

Kodu Module 1: Eating Apples in the Kodu World

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Learning Goals

- How to navigate through a world using the game controller.
- New idioms: “Pursue and Consume”, “Let Me Drive”
- Introduction to Kodu tile manipulatives.
- How to use the Kodu rule editor.
- First Law of Kodu: “See” always chooses the closest matching object.

Worlds

- Treasure1, Treasure1b, Treasure2, Treasure2b
- Apple1X – with Debug LOS turned on for the kodu
- Star1X – with Debug LOS turned on for the kodu
- Star2 – with Debug LOS turned on for the kodu
- Flee1X – with Debug LOS turned on for the kodu
- FreeWorld1

Handouts

- Treasure Hunt
- Apple1X-Tips
- Star1X-Tips
- Closest1 World
- Flee1X World

Tile Manipulatives

- WHEN-see, WHEN-bumped
- DO-move, DO-eat
- apple (2 tiles), star (2 tiles)
- toward, it

Flash Cards

- Pursue and Consume
- Let Me Drive

Part 1: Using the Game Controller in a Treasure Hunt

1. This treasure hunt exercise is done in teams of two. Have students pair up.
2. Have students start Kodu and use the left stick to navigate to the “Load World” menu item. Note: if the cursor isn’t moving down the menu items to get to “Load World”, it could be because it’s stuck in the “Community News” window on the left. Move the left stick to the right to get to the main menu so you can scroll down to “Load World”.
3. Press the green A button to confirm.
4. Use the shoulder buttons (also called “bumpers”) to move to the “Downloads” tab. You should see a long list of worlds.
5. Press the yellow Y button to change the sort order, and use the left stick to select “Title”, then press the green A button to confirm. Now the worlds are sorted alphabetically by name.
6. Use the left stick to scroll through the worlds. Load and play the Treasure1 or Treasure1b world. (There are two versions so that students working in different teams can use different worlds and not use what they overhear from another team. The questions are the same for both worlds but the answers are different. Likewise, Treasure2 and Treasure2b will have the same questions but different answers.)
7. Hold up the game controller and teach the students these four controls:



8. Give students the Treasure Hunt worksheet and explain the Treasure Hunt task:
- Student 1 is the “driver” who operates the game controller.
 - Student 2 is the “navigator” who reads and fills out the questionnaire.
 - For each object listed in the questionnaire, write down what object is next to it.



Part 2: Loading A Different Treasure World

1. When the first treasure hunt is complete, the students need to load and play the Treasure2 or Treasure2b world.
2. Show students the Back button on the controller (see picture above).
3. To load the world, follow these steps:
 - a. Press the Start button to get to the Home Menu.
 - b. In the Home Menu, use the left stick to put the cursor on Load World.
 - c. Press the green A button to select Load World.
 - d. When the list of worlds is displayed, use the left or right shoulder buttons (also called “bumpers”) to move to the “Downloads” section. Don’t try to navigate through “All” or “Samples”: there are too many irrelevant worlds there.
 - e. If the worlds are not already sorted by title, press the yellow Y button and use the left stick to select “Title”, then press the green A button to sort.
 - f. Now use the left stick to scroll through the thumbnail images, listed alphabetically, to get to Treasure2 or Treasure2b. For students it might help to project your screen with your own cursor on the thumbnail so they can match visually instead of reading the names.
 - g. Press the green A button to select the world, then press A again to select “Play”.
4. With the new world loaded, have the students switch roles and complete the questionnaire for the second treasure hunt.

Part 3: The Apple1X World and the Pursue and Consume Flash Card

1. If working in pairs, have student 1 “drive” and student 2 navigate.
2. Load and play the Apple1X world.
3. Let the students move around and examine the world.
 - Point out the kodu and flying fish characters.
 - How many apples are there? (five)
4. Explain that the goal is to teach the Kodu to eat all the apples.
5. Give students the Pursue and Consume flash card and show them the rules for eating apples.

