Design Sketch:
Lumen Learning 'Utility' Simulation

This document shows possible changes to the existing Utility simulation to improve usability, accessibility, and inclusiveness of the learning material.

Note: this document supplements the analysis detailed here:
https://wiki.fluidproject.org/x/B4DpAg

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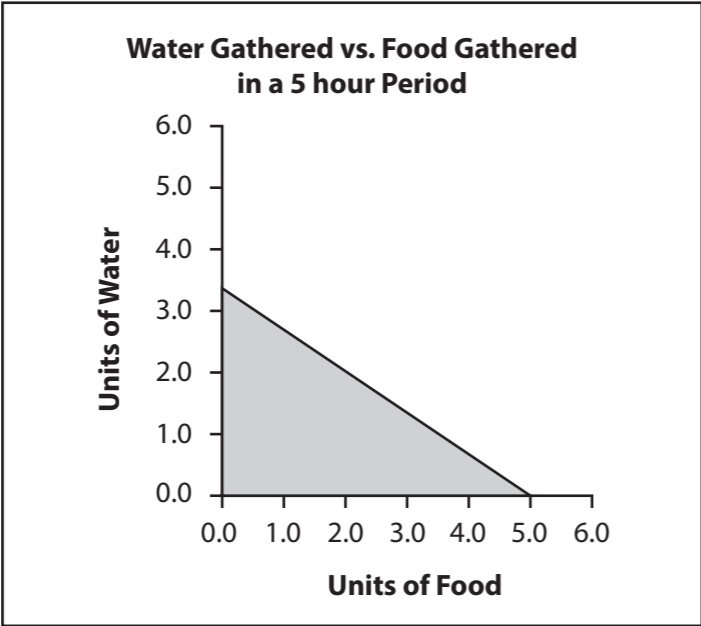
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Step indicator helps users track their progress and guage the time required to complete the simulation.

Improved chart description improves experience for all users.

Fluid UI Options component easily adds accessibility features like increased text sizes and contrast themes.

display preferences ⚙

Step X of Y

Water Gathered vs. Food Gathered in a 5 hour Period

Units of Water

6.0
5.0
4.0
3.0
2.0
1.0
0.0

0.0 1.0 2.0 3.0 4.0 5.0 6.0

Units of Food

This graph shows the relationship between how much food or water you can gather in 5 hours. The less water you gather, the more food you can get, and vice versa.

Show the data table.

Choose a response:

1   Can we go back to looking at the discrete combinations?

2   I'm getting bored. What else?

"Show the data table" button reveals a chart that allows screen reader users access to a text equivalent of the line graph.

Added "Choose a response" label to the choices. Helps give direction and offers a consistent landmark for screen reader users.

Visual style of choices look more like buttons that can be interacted with.

User has put keyboard focus onto the button.
All interactive widgets should have a focus style.

display preferences ⚙

**Water Gathered vs. Food Gathered
in a 5 hour Period**

Units of Water

6.0
5.0
4.0
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0.0 1.0 2.0 3.0 4.0 5.0 6.0

Units of Food

This graph shows the relationship between how much food or water you can gather in 5 hours. The less water you gather, the more food you can get, and vice versa.

Show the data table.

Choose a response:

