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# BOARD # 214: Project Drider - Teaching Students about the Dangers of Ticks the Fun Way (Work in Progress)

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# Project Drider: Teaching Students about the Dangers of Ticks the Fun Way (Work in Progress)


## Abstract

Young children are at high risk of developing Lyme disease from ticks due to a combination of their underdeveloped immune systems and playful obliviousness to potential bite locations. While not the only at-risk demographic, informing children of the dangers of ticks poses interesting challenges: reasonable caution needs to be weighed against how easily certain ages are frightened, and care must be taken that an extreme message such as "the outside world is scary I should never go outside" isn't received. Thus, we have created a charming simulation designed to teach children about the areas and animals around which ticks can be found. In addition, we have developed some example lessons that can be conducted using this simulator and are coordinating with educational partners to test their efficacy.


## Introduction

Joint pain and swelling (arthritis), chronic migraines, and even cardiovascular problems are potential symptoms of Lyme disease [1]. Ticks are commonly responsible for spreading Lyme disease and Rocky Mountain Spotted Fever. They are typically found in forested and grassy areas, making it difficult to avoid exposure. As Monika Gulia-Nuss, our local tick expert, notes, "Whenever you go outside, you are at risk." Children, the elderly, and immunosuppressed individuals are at an increased risk of contracting Lyme disease [2].

We created a simulation using the Unity game engine [3] to educate children about tick awareness. The simulation introduces children to areas where ticks are commonly found, raising awareness without causing fear. Prevention methods include performing a 'Tick Check' after visiting tick-prone areas, taking hot showers, and placing clothes in the dryer, as ticks are vulnerable to heat. *Project Drider* draws inspiration from a variety of sources, as outlined in Section 1, and its simulation platform for tick education is detailed in Section 2, providing an overview of the project. Furthermore, we are currently seeking feedback on a sample lesson plan in Section 3. Finally, the conclusion of our paper outlines areas where further work is needed, as discussed in Section 4.

## Related Work

Düzkaya et al. [4] suggest that incorporating cartoon theming into educational content can reduce fear when addressing potentially scary topics. By utilizing game-based learning principles [5], we

have created an engaging and enjoyable learning environment that helps alleviate student apprehension.

A game is defined as “a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome” [6]. *Project Drider* provides rules and a quantifiable outcome within a safe ”sandbox” environment, ensuring no risk of actual harm. Additionally, we offer suggested lessons that incorporate conflict while leaving their implementation to individual instructors, enabling them to tailor the experience to their specific classes.

Research indicates that competing in a game-based scenario enhances students' understanding [7]. In addition, cooperation fosters greater interest in repeating scenarios. By incorporating both competitive and collaborative tasks, we aim to leverage the benefits of both approaches. Furthermore, engaging the entire classroom not only increases participation but also reduces the administrative burden on teachers.

Impulse [8] is a direct example of a game that prepares students for future learning. It offers a simulation-based environment in which students can learn and practice important skills.

## Design

Our primary design goal was to create an educational platform that teaches elementary school students about tick safety and fundamental scientific concepts. To achieve this, we developed a platform that is simple, easy to understand, and simulates an outdoor environment that children would enjoy exploring. We took care to ensure that the simulation is not intimidating, featuring clear objectives and controls that are accessible and engaging for our young audience.

### *Art Style*

During the development of *Project Drider*, a variety of art styles were explored. Ultimately, we selected a vibrant 3D style with clean, simple visuals. This style features soft shapes and vibrant colors, which are applied throughout the interface and models to create a toy-like atmosphere. Science fiction elements introduce a technological research ambiance, making data collection feel like an enjoyable adventure. The inclusion of beautiful outdoor environments further enhances the experience, making the study of ecology more engaging and enjoyable. Together, these elements aim to connect with a younger audience, fostering learning while reducing fear.

