair students and assign roles for the current project. Consider having students line up in two lines with the lines facing each other and pair students with the person opposite them. Have students on the right raise their hands. Tell these students that they are the Team Keepers, and that they need to make sure the team looks like and sounds like good collaborators. Have students on the left raise their hands. Tell those students that they are the Task Masters and need to keep their team on task. Ask the Task Masters to come up and receive their Botzees Mini kits showing "Care for Hardware." If there is a group or three, the third member of the group will have the role of Robot Wrangler. They are to make sure the team shows "Care for Hardware."

III. Make Reindeer (12 min)

A. Have students watch you make the reindeer.
B. Guide students step-by-step through attaching the antler pieces to the robot.
C. Point out groups that look like and sound like collaborators and are on task. If a group is not together, ask the Team Keeper to gather their group. If a group is not on task, ask the Task Master to refocus their group. Assist groups if needed.





Reindeer

V. Clean up (5 min)

A. Have Task Masters return their reindeer Botzees Mini to a storing area. Have Team Keepers return the rest of the kits to the storing area.
B. Point out students showing "Care for Hardware."

Part 2 (35 min)

I. Code (18 min)
   A. Show students the Botzees Mini as a reindeer and the "What Do Reindeer Need?" map. Explain that we need to code the reindeer to get what it needs. Ask students, "What do we call it when we make a robot do what we want?" Students will hopefully respond with, "Code," and if not, remind them and utilize the word wall for emphasis. Ask students, "How do we code our Botzees Mini robot?" Hopefully students will remember how to use the command cards. Demonstrate a turn as a reminder by placing a command card on the map and showing how the robot responds.
   B. Have students get together with their partners for coding. Ask the Task Masters to retrieve the assembled reindeer robots and have the Team Keepers retrieve the kits and/or maps. Remind them about "Care for Hardware."
   C. As students work, point out examples of "Care for Hardware," collaboration, and efforts to de-bug.

II. Presentation (7 min)
   A. Have students demo their Botzees Mini and determine if "Success" or "Time to Debug."
   B. Use the rubrics to assess students if you wish.
   C. Ask students to explain why they chose the path they did.

III. Clean Up (5 min)
   A. Have students power down the robot.
   B. Have students dismantle the reindeer Botzees Mini and pack up their kit boxes, placing command cards in plastic bags.
   C. Have students fold maps.
   D. Have students return Botzees Mini kit boxes to the storage area.

IV. Reflect (5 min)
   A. Ask students to reflect on what they learned and accomplished. Guide them towards the following:
      - We coded. (Draw their attention to the fact that this goal was more challenging than the last one. Point out that they are becoming more advanced coders.)
      - We debugged.
      - We collaborated.
      - We learned about reindeers' food and predators.

WORKSHEETS

You will find a rubric and checklist on the following pages to use with this lesson.

Name_____ Date_____

PROJECT 2 RUBRIC - WHAT DO REINDEER NEED?

	Not Yet	Almost	Yes
I showed "Care for Hardware."	☆	☆☆	☆☆☆
I understand that reindeer eat certain foods.	☆	☆☆	☆☆☆
I understand that reindeer need protection from certain animals.	☆	☆☆	☆☆☆
I coded my robot to get what it needs.	☆	☆☆	☆☆☆
I stepped up and stepped back.	☆	☆☆	☆☆☆
I faced my partner and the robot.	☆	☆☆	☆☆☆

Name_____ Date_____

PROJECT 2 CHECKLIST - WHAT DO REINDEER NEED?

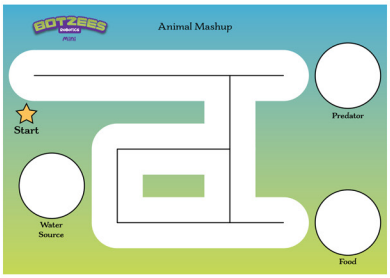
Task	Completed?	Reflection
I powered on and off my robot.	☐	
I coded my robot to reach food.	☐	☐ I enjoyed this. ☐ I worked hard on this. ☐ I need more help to complete this task. ☐ I have questions. Draw a picture of one type of reindeer food.
I packed up my robot showing "Care for Hardware."	☐	

PROJECT 3 – WHAT DO ANIMALS NEED?

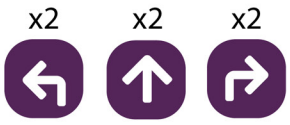
MATERIALS

- Botzees Mini robot (1 for each group)
- Command cards (1 set for each group)
    - At least 2 “turn left” cards
    - At least 2 “turn right” cards
    - At least 2 “go straight” cards
- Project 3 map, “Animal Mash Up” (1 for each group)
- Accessory pieces (1 set for each group)
- Word wall in the classroom
- Graphic Organizer, “Our Animal” (provided in lesson plan)
- Rubric (provided in lesson plan)
- Pipe cleaners (optional—can give students more options when creating their animals)

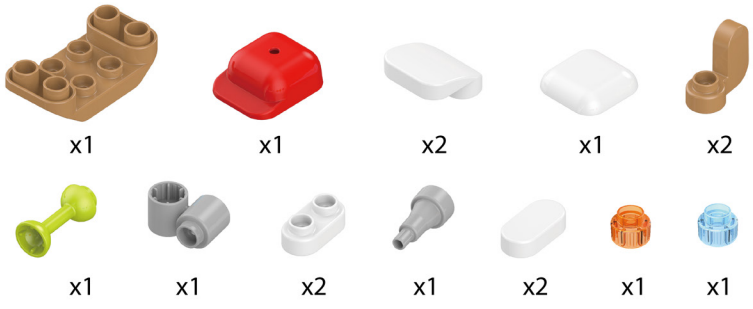
Botzees Mini Robot



Project 3 Map



Command Cards



Animal Pieces

LESSON OBJECTIVES

Computer Science

- Students utilize awareness of cause and effect and if/then thinking to program a robot to move and perform a task.
- Students practice trouble shooting and de-bugging while programming their robot.
- Students will practice handling hardware components appropriately.
- Students will power-on and power-off their robots.