1   Can we go back to looking at the discrete combinations?

2   I'm getting bored. What else?

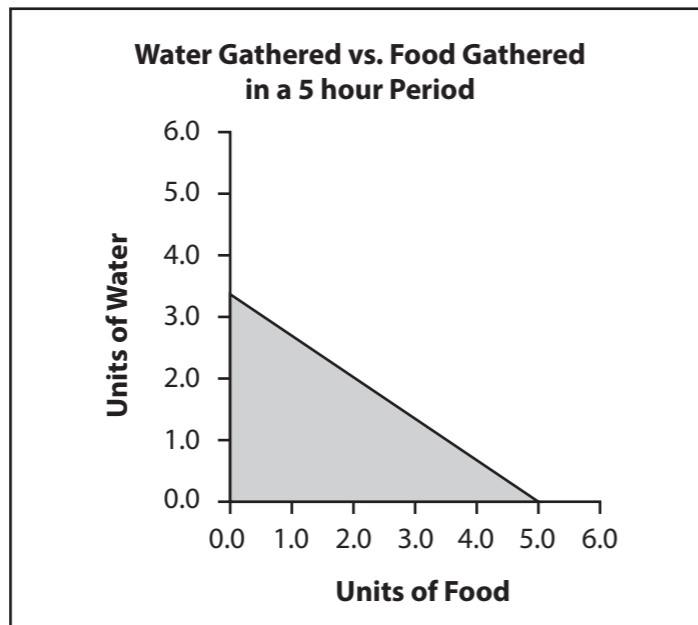Graph should have alt-text, and follow the W3C recommendation for describing complex images.

The position of the choices has been moved from the original position, on the right side, to the left side.

This creates a more natural flow for interaction.

display preferences ⚙

Step X of Y

Water Gathered vs. Food Gathered in a 5 hour Period

Units of Water

6.0
5.0
4.0
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2.0
1.0
0.0

0.0 1.0 2.0 3.0 4.0 5.0 6.0

Units of Food

This graph shows the relationship between how much food or water you can gather in 5 hours. The less water you gather, the more food you can get, and vice versa.

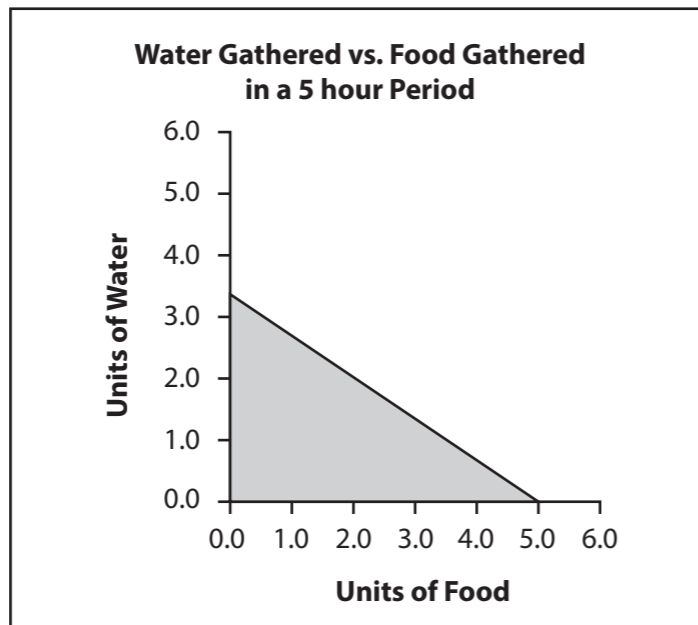| Food	Water
0	3.33
1.0	2.66
2.0	2
3.0	1.33
4.0	1
5.0	0

Hide the data table.

Choose a response:

1 Can we go back to looking at the discrete combinations?

2 I'm getting bored. What else?

User presses Tab key and the focus moves from the "Hide the data table" button to the first choice on the bottom-right.

display preferences ⚙

Step X of Y

This graph shows the relationship between how much food or water you can gather in 5 hours. The less water you gather, the more food you can get, and vice versa.

Water Gathered vs. Food Gathered in a 5 hour Period

Food	Water
0	3.33
1.0	2.66
2.0	2
3.0	1.33
4.0	1
5.0	0

Hide the data table.

Choose a response:

1   Can we go back to looking at the discrete combinations?

2   I'm getting bored. What else?

Original chart had both berries and apples merged into one large chart which was a poor accessible experience. Splitting into two tables helps.

Row headers were added which are also used to textually indicate an "eaten" state (seen later).

display preferences ⚙

Here are the marginal utility charts of eating apples from a tree and berries from a patch - it shows how much you value each.

For both apples and berries, the value of each decreases the more of each food you eat.