### *Ecological Simulation*

*Project Drider* visualizes a charming ecological system in which various species of animals roam a small valley, collecting ticks as they travel. The simulation accounts for the natural habits of each species; for example, possums have fewer ticks on average due to their cleanliness, while larger moose tend to have more. Creatures interact in meaningful ways, such as foxes chasing bunnies, adding life and flavor to the environment. Texture maps define the locations of different biomes, such as grasslands, rivers, and forests, which influence the species of animals present and their chances of naturally acquiring ticks from their surroundings. This system is designed to enhance the overall experience without overwhelming computational resources or sacrificing performance.

To achieve this, we created tags such as dense forest, sparse forest, forest path, beach, shallow water, deep water, grasslands, and more to define the environment of specific areas within the

game map. These maps also mark areas that restrict animal movement, such as rocks, trees, and cliffs. Each animal is assigned a list of biome tags indicating where it can spawn and move, ensuring it stays within its designated area. This approach is more efficient for pathfinding and object avoidance than other artificial intelligence systems, resulting in a significant performance boost.

*Multiplayer*
A self-contained peer-to-peer networking environment is well-suited for teaching in a computer lab setting. Each classroom can have a unique lobby with a code assigned by the teacher, which students can share among themselves. This setup allows for synchronous or asynchronous collaborative gameplay, enabling students to work together without disrupting each other through misconduct. For example, students can analyze and catch animals while sharing and observing each other's experiences, but they cannot interfere with or obstruct one another's progress, fostering a cooperative learning environment.

*Tick Statistics*
*Project Drider* logs tick statistics for every animal caught by a student. Each animal is assigned a randomly determined number of ticks, influenced by its environment and behavior. For example, moose, with their larger surface area, host more ticks on average compared to smaller animals like rabbits. These tick statistics are tracked and presented to students in graphical form.

*Project Drider* is an instructional tool designed to teach children about tick safety, basic statistics, and how to read and interpret graphs. For instance, a lesson on averages can be taught using fractional numbers of ticks, an entity that is inherently indivisible. *Project Drider* includes various graphs, such as those displaying the average tick count per animal (Figure 1) and the regions where each animal was found. Another graph, as shown in Figure 1, can also be used to teach students about the geographic distribution of ticks.

**Example Lesson Plan**

We now present an example lesson plan for *Project Drider* can be incorporated into a classroom. This lesson plan educates students about ticks and the importance of tick checks. As an outcome, students will understand the risks of tick-borne illnesses, explore tick habitats and hosts, practice critical thinking and teamwork in data collection, and emphasize the importance of tick checks for personal and public health.

It is important not to scare children; few ticks carry diseases, and even those require at least 24 hours to transmit diseases. Begin the lesson by discussing the dangers of tick-borne illnesses and their methods of transmission. For example, you could say: "Removing ticks can be difficult and discomforting, but is necessary because, ticks carry Lyme disease. Despite its name, it isn't from a fruit. Lyme disease can cause swelling in your joints and heart, and lead to painful headaches."

Students can explore where ticks are most likely found and which animals host the most by using an example interface (Figure 2). Teachers can assign groups to different biomes to observe which ones collect the most ticks, emphasizing the importance of a thorough "tick check" before