Science

- Students will understand that animals are adapted to particular habitats.
- Students will understand that animals need food and water and that specific animals eat specific things.
- Students will understand that certain animals have certain predators.

Collaboration

- Students will collaborate using appropriate body language, i.e., facing each other and the task.
- Students will practice “step up/step back.” They will participate and allow others to participate.
- Students will practice “yes, and...” while engaging in the brainstorming process.
- Students will provide positive feedback.

Communication

- Students will present their projects with appropriate body language, vocabulary, and voice.

CSTA STANDARDS

Algorithms and Programming

- Develop programs with sequences and simple loops, to express ideas or address a problem. (1A-AP-10)
- Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (1A-AP-11)
- Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops. (1A-AP-14)
- Using correct terminology, describe steps taken and choices made during the iterative process of program development. (1A-AP-15)

Computing Systems

- Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (1A-CS-02)

PREPARATION

- Charge Botzees Mini robots if needed.
- Set aside accessory pieces.
- Set aside command cards.

VOCABULARY

- Adaptation: Features that help an animal get what it needs
- Brainstorm: To come up with ideas

LESSON PLANS: WHAT DO ANIMALS NEED?

Part 1 (45 min)

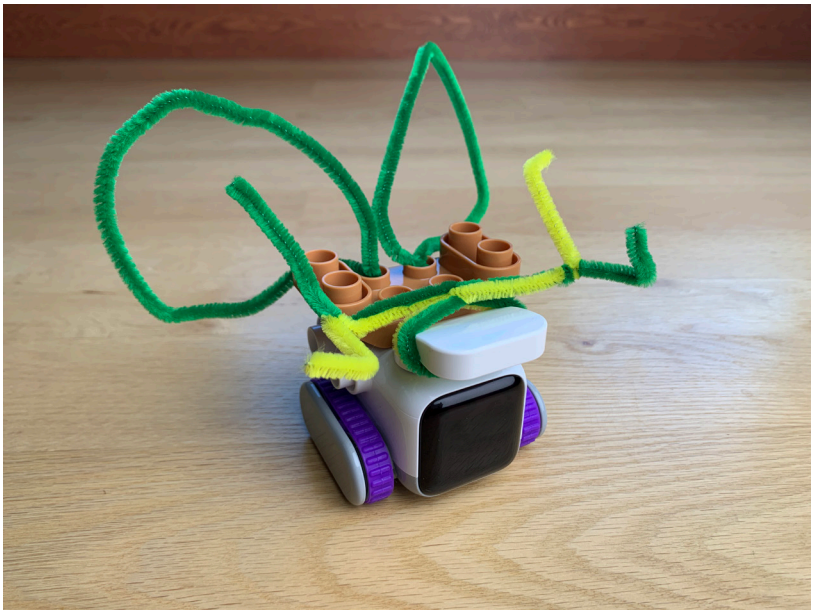
I. Intro – What do animals need? (7 min)
   A. Ask students, "Who can remember what reindeer need?" Call on a few students and guide them to identify food specifically.
   B. Then ask students, "What do *you* need every day to live?" Call on a few students and guide them to identify food and also water.
   C. Explain to students that reindeer and humans are both animals. Ask students, "What do you think all animals need?" Have students turn to their partner and share their thoughts. Then ask students to share out. Explain to students that all animals need food and water and that they usually have to travel to find these. (They might also mention warmth, rest, or air.)
   D. Say to students, "What do reindeer have that help them get what they need? Let's look back at the book." Point out antlers and explain that antlers help reindeer clear snow when looking for food. Point out hooves and remind students that hooves help reindeer to travel and dig as they look for food. Point out hair and remind students how hair keeps reindeer warm. Point out the reindeer nose and remind students that the nose warms the cold air reindeer breathe. Explain to students that these are adaptations. Put the definition on the word wall. *Adaptation: Features that help an animal get what it needs.*
   E. You can also ask students what features humans have that allow humans to get what they need. For example, our legs help humans walk to where food us and teeth help humans chew food.
   F. Explain to students that today they are going to create a robot animal. Tell students that the animals should have an adaptation--a feature that helps them get what they need. It could be an antler, wings, antennae, a wacky nose. Explain that students will also decide what the animal will eat, and that they can also decide if an animal has a predator.
   G. Quickly demonstrate the task.

II. Collaboration (8 min)
   A. Explain to students that today they are going to brainstorm. Define brainstorm and put it on the word wall. *Brainstorm: To come up with ideas.*
   B. Explain to students that during a brainstorm, all ideas are good ideas, and that they can narrow ideas down later, especially when they come to build their Botzee. For now, they want as any ideas as possible. Explain to students that one way to make sure this happens easily, is to say, "Yes, and…" Have students repeat, "Yes, and…" Ask for a student volunteer and have them say "Yes, and…" to every idea you offer as you and the volunteer describe an ice cream sundae with toppings you will make. For example: "Let's make an ice cream sundae with chocolate ice cream." "Yes, and let's add strawberry ice cream." "Yes, and let's top it with chocolate sauce!" "Yes, and let's add peanuts!!" "Yes, and let's add whip cream!!!" "Yes, and let's add pepperoni!!!!" "Yes, and let's add mashed potatoes!!!!!" "Yes, and let's add sprinkles!!!!!!"

C. Afterwards, ask students, “What was helpful about saying, “Yes, and…” all the time. Sample answers: “It makes it fun,” “It makes the other person feel good about their idea,” “It makes it easier to come up with ideas,” etc.
D. Encourage students to use “Yes, and…” as much as they can during their brainstorm, so that it facilitates offering and receiving ideas.