	Marginal Utility
Apple Tree 1	20
Apple Tree 2	19
Apple Tree 3	18
Apple Tree 4	17

	Marginal Utility
Berry Patch 1	14
Berry Patch 2	12
Berry Patch 3	10
Berry Patch 4	8

Choose a response:

1	Go back to previous screen.
2	What about the price?
3	What does Marginal Utility mean?

Where it makes sense, adding an option to let players review concepts will aid in learning and improve usability.

display preferences ⚙

Step X of Y

Here are the marginal utility charts of eating apples from a tree and berries from a patch - it shows how much you value each.

For both apples and berries, the value of each decreases the more of each food you eat.

	Marginal Utility
Apple Tree 1	20
Apple Tree 2	19
Apple Tree 3	18
Apple Tree 4	17

	Marginal Utility
Berry Patch 1	14
Berry Patch 2	12
Berry Patch 3	10
Berry Patch 4	8

Choose a response:

1   Go back to previous screen.

2   What about the price?

3   What does Marginal Utility mean?

User has put keyboard focus onto choice #2 using the keyboard and selects it.

display preferences ⚙

Here are the marginal utility charts of eating apples from a tree and berries from a patch - it shows how much you value each.

For both apples and berries, the value of each decreases the more of each food you eat.

	Marginal Utility
Apple Tree 1	20
Apple Tree 2	19
Apple Tree 3	18
Apple Tree 4	17

	Marginal Utility
Berry Patch 1	14
Berry Patch 2	12
Berry Patch 3	10
Berry Patch 4	8

Choose a response:

1	Go back to previous screen.
2	What about the price?
3	What does Marginal Utility mean?

display preferences ⚙

The time for finding an apple tree and picking the fruit is 4 hours. The time for finding and harvesting a patch of berries is 2 hours.

	Marginal Utility	Marginal Utility per Hour
Apple Tree 1	20	20/4 = 5.00
Apple Tree 2	19	19/4 = 4.75
Apple Tree 3	18	18/4 = 4.50
Apple Tree 4	17	17/4 = 4.25

	Marginal Utility	Marginal Utility per Hour
Berry Patch 1	14	14/2 = 7.00
Berry Patch 2	12	12/2 = 6.00
Berry Patch 3	10	10/2 = 5.00
Berry Patch 4	8	8/2 = 4.00

Choose a response:

1   Go back to previous screen.

2   Okay. Let's continue.

3   What is Marginal Utility per Hour again?

display preferences ⚙

Step X of Y

The time for finding an apple tree and picking the fruit is 4 hours. The time for finding and harvesting a patch of berries is 2 hours.

	Marginal Utility	Marginal Utility per Hour
Apple Tree 1	20	20/4 = 5.00
Apple Tree 2	19	19/4 = 4.75
Apple Tree 3	18	18/4 = 4.50
Apple Tree 4	17	17/4 = 4.25

	Marginal Utility	Marginal Utility per Hour
Berry Patch 1	14	14/2 = 7.00
Berry Patch 2	12	12/2 = 6.00
Berry Patch 3	10	10/2 = 5.00
Berry Patch 4	8	8/2 = 4.00

Choose a response:

1   Go back to previous screen.

2   Okay. Let's continue.

3   What is Marginal Utility per Hour again?

User puts keyboard focus on the second choice.

display preferences ⚙

The time for finding an apple tree and picking the fruit is 4 hours. The time for finding and harvesting a patch of berries is 2 hours.

	Marginal Utility	Marginal Utility per Hour
Apple Tree 1	20	20/4 = 5.00
Apple Tree 2	19	19/4 = 4.75
Apple Tree 3	18	18/4 = 4.50
Apple Tree 4	17	17/4 = 4.25

	Marginal Utility	Marginal Utility per Hour
Berry Patch 1	14	14/2 = 7.00
Berry Patch 2	12	12/2 = 6.00
Berry Patch 3	10	10/2 = 5.00
Berry Patch 4	8	8/2 = 4.00

Choose a response:

1 Go back to previous screen.

2 Okay. Let's continue.

3 What is Marginal Utility per Hour again?

So, if you were an animal trying to make the most economically optimized decision, which would you choose now, apples or berries?

