

# Using Roblox to Explore Natural Selection

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## OVERVIEW

This is part of a series of biology lessons that teach 9<sup>th</sup> to 12<sup>th</sup> graders about natural selection and uses the Roblox game to engage students. This lesson begins with a reminder to students about expectations and rules regarding appropriate use of technology, which can provide opportunities to explore scientific concepts in the virtual environment of Roblox. Students are expected to explore the Darwin postulates of natural selection using the examples provided. Then they discuss their findings with fellow students. This discussion is followed by an activity where students model evolution using previously created Roblox games. Next, students create their own Roblox game. This lesson concludes with students exchanging their finished games for others to explore.

Topics: Roblox, natural selection, evolution, games

Time: 60 to 75 minutes. Multiple class sessions are required to complete all aspects of the lesson.

## MATERIALS

- Computer with internet and Google drive access
- Learning Management System
- Cellphones or mobile devices
- Teacher account on [Roblox](#)
- Student accounts on Roblox
- Setting up a Roblox classroom website (Roblox Corporation, n.d.)
- [Natural selection video](#) (Amoeba Sisters, 2016)
- [Roblox presentation slides](#)
- [Create your first Roblox game in just 15 minutes!](#) video (CodeBro29, 2023)

## CONTEXT-AT-A-GLANCE

### Setting

9<sup>th</sup> through 12<sup>th</sup> grade students in a suburban, public high school in the United States.

### Modality

Hybrid instruction, a combination of in-person and online instruction

### Class Structure

One of the lessons in a graded science class that meets for 75 minutes every other day in a block schedule throughout the school year.

### Organizational Norms

This course is one of the state mandated science options offered yearlong by the school.

### Learner Characteristics

15 to 30 students generally enroll in the course. They are largely freshmen students who have little or no prior knowledge of evolution concepts. They are beginning their science career and learning about the inquiry process.

### Instructor Characteristics

Both instructors are high school science teachers. One is affiliated with the local university and is interested in the use of technology to drive instruction.

### Development Rationale

This lesson was part of a series of lessons that explored scientific concepts in evolution. Students were able to review existing Roblox games to identify evolutionary concepts and determine how well the games covered those concepts.

### Design Framework

The 5E constructivist model Engage, Explore, Explain, Elaborate, and Evaluate (Bybee, 1987) was used with a focus on the engage, explore and elaborate components.

## SETUP

Setup the teacher and student Roblox accounts ahead of time. The Create Roblox application should be installed. Explore the options provided before the start of the lesson. Students should be able to move around the room to discuss ideas without distracting other groups. Students will work in small groups to create the project. A shared Google Drive folder should be created for students to access lesson materials and submit their finished work.

## STANDARDS

This lesson aligns with the Indiana Academic Standards for high school students studying biology. Specifically, it addresses the HS-LS4-2 Biological Evolution: Unity and Diversity standard (Indiana Department of Education, 2023, p. 25):

Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

## CONTEXT AND SETTING

This lesson was developed as part of a 4-week, 60-75 minute block scheduled Biology class during the evolution unit. The school is a suburban public high school in the mid-western United states. It is situated in a university town with a student population from multiple countries. This course is offered to all freshmen in the school and is a required course for graduation credit. This class is offered as a general credit course as well as an honors level course. This activity can be used for both class levels.

This lesson was designed by teachers who use technology to drive instruction by creating technology rich lessons that enable students to explore biological concepts using collaborative and engaging strategies. Typical class sizes are from 15-20 students and the Canvas LMS is used for content delivery. The Roblox program is permitted by the school district and can be downloaded by the

students from a repository designed by the technology department. Students have little or no prior knowledge of evolution concepts. But, most are familiar with the Roblox game in various contexts. This lesson was designed to allow students to explore the concept of natural selection and review and critique existing games to see how they present the concepts of evolution and natural selection. Eventually students present their understanding by written response and create games that display the key tenets of natural selection and evolution, especially variation, heritability, and adaptation.

