



Instructor Packet

Everything you need to make the most of your Dream Flight Adventures mission



Introduction

Dream Flight Adventures is an interactive learning experience teaches **teamwork, critical thinking, and problem solving** by blending **science, technology, and engineering** with **social studies, humanities, and the arts**. In other words, it's a **real-life "Magic School Bus."** It's part simulator, part game, and part theater—and it creates an out-of-this-world experience!

The Dream Flight Adventures experience centers around an educational adventure that takes place in one of our full immersion simulators. Groups of students enter the simulator, work together to operate it, and go on incredible adventures. They travel to outer space, under the sea, back in time, through the body—anywhere their imaginations take them!

Students become the captain and crew of these simulators and must **work together** to complete their missions, and their success or failure can depend on the action of a single person. Our missions are **completely flexible and open-ended**. Students must **think creatively**, and each action can change the outcome of the mission.

Dream Flight Adventures builds upon the 20+ years of experience of the Christa McAuliffe Space Education Center, which has enriched the lives of over 300,000 children. Our missions are designed around **Common Core and state standards** by professional educators and are brimming with educational content. And the kids love them! They're often described as "better than Disneyland."

Our adventures use science fiction and fantasy contexts to expose students to **standards-based curriculum**, thought-provoking **social and ethical issues**, and crucial **21st Century skills**. These unique adventures create a strong emotional experience. This helps imbue the concepts deeply in our students' memory, so the lessons they learn remain with them for their lifetimes.

How To Use This Packet

Whether you're a frequent visitor or taking your class to Dream Flight Adventures for the first time, this packet contains all the information you'll need to make the most out of a Dream Flight Adventures mission. It includes background information about the simulator and mission, instructions to prepare your students, and a variety of lesson plans and curriculum-based activities that supplement the mission. We want your experience with Dream Flight Adventure to be unforgettable from beginning to end.



Preparation Guide & Checklist

This packet is loaded with all sorts of materials to help you integrate your Dream Flight Adventures mission seamlessly into your existing lesson plans. That said, this packet can be a little daunting at times. Please take advantage of the following checklist to make sure you and your students are fully prepared for an unforgettable experience.

Getting Started

- ☐ Review the available missions at www.dreamflightadventures.com/missions and select one that matches your curriculum or seems interesting to your students.

Each mission has multiple curriculum touch-points. If you need help deciding which one is best for your students, please contact us via www.dreamflightadventures.com/contact. We're eager to help!

- ☐ Schedule your adventure by contacting us at www.dreamflightadventures.com/contact.

Preparing for the Adventure

- ☐ Start by reviewing the **Simulator Overview** section of this packet, which describes the simulator experience and curriculum.
- ☐ Pay particular attention to the *Student Stations* section, which describes the various roles your students will have during the adventure.

You may consider assigning these roles to your students in advance. The *Student Stations* section includes several pointers about what type of student is most appropriate for each role. For an even richer experience, allow your students to complete the *Infinity Knights Job Application* project in the **Lesson Plans & Curriculum-based Activities** section.

- ☐ Review the *Mission Introduction* for your mission with your students. This introduction is included in the **Mission Materials** section of this packet.

The *Pre-Mission Diary* project, included in the **Lesson Plans & Curriculum-based Activities** section of this packet, provides a great way for students to reflect on their upcoming adventure.



The “Big Day”

- ☐ Arrive on time to maximize your students’ time inside their simulator adventure.
- ☐ Watch the adventure unfold. While your students are engulfed in their fully immersive adventure, you are welcome to join the Dream Flight Adventures staff behind the scenes to watch your students in action.

Aftermath

- ☐ Hold a class discussion with your students. Review how the mission relates to material you’ve covered in your curriculum.

The *Mission Debrief Class Discussion Guide*, included in the **Lesson Plans & Curriculum-based Activities** section of this packet, contains several thought-provoking and mission-specific questions to help spur discussion.

