



**DREAM FLIGHT  
ADVENTURES**

*Inspiring the world to think and dream*

# **Lesson Plans & Curriculum-based Activities**

*Helpful tools to extend the magic before and after the mission*



Name \_\_\_\_\_

## Infinity Knights Job Application

In the near future you will embark on an exciting Dream Flight Adventures mission. You and your peers will become members of the *Infinity Knights*, the protectors of peace and justice throughout the universe. Together, you will operate a fantastic ship to accomplish a challenging mission. It will not be easy, and you will need to work as a team to be successful.

It is a great honor to serve with the *Infinity Knights*, and every station on your ship is important. Review the ship's stations at [www.DreamFlightAdventures.com/simulators/](http://www.DreamFlightAdventures.com/simulators/). Pay attention to how your crew must work together and think about the stations that interest you most.

Identify the three stations where you'd most like to serve. Write a persuasive essay describing why you'd be a good choice for these positions. Describe why you are interested in the roles and how you think you would do a good job. Share how these positions relate to past experiences you've had or goals you have for the future. Use the space below or separate sheets of paper to write your persuasive essay.

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## The Effect of Nitrate Levels in Water on the Growth of Plants

This project can be done either **before** or **after** the *Contaminant* simulation. It includes a group classroom activity.

### Overview

The events in the *Contaminant* mission explore many of the effects of water pollution. This activity expands upon this topic by letting students conduct their own experiment, make observations, and form their own theories about the effects of Nitrate (common pollutant) levels in water.

### Materials

The materials required for this science project experiment:

- 1 packet of mung beans
- 6 pots
- Soil for the 6 pots
- Nitrate fertilizer
- Tap water
- 6 beakers
- 1 digital scale
- Ruler (1 meter)



## Procedure

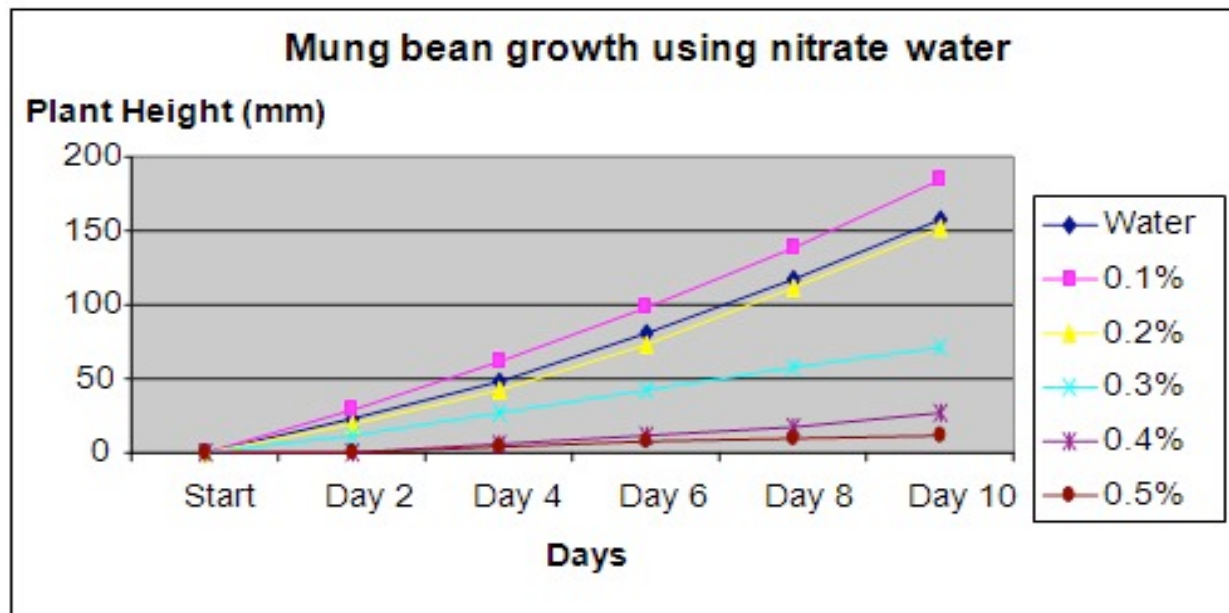
1. For this project, the independent variable is the concentration of nitrates in the water. The dependent variable is the growth of the beans. This is determined by measuring the average height of the three plants in each group. The constants (control variables) are the amount of water used, the amount of sunlight, and the type of plant used.
2. Fill the six pots with the same amount of soil. Place at least three mung beans in each pot. Once some of the beans start to germinate, remove any unwanted plants from the pot.
3. Label the six pots and six beakers as A to F. Mix nitrate solutions into the beakers according to the ratios below:
  - a. Beaker A will contain only tap water
  - b. Beaker B will contain 0.1 gram of nitrate with 100ml water (0.1%)
  - c. Beaker C will contain 0.2 gram of nitrate with 100ml water (0.2%)
  - d. Beaker D will contain 0.3 gram of nitrate with 100ml water (0.3%)
  - e. Beaker E will contain 0.4 gram of nitrate with 100ml water (0.4%)
  - f. Beaker F will contain 0.5 gram of nitrate with 100ml water (0.5%)
4. Water the beans and observe their growth for ten days. Measure their average height every two days and record them in the table on the next page.

## Recording Data

Have the students create a chart to mark their observations on each day.

Pot #	Nitrate Concentration	Start Plant Height (mm)	Day 2 Plant Height (mm)	Day 4 Plant Height (mm)	Day 6 Plant Height (mm)	Day 8 Plant Height (mm)	Day 10 Plant Height (mm)
A	Water						
B	0.1% nitrate						
C	0.2% nitrate						
D	0.3% nitrate						
E	0.4% nitrate						
F	0.5% nitrate						

Have the students express the data from the chart using a line graph like the following example:





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## Conclusion

You should discover that water containing nitrates do help the bean sprouts grow more quickly, but only to a certain extent. The plants grow more quickly with 0.1% nitrate solution (pot B). The growth rate falls in the other pots indicating an overdose of nitrates.