Part 4: Introducing Tile Manipulatives

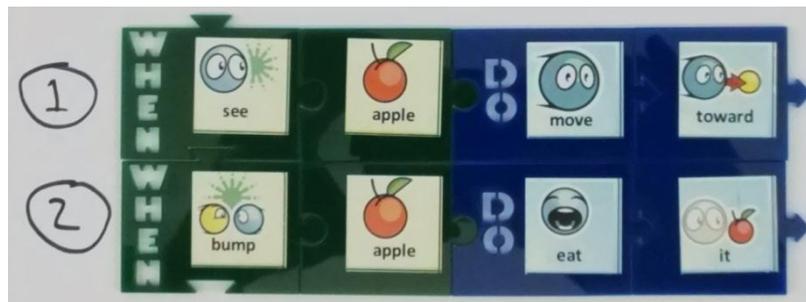
1. Distribute the tile manipulatives (one set for each pair of students).
2. Ask students to make the “pursue” rule from tiles; use the flash card for reference. Note: “star” or “ball” is on the back of the “apple” tiles, so students may need to turn these tiles over to find “apple”.

WHEN see apple DO move toward

3. Ask students to make the “consume” rule from tiles, using the flash card for reference.

WHEN bumped apple DO eat it

4. Point out that the WHEN half of a rule is green and the DO half is blue.
5. Show the students how to link the two rows of tiles together.
6. Keep this tile structure handy as it will be used again in later steps of this session.

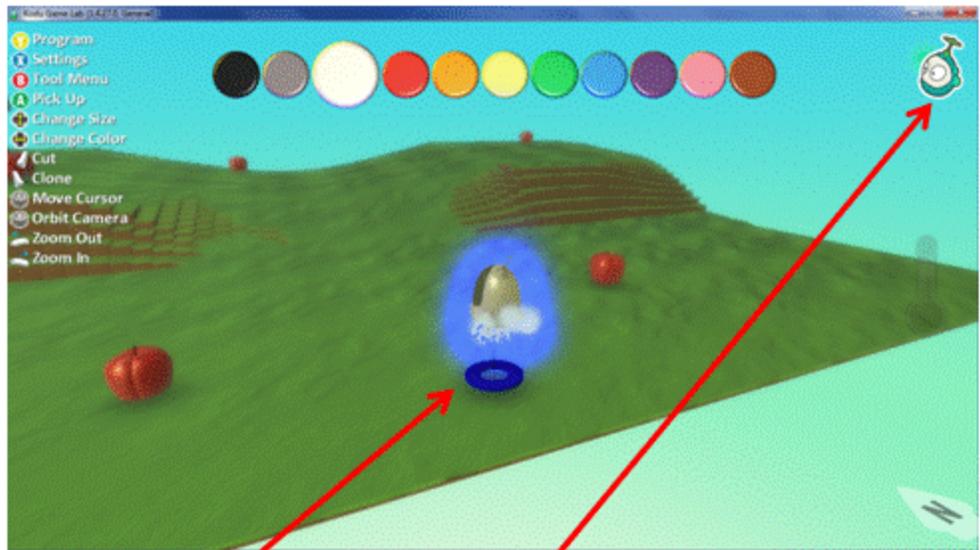


Part 5: The Kodu Rule Editor

1. Review the game controller buttons:
 - The Back button stops the game and brings up the tool menu.
 - Use the left stick to select the object tool (see images below) and the green A button to confirm.
2. Using the object tool, use the left stick to move the cursor (purple ring) under the kodu character. The kodu will glow blue when the cursor has selected it.
3. Press the yellow Y button to enter the rule editor and program the kodu.
4. Press the red B button to return to the object tool.
5. The only tools we'll use today are the object tool and the home page button. Tell students that the other tools can be ignored for now.
6. Point out that when the object tool (or any tool) is selected, help text appears in the upper left corner of the screen explaining what the various controller buttons will do when using that tool.



Object tool: press A to select.



Cursor from object tool is on the Kodu.
Press Y to program the Kodu.



Editing the Kodu's rules.

7. Press the Y button to enter the rule editor again. Guide students to enter the following rules. Note: words in parentheses indicate submenus, e.g. “apple” can be found in the “objects” submenu.