III. Brainstorm (10 min)
A. Pair students and assign roles for the current project. To do this, consider having students line up in two lines with the lines facing each other. Students are paired with the person they are facing. Have students on the right raise their hands. Tell these students that they are the Team Keepers, and that they need to monitor if the team is using “Yes, and...” while brainstorming. Have students on the left raise their hands. Tell those students that they are the Task Masters and need to keep their team on task. If there is a group or three, the third member of the group will have the role of Robot Wrangler. They are to make sure the team shows “Care for Hardware.”
B. Give students time to brainstorm. Point out examples of “Yes, and...” and how team members are facing each other. Call on Team Keepers to coach their groups if this is not happening.
C. Pass out the graphic organizers and instruct students to draw in their animal or adaptation, an item the animal eats, and a predator if they have time. Check to see that students have decided on an adaptation at least. If it is not filled out, ask Task Masters to coach their team to decide on and draw the adaptation.

IV. Animal Construction (15 min)
A. Ask the Task Masters to come up and receive their Botzees Mini kits showing “Care for Hardware.” Give students time to construct the animals in pairs.
B. Have students present their animals and explain their feature (adaptation), food and predator. (Optional)



V. Clean up (5 min)
A. Have Task Masters return their assembled Botzees Mini animal to a storing area. Have Team Keepers return the rest of the kits to the storing area.
B. Point out students showing “Care for Hardware.”

Part 2 (45 min)

I. Map Creation (15 min)
   a. Tell students that today, they are going to code their animals to get what they need on their way home, back to their habitat.
   b. Have students get in their pairs. Pass out the maps. Explain to students that first, they will draw in food items. If their animal has a predator, explain that they can draw that in too. They can also draw in where their animal gets water and/or add features to the habitat.
   c. Remind students that during collaboration, they need to "step up and step back" and look like and sound like collaborators. Remind Team Keepers to monitor whether their team is doing that.

II. Coding (15 min)
   a. Once most groups have most of the map filled in, ask the Task Masters to retrieve their assembled Botzees Mini.
   b. Tell students that they should code their robot to get what they need in a day.

III. Presentation (8 min)
   a. Have students demo their Botzees Mini. Ask each group to name the adaptation, the food, and predator if they have a predator. After each group, have students think of a piece of positive feedback for the group that just presented. Tell students that it could be the robot, the coding, the drawings, the food, the predator, etc. Then call on a student to give their positive feedback to the group presenting.
   b. Use the rubrics to assess students if you wish.

IV. Clean Up (5 min)
   a. Have students power down the robot.
   b. Have students dismantle the animals and pack up their kit boxes, placing command cards in plastic bags.
   c. Have students fold maps.
   d. Have students return Botzees Mini kit boxes to the storage area.

V. Reflect (2 min)
   a. Ask students to reflect on what they learned and accomplished. Guide them towards the following:
      i. We learned about adaptations
      ii. We were creative.
      iii. We brainstormed.
      iv. We practiced "Yes, and..."
      v. We coded our robots.
      vi. We gave positive feedback.
      vii. We presented our project.

WORKSHEETS

You will find a graphic organizer, rubric, and checklist on the following pages to use with this lesson.

Names_____ Date_____

OUR ANIMAL

Adaptation	Food	Predator

Name_____ Date_____

PROJECT 3 RUBRIC - ANIMAL MASH UP

	Not Yet	Almost	Yes
I showed "Care for Hardware."	☆	☆☆	☆☆☆
I understand that animals need food.	☆	☆☆	☆☆☆
I coded my robot to get what it needs.	☆	☆☆	☆☆☆
I stepped up and stepped back.	☆	☆☆	☆☆☆
I faced my partner and the robot.	☆	☆☆	☆☆☆
I used "Yes, and..." to brainstorm with my team.	☆	☆☆	☆☆☆

Name_____ Date_____

PROJECT 3 CHECKLIST - ANIMAL MASH UP

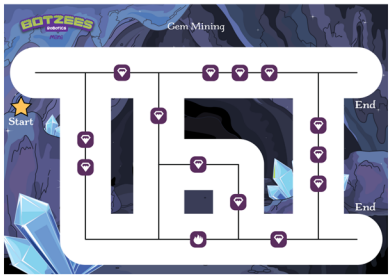
Task	Completed?	Reflection
I imagined an animal with an adaptation.	☐	☐ I enjoyed this. ☐ I found this challenging. ☐ I have questions.
I built a robot of my own design.	☐	☐ I enjoyed this. ☐ I worked hard on this. ☐ I found this challenging.
I created a map that showed my animal's food.	☐	☐ I enjoyed this. ☐ I worked hard on this. ☐ I found this challenging.
I coded my robot to get food.	☐	☐ I enjoyed this. ☐ I worked hard on this. ☐ I need more help to complete this task. ☐ I have questions.

PROJECT 4 – GEM MINING

MATERIALS

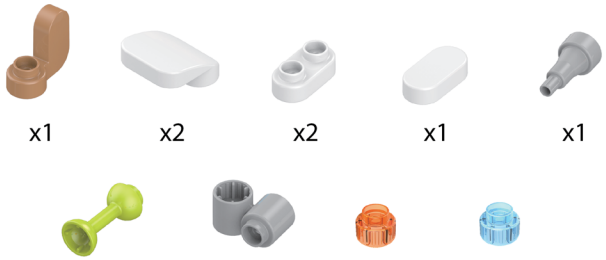
- Botzees Mini robot (1 for each group)
- Command cards (1 set for each group)
    - At least 3 “turn left” cards
    - At least 3 “turn right” cards
    - At least 3 “go straight” cards
- Project 4 map, “Gem Mining” (1 for each group)
- Gem explorer pieces (1 set for each group)
- Word wall in the classroom
- Rubric (provided in lesson plan)

Botzees Mini Robot



Project 4 Map

Command Cards



Gem Explorer Pieces

LESSON OBJECTIVES

Computer Science

- Students utilize awareness of cause and effect and if/then thinking to program a robot to move and perform a task.
- Students practice trouble shooting and de-bugging while programming their robot.
- Students will practice handling hardware components appropriately.
- Students will power-on and power-off their robots.