- ☐ Allow your students to reflect on the adventure, record their experiences, and share what they have learned.

The *Multimedia Mission Memoir* project, included in the **Lesson Plans & Curriculum-based Activities** section of this packet, helps students think through their mission’s underlying concepts through the creative use of multimedia.

- ☐ Look ahead. Each of our missions blends a wide variety of topics. While you may have already addressed some of these topics in your lessons, others might still be down the road. Review the mission’s curriculum topics and prepare to reflect back on the mission in future lessons. The curriculum topics associated with the mission are listed in the *Mission Overview*, found in the **Mission Materials** section of this packet.



Simulator Overview

A quick look at the where the magic happens



Full Immersion Simulators

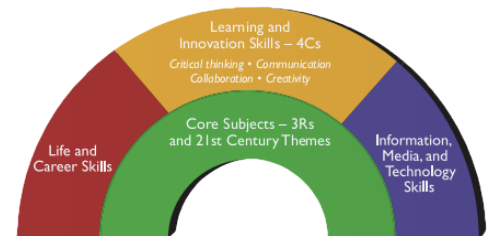
Dream Flight Adventure simulators are **immersive interactive environments** that throw students into the middle of epic stories. These stories are standards-based and built around core curriculum topics in science, social studies, technology, history, literature, and the arts.

Students become **active participants** in these stories, not passive observers. They must **learn how to operate the technology controls**, and then they must **apply that knowledge** in pursuit of their mission.

By virtue of the simulator's design, each mission—regardless of content—teaches over **forty 21st century skills**, which are organized below according to the [Framework for 21st Century Learning](#).

Life and Career Skills

- Leadership & responsibility
- Productivity & accountability
- Cross-cultural interaction
- Initiative & self-direction
- Flexibility & adaptability
- High-stakes decision making
- Giving & following directions
- Planning
- Cost/benefit analysis
- Scarce resources & tradeoffs
- Prioritization
- Law enforcement
- Medicine
- Forensics
- Emergency response



Learning and Innovation Skills

- Critical thinking
- Problem solving
- Creativity and innovation
- Teamwork & collaboration
- Written communication
- Verbal communication
- Situational analysis
- Interpersonal relations

Information, Media, & Technology Skills

- Computers
- Music & sound
- Information literacy
- Cybersecurity
- Cryptology
- Acceleration
- Waveforms
- Additive color mixing

Core Subjects and 21st Century Themes

- Anatomy
- Immune systems
- Genetics & mutation
- Drama
- Acoustics
- Vital signs
- Navigation
- Atmospheric conditions
- Summarization

Each mission also includes its own unique curriculum aligned to Common Core and state standards. These missions all includes several relevant **STEM topics**; topics from **history, literature, and the humanities**; and thought-provoking **social or ethical issues**.



Student Stations

During a Dream Flight Adventure mission, groups of students must work together as a team to accomplish a challenging objective. Each student is assigned a station and has individual responsibility for his or her role, which contains several important tasks. Our simulators support groups of 4-16 students at a time. The stations are:

Captain

The Captain is responsible for making all command decisions and ensuring that the mission is completed successfully. The Captain also serves as the official representative of the Infinity Knights.

Embedded Concepts:

Leadership, verbal communication, high-stakes decision making, group cohesion and morale

Selection Suggestions:

The Captain should be a student who can speak clearly and think on his or her feet. Level-headed students with strong leadership skills tend to make good Captains.

First Officer

The First Officer is responsible for ensuring that the captain's orders are carried out. The First Officer will assume command in the event that the Captain is disabled.

Embedded Concepts:

Situational analysis, teamwork, leadership, summarization, oral communication, multitasking

Selection Suggestions:

The First Officer should be a student who interacts easily with his or her peers, follows directions, and exhibits strong leadership abilities. Students who pay close attention to detail tend to make good First Officers.



Second Officer

The First Officer is responsible for ensuring that the captain's orders are carried out. The First Officer will assume command in the event that the Captain is disabled.