This lesson can be delivered synchronously or asynchronously using Canvas as the delivery mechanism. The first aspect of this lesson could be delivered in class while students could be allowed to complete the game activity at their pace at home or elsewhere if they can collaborate when necessary. This article focuses on the hybrid approach used for this lesson. Students are allowed to develop their game as homework with a timeframe that does not affect their schedule or create additional stress due to feeling rushed to complete the project. The time frame must fit within the 4 weeks used to complete the unit. The instructors gave the students one week to complete the project. This flexibility is important especially for students with internet connectivity or broadband connection issues, which could cause lagging or delayed loading for programs like Roblox. Students are allowed to use their mobile devices during this activity and work in groups. However, individual work is also allowed when necessary. A collaboration tool like Google Docs or Jamboard can be used for group members to share ideas and develop their storyboard and script for the game.

This lesson uses the review, discussion, critique, storyboarding and prototype format to drive instruction. Questions and keywords are provided to prompt the students, which act as reminders of what must be delivered in the game. These prompts are shown in the engagement and knowledge application section of this manuscript (also see the [presentation slides](#) for more details).

## LEARNING REPRESENTATION

The evolution unit was about 4 weeks long and this was one of the activities used in addressing the concepts. The information outlined below reflects what happened in one day over a 65-minutes class

period. Afterwards, students continued working on the game outside of class. Students were given one week to complete game creation and the activity was concluded in another class session. Students were also allowed to share the game they created (within the one-week period) and provide feedback on other's games. The feedback and responses were discussed before the activity was concluded.

The outline for the lesson was organized around the following elements: engagement, activate prior knowledge (to introduce the topic and review information from previous lessons), knowledge demonstration (to show students what to do), and knowledge application (to allow the students to actually complete the first Roblox activity where they explore games associated with natural selection and explain their quality based on studied principles). Afterwards, students elaborate what they learned by creating their own Roblox game about natural selection outside of class time. The conclusion section was deferred to another class session.

Please note that the times can be flexible, depending on the type of students in a particular class. Some students work faster than others and for those students, they could be encouraged to add more components to the game. It all depends on student interest or willingness to work on the activity. Since you know your students, adjust the time frame for this activity based on their needs and interests.

### ENGAGEMENT COMPONENT (10 MINS.)

Access the Using Roblox to explore natural selection PowerPoint, Show slide 2 *What is Natural Selection?* Ask students to provide answers to the questions listed below, which can be written down by the teacher. During the class discussion, students could also type in their responses on any answer collecting or feedback tool like Mentimeter, Jamboard, or Nearpod. You can use any method that allows the students to see the responses.

- *What are Darwin's 5 Postulates of Natural Selection?*
- *Explain the interaction of mutation and selection in producing evolutionary change.*
- *Describe the different modes of selection and differentiate between them.*

Discuss the answers then play the video on slide 3 to review natural selection. Students will answer the following questions:

- *How does natural selection work?*
- *Can you provide examples of natural selection in real life?*

Give students time to come up with answers and address any misconceptions that arise. This should be a whole class discussion where the students write down their answers either on paper or on an interactive board. Everyone should be able to see the responses and know what others came up with.

### ACTIVATE PRIOR KNOWLEDGE (5 MINS.)

Remind students about expectations and rules for using technology. Refer to slide 4 on the Using Roblox to explore natural selection PowerPoint and make sure you have the signed permission slip on file.

### KNOWLEDGE DEMONSTRATION (10 MINS.)

Ask the students if they have used Roblox before. Create groups based on their answers. Each group should include those that are experts and novices. Go through slides starting from slide 5:

- *Find out who has used Roblox before*
- *Create groups based on familiarity with the program*
- *Students are allowed to work individually if they wish to*

When you get to slide 6, review and explain the instructions for the activities and allow students to ask questions.

*In this lesson, Roblox games will be used to model evolution specifically to show the process of natural selection.*

Log in to Roblox using [www.roblox.com](http://www.roblox.com). The log in page view will differ depending on individual choices. This could be due to previous visits to the website or algorithm configurations for individual users. This will not be a problem because the menu bar is all that matters.

Select the Discover option from the log in page (indicated by the yellow arrow near the bottom of Figure 1).

Use the search option on the discover page to look for the game that students want to play (Figure 2). Please note, complete this search before class so you are aware of games you want students to review during this activity. Additionally, show students how to conduct searches so they can search for games when it is required.