Math

- Students will add within 10.
- Students will understand the significance of “at least” and “no more than.”

Collaboration

- Students will practice “step up/step back.” They will participate and also allow others to participate.
- Students will collaborate using appropriate body language, i.e., facing each other and the task.

Design

- Students will engage in a design process that adheres to contraints.
- Students will take on open-ended problems and persevere to find solutions.

CSTA STANDARDS

Algorithms and Programming

- Develop programs with sequences and simple loops, to express ideas or address a problem. (1A-AP-10)
- Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (1A-AP-11)
- Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops. (1A-AP-14)
- Using correct terminology, describe steps taken and choices made during the iterative process of program development. (1A-AP-15)

PREPARATION

- Charge Botzees Mini robots if needed
- Set aside accessory pieces for the Gem Explorer
- Set aside command cards

VOCABULARY

- Constraint: Rules that limit you in some way.
- “At least” and “no more than”

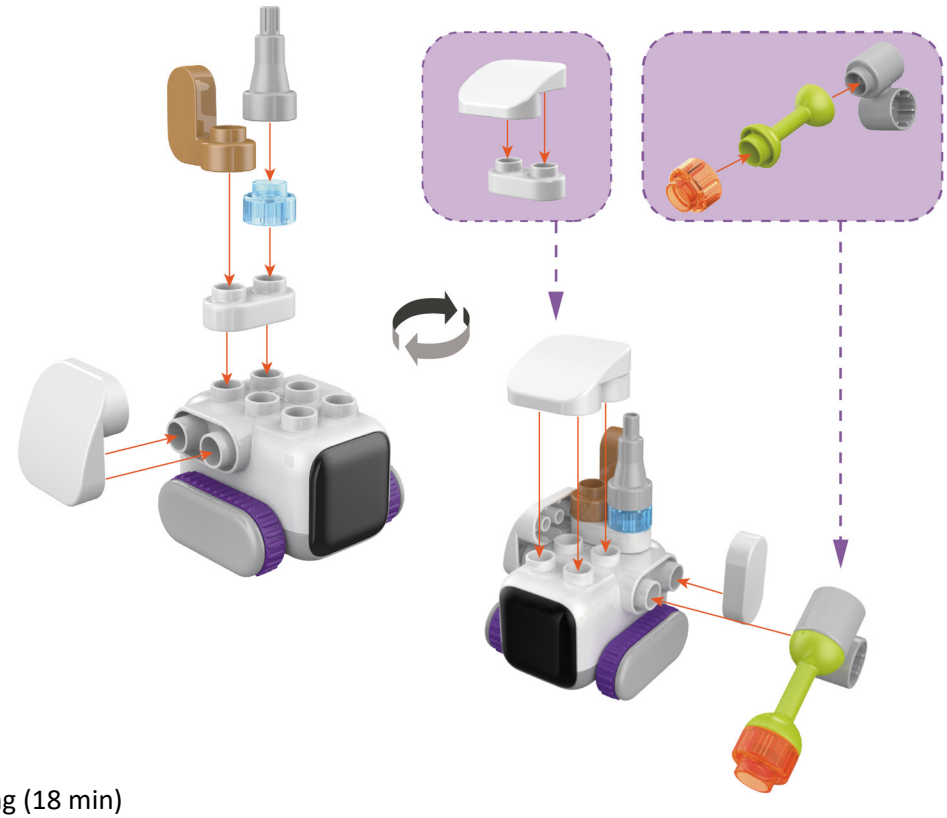
LESSON PLANS: GEM MINING

(45 min)

I. Introduction (5 min)
   A. Show students the *Gem Mining* map. Explain to students that they are going to code the gem explorer robot to mine at least 5 gems, but not more than 10 gems. This is called a constraint. Define constraint and put it on the word wall. ***Constraint****: Rules that limit you in some way.*
   B. Ask students, "Why are constraints challenging?" Have students share with a partner then call on students to share their answers.
   C. Ask students, "When are constraints important?" Have students share with a partner then call on students to share their answers.
   D. Explain to students that in our case, the gem miner robot has a maximum load of 10 gems. If the robot carries more than 10 gems, it could break down. Explain that often in the real world, coders have to code within constraints like these, and it's your job as coders to figure out how to do the best you can within those constraints.

II. Build Gem Explorer (12 min)
   A. Pair students and assign roles for the current project. To do this, consider having students line up in two lines with the lines facing each other. Students are paired with the person they are facing. Have students on the right raise their hands. Tell these students that they are the Team Keepers, and that they need to make sure the team is facing each other. Have students on the left raise their hands. Tell those students that they are the Task Masters and need to keep their team on task. Ask the Task Masters to come up and receive their Botzees Mini kits showing "Care for Hardware." If there is a group of three, the third member of the group will have the role of Robot Wrangler. They are to make sure the team shows "Care for Hardware."
   B. Have students watch you make the Gem Explorer.
   C. Guide students step-by-step through attaching accessory pieces to create the Gem Explorer
   D. Point out groups and pairs that have their teams together and are on task. If a group is not together, ask the Team Keeper to gather their group. If a group is not on task, ask the Task Master to refocus their group.
   E. As students finish, have Team Keepers retrieve *Gem Mining* maps.

Gem Explorer



III. Coding (18 min)
   A. Explain to students that they are now going to work code their Gem Explorer robot to get at least five gems and no more than ten gems, and that they should avoid the fires.
   B. As students code in groups, point out examples of Step-up/Step Back, appropriate collaboration body language, and of students staying on task. Call on Task Masters and Team Keepers to coach their groups as needed.

