RANDOM STORY GENERATOR

HOUR OF CODE

Grades 4-8	Ozobots Evo or Bit	Coding Method OzoBlockly
Pre-Requisites OzoBlockly Basic Training	**Timing** 50 minute lesson	**Topics** Art, Literature, Language Arts, Computer Science

Learning Outcomes: Understand how "random" numbers are generated in computers, which isn't really random. Build a story with random verbs, adverbs, nouns and adjectives.

Teacher Resources: About the Lava Lamp Wall: https://bit.ly/2AjMQEv About shuffling decks of cards https://bit.ly/2CMHG9t

Introduction

For the times when writer's block haunts you, let Evo or Bit use their spooky randomness to help you create your own story. Watch as your Ozobot chooses some adjectives, nouns, adverbs and verbs for you. Once you have a collection of ideas, write a story.

First, this lesson begins by dispelling the idea that computers create truly random numbers by explaining how the random number generation actually works, and the interesting ways that engineers try to get truly random numbers (here's a secret: it can involve lava lamps!). Knowing this, students will be better equipped to expect magic from their devices and programs.

After the learning comes the creating. Students will use a pre-designed program that moves Evo or Bit randomly on a map. Whenever Ozobot pauses on a picture, students will write a word it represents. Do this until Ozobot lands on 'The end' (see the map, attached). Note that some images are 'seeded' in this map, but students will draw the rest ahead of running the program. Finally, students use all of the words their bot randomly chose to write their own story (which can be homework, if you've run out of time). You will decide on any word count or other parameters.

To plan this lesson, read SETUP and LESSON OUTLINE, below, as well as the student handouts. If you have any questions about this lesson, or others, feel free to email us at ozoedu@ozobot.com.

Lesson Summary

1. Read about 'random number generation' and how randomness is used in today's program.
2. Students draw pictures on their Random Story Generator maps that represent nouns, verbs, adjectives and adverbs.
3. Students load a program for Ozobot's random movements, starting it at 'Once upon a time'.
4. While Ozobot is moving and pausing randomly, students write down which picture/word it paused on, until it lands on 'The end'.
5. Students write a story with a beginning, middle and end using the words they got.

SETUP

REQUIRED MATERIALS

- **CHOOSE A PROGRAM:** Choose one program from the three above. The Evo program with proximity (#2) requires users to place hands or fingers around Evo to make move.
- 1 Bit or Evo per group,
- 1 printed map per student or group,
- 1 printed 'Random Number' essay & 1 'Program Explanation' of chosen program per student or group,
- 1 computer or tablet with wifi per group. Preload program and pre-calibrate Ozobot to save time.

TIME MANAGEMENT

- This lesson is planned for 50 minutes.
- If there is no time to write the story in class, assign as homework or as work for the next class.

STUDENT GROUPING

- Groups of 2-3 or 1:1 student to robot ratio.

CREATING THE MAP

- Choose a color for the border; this color canNOT be used in the picture boxes.
- Use an Ozobot marker to fill in the border.
- Draw simple pictures in each box to make a noun, verb, adverb or adjective, as specified.
- Remember to calibrate your bot to a black circle before running on the map.

RUNNING THE PROGRAM

- **OBJECTIVE**: Watch Evo or Bit's random movements choose things for students write about.
- Start Evo or Bit in the 'Once upon a time' box to start the story, facing any direction.
- Watch Evo or Bit (or, for program #2, hold fingers or hands around Evo the whole time it's moving) walk randomly on the map until it pauses and the top LED turns purple; write down the word it's on at this time.
- When Evo or Bit lands on 'The end', students turn it off and have a finished list of words.

WRITING THE STORY

- **OBJECTIVE**: Use the words from the picture boxes Ozobot paused on to make a story.
- It's up to the teacher what the word length is, and whether chosen words must be used in order.

PROGRAM EXPLANATION

'RANDOM' PROGRAM FOR EVO https://ozo.bot/random-evo

Note, the magenta blocks are *functions*, which allow you to create your own blocks.

Turn pink and pause for 2 seconds.

Set lights gives a number to each of Evo's front lights so we can randomize them.

Random lights sets Evo's front lights different colors:
- **Randomness:** 1 means change every loop, larger numbers mean change less often.

R**epeat while true** repeats light changes, movement, and pausing.

Random lights is the same as above.

Randomly move creates random movement:
- **Max speed**: a random speed for each motor (from 0 to max speed)
- **Max time**: a random length of time for movement (between 10 and 30)
- **Turn speed**: how fast it turns on the border.
- **Border color**: the color of the border you chose.

'**Randomly pause**' will make Evo turn purple and pause:
- **Seconds**: how many seconds Evo pauses for.
- **Randomness**: how often Evo might pause. Here, Evo will pause 1 time every 6 loops (0 to 5). Use a smaller number to pause more often.