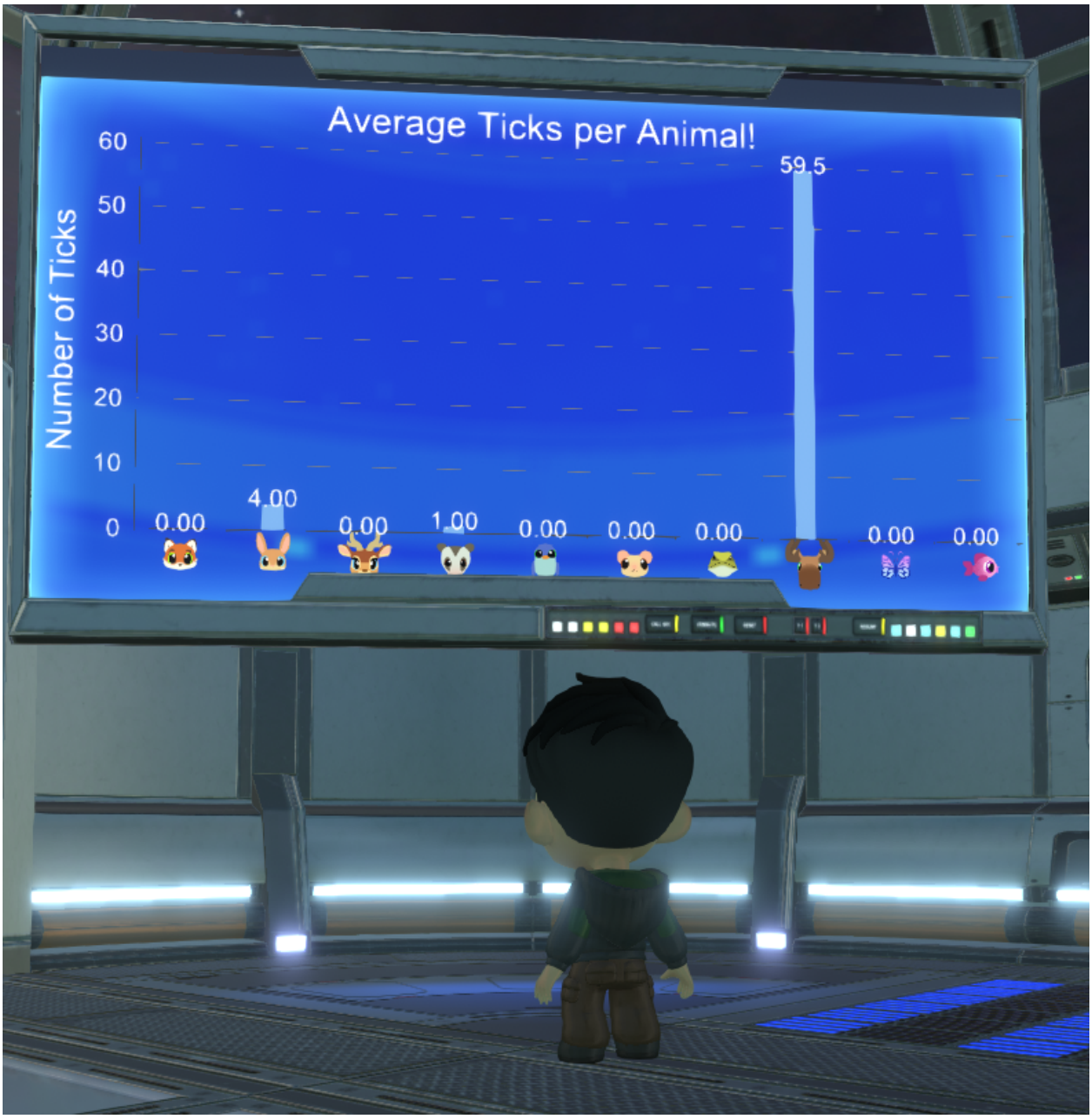


Figure 1: A graph showing the average number of ticks on the animals that have been caught. Given this graph, the student may be asked to find out why moose have much higher tick counts than other animals, such as rabbits.