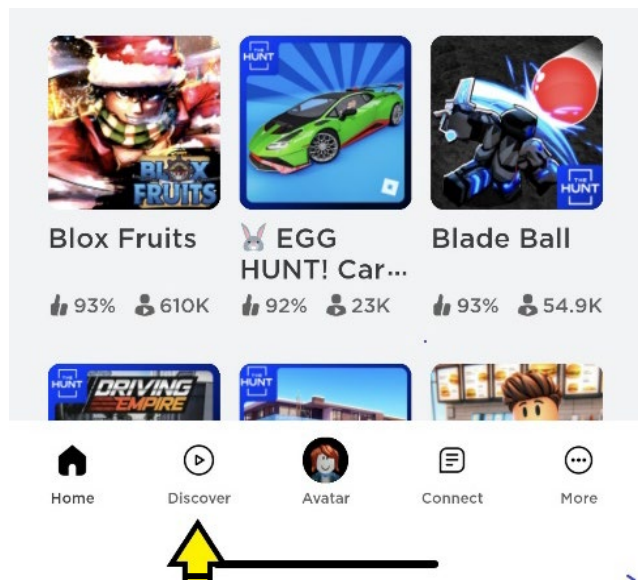


Figure 1: Image for Roblox account of teacher

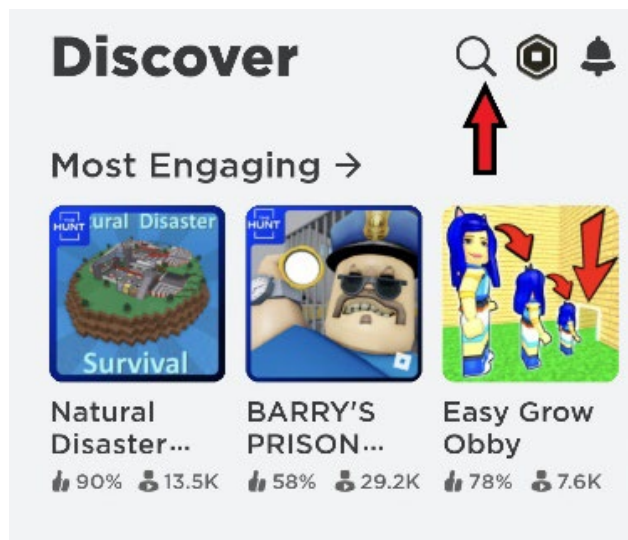


Figure 2: Search the Discover option Image for Roblox

## KNOWLEDGE APPLICATION (30 MINS.)

In this section, students will begin work on the Roblox application. Follow instructions on presentation slides 7 through 12 to walk the students through the process. Include the presentation on the LMS created for the activity and share the presentation with the students for them to review again on their own, if necessary. Also include necessary videos, website links and Roblox tutorial videos for the activity to the LMS where students can access them.

## FIRST ACTIVITY (EXPLORE AND EXPLAIN)

Students will play and review several Roblox games. These games previously existed in the Roblox system. Students should consider how these games applied the principles of evolution and natural selection, as addressed in class. Students are told and provided with the following instructions below before they start the activity. Refer to the PowerPoint for detailed information.

*Play the following games and provide a critique based on your experience. You should include a picture of the starting page of the game and the ending page showing your game data.*

*Play all games and at the end of the game answer the following questions:*

- *What evolution topics were presented in the game?*
- *How well did they cover evolution topics?*
- *What issues did you face while playing the game?*
- *Using the following rating of 1 to 10 rate, with 1 = least & 10 = most*
  - *Provide an annoying rating: 1 to 10*
  - *Provide run/like rating: 1 to 10*

*Links to games for activity 1:*

- [Animal Evolution Simulator](#) (WildRun, 2024)
- [Cells to Singularity – Evolution Island \[Beta\]](#) (-Cells-to-Singularity-, 2024)
- [Shark Evolution](#) (Op Games Corporation, 2024)

*Submit the pictures and your review on the canvas page created for this assignment.*



Note: This is the end of the first segment of the activity. Anything beyond this point is an extension that can be completed by students in subsequent lessons or outside class time.

## SECOND ACTIVITY (ELABORATE)

Students will be given the opportunity to create their own Roblox game that will reflect how natural selection occurs within their chosen environment.

