Science for Lunch

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Overview

The "Science for Lunch" curriculum unit will span from the school cafeteria to the science lab with hands-on experiments and activities that emphasize the relationships between the food found in school lunches, and teaching the students science. The material is focused on foods in the school lunch system but also touches on some of their welfare stigma based implications.

Although I suggest that the unit be taught in connection with other units, it can be used in any order, either independently or as part of a series. The core audience is middle school students in the science center. Utilizing vocabulary -building strategies it is recommended that students become familiar with key vocabulary terms before beginning each lesson.

These activities are designed for use with the list of definitions provided in each unit. Students will trace the ingredients of a meal back to their origins from the soil or the factory and then openly embrace the new found excitement about the connections between the common food they eat daily, to the plant biology, to cell structure and ultimately appreciate them both. All too often the students want to know how the information they are learning relates to their daily lives.

If students understand the biology of the foods they eat (i.e. cell structure, plant biology, nutritional factors etc.) perhaps they will be more accepting of this food and less influenced by social factors, such as the stigma attached to accepting welfare, or food not purchased directly by their parents.

I believe this unit on science for lunch will come alive for students, and become an extension for enrichment quite well.

Rationale

The rationale designed for this unit is inspired by the belief that if students are able to understand the biological connection of the foods they eat, the cell structure, life processes and

their commonalty to these organisms, they will be more interested and appreciative of the food they are given to eat. Many urban students in my school currently view the Title I Food Program as "welfare food" and are stigmatized by having to except it. They are often ridiculed because their parents are unable to provide the more popular lunches such as hoagies, steak sandwiches, and unhealthy snack choices from the local stores.

This curriculum will scientifically analyze such items as hamburger, bread, Jell-O and milk, which are routinely offered in the Title I school lunch program for their molecular, plant structure and chemical impact. Lessons will provide activities and experiments to capture the interest of middle years students so they will better understand the benefits of the foods they consume.

This curriculum will meet Common Core Standards of Pennsylvania for grades six through eight in the areas Chemistry and Biology. The School District of Philadelphia follows the nation in establishing the goal that all students should achieve scientific literacy. An understanding of science makes it possible for everyone to share in the richness and excitement of comprehending the world around them.

Knowledge from the content areas of Biology, Physics, and Chemistry is a necessary part of every student's education if they are to meet the challenges of an ever-changing world. Each area offers very specific intertwined content that is makes for a comprehensive school curriculum.

Objectives

The objective is for the students to read, understand, and respond to informational text – with an emphasis on comprehension, vocabulary acquisition, and making connections among ideas and between texts with a focus on textual evidence.

The students will be able to:

- use measurement units and tools in order to provide data for science experiments.
- read a thermometer in order determine the temperature in degrees Celsius and degrees Fahrenheit.
- use a ruler or a meter stick in order to determine the length of an object in inches and centimeters.
- use pictorial representation of a scale in order to determine the weight of a given object in pounds and kilograms.
- analyze information in a given format in order to organize, interpret and display data in a table, take it apart and dissect the data to form a hypothesis.

Chemical

Chemistry can be defined as the study of matter and how that matter undergoes change. By using hands on experiments, the intension is to capture and maintain the interest of the students in the classroom.

Molecular

Often students learn best if they are actively engaged in activities that are closely linked to understanding important science concepts. Having the ability to connect with concepts of everyday living lends to a better understanding of complex concepts. Having the ability to look at the food they eat through the lens of a microscope as a living-breathing organism is a great way to understanding and appreciating there's life all around us.

Biological

My intention is to delve deeply into a minds-on discussion or worksheet activity to challenge students and to cultivate understanding of biological concepts using logical higher order thinking experiment and observational data referenced in the Common Core Standards used in Public Schools.http://static.pdesas.org/content/documents/PA_Common_Core_Standards_for_Reading_in_Science_And_Technical_Subjects_8-7-12.pdf

Strategies

One of the main strategies I will implement will be hands-on activities. Students usually remain engaged when a multi-sensory approach is used to enhance their learning experience in the Science Lab.

A key focus in designing this curriculum is towards students with special needs. These students often require specially designed instruction to meet most curricular-based goals. Middle years students are quickly bored and often start to engage or participate in off task behaviors when not properly motivated . In some cases, these students have developmental disabilities that challenge their academic progress.

Some general strategies:

1. General and Domain Specific Vocabulary Words

   A list of key science terms that are determined essential in order for the student to master the objective. The students will be encouraged to use the dictionary to further their understanding of the terms pertinent to the lesson. This vocabulary list with definitions can be offered prior to the lesson for students with special designed instructions.

2. Gradual Release:

   The students benefit from being gradually released from dependence upon the teacher's directed knowledge by using their own knowledge. The students will

discuss among themselves in group discussion to facilitate problem solving techniques within the objective. It's essentially a student -guided strategy to problem solving.

3. Teacher Model:

   The teacher demonstrates the experiment almost like "Show-N-Tell" as to what the students should know and be able to do while students look and listen actively without taking notes.

4. Guided Practice:

   Utilizing this strategy the teacher and the students work together. In a call response method like a "I do, you do" sequence. This is performed step by step until the end of the lesson.