Here is a quick look inside of **randomly move**.

Each of the two motors (left and right) will get a different random number between 0 and 'max speed' (originally 20).

Evo will move with those wheel speeds for a random length of time, The random number of loops that repeat 1/10 of a second pause. 20 loops of 1/10 of a second is 2 seconds.

Look in the program for the details of the other functions.

PROGRAM EXPLANATION

TO PLAY: Hold fingers or hands around Evo to move it. When it pauses and turns purple, you can let go. Put your hands back around Evo to start moving it again. *Note, the magenta blocks are functions, which allow you to create your own blocks.*

Turn pink and pause for 2 seconds.

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Random lights sets Evo's front lights different colors:
- **Randomness:** 1 means change every loop, larger numbers mean change less often.

R**epeat while true** repeats light changes, movement, and pausing.

If IR activated checks if all four sensors are activated. If so, run the code inside. If not, stop motors.

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Look in the program for the details of the other functions.

PROGRAM EXPLANATION

'RANDOM' PROGRAM FOR BIT https://ozo.bot/random-bit

Note, the magenta blocks are *functions*, which allow you to create your own blocks.
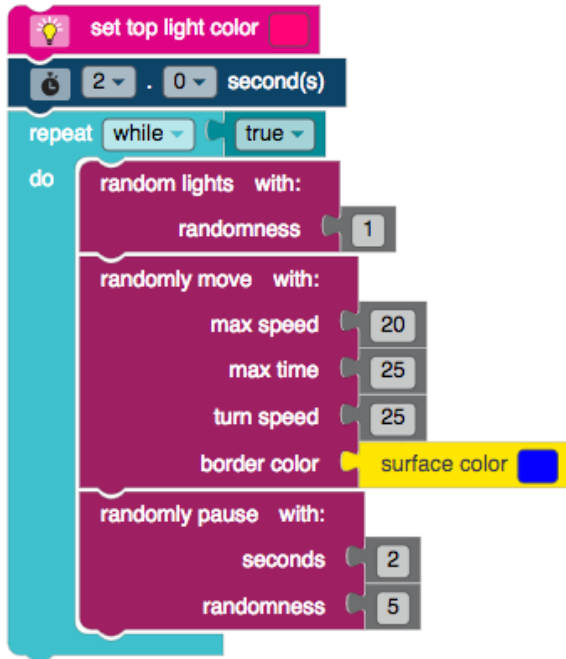
Turn pink and pause for 2 seconds.

Repeat while true repeats light changes, movement, and pausing.

Random lights sets Bit's top LED different colors:
- **Randomness:** 1 means change every loop, larger numbers mean change less often.

Randomly move creates random movement:
- **Max speed**: a random speed for each motor (from 0 to max speed)
- **Max time**: a random length of time for movement (between 10 and 30)
- **Turn speed**: how fast it turns on the border.
- **Border color**: the color of the border you chose.

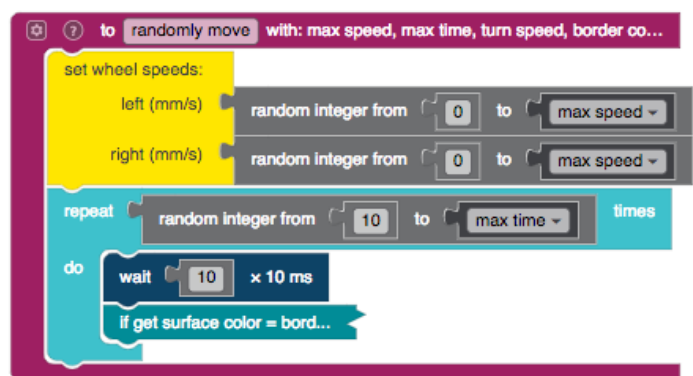'**Randomly pause**' will make Evo turn purple and pause:
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Evo will move with those wheel speeds for a random length of time, The random number of loops that repeat 1/10 of a second pause. 20 loops of 1/10 of a second is 2 seconds.

Look in the program for the details of the other functions.

LESSON OUTLINE

1. **Introduce the topic:** students will learn what a random number is, how it's made in computers and what they're for, then use a random movement program to create a random story.

2. **Hand out** copies of About Random Number Generation to each student or group. Read aloud as a class or let groups read then answer the following prompts:

   a. Can computers think of random numbers?

   b. Why are random numbers used in programming?

   c. What is a **seed** number?

   d. What is some way to get a truly random number for a computer to use?

3. **Hand out** copies of the program explanation for the program you chose out of the 3 options.