Embedded Concepts:

Situational analysis, teamwork, leadership, summarization, oral communication, multitasking

Selection Suggestions:

The Second Officer should be a student who interacts easily with his or her peers, follows directions, and exhibits strong leadership abilities. Students who pay close attention to detail tend to make good Second Officers.

Pilot & Navigator (1 or 2 students, depending on the simulator)

The Pilot and Navigator are responsible for navigating the ship. This involves understanding the current location, charting a course to the destination, and steering the ship.

Embedded Concepts:

Cartography, 2D representations of 3D space, compass directions, velocity and inertia, acoustics

Selection Suggestions:

The Pilot should be a student with strong spatial perception skills and the ability to multitask well. Students who play video games in their spare time and have a good sense of direction tend to make effective Pilots. However, hyperactive students are **discouraged** from being Pilots.

Biologist

The Biologist is responsible for mutating and controlling the onboard Chimera, a genetically modifiable creature that can be adapted to the needs of the mission.

Embedded Concepts:

Genetics, mutation, tradeoff of scarce resources, zoology, addition and subtraction

Selection Suggestions:

The Biologist should have a relatively strong number sense. Students with a love for plants or animals tend to make good Biologists.



Physicist

The Physicist is responsible for operating the ship's Versabeam, an energy beam with several different abilities. The physicist is also in charge of strategically allocating the ship's power supply.

Embedded Concepts:

Planning, tradeoff of scarce resources, effects of radiation, multitasking

Selection Suggestions:

The Physicist should be a student with quick reaction skills and a strong understanding of cause-and-effect relationships. Students who are interested in science tend to make good Physicists.

Engineer (2x)

The Engineers are responsible for making sure that all ship systems function properly. This involves repairing damaged systems and creating ammunition for the ship's weapons and Versabeam.

Embedded Concepts:

Following instructions, pattern recognition, additive color mixing, planning, multitasking

Selection Suggestions:

The Engineers should be strong readers who are good at following directions. Students with good attention to detail and interest in mechanical processes tend to make good Engineers.

Hacker

The Hacker is responsible for hacking into enemy computers. The Hacker is also in charge of strategically allocating the ship's computer capacity.

Embedded Concepts:

Technology literacy, computer engineering, artificial intelligence, tradeoff of scarce resources

Selection Suggestions:

The Hacker should be a student who is patient and pays close attention to detail. Students interested with computers and gaming tend to make good Hackers.



Gunner

The Gunner is responsible for using the ship's weapon systems to protect the crew from threats. The Gunner is also in charge of transforming the ship into different forms, depending on the needs of the mission.

Embedded Concepts:

Planning, tradeoff of scarce resources, timing, cause and effect

Selection Suggestions:

The Gunner should be a student with quick reaction skills and a strong understanding of cause-and-effect relationships. Level-headed students tend to make good Gunners. Hyperactive or aggressive students are **discouraged** from being the Gunner.

Security Chief

The Security Chief is responsible for ship wide safety and security. This involves controlling the ship's shield, stealth, and cybersecurity systems.

Embedded Concepts:

Planning, strategic thinking, tradeoff of scarce resources, IT security, leadership

Selection Suggestions:

The Security Chief should be a student who is a good team player with leadership skills. Students who are self-starters and pay close attention to detail tend to make good Security Chiefs.

Security Guard (2x)

The Security Guards are responsible for maintaining order and safety within the ship. They defend the ship from invaders, investigate shipboard disturbances, and respond to security alerts.

Embedded Concepts:

Investigative inquiry, reporting, law enforcement, teamwork, forensics

Selection Suggestions:

The Security Guards should be students who are good at following directions and have strong writing skills. Outgoing students tend to make good Security Guards.



Doctor

The Doctor is responsible for the well-being of the crew. This involves everything from maintaining crew morale to performing emergency medical operations.