[1] WHEN see (*objects*) apple DO move toward

[2] WHEN bumped (*objects*) apple DO eat it

8. A common error to watch for: selecting “move forward” instead of “move toward”.
9. If students make editing mistakes, show them how to fix things:
 - a. When the pencil is on the + sign, press the green A button to add a new tile.
 - b. When the pencil is on a tile:
 - The green A button changes the tile.
 - The blue X button deletes the tile.
 - c. When the pencil is on a rule number, the left trigger cuts (deletes) the entire rule.
 - d. Rule editor help is always visible in the top left corner of the screen.
10. Make sure students stay on page 1. If they accidentally move to another page, show them how to use the shoulder buttons to switch pages.
11. When finished editing, press the red B button (or the Back button) to leave the rule editor. Press the B button again (or use the Back button) to return to the tool menu.
12. **Running the program:** press the Back button. Depending on whether you’re at the tool menu, in the object tool, or in the rule editor, you may have to press the Back button once, twice, or three times.
13. **Stopping the program:** press the Back button once to stop the program and return to the tool menu.

Do Worksheet 1

Part 6: Why We Need Both Pursue and Consume Rules

1. Have students go back into the rule editor and delete the pursue rule, leaving only the consume rule. To do this, put the pencil on the rule number “1” and press the left trigger to delete the rule. Now the page looks like this:

[1] WHEN bumped apple DO eat it

2. Ask students what they think will happen when we run the program.
3. Run the program and observe that nothing happens. The kodu isn't eating any apples because it hasn't bumped any. None are in reach, and it's not moving. We have consume without pursue.
4. The point of this exercise is that “bumped” is a predicate, not an action. The consume rule does not tell the kodu to go off and bump an apple; it tells the kodu how to react when a bump occurs. If nothing is moving, there will be no bumping. We need a pursue rule to make the kodu move.
5. Now have students restore the pursue rule and delete the consume rule. The page will look like this:

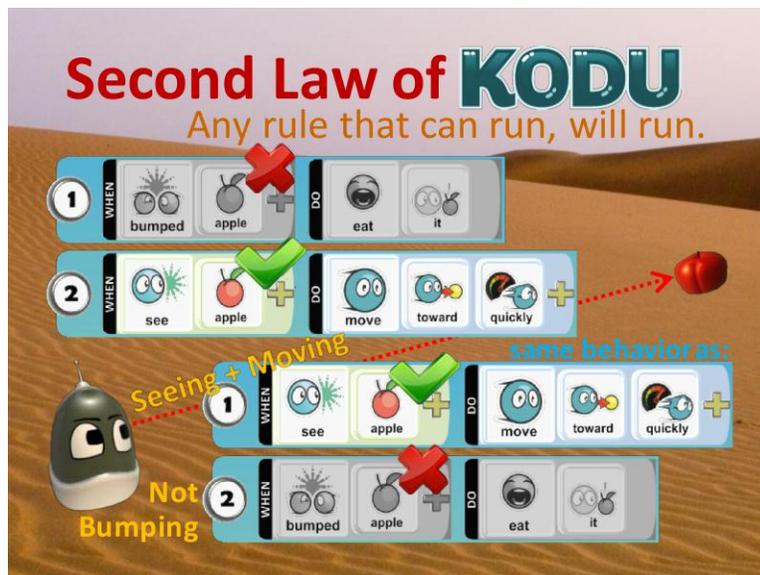
[1] WHEN see apple DO move toward

6. Ask them to predict what will happen when they run this program. Will the kodu ever visit the farthest apple?
7. Answer: the kodu goes to the closest apple (this is the First Law of Kodu) and gets stuck there. It never visits any of the other apples because it never consumes the first one.
8. Finally, have students re-enter the consume rule and move it so it's the first rule. To move a rule, put the pencil on the rule number, press “A” to pick it up, use the left stick to move the rule up or down, and press “A” again to put the rule down again. Make sure students don't accidentally indent a rule when moving it up or down. Now we have Consume and Pursue. The page should look like this:

[1] WHEN bumped apple DO eat it

[2] WHEN see apple DO move toward

9. Ask students what the kodu will do given a Consume and Pursue idiom.
10. Answer: rule order doesn't matter in this case; it will behave the same as when the order was Pursue and Consume. *Any rule that can run, will run.* This is the Second Law of Kodu.



Part 7: Bringing Apples to the Kodu with “Let Me Drive” (Optional)

1. Have students read the Let Me Drive flash card.
2. Tell them to program the flying fish with the Let Me Drive rule so they can drive it with the left stick. Leave the kodu with just its consume rule; there should be no pursue rule.
3. When running the program, use the flying fish to push apples to the kodu. When an apple bumps the kodu, the kodu will eat it.
4. Question for the students: what happens if the flying fish bumps the kodu? Answer: nothing, because the consume rule is configured to only eat apples.