	Marginal Utility	Marginal Utility per Hour
Apple Tree 1	20	$20/4 = 5.00$
Apple Tree 2	19	$19/4 = 4.75$
Apple Tree 3	18	$18/4 = 4.50$
Apple Tree 4	17	$17/4 = 4.25$

	Marginal Utility	Marginal Utility per Hour
Berry Patch 1	14	$14/2 = 7.00$
Berry Patch 2	12	$12/2 = 6.00$
Berry Patch 3	10	$10/2 = 5.00$
Berry Patch 4	8	$8/2 = 4.00$

Choose a response:

1   Apples (takes 4 hours)

2   Berries (takes 2 hours)

3   I don't know. How should I decide?

display preferences ⚙

So, if you were an animal trying to make the most economically optimized decision, which would you choose now, apples or berries?

	Marginal Utility	Marginal Utility per Hour
Apple Tree 1	20	20/4 = 5.00
Apple Tree 2	19	19/4 = 4.75
Apple Tree 3	18	18/4 = 4.50
Apple Tree 4	17	17/4 = 4.25

	Marginal Utility	Marginal Utility per Hour
Berry Patch 1	14	14/2 = 7.00
Berry Patch 2	12	12/2 = 6.00
Berry Patch 3	10	10/2 = 5.00
Berry Patch 4	8	8/2 = 4.00

Choose a response:

1   Apples (takes 4 hours)

2   Berries (takes 2 hours)

3   I don't know. How should I decide?

display preferences ⚙

Step X of Y

So, if you were an animal trying to make the most economically optimized decision, which would you choose now, apples or berries?

	Marginal Utility	Marginal Utility per Hour
Apple Tree 1	20	20/4 = 5.00
Apple Tree 2	19	19/4 = 4.75
Apple Tree 3	18	18/4 = 4.50
Apple Tree 4	17	17/4 = 4.25

	Marginal Utility	Marginal Utility per Hour
Berry Patch 1	14	14/2 = 7.00
Berry Patch 2	12	12/2 = 6.00
Berry Patch 3	10	10/2 = 5.00
Berry Patch 4	8	8/2 = 4.00

Choose a response:

1 Apples (takes 4 hours)

2 Berries (takes 2 hours)

3 I don't know. How should I decide?

User has made a choice and the table is updated to reflect their choice.

The row header is updated with the word "eaten" to indicate that this berry patch has already been selected.

display preferences ⚙

Step X of Y

Great. You have 8 hours left before the monsoon. Which is next?

	Marginal Utility	Marginal Utility per Hour
Apple Tree 1	20	20/4 = 5.00
Apple Tree 2	19	19/4 = 4.75
Apple Tree 3	18	18/4 = 4.50
Apple Tree 4	17	17/4 = 4.25