The excessive use of nitrate based fertilizers can cause nitrate to leak into our drinking waters. Levels of nitrates above 10ppm in drinking water is known to cause health problems. Nitrate leakage into ponds will increase the levels of ammonia, which is toxic to fish.

That said, this is a scientific experiment and results will vary slightly.



## Aquaponics: Food and Fish

During the *Contaminant* simulation, students learn about the impact humans have on their environment and specifically fish. In this project we will see how fish and people can work together to produce food. This project can be done either **before** or **after** the *Contaminant* simulation.

### Overview

Aquaculture and agriculture have been an important part of human society for many thousands of years. The pairing of these two technologies, termed aquaculture, has recently gained momentum on many island nations where land is scarce. Farmers grow a food fish, such as tilapia or catfish in symbiosis with crops. A small system comprised of a 1500 liter tank and 20 square meters of planting surface space can yield up to 15 kilograms of fish and 100 kilograms of vegetables per month. For many poor nations, where malnutrition is often a serious issue, the introduction of these systems could greatly improve health and increase life expectancy. If it can be proven that aquaponic systems significantly boost plant growth and vegetable production, farmers can be taught how to incorporate the systems into their current farming practices and world food production can increase, potentially staving off famine in many parts of the world.

### Objective

To determine whether plants grow better in soil or in fish ponds. The purpose of this experiment is to grow lettuce plants in two different conditions to determine whether plants grow more rapidly in soil or in water. Seeds will be started in both mediums and growth will be measured daily in overall plant health and number of leaves.

### What you'll need:

- 2- 20 gallon plastic tubs
- 10-15 feeder goldfish
- Styrofoam
- Lettuce seeds
- Paper towels
- Fish food





## Instructions:

1. Fill one plastic tub with clean water (preferably either distilled or conditioned to remove chlorine and other harmful chemicals found in tap water).
2. Fill the second plastic tub with potting soil or soil from the garden.
3. Place 10-15 feeder goldfish in the tub with water. The fish will require about a week to "cycle" the water. During this time expect that 25-75% of the fish will die. While you can start your seeds as soon as you add fish to the system, there will be very few nutrients in the water until the end of the first week. It is recommended that you start your seeds after this time.
4. Feed fish daily, following the instructions on the fish food.
5. Bore 10 dime-sized holes two inches apart in the piece of Styrofoam.
6. Tear the paper towel into ten strips.
7. Sink 1/4 of a strip into the water through one of the holes. Repeat for the other paper towels in the other holes.
8. Lay the rest of each paper-towel flat on top of the Styrofoam.
9. The paper towels will soak up water through the submerged end and become wet.
10. Place a lettuce seed on each towel.
11. Plant 10 seeds 2 inches apart 1/4 inch deep in the soil and water gently with tap water.
12. Water plants in soil daily. Do not fertilize.
13. Measure plant growth daily, using charts such as the one found at <http://www.education.com/science-fair/article/aquaponics/>.
14. To determine whether plants grow more quickly in water or in soil, compare the average growth rates from each group.



## Recording Data

Have the students create a chart to mark their observations on each day. A sample chart can be found at <http://www.education.com/science-fair/article/aquaponics/>

## Conclusion

This is the fun part! Using their observations, see if the students can come up with their own theory on how fish fertilize food.

## Credits

We'd like to thank Crystal Beran and our partners at Education.com for this activity.



## Mission Debrief Class Discussion Guide

Your students will encounter a wide variety of educational topics in their Dream Flight Adventures mission. After the mission is complete, use this guide to lead your students in a class discussion to explore these topics in more depth.

Consider dividing your students into small groups to discuss each question and then share their group's opinion with the entire class. Be sure to let every student's voice be heard. Dream Flight Adventure missions are multi-faceted, and each student is exposed to a slightly different part of the story. Let every student share their thoughts and experiences so the entire group can benefit.

Suggested thought-provoking questions for *Contaminant* are:

What is societies relationship with its environment?

What responsibilities do businesses have for protecting the environment?

What can individual citizens do to ensure a safer environment?

What are the costs and benefits of socially responsible behavior?

Was the Vikasa Corportion correct in saying that consumers are ultimately responsible for environmental regulation? Explain why or why not.

Nitrate in fertilizers can help things grow, but too much can damage the environment. Give other examples of positive things that have negative effects when used in excess.

If you could do the mission again, what would you do differently?

How do you relate to the characters, events, or issues that you encountered during the mission?

What parts of the mission were the most challenging?

What new things did you learn during the experience?



Name \_\_\_\_\_

## Multimedia Mission Memoir

Reflect on your recent Dream Flight Adventures mission and prepare a multimedia project that tells about your experience.

Be creative and draw upon any type of multimedia to create your project. Possible examples include posters, collages, short stories, PowerPoint presentations, dioramas, plays, podcasts, animations, videos, music, or comic books.

In your project, be sure to address the following questions:

What happened during your mission? Summarize the events.

What was your responsibility?

What did you do in your mission? What were the results?

If you could do the mission over again, what would you do differently?

How do you relate to the characters, events, or issues that you encountered during the mission?

What parts of the mission were the most challenging?

What parts of the mission were the most exciting?

What new things did you learn during the experience?

Did the mission change the way you think about anything? If so, what, and how has your perspective changed?

Be prepared to share your project with your peers and to describe why you chose the form of multimedia you did.