Embedded Concepts:

Human anatomy, medicine, toxins, healthcare, blood cells

Selection Suggestions:

The Doctor should be a student who is comfortable multitasking and pays close attention to detail. Students with interest in biology tend to make good Doctors.

Communications

The Communications Officer is responsible for incoming and outgoing communications, both written and verbal. This also includes decrypting encoded messages.

Embedded Concepts:

Written communication, waveform amplitude and frequency, encryption

Selection Suggestions:

The Communications officer should be a student with excellent reading and writing skills. Students with good spatial perception and a passion for reading tend to make good Communications officers.

Deck Chief

The Deck Chief is also responsible for monitoring internal and external sensors and performing detailed scans of the objects the ship encounters.

Embedded Concepts:

Forensics, 2D representations of 3D space, pressure, atmospheric conditions

Selection Suggestions:

The Deck Chief should be a student who is comfortable multitasking and pays close attention to detail. Students with strong reading and writing skills tend to make good Deck Chiefs.



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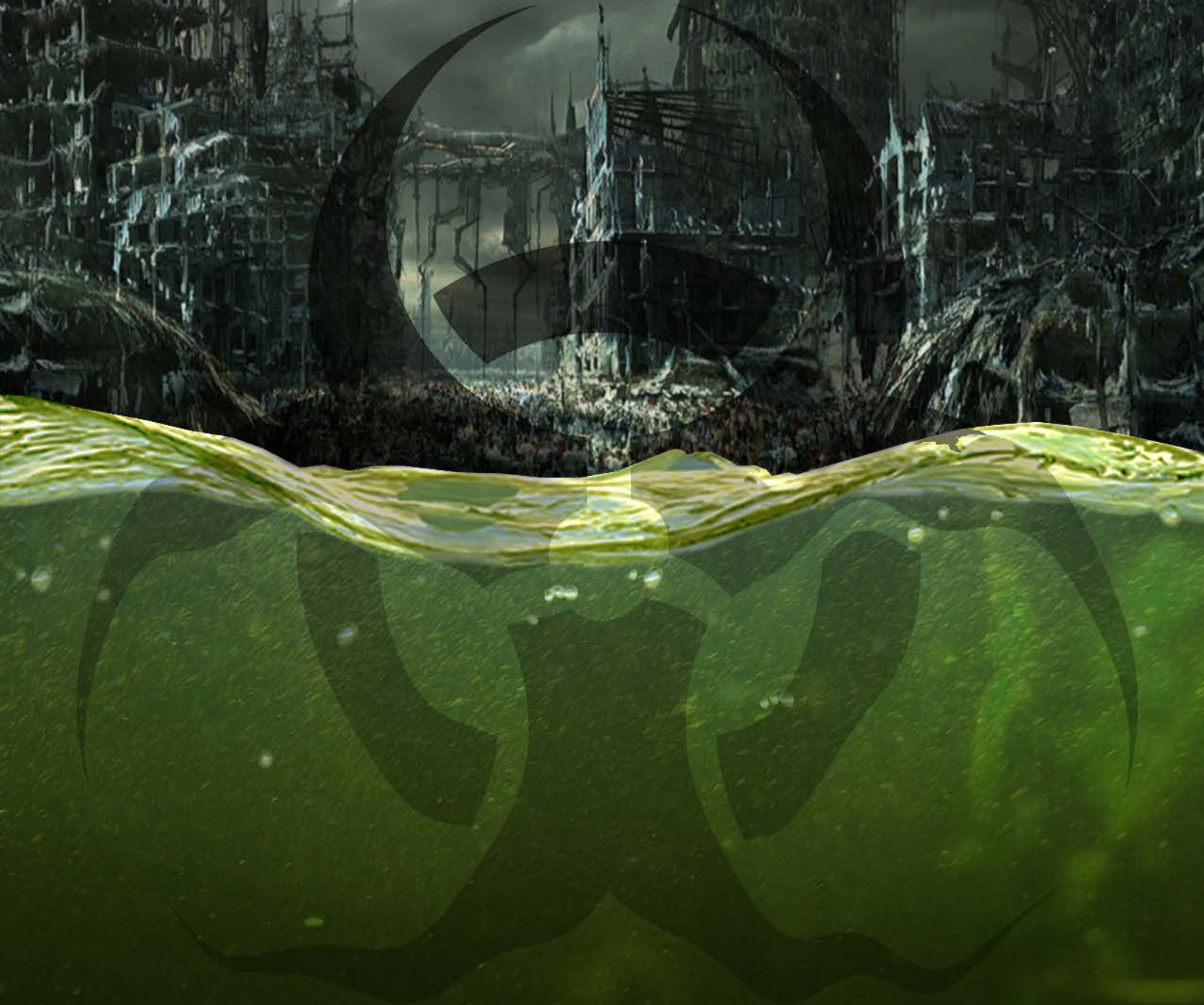
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Mission Materials