IV. Presentation (7 min)
   A. Have students demo their Botzees Mini and determine if "Success" or "Time to Debug."
   B. Use the rubrics to assess students if you wish.

V. Clean Up (2 min)
   A. Have students power down the robot.
   B. Have students dismantle the gem explorer Botzees Mini and pack up their kit boxes, placing command cards in plastic bags.
   C. Have students fold maps.
   D. Have students return Botzees Mini kit boxes to the storage area.

VI. Reflect (1 min)
   A. Ask students what new word they learned today and what it means. Guide them to define constraint, referring to the word wall if necessary.

WORKSHEETS

You will find a rubric and checklist on the following pages to use with this lesson.

Name_____ Date_____

PROJECT 4 RUBRIC - GEM MINING

	Not Yet	Almost	Yes
I showed "Care for Hardware."	☆	☆☆	☆☆☆
I used addition to meet a constraint.	☆	☆☆	☆☆☆
I coded my robot to collect gems.	☆	☆☆	☆☆☆
I stepped up and stepped back.	☆	☆☆	☆☆☆
I faced my partner and the robot.	☆	☆☆	☆☆☆

Name_____ Date_____

PROJECT 4 CHECKLIST - GEM MINING

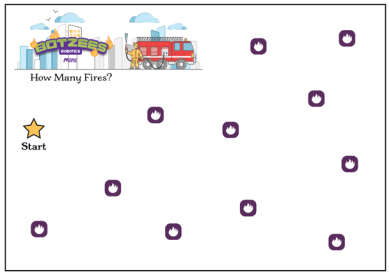
Task	Completed?	Reflection
I powered on and off my robot.	☐	
I coded my robot to collect gems.	☐	☐ I enjoyed this. ☐ I worked hard on this. ☐ I need more help to complete this task. ☐ I have questions. How many gems did your robot collect? Draw the path your robot took.
I packed up my robot showing "Care for Hardware."	☐	

PROJECT 5 – HOW MANY FIRES?

MATERIALS

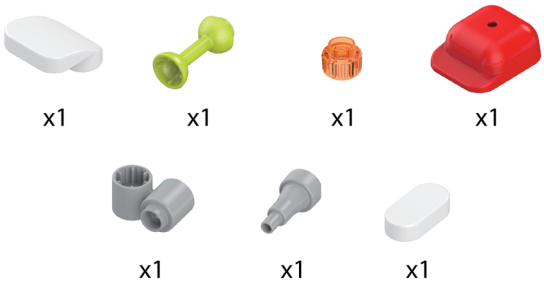
- Botzees Mini robot (1 for each group)
- Command cards (1 set for each group)
    - At least 3 “turn left” cards
    - At least 3 “straight” cards
    - At least 3 “turn right” cards
- Project 5 map, “Put Out Fires” (at least 3 for each group)
- Fire engine pieces (1 set for each group)
- Pencils or black pens or pencils (at least one per group)
- Word wall in the classroom
- Rubric (provided in lesson plan)

Botzees Mini Robot



Project 5 Map

Command Cards



Fire Engine Pieces

LESSON OBJECTIVES

Computer Science

- Students utilize awareness of cause and effect and if/then thinking to program a robot to move and perform a task.
- Students will practice handling hardware components appropriately.
- Students will power-on and power-off their robots.

Collaboration

- Students will practice “step up/step back.” They will participate and also allow others to participate.
- Students will collaborate using appropriate body language, i.e., facing each other and the task.

Design

- Students engage in a design process that adheres to constraints.
- Students engage in an iterative process, testing and revising.
- Students take on open-ended problems and persevere to find solutions.

CSTA STANDARDS

Algorithms and Programming

- Develop programs with sequences and simple loops, to express ideas or address a problem. (1A-AP-10)
- Using correct terminology, describe steps taken and choices made during the iterative process of program development. (1A-AP-15)

PREPARATION

- Charge Botzees Mini robots if needed
- Set aside accessory pieces for the fire engine

VOCABULARY

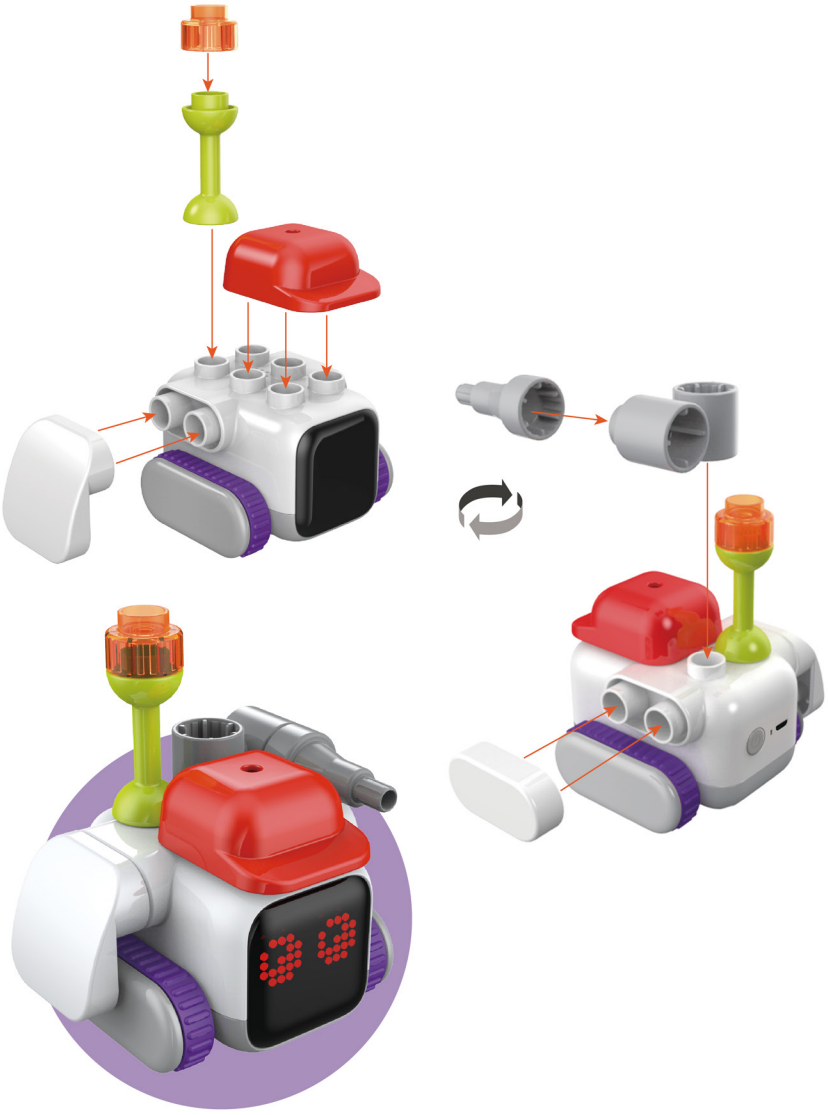
- Constraint: Rules that limit you in some way.
- Test and Revise: Try it out, then make it better.

