Uwyo RAMPED 2016 -Curtis Lesson Plan Willow Curtis

P = Pretest (think essential questions)
O = Objectives (measurable - see Bloom's taxonomy)
C = Catch (hook, anticipatory set, etc... use different senses, not a question)
A = Activity (procedure of what the students should do)
R = Review (how will students go over what they've learned?)
A = Assessment (formative and/or summative)
P = Posttest (same as pretest for comparison purposes)
S = Standards (Wyoming, NGSS, etc...) showcasing crosscutting concepts

Lesson Overview: Students will run a simulation using NetLogo software. The simulation demonstrates the behavior dynamics in an ant colony. Students will manipulate the population, diffusion rate, and evaporation rate. Students will change and manipulate these and see what happens as a result, which are displayed in the interface tab. While looking at the display in the coding tab, students will apply various math concepts such as inequalities and functions.

Target grade level: GT 6th-7th Math and Science interdisciplinary lesson

Pretest Questions	Students will answer the following questions before the lesson has begun.. 1. What is a function and how can it be applied using technology? 2. What is an inequality? Give me an example of how it can be used in technology and explain what the statement means. 3. Explain what a limiting agent is for organisms and how it can affect population growth. Provide two examples and explain the effects on a given population.
Objectives	1. Students will explain how functions are utilized and applied in the simulation 2. Students will identify the inequalities found in the code and explain what they mean in the code and how it is displayed in the simulation 3. Students will use the simulation to demonstrate that resource availability is a limiting agent for organism and population growth
Catch	Students will be asked to open NetLogo software Next they will go to ➢ File ➢ Library Model ➢ Biology ➢ Ants Students will have 7 minutes of exploratory free-time with the simulation before we begin the lesson, they will not be given any additional instructions at this time. After the 7 minutes of exploratory free-time, students will be asked to share one "I noticed" and one "I wonder…." (one observation and one question to explore during the lesson)
Activity	1. Students will run the Ant Colony simulation on NetLogo and respond to prompts on the given handout. *See Appendix A*

Review	Students will prepare and present what their findings were when they did the activity and discuss the results as a class.
Assessments	Students will complete an Exit Ticket as an informative assessment when they complete the activity. *See Appendix B*
Posttest Questions (same as pretest questions)	Students will answer the following questions after the lesson is finished.. 1. What is a function and how can it be applied and used in technology? 2. What is an inequality? Give me an example of how it can be used in technology and explain what the statement means. 3. Explain what a limiting agent is for organisms and how it can affect population growth. Provide two examples and explain the effects on a given population.
Standards	<u>Science</u> Life Integrated Science Standards- Systems and Structures Growth 3: Construct a scientific explanation demonstrating that resource availability is a limiting agent for organism and population growth. <u>Technology</u> ISTE Standards- Creativity and innovation Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Use models and simulations to explore complex systems and issues <u>Math</u> Expressions and Equations 6.EE Reason about and solve one-variable equations and inequalities. Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams. Functions 8.F Define, evaluate, and compare functions. Understand that a function is a rule that assigns to each input exactly one output.
Crosscutting Concepts from NGSS	Patterns- Middle Level ● Macroscopic patterns are related to the nature of microscopic and atomic-level structure. ● Graphs, charts, and images can be used to identify patterns in data. ● Patterns in rates of change and other numerical relationships can provide information about natural systems. ● Patterns can be used to identify cause-and-effect relationships.

Appendix A

Ant Colony Simulation Handout

Scenario:
You will manipulate an ant colony by changing/having control over 3 different factors, they are explained below:

Population	The # of organisms of the same species in a given area
Diffusion-rate	Ants produce a scented chemical called a pheromone. The diffusion-rate is the rate at which the chemical is released. Ants use pheromones to communicate with each other.
Evaporation-rate	An evaporation rate is the rate at which a material will vaporize (evaporate, change from liquid to vapor) compared to the rate of vaporization of a specific known material.

Instructions: Respond to each of the following prompts and answer the questions.

1. The initial settings for the simulation are:

Population	125
Diffusion-rate	50
Evaporation-rate	10

2. What did you observe after you started this simulation?

3. Now, change the view to “watch one-of turtles”. What did you observe?

4. Click, “reset-perspective.” Change the evaporation rate to 99. What happens and why?

5. If you change the diffusion rate to 99, what do you observe?

6. Now, change the population to 9 and keep all of the other settings the same. What do you observe

7. Now go to the “Code” tab. Identify 3 different functions that are stated. Describe what happens in response to each function.

8. Identify 3 different inequality statements, explain in detail what each of the statements is saying.

Appendix B

Exit Ticket

Provide an example with a description for each prompt from the simulation…

1. A function

2. An inequality

3. Limiting agent for population growth