Details about your specific mission

CONTAMINANT

What secrets do these waters hide?



SOCIAL RESPONSIBILITY OF ORGANIZATIONS – AQUATIC ECOSYSTEMS AND FOOD CHAINS –
RECYCLING, WASTE DISPOSAL, AND THE ENVIRONMENT – INTERCONNECTEDNESS OF LIVING THINGS –
SCIENTIFIC MEASUREMENTS AND OBSERVATIONS – CONTAMINATION AND PURIFICATION –
CHARACTERISTICS OF AQUATIC LIFE – ACIDITY AND ALKALINITY



CONTAMINANT

Mission Overview

Sudura City is an isolated city in the middle of a large forested region. Despite being far from any other city, it has recently begun to grow rapidly because Vikasa Corporation has opened a fertilizer factory along the shore of Upahara River, which resulted in hundreds of new workers moving into the region.

Recently Sudura City had an unexplained outbreak of the Chandipura virus, a dangerous disease that infects children, causing comas and even death. So far about one thousand children have been infected, many of whom have died. The Chandipura virus is transmitted by Sandflies, a small type of biting midge whose populations are unusually high this year, for unknown reasons. To make matters worse all the fish have disappeared, also for unknown reasons, causing a severe food shortage.

The underlying cause behind all this is believed to be tied to the Upahara River, but there's a problem. Vikasa Corporation purchased the property rights to the entire river when they opened their factory, and they are not allowing anyone to enter it, even despite the emergency conditions. Having no alternative, the governor of Sudura City has called upon the Infinity Knights—the renowned protectors and peace and justice throughout the universe—to investigate the source of this strange plague and the disappearance of the fish and to save their city before it's too late.

Standards-Based Curriculum

Aquatic ecosystems & food chains
Interconnectedness of living things
Contamination & purification
Social responsibility of organizations

Recycling, waste disposal, and the environment
Acidity and alkalinity
Scientific measurements & observations
Characteristics of aquatic life

Higher Order Thinking

What is societies relationship with its environment?
What are the responsibilities of businesses and other organizations for protecting the environment?
What can individual citizens do to ensure a safer environment?
What are the costs and benefits of socially responsible behavior?
Do the ends justify the means?



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CONTAMINANT

Mission Introduction

Biohazard alert! A terrible disease is spreading and no one knows why. In order to stop this terrible plague some background information is required:

Sudura City is a new and growing city in the middle of Vana, a large forested region. It is quite isolated, with the nearest neighboring city over 1,000 kilometers away. However, Sudura City has recently begun to grow rapidly because Vikasa Corporation has opened a fertilizer factory along the shore of Upahara River, which resulted in hundreds of new workers moving into the region.

Things were going very well for Sudura City until recently when it began experiencing a sharp increase in cases of the Chandipura virus, a dangerous disease which infects children, beginning with flu-like symptoms, but progressing to cause comas and death. So far about one thousand children have been infected, many of whom have died. The Chandipura virus is transmitted by Sandflies, a small type of biting midge whose populations are unusually high this year, for unknown reasons. To make matters worse all the fish have disappeared, also for unknown reasons, causing a severe food shortage.