LESSON PLANS: HOW MANY FIRES?

(45 min)

I. Introduction (5 min)
   A. Tell students that today, they are going to program a fire fighting robot.
   B. Optional: Show students this article about the first firefighting robot being utilized by the Los Angeles Fire Department in 2020: https://www.latimes.com/california/story/2020-10-13/los-angeles-fire-departments-robot-goes-where-firefighters-cant. You can also show them this video of the robot in action on the manufacturer's website: https://www.howeandhowe.com/civil/thermite.
   C. Ask students, "If you are a firefighter trying to use the robot to put out fires, would you want the robot to put out one or two fires, or as many fires as possible?" Establish that you would want to put out as many fires as possible.
   D. Show students the *How Many Fires?* map. Explain that the flames represent fires that the robot needs to put out, and that the robot needs to get to as many as it can.
   E. Ask students, "Who can tell me how our robot is coded to move?" Guide students to recall that the robot is coded to follow a line. Point out that there is no line on this map. Ask students, "What do you think you might do to get the robot to move?" Guide students toward the idea that they will have to draw a path for the robot to follow.
   F. Show students an example of a path that won't work. Then ask students if they have any ideas about how to fix it. "Does anyone have any idea about how to make this better?" Try out different ideas and see what happens, guiding students towards a more desirable outcome, i.e. the robot is able to reach two fires.
   G. Point out that the robot has a variety of constraints to its movement. Ask students to recall what a constraint is, referring to the word wall. (Constraint: Rules that limit you in some way.) Prompt students to think about the constraints of the robot's movement and demonstrate this constraint to the students where necessary. Ask students,
      - "Can it go backwards?"
      - "Can it make a sharp turn or does the turn need to be gradual?"
      - "Will it follow a light grey line?" (Demonstrate with a faint pencil line)
      - "Will it follow a messy line?" (Demonstrate with a messy line)
   H. Remind students that often in the real world, coders have to code within constraints like these, and that it's their job to figure out how to work within those constraints.

II. Build Fire Engine (12 min)
   A. Pair students and assign roles for the current project. To do this, consider having students line up in two lines with the lines facing each other. Students are paired with the person they are facing. Have students on the right raise their hands. Tell these students that they are the Team Keepers, and that they need to make sure the team is facing each other. Have students on the left raise their hands. Tell those students that they are the Task Masters and need to keep their team on task. Ask the Task Masters to come up and receive their Botzees Mini kits showing "Care for Hardware." If there is a group of three, the third member of the group will have the role of Robot Wrangler. They are to make sure the team shows "Care for Hardware."
   B. Have students watch you make the Fire Engine.
   C. Guide students step-by-step through attaching the Fire Engine pieces.
   D. As students work, point out groups and pairs that have their teams together and are on task. If a group is not together, ask the Team Keeper to gather their group. If a group is not on task, ask the Task Master to refocus their group.
   E. As students finish building the fire engine, have Team Keepers retrieve *How Many Fires?* maps.



Fire Engine

III. Coding (18 min)

A. Explain to students that they are now going to draw a path for the Fire Engine robot to follow so that it can put out as many fires as possible. Explain that they will "Test and Revise" which means to try out and make better. Put this on the word wall. ***Test and Revise****: Try it out, then make it better.*
B. Demonstrate the Test and Revise process. Ask students, "How many tests do you think they robot maker went through to make their firefighting robot?" Convey the point that they went through *a lot* of tests.
C. Explain to students that part of "step up/step back" means that all members of the group should have a go at drawing the line at some point. Ask the Team Keepers to make sure this happens. Ask students, "What can the Team Keeper say to get this to happen?" Guide students towards a sentence like, "Jessie, would you like to try the next test?" or "Sam, do you have any ideas for a revision?"
D. As students code in groups, point out when different members of the group get a chance to draw the path. Also point out and celebrate when a group tries out a revision. Call on Task Masters and Team Keepers to coach their groups as needed.

IV. Presentation (7 min)

A. Have each group present their "tests" by holding up all the maps they used during their testing process. Then have each team demo their Botzees Mini. Have the class count out loud as the Fire Engine robot passes a fire. Keep track of the highest number of tests and the highest number of fires "put out" on the board.
B. Congratulate the team with the most tests and with the most fires put out.

V. Clean Up (2 min)

A. Have students power down the robot.
B. Have students dismantle the Fire Engine Botzees Mini and pack up their kit boxes, placing command cards in plastic bags. (NOTE: You may decide to keep the Fire Engine assembled for the next project.)
C. Have students return Botzees Mini kit boxes to the storage area.