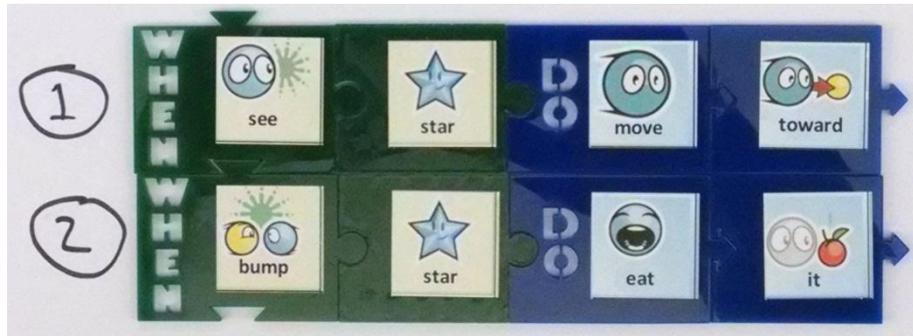
Part 8: Competing with the Kodu (Optional)

1. Have students go back into the rule editor and re-enter the kodu’s pursue rule.
2. Run the program. Now their goal is to use the flying fish to keep the kodu from eating all 5 apples before the time runs out. In addition, the flying fish can score 2 points for every apple it drops into the pit where the kodu can’t get it. If the flying fish ends up with at least 4 points, it wins.
3. **Optional:** you can add a Let Me Drive idiom to the kodu and let two students compete against each other. The student driving the kodu must still rely on the kodu’s consume rule, and only needs to use the joystick to override the pursue rule. The Let Me Drive rule should *precede* the Pursue and Consume rules to get a clean override. Either use the arrow keys for the kodu driver, or use a second game controller and modify the kodu driving rule to include a “Player2” tile. The kodu’s program will look like this:

```
[1] WHEN gamepad L-stick player-2 DO move  
[2] WHEN see apple DO move toward  
[3] WHEN bumped apple DO eat it
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Part 9: Programming Another World: Star1X

1. Remind students of the four motion controls: left stick moves the cursor, right stick orbits the camera around the cursor, and the left and right shoulder buttons zoom out and in, respectively, centered on the cursor.
2. Give them the Star1X handout.
3. Load and play the Star1X world. During the Load World dialog, press the blue X button to discard the changes made to the Apple1X world.
4. Have the students explore the Star1X world.
5. Explain that the goal is to have the Kodu eat all the stars. The octopus moves stars around randomly, which can help the kodu if it gets stuck.
6. Optional: have the students use the tile manipulatives to represent the program. Note: they should recognize that the rules will be the same as for the Apple1X world, except “apple” is replaced by “star”. Two of the four “apple” tiles have “star” on the back.



7. Have the students program the kodu to eat the stars. Note: to find the star tile in the editor they must select “more” from the objects menu.
[1] WHEN see (*objects*) (*more*) star DO move toward
[2] WHEN bumped (*objects*) (*more*) star DO eat it

Part 10: Reasoning About Behavior in Star1X: Closest Matching Object

1. Ask the students: *How does the kodu decide which star to eat first?*
 - Let them discuss their ideas.
 - Guide them to this hypothesis: It always goes to the closest star.
2. Have them complete the second page of the Star1X activity. This will help the students test their hypothesis by moving the kodu to new starting places.
3. Students might decide on their own to move the stars instead of or in addition to moving the kodu. That's okay; they can still investigate the question of where the kodu decides to go.

Part 11: The First Law of Kodu and the Closest1 World

1. Tell students the First law of Kodu is: **“Rules pick the closest matching object.”** We call this the “Closest Law”.
2. Show them the First Law of Kodu graphic (or hand out the fridge magnet).

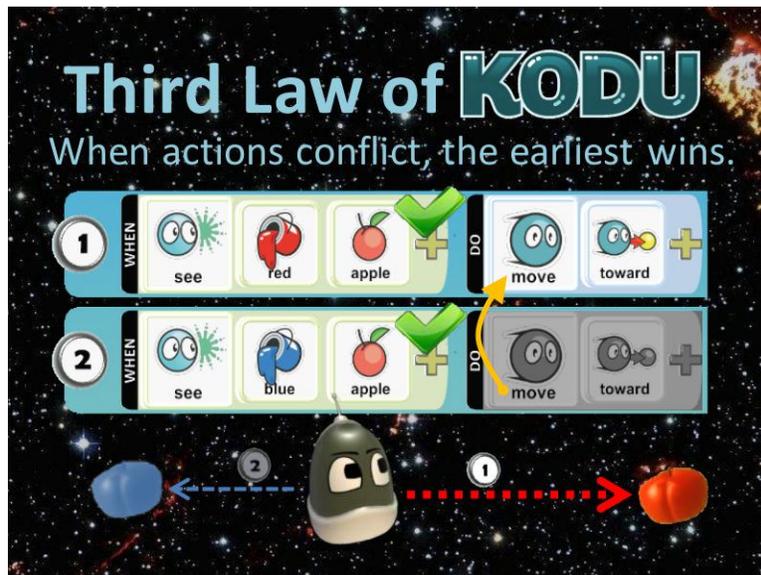


3. Test their understanding by having them load the Closest1 world and complete the Closest1 exercise.

Do Worksheet 2