The underlying cause behind all this is believed to be tied to the Upahara River, but there's a catch. Vikasa Corporation purchased the property rights to the entire river when they opened their factory and they are not allowing anyone to enter it, even despite the emergency conditions. They have threatened to use force against anyone attempting to enter their private property.

Having no alternative, the governor of Sudura City has called upon the Infinity Knights—the renowned protectors and peace and justice throughout the universe—to investigate the source of this strange plague and the disappearance of the fish and to save their city before it's too late.

Your mission is to shrink your vessel, enter the Upahara River, and determine the cause of this terrible plague. Your ship is equipped with an advanced stealth system, which will disguise the ship as a fish, allowing you to explore the river undetected. Be careful, but move quickly. Time is running out!



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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/. 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.



Name _____

Pre-Mission Diary

Read the *Mission Introduction* for your upcoming Dream Flight Adventures mission. Write a journal entry describing how you feel about the mission. What do you think it will be like? What will you do? What challenges will you face, and how do you plan on handling them? Use the space below or a separate sheet of paper if you need more room.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



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.

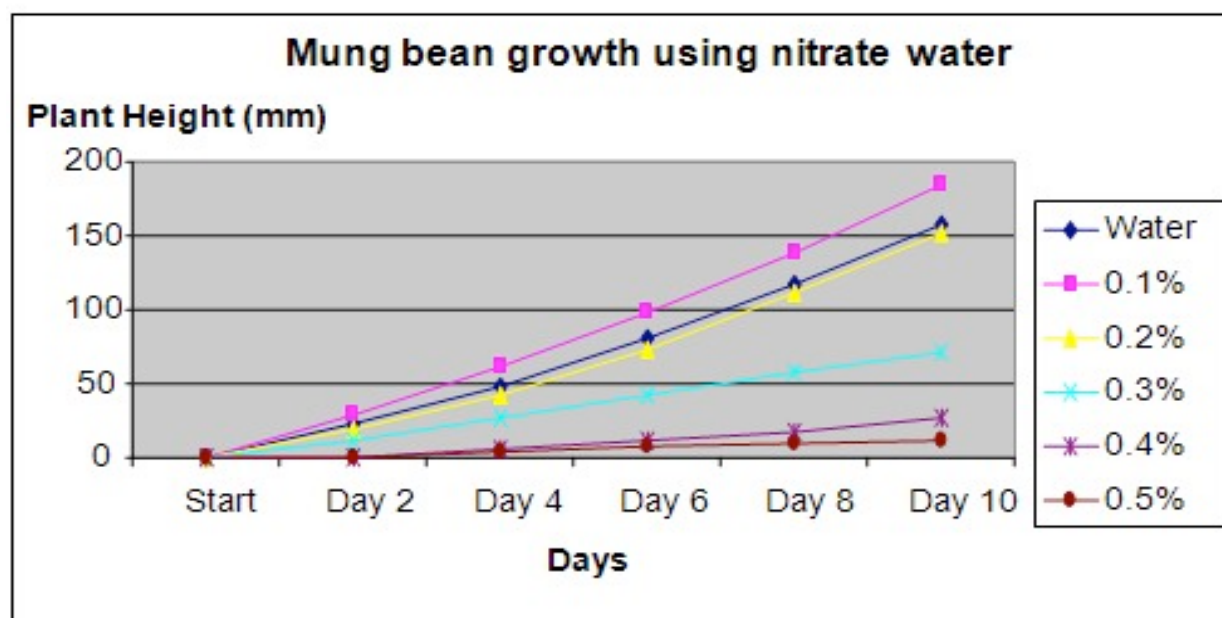


Recording Data

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:





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.



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Enrichment Materials

Resources for deeper inquiry and advanced students



The following third-party resources are recommended as enrichment materials for gifted or advanced students.