VI. Reflect (1 min)

A. Ask students what they did today. Guide students towards the notion of working with constraints and towards the notion of the test and revise design process.

WORKSHEETS

You will find a rubric and checklist on the following pages to use with this lesson.

Name_____ Date_____

PROJECT 5 RUBRIC - HOW MANY FIRES?

	Not Yet	Almost	Yes
I showed "Care for Hardware."	☆	☆☆	☆☆☆
I tested and revised.	☆	☆☆	☆☆☆
I coded my robot to put out fires.	☆	☆☆	☆☆☆
I stepped up and stepped back.	☆	☆☆	☆☆☆
I faced my partner and the robot.	☆	☆☆	☆☆☆

Name_____ Date_____

PROJECT 5 CHECKLIST - HOW MANY FIRES?

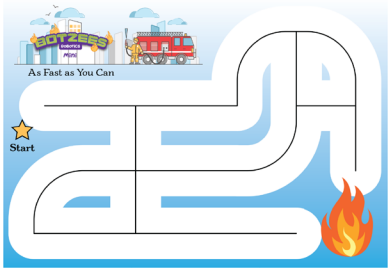
Task	Completed?	Reflection
I powered on and off my robot.	☐	
I tested and revised.	☐	☐ I enjoyed this. ☐ I worked hard on this. ☐ I have questions. How many tests did you complete?
I coded my robot to put out fires.	☐	☐ I enjoyed this. ☐ I worked hard on this. ☐ I need more help to complete this task. ☐ I have questions. How many fires did you put out?
I packed up my robot showing “Care for Hardware.”	☐	

PROJECT 6 – AS FAST AS YOU CAN

MATERIALS

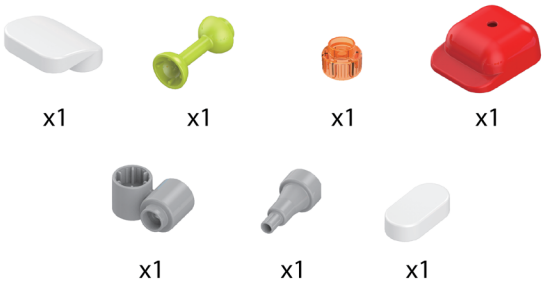
- Botzees Mini robot (1 for each group)
- Command cards (1 set for each group)
    - At least 3 “turn left” cards
    - At least 3 “straight” cards
    - At least 3 “turn right” cards
- Project 6 map, “As Fast as You Can” (1 for each group)
- Fire engine pieces (1 set for each group)
- Word wall in the classroom
- Rubric (provided in lesson plan)
- Test and Revise table (provided in the lesson plan)
- Timer

Botzees Mini Robot



Project 6 Map

Command Cards



Fire Engine Pieces

LESSON OBJECTIVES

Computer Science

- Students utilize awareness of cause and effect and if/then thinking to program a robot to move and perform a task.
- Students practice trouble shooting and de-bugging while programming their robot.
- Students will practice handling hardware components appropriately.
- Students will power-on and power-off their robots.

Collaboration

- Students will practice “step up/step back.” They will participate and allow others to participate.
- Students will collaborate using appropriate body language, i.e., facing each other and the task.

Design

- Students engage in an iterative process, testing and revising.
- Students take on open-ended problems and persevere to find solutions.

CSTA STANDARDS

Algorithms and Programming

- Develop programs with sequences and simple loops, to express ideas or address a problem. (1A-AP-10)
- Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (1A-AP-11)
- Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops. (1A-AP-14)
- Using correct terminology, describe steps taken and choices made during the iterative process of program development. (1A-AP-15)

PREPARATION

- Charge Botzees Mini robots if needed
- Set aside accessory pieces for the fire engine
- Set aside command cards

VOCABULARY

- Test and Revise: Try it out, then make it better.