Use instructions from slide 13 to help students create their scripts and outline the game they want to create. The instructions are also included below:

*Second Activity: Create a storyline with your group about the game. Include the following representation of natural selection in your game:*

- Variation
- Heritability
- Environment

*Also describe the environment of your game.*

*Write your script for the game you intend to create. The environment and live organisms could be real or imaginary, so long as they reflect the tenets of natural selection.*

*Submit the link to your game to the shared Google document created for this assignment.*

*The storyboard should accurately reflect:*

- The environment and organisms that students want to display.
- Evidence of variation.
- How traits are inherited.
- Evidence of adaptation.

Create a collaboration tool like a Google Doc or Padlet so students can share this information as a group and as a class.

## ROBLOX INSTRUCTIONS

- Log in to Roblox and select Creations (Figure 3).
- Follow the instruction from the Creations section and download Roblox studio.
- Log in to Roblox studio.

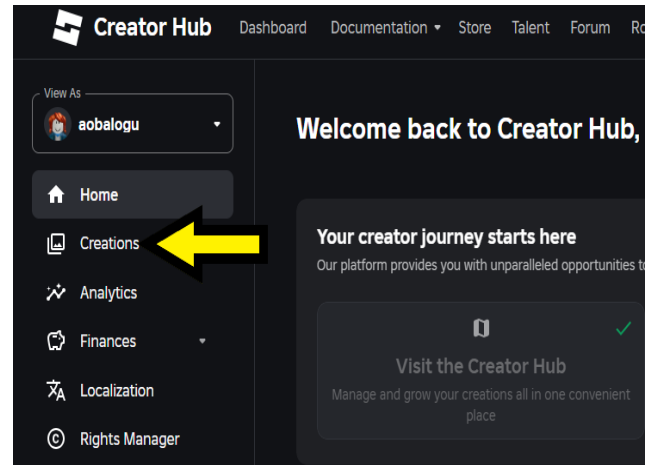


Figure 3: Image for the teacher Roblox account.

## STUDENT COLLABORATION

Roblox provides an opportunity for collaboration when creating a game. Students should select the collaboration option on the top-right of the window and add the names of their group members (see Figure 4). This will enable every group member to work and develop the game together.

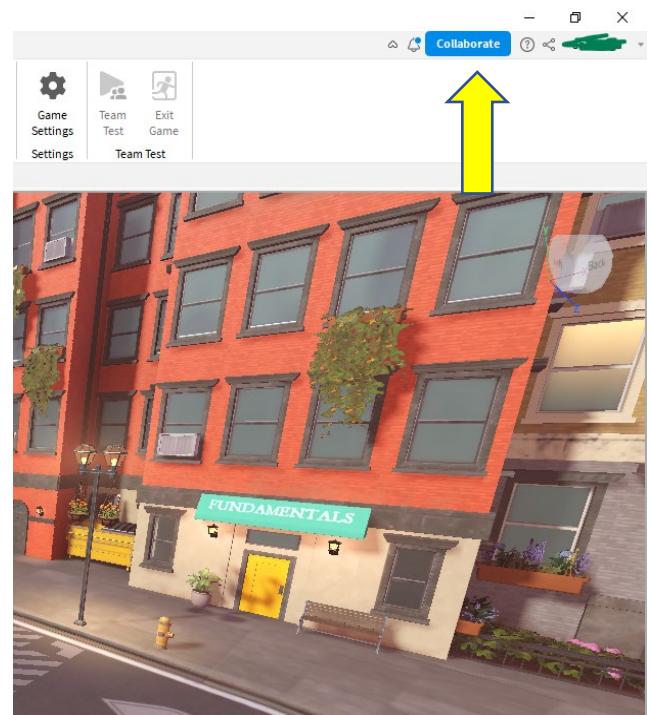


Figure 4: Collaboration view

Use the instructions on slides 14 through 28 to help students learn how to create their games using Roblox.

Use the instructions on slide 27 to help students save their games.

## CONCLUSION (10 MINS.)

Have students share their games with their classmates and instructor by using the shared Google drive. Discuss what they have learned while creating the game. This activity can be extended by making students create other versions of their games while the evolution unit is covered.

Please note that this conclusion will happen during another class session.

## CRITICAL REFLECTION

This was a very useful activity that helped the students demonstrate their understanding of the evolution unit, especially the concept of natural selection. Enabling students to play pre-made games and critique those games on how well they presented natural selection concepts was a great way to gauge what students understood.