Aquatic Ecosystems & Food Chains

Videos

Aquatic Ecosystems

<http://www.youtube.com/watch?v=kL-9TB4qAho>

Human Effect of Aquatic Food Chains

<http://www.youtube.com/watch?v=roRQQZIGlvM>

National Geographic: Marine Food Webs

<http://video.nationalgeographic.com/video/education-videos/edu-ocean3-foodweb/>

Educational Portal: Ecosystems of Oceans and Freshwater: Biological Diversity and Water

<http://education-portal.com/academy/lesson/ecosystems-of-oceans-and-freshwater-biological-diversity-and-water.html#lesson>

Websites

National Geographic: Freshwater Aquatic Ecosystems: Connecting, Water, Land, People and Wildlife

<http://environment.nationalgeographic.com/environment/freshwater/aquatic-ecosystems/>

Scholastic: Study Jams: Videos and Quizzes

<http://studyjams.scholastic.com/studyjams/jams/science/ecosystems/aquatic-ecosystems.htm>

Tutor Vista: Aquatic Food Chains

<http://www.tutorvista.com/science/aquatic-food-chains>



Teach Ocean Science: Aquatic Food Webs

http://www.teachoceanscience.net/teaching_resources/education_modules/aquatic_food_webs/get_started/

Additional Instructor Resources

Penn State University: Water Lesson Plans

<http://ecosystems.psu.edu/youth/sftrc/lesson-plans/water>

Discovery Education: Aquatic Habitat

<http://www.discoveryeducation.com/teachers/free-lesson-plans/aquatic-habitats.cfm>

Sarah Anderson: Aquatic Lesson Plans and Handouts

<http://sarah-anderson.net/aslp.htm>

Scientists in Residence Program: Aquatic Ecosystems

<http://scientistinresidence.ca/science-lesson-plans/aquatic-ecosystems/>

Projects

Build a Marine Food Web

<http://www.sciencelearn.org.nz/Contexts/Life-in-the-Sea/Teaching-and-Learning-Approaches/Build-a-marine-food-web>

Making Your Own Aquatic Ecosystem

http://www.ehow.com/list_5930956_ecosystem-science-projects.html



Contamination & Purification

Videos

Water Purification Process: King Street Water Treatment Plant Tour

<http://vimeo.com/65647674>

Websites

NRDC (Natural Resources Defense Council): Water Pollution Facts

<http://www.nrdc.org/water/>

EPA (Environmental Protection Agency): Water Contaminants

<http://water.epa.gov/drink/contaminants/>

Science Daily: Water Purification

http://www.sciencedaily.com/articles/w/water_purification.htm

Princeton University: Guide to Water Purification

<http://www.princeton.edu/~oa/manual/water.shtml>

Additional Instructor Resources

National Geographic: Contaminants in the Water Cycle

http://education.nationalgeographic.com/archive/xpeditions/lessons/14/g912/tgsouhegan.html?ar_a=1

Chewonki: Water Pollution

http://www.chewonki.org/cleanwater/water_pollution.asp

Utah State University: Water Pollution Lesson Plans

<http://extension.usu.edu/waterquality/htm/educator-resources/lessonplans/wp/>



CIESE Collaborative Project: Water Purification

<http://www.ciese.org/curriculum/purification/lessons.html>

Seametrics: Water Lesson Plans

<http://www.seametrics.com/water-lesson-plans>

AAAS: SciencNetLinks: Ecosystem Services- Water Purification

<http://sciencenetlinks.com/lessons/ecosystem-services-water-purification/>

Projects

Build Your Own Watershed

[http://water.epa.gov/learn/kids/drinkingwater/
activity_grades_9-12_buildyourownwatershed.cfm](http://water.epa.gov/learn/kids/drinkingwater/activity_grades_9-12_buildyourownwatershed.cfm)