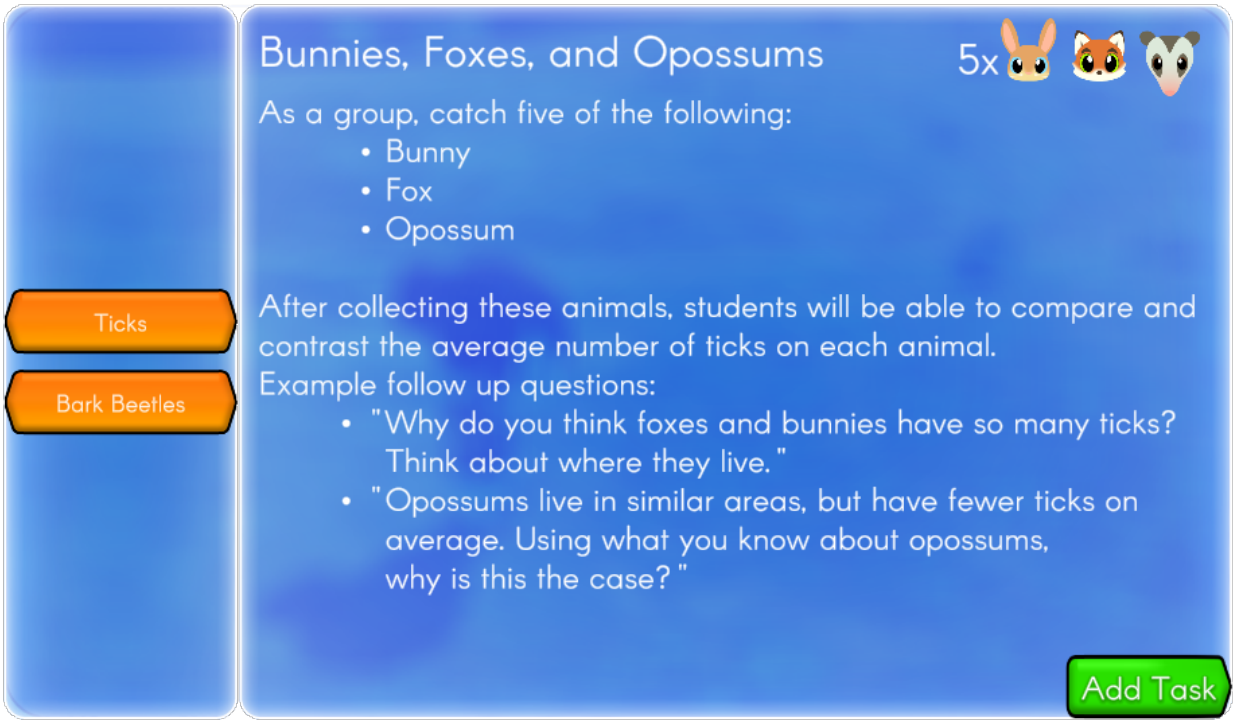


Figure 2: A user interface shown to the teacher that allows the assignment of tasks to the class. The left column provides a listing of tasks that can be selected. Selecting a task will bring up a detailed view (the right column) explaining the task. Since the task system is currently in development, the text is not final.

returning to the ship. This example lesson plan focuses on fostering engagement, critical thinking, teamwork, problem-solving, and tick safety.

In addition to learning about good tick habitats, students can also explore the types of animals that are most likely to carry ticks. For example, students can be tasked with finding N animals (where N is a variable number) and determining how large N needs to be before the average tick count stabilizes.

Students can investigate which environments are more likely to harbor ticks by spending five minutes collecting as many ticks as possible, followed by a discussion on why they chose certain areas and their reasoning behind those choices. The lesson should conclude with a reflection emphasizing the importance of tick checks, highlighting that removing ticks is essential not only for their own health but also for the health of others.

## Conclusion & Future Work

Looking to the future, there are several areas for potential improvement in *Project Drider*. First, we don't emphasize enough in gameplay why ticks are harmful. Some students may find the idea of getting sick interesting; therefore, finding a way to include more negative messaging while maintaining the goal of not being too frightening is an area of interest for us. Additionally, we are considering placing greater emphasis on teacher authority, potentially by adding larger teacher player models and fleshing out the task system, where objectives can be assigned to students. However, before we begin coding these implementations, we want to test our current theories about how they could be utilized in the classroom.

We also think it would be beneficial to model ticks similarly to animals, allowing them to move around. Additionally, we would like to track where animals and ticks spawn, including a history of areas and positions explored. To further enhance gameplay, we're considering adding additional tweakable parameters, such as the ability to change tick spawning rates based on the type of flora or ways to automatically generate maps that drive our ecological simulation.

In conclusion, *Project Drider* provides a unique and engaging way to teach students about ticks and the mitigation of their threat. By incorporating game-like elements into the learning experience, *Project Drider* has shown promise in increasing student engagement and understanding of complex concepts. The example lesson plan provided highlights the potential of *Project Drider* as a tool for educators, allowing them to create interactive and immersive experiences that cater to different learning styles. As we move forward with future development, we are excited to explore new features and improvements that will enhance the overall experience for both students and teachers.

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