Some of the highlights of the activity were when students shared that a game did not properly reflect the concept because the organisms were evolving into other animals, which is not possible. In reviewing the Animal Evolution Simulator game, one student shared that “The topics were poorly and inaccurately covered as the changes occurred very abruptly and to entirely different species.” Another student wrote, “Starting at the earthworm and ending at the dragon. My partner and I put a decent amount of time into the game and made it to become a polar bear and elephant.” A third student shared, “It [the game] didn't show anything about mutations or relationships with other organisms. It didn't cover the topics that well because the animals all ate the same foods. There was no natural selection. It was not realistic because I went from a rabbit to a hedgehog.”

From the comments, it could be deduced that the students understood what evolution by natural selection is, what is supposed to happen during the process, and what it is not supposed to happen. Another example occurred in a game created by a

student. The game was based on changes or variation in the environment, food, and the area the species are found. Students shared that “Birds are all originally the same species and look the same. However, due to different environments, various species emerged.” They also provided details about how and why the changes will occur for the population to evolve.

## PRIVACY CONCERNS

Unfortunately, we cannot share links to student games because of privacy concerns. We must be careful when sharing games developed by students because the Roblox environment enables people to chat with the creators, which could be problematic. To avoid communication issues, we reminded students to only share their games within the class group created for the assignment on the LMS. We also reminded them constantly about the permission slip they signed and encouraged them to take privacy seriously, especially in situations like this one.

## TIME

This activity was time-consuming and had to be adjusted while the students were working on it. Although the game Roblox is proliferated amongst students, not all of them have experience with the game. This lack of experience meant more instructor led learning time regarding game creation than was mentioned or intended for the lesson. We dedicated about 5 to 6 minutes in subsequent class periods to address questions or issues that came when students worked on their own. Some of the most useful tools were the Roblox tutorial videos that were available to walk students through building the game (as well as tutorials built into the Roblox studio for game creation).

Allowing students to work outside the classroom was very helpful. For this activity, it took the students about a week to conclude. However, most students finished the activities within 3 to 5 days. Students who finished early and were still interested in exploring further were allowed to search for other games that fit the criteria. Yet, care must be taken to help students avoid unlimited searches for games, forgetting the main purpose of the activity to reinforce evolution concepts.

To avoid student search problems, provide guidelines and instructions about exact expectations. For instance, students might search for one or two additional games using the activity instructions provided. They could also do a comparative analysis of the strengths and weaknesses of each game while providing suggestions for improvement of the ecological concepts in the games they reviewed.

## TECHNICAL CHALLENGES

Another challenge was the loading time required to create the game; it made some students a little frustrated. We had to discuss challenges that come with game creation. Some students complained about the difficulty in getting hardware that could play the game, the lag time in loading the game, and at times how boring the games were with constant repetition.

Loading or lagging time was more of a connection and broadband issue, which could be corrected by moving to another location with a better internet connection. As for the software issue, students could switch to another device with more capacity to play the game.

It was fun watching the students teach each other and learn from each other as they created the games. But, there were a few challenges that included deletion of objects that were required for the game. To avoid situations like this from happening, the students should establish effective communication channels so they all agree before a decision to delete any component of the game is made.

If something was deleted while students were working on the game, they could immediately undo the change by using the commands: Ctrl + Z or Alt + Backspace. They could also use the undo button on the plugins tab on the studio program. This button only becomes highlighted when a change has been made.

## CONCLUSION

This activity might seem time-consuming. It may appear to take time away from other concepts that need to be covered in the unit. Although these activities might seem daunting to take on, remember that these students were very familiar with some sort of games. Bringing something that they were

interested in as a learning tool helped break down what might be perceived as the monotony of learning. Why not use what students like or love to promote learning? At first, students might be hesitant, resistant or reluctant but most will be intrigued (especially when they are given the autonomy to create a game or search for more games to critique). Our students eventually found the activity so interesting that they wanted to continue, which we allowed as an extra credit opportunity.

Overall, it was a great activity that incorporated scientific concepts as well as gaming concepts to engage students. It would be useful if the Roblox games had already existing templates based on scientific concepts to make them easier to manipulate. However, the activity is manageable without these templates.

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## ABOUT THE AUTHORS

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