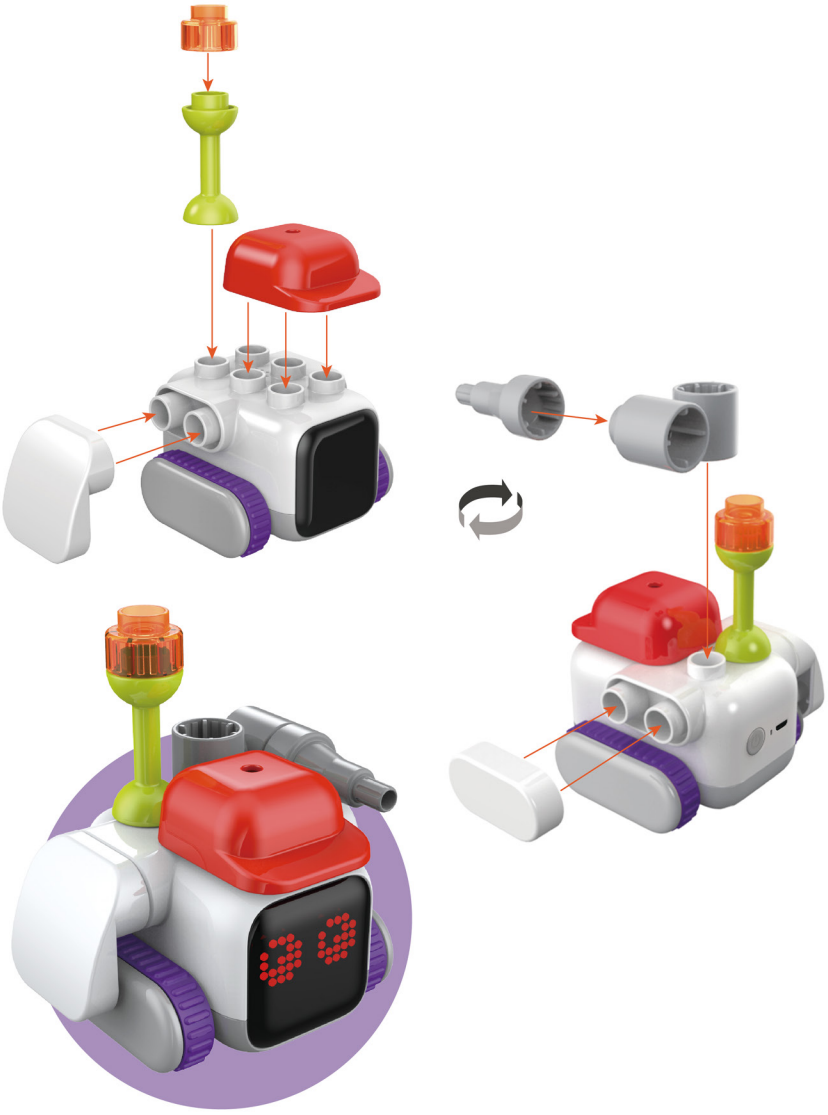
LESSON PLANS: AS FAST AS YOU CAN

(45 min)

I. Introduction (3 min)
   A. Tell students that today, they are going to program their firefighting robots again.
   B. Ask students, “Do you want your robot to get to the fire as fast as it can, or as slow as it can?” Students may say that the robot should go slowly to be safe. Acknowledge that, yes, the robot should go safely, to which you can ask students if the robot should take the long way or the short way to the fire. Establish that you would want to get to the fire as quickly (and as safely) as possible.
   C. Show students the *As Fast as You Can* map. Explain to students that their robot fire engines need to get to the fire as quickly as possible, and that they will need to code the robot to do that.

II. Pair Students (2 min)
   A. Pair students and assign roles for the current project. To do this, consider having students line up in two lines with the lines facing each other. Students are paired with the person they are facing. Have students on the right raise their hands. Tell these students that they are the Team Keepers, and that they need to make sure the team is facing each other. Have students on the left raise their hands. Tell those students that they are the Task Masters and need to keep their team on task. Ask the Task Masters to come up and receive their Botzees Mini kits showing “Care for Hardware.” If there is a group of three, the third member of the group will have the role of Robot Wrangler. They are to make sure the team shows “Care for Hardware.”

III. Build Fire Engine (If the fire engine is not intact from previous lesson) (8 min)
   A. Have students watch you make the Fire Engine.
   B. Guide students step-by-step through attaching the Fire Engine pieces.
   C. Point out groups and pairs that have their teams together and are on task. If a group is not together, ask the Team Keeper to gather their group. If a group is not on task, ask the Task Master to refocus their group.



Fire Engine

IV. Test and Revise (3-5 min)

A. Remind students how to code the robot by placing turn command cards on the map, and model your thinking.
B. Remind students about the "Test and Revise" process, referring to the Word Wall. Ask students, "What is helpful about the Test and Revise process?" Guide students towards the understanding that it leads to solving a problem and that in this case, it will help them code the robot to get to the fire as fast as it can.
C. If there are timers or a clocks with a second hand available, have students time each test to see if they can improve their time. If students are not able to do this, tell students to call you over when they are ready for a test, and you will time them. Demo and have the students fill out the Test and Revise table if you wish.
D. Tell students that at the end, we will see how fast the robots can make it to the fire.
E. Explain to students that you should see all members of the group placing command cards at some point. Ask the Team Keepers to make sure this happens. Ask students, "What can the Team Keeper say to get this to happen?" Guide students towards a sentence like, "Jessie, would you like to try the next test?" or "Sam, do you have any ideas for a revision?"

V. Coding (12-15 min)

A. Have Team Keepers retrieve *As Fast As You Can* maps.
B. Prompt groups to begin coding.
C. Point out when different members of the group get a chance to place command cards. Point out and celebrate when a group tries out a revision. Call on Task Masters and Team Keepers to coach their groups as needed.

VI. Presentation (7-8 min)

A. Have each group demonstrate their robot and time them, assessing students with the rubric if you wish. Ask students how many tests they completed and celebrate groups that were able to run a lot of tests. If students used the Test and Revise table, have groups present their tables. Congratulate groups on improvements in times, and ask groups to reflect on what helped them improve their time.

VII. Clean Up (5 min)

A. Have students power down the robot.
B. Have students dismantle the Fire Engine Botzees Mini and pack up their kit boxes, placing command cards in plastic bags.
C. Have students return Botzees Mini kit boxes to the storage area.

VIII. Reflect (2 min)

A. Ask students what they did today. Guide students towards the benefits of the test and revise design process.

WORKSHEETS

You will find a rubric, checklist, and a "Test and Revise" table on the following pages to use with this lesson.

Name_____ Date_____

PROJECT 6 RUBRIC - AS FAST AS YOU CAN

	Not Yet	Almost	Yes
I showed "Care for Hardware."	☆	☆☆	☆☆☆
I tested and revised.	☆	☆☆	☆☆☆
I improved my robot's time.	☆	☆☆	☆☆☆
I stepped up and stepped back.	☆	☆☆	☆☆☆
I faced my partner and the robot.	☆	☆☆	☆☆☆

Name_____ Date_____

PROJECT 6 CHECKLIST - AS FAST AS YOU CAN

Task	Completed?	Reflection
I powered on and off my robot.	☐	
I tested and revised.	☐	☐ I enjoyed this. ☐ I worked hard on this. ☐ I have questions. How many tests did you complete?
I improved my robot's time.	☐	☐ I enjoyed this. ☐ I worked hard on this. ☐ I need more help to complete this task. ☐ I have questions. What was your robot's fastest time?
I packed up my robot showing "Care for Hardware."	☐	

Names of Group Members_____
Date_____

PROJECT 6 TEST AND REVISE - AS FAST AS YOU CAN

Test	Time
1	_____min _____sec
2	_____min _____sec
3	_____min _____sec
4	_____min _____sec
5	_____min _____sec