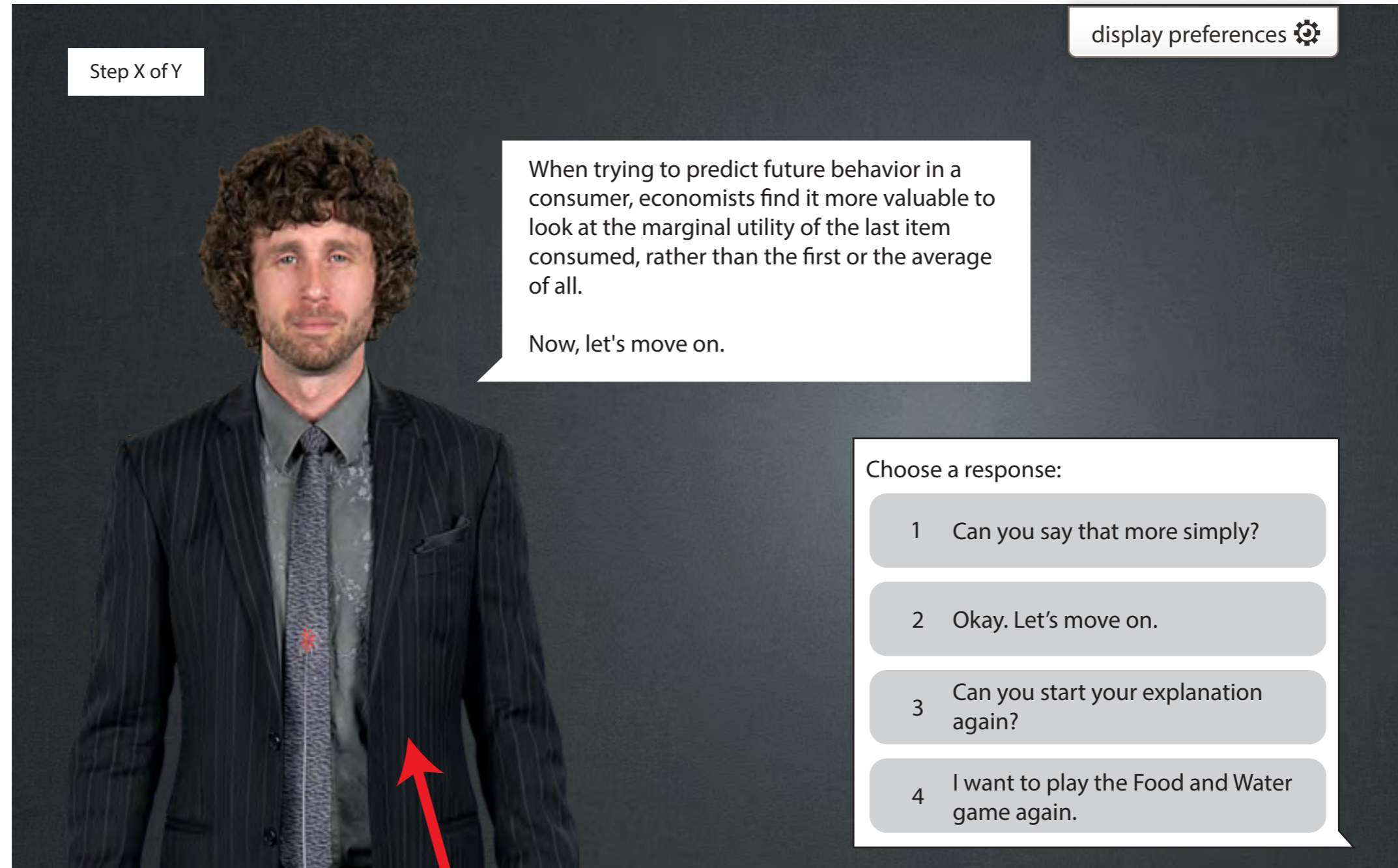|	Marginal Utility	Marginal Utility per Hour
Berry Patch 1 - Eaten	~~14~~	~~14/2 = 7.00~~
Berry Patch 2	12	12/2 = 6.00
Berry Patch 3	10	10/2 = 5.00
Berry Patch 4	8	8/2 = 4.00

Choose a response:

1   Apples (takes 4 hours)

2   Berries (takes 2 hours)

3   Wait... Monsoon?

The strike-out is cosmetic and done through CSS.

<strike> or <del> should not be used in this particular case because a screen reader would repeated tell the user that the value is deleted.

Example of a screen with re-worded choices (#1 and #2), and two additional "self-help" choices (#3 and #4).

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Step X of Y

When trying to predict future behavior in a consumer, economists find it more valuable to look at the marginal utility of the last item consumed, rather than the first or the average of all.

Now, let's move on.

Choose a response:

1   Can you say that more simply?

2   Okay. Let's move on.

3   Can you start your explanation again?

4   I want to play the Food and Water game again.

The actor has moved from original position on left to right because the player choices are now on the left.

size

A ⊙———— A

contrast

A A **A** **A**

narrator

⊙ off   Have the
         spoken out

reset ↺   display preferences ⚙

Choose a response:

1   Can you say that more simply?

2   Okay. Let's move on.

3   Can you start your explanation
     again?

4   I want to play the Food and Water
     game again.