Role of Plants in Water Filtration

[http://water.epa.gov/learn/kids/drinkingwater/upload/
2005_03_10_kids_activity_grades_4-8_plantsinwaterfiltration.pdf](http://water.epa.gov/learn/kids/drinkingwater/upload/2005_03_10_kids_activity_grades_4-8_plantsinwaterfiltration.pdf)

Building a Model Aquifer

[http://water.epa.gov/learn/kids/drinkingwater/upload
2009_04_29_kids_activity_grades_9-12_buildingamodelaquifer.pdf](http://water.epa.gov/learn/kids/drinkingwater/upload/2009_04_29_kids_activity_grades_9-12_buildingamodelaquifer.pdf)

Recycling, waste disposal, and the environment

Videos

Wast Management Single Stream Recycling

[http://www.youtube.com/watch?v= GP3JuiX5BY](http://www.youtube.com/watch?v=GP3JuiX5BY)

HowStuffWorks: Cell Phone Recycling

<http://electronics.howstuffworks.com/13-how-cell-phone-recycling-works-video.htm>



Wast Management: Think Green

<http://www.wm.com/thinkgreen/index.jsp>

Websites

EPA (Environmental Protection Agency): Reduce, Reuse, Recycle

<http://www2.epa.gov/recycle>

HowStuffWorks: How Recycling Works

<http://science.howstuffworks.com/environmental/green-science/recycling.htm>

NRDC (Natural Resources Defense Council): Recycling 101

<http://www.nrdc.org/recycling/>

Guide Network: Water Pollution Guide: What Can You Do?

<http://www.water-pollution.org.uk/preventingyou.html>

NRDC (Natural Resources Defense Council): 10 Simple Ways You Can Help Reduce Pollution and Runoff

<http://www.nrdc.org/water/pollution/gsteps.asp>

eSchool Today: Cool Facts and Tips on Water Pollution

<http://eschooltoday.com/pollution/water-pollution/prevention-of-water-pollution.html>

EPA (Environmental Protection Agency): What You Can Do to Prevent NPS (Non Point Source) Pollution

<http://water.epa.gov/polwaste/nps/whatudo.cfm>

Additional Instructor Resources

Department of Environmental Protection Pennsylvania: Recycling Lesson Plans

http://www.dep.state.pa.us/dep/deputate/enved/rec_lessons/contents.htm



Recycle Guys: Recycle Lesson Plans and Activities

<http://www.recycleguys.org/lessonplans.html>

Science Kids: Recycling Activities

<http://www.sciencekids.co.nz/lessonplans/earth/recycling.html>

Acidity and alkalinity

Videos

NOAA (National Oceanic and Atmospheric Administration): Ocean Acidification

http://www.ioos.noaa.gov/ocean_acidification/welcome.html

Websites

Virginia Community College System: Introduction to Alkalinity

http://water.me.vccs.edu/exam_prep/alkalinity.html

Free Drinking Water: Alkalinity of Drinking Water Explained

<http://www.freedrinkingwater.com/water-education2/74-alkalinity-water.htm>

U.S. Geological Survey: pH -- Water Properties

<http://water.usgs.gov/edu/ph.html>

EPA (Environmental Protection Agency): What is pH? Introduction to pH and the pH scale.

<http://www.epa.gov/acidrain/measure/ph.html>

Free Drinking Water: pH Values of Water Completely Explained

<http://www.freedrinkingwater.com/water-education/quality-water-ph.htm>

National Geographic: Ocean Acidification

<http://ocean.nationalgeographic.com/ocean/critical-issues-ocean-acidification/>



Additional Instructor Resources

LaMotte: Outdoor Education Lesson Plans: Water Quality, Water Treatment, Water pH and more.
<http://www.lamotte.com/en/environmental-education-resources/lesson-plans>

Salt River Project: Lesson plan: How Do We Know What is Healthy Water?
<http://www.srpnet.com/education/pdfx/RawWater.pdf>

Projects

Middle School Chemistry: Testing pH Levels
<http://www.middleschoolchemistry.com/lessonplans/chapter6/lesson8>