Part 12: Eating Two Things: Star2 World and the Third Law of Kodu

1. Distribute the Star2 handout.
2. Have students load the Star2 world. Notice that it contains hearts and coins.
3. Ask the students to program the kodu to eat both the hearts and the coins. Their likely solution:
 - [1] WHEN see heart DO move toward
 - [2] WHEN bumped heart DO eat it
 - [3] WHEN see coin DO move toward
 - [4] WHEN bumped coin DO eat it
4. Run the program and have students fill out the table showing the order in which objects are eaten. The kodu eats all the hearts before eating any coins. Ask the students why they think it does this.
5. Answer: this behavior is a consequence of the Third Law of Kodu, the “Conflict Law”: *When actions conflict, the earliest wins.*



6. **Rule Scramble 1:** Have students swap the first two rules, so that the consume hearts rule is the first rule and the pursue hearts rule is the second. To do this in the rule editor:
 - a. Put the pencil on the rule number of the pursue hearts rule (rule 1).
 - b. Press A to pick up the rule.
 - c. Use the left stick to move the rule down, to the second position. Make sure you do not accidentally indent the rule.
 - d. Press A again to drop the rule.
7. Ask students if they think this change will make a difference. Have them run the program and fill out the table with their observations. (Answer: the switch makes no difference.)
8. **Rule Scramble 2:** Have students move the pursue coin rule *before* the pursue hearts rule.
9. Run the program again and observe that now the kodu eats all the coins first, then the hearts.
10. **Rule Scramble 3:** Would it make a difference if we swapped the order of the two consume rules?
11. Answer: no difference, because the consume rule only runs when the kodu bumps an object, and what gets bumped next is determined by the pursue rule.

Part 13: Flee is the Opposite of Pursue (Advanced Exercise)

1. Distribute the Flee1X World handout.
2. Let students read the instructions and try to complete the exercise.
3. By looking at the tile menu, students should recognize that they can use “move away” to flee from the pushpad.
4. Note: “move avoid” will sort of work, but not very well; the kodu flees more aggressively with “move away”. If a student chooses “move avoid”, suggest they look for another tile to use.
5. The “move away” rule must come *before* the rule to move toward coins.
6. They can also use Let Me Drive to drive the octopus, and use it to push coins toward the kodu, or push the kodu away from the pushpad. But if the octopus bumps a pushpad it will be knocked out.
7. Let students write the code on their own.

Do Worksheet 3

Part 14: Create You Own Pursue and Consume Example

1. Have students load the FreeWorld1 world.
2. Show them how to add objects to the world using the object tool.
3. Show them how to change the color of an object using the D-Pad.
4. Invite them to populate the world with objects of their choosing.
5. Then, have them program the kodu to demonstrate some form of Pursue and Consume behavior.
6. Ideas to consider:
 - a. Have the kodu pursue and consume all the trees.
 - b. Put in multiple kodus of different colors and have them eat each other; see who is left.
 - c. Program the kodu to pursue and consume apples; program a cycle to pursue and consume kodus.

Do Worksheet 4