4. **Show the program** on a main screen and walk through the program explanation.

   a. *(Optional) If you know how to use RNG seeds, have students go to the Math category to grab a **random number generator seed** block and put it at the top of the program. This will make Evo or Bit do the same movements and colors every time the program runs.*

5. **Hand out copies** of the map, and markers, pencils, and spare paper to record what Ozobot sees.

   a. **Students read** the instructions on the map.

   b. **Students color** the border green, blue or red. They canNOT use that color in the map pictures.

   c. **Students draw** pictures in the empty spaces of the map, choosing images that can create a noun, verb, adjective or adverb easily.

6. **Hand out devices** or computers for students to load the program into their Ozobot.

7. **Students program** the color of their border into the program.

   a. It's up to the teacher if students will change any other code. Students don't need to know how all the code works to change the number values of the program.

8. **Students run** the programmed Ozobot on their map, writing down each image/word that it pauses and turns purple on. Once Ozobot lands on 'The end', they can stop recording words.

   a. If Ozobot takes too long to get to the end, students can choose to stop.

   b. If Ozobot hit the end too soon, students can keep going. Or, task them to focus on these few ideas for their whole story.

   c. If Ozobot lands on a corner between pictures, pick the picture it's facing.

9. **Students write** their story using the word seeds they got from the activity.

   a. It's up to the teacher if this task has a word limit or minimum, and other parameters.

   b. Ozobot would love to see the stories! Feel free to share by posting on social media @Ozobot or #ozobot, #ozosquad. Or, email to ozoedu@ozobot.com

HOW COMPUTERS MAKE RANDOM NUMBERS

WHAT IS RANDOMNESS?

A random number is one you can just think up or get from a pile of cards, and it can't be predicted.

Random numbers are helpful in programming. The most important thing is that random numbers help keep passwords and other information secret on the internet by changing what the they look like. If the program and random numbers that hide information aren't very random, a hacker can get everyone's passwords.

However, computers can't think randomly. They need to be programmed to get a random number. And, as we'll see, that number isn't really random.

HOW COMPUTERS GET RANDOM NUMBERS

Here is an example of a program to get a random number between 1-100.

First, we need a **seed**, which is the number we start with and that will be changed with math to create a 'random' number. A seed can be from the computer's clock in milliseconds because that changes all the time.

That seed is changed with math, maybe like this: divide the seed by 10 until the given number is less than 100, then add 1.

a.   Current time is 10:37:01.**570** AM
b.   570/10 = 57
c.   57 + 1 = 58

Or, if it's 10:39:55.**011** AM, then 011 is 11, and that's already less than 100. Add 1 to get 12.

NOT RANDOM ENOUGH

Which part of this process is random? Choosing the time or doing the math to create a new number?

Actually, neither of them are random. Plus, there are only 1000 choices of seeds from the clock, which means an obvious pattern will appear.

If this simple algorithm were used to hide passwords, hackers would likely figure out the seeds, because there are so few and they come from the clock, and the program that changes the numbers is so simple.

These algorithms for RNG are often called PRNG – pseudo ("sudo") random number generators - where pseudo means 'not quite real'. You can see that using the same **seed** number and the same program will get you the same 'random' number, which isn't really all that random.

UNIQUE WAYS TO GET RANDOMNESS INTO A COMPUTER

A clock can be predictable, but there are a few clever methods that can give a computer truly random number values.

One idea was made by Cloudflare, a company that keeps 10% of the webpages on the internet safe from hackers. They built a wall of lava lamps and set a camera to watch them. The camera will see different shapes and colors from this wall at any time and that creates a large, very random seed number.

The larger the seed number, and the more random it truly is, then the harder it is to hack or predict. The Lava Lamp Wall is a great tool for random number generation, and keeping your information a secret.
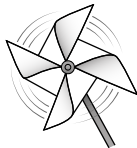
Now you know that there's nothing magical about a computer's random numbers!

DID YOU KNOW?

Every time you shuffle a deck of cards, you might be shuffling it in an order that no deck of cards has ever been in, in all of history. That's because a deck of 52 cards has this many possible orders of the cards: 80658175170943878571660636856403766975 2890544088327782400000000000000. That's 67 places! And 1 million only has 7.

Random Story Generator

noun	verb	noun	verb	adjective
adjective	noun	verb	noun	verb
noun	verb	adjective	noun	verb
adverb	noun	verb	adverb	noun
adjective	verb	noun	verb	adverb

Once upon a time... | **The end.**

Instructions

1 Choose red, green, OR blue for the thick border. That color can't be used in your pictures!

2 Draw a picture in each square that works with the word type. For example, the cat is an adverb, which can mean 'fluffily', 'sassily' or 'lazily'.

3 Edit the program to pick the border color.

4 Load, then run Ozobot and place it on 'Once upon a time'.

5 Watch your Ozobot walk around the map.

6 Write down what word Ozobot is on when it pauses and turns purple. You will use that in your story later.

7 Finish writing when Ozobot lands on 'The end'

8 Write your new, random, story.

ozobot