5. Cooperative Practice:

   Students are asked to work in small groups or pairs, to demonstrate developing knowledge of the objective. The teacher uses the opportunity to circle the room assessing and assisting as many students as possible with special attention to struggling learners

6. Independent Practice:

   Students are asked to work independently to demonstrate knowledge of the objective to determine what students know and can do without assistance from the teacher, teacher assistant, or their peers. The students will have access to the finished product to use as an example. If students are unsuccessful in this phase, then the students will continue to benefit from exposure from repetition.

7. Homework:

   Students would benefit from the completed homework assignments that would be teacher designed with the prerequisite skill necessary to demonstrate mastery of the objective. This is also an assessment tool for the teacher.

8. Differentiated instruction and assessment

   For effective teaching that involves providing different students with different styles of learning by using different constructing making sense of ideas; and developing teaching materials and assessment measures so that all students within a classroom can learn through games, videos, word search, puzzles and various forms of technology regardless of differences in ability

Classroom Activities

Lesson Plan Format

Lessons1, 2 and 3

Author: Juan Austin

Based on lesson by: Dr. Ingrid Waldron, Dr. Mecky Pohlschroder, and Jennifer Doherty (2004)

Date created: June 13,2014

VITAL INFORMATION

Subject(s) Biology and Chemistry

Topic or Unit of Study: How environmental factors influence the growth of molds

Grade/Level: 6, 7 and 8

Start and End Time: 45 minutes per session

IMPLEMENTATION

Concept Molds, mushrooms and other fungi seem like plants because they don't move. However, fungi do not photosynthesize, so they cannot make their own food. Molds and other fungi often grow on decaying plant material, such as fruit, bread, and leaves. The decaying plant material provides the food for molds to grow.

Objectives:

The students will be able to:

- follow precisely a multistep procedure to carry out experiments or carry out technical tasks.
- describe a controlled experiment that will test for the effects of a physical feature of the environment, such as moisture level, on the rate of decomposition by soil microbes.
- describe some of the physical conditions that are favorable or unfavorable to microbial decomposers.

MATERIALS AND RESOURCES

- **Instructional Materials**: plain gelatin powder (contains protein)
- orange Jell-O powder (contains similar protein plus sugar and flavoring)
- sugar
- small cups of prepared gelatin and Jell-O (made from gelatin or Jell-O powder plus water)
- clean Q-tips for transferring mold
- aluminum foil and plastic wrap to cover cups
  mold from bread, cheese, etc. (Please bring some from home if possible.)

PROCEDURE

Introduction: Green plants can make their own food from sunlight, air, and water. This process is called photosynthesis. In contrast, animals must eat to get food. Molds grow well at room temperature, and many can also grow in the lower temperature of home refrigerators. Sometimes, when you leave food in the refrigerator or the kitchen too long and the food spoils, you can see mold growing on it. This happens because molds reproduce by spores that are light enough to float in the air – mold spores in the air in your kitchen will settle on food and then start to grow. ***You (students) will come up with a hypothesis and design an experiment to answer one or more of the following questions:***

1. Does mold grow faster at cold temperatures (in the refrigerator) or at warm temperatures (in the room), or the same at both temperatures?
2. Does mold grow faster in the light or in the dark, or the same in both light and dark?
3. Does mold grow faster with just protein for food or with protein and sugar for food?
4. Can mold grow on a substance that does not contain water?
5. Does the air in your classroom contain mold spores?

Teacher Model: The teacher designs and demonstrates an experiment to answer one of the above questions: ***The students are to actively listen and observed without taking notes***.

1. **Developmental Activities**
   http://youtu.be/H8WJ2KENlK0

   Science (Inquiry and Design)

   Students will construct a hypothesis about the question your group has decided to try to answer.

   Reading, Writing, Speaking and Listening (punctuation, capitalization, spelling and grammar)

   Students will prepare a report on your experimental hypothesis, results, and interpretation for the rest of the class

Mathematics, (measurement) Observe, measure and record the changes in the mold.

Guided Practice:

The students will be asked in this laboratory to design an experiment to evaluate how environmental factors influence the growth of various molds. This will be done in a large group setting. The teacher is to use this opportunity to assess as many students as possible with special attention to the struggling learners. If students are unsuccessful at this phase, the teacher can use this as an opportunity to model another lesson.

Cooperative Practice:

Students are asked to work in groups of two to demonstrate developing knowledge of the objective. The teacher uses the opportunity to circle the room assessing and assisting as many students as possible with special attention to struggling learners.

Independent Practice:

Students are asked to work independently to demonstrate knowledge of the objective to determine what students know and can do without assistance from the teacher, teacher assistant, or peers. If students are unsuccessful, in this phase, students may better benefit from exposure to the general and domain specific vocabulary and/or a second round of the gradual release process.

Homework:

The students will be asked to duplicate their theory and design an experiment using other food items at home and record the results.

Closure

(Reflections on the Day) Ask the students:

-- Why can fungi not make their own food? (They cannot photosynthesize)

-- Molds reproduce by spores that are light enough to float in the air, so explain further.

-- Explore experimental design, including the concept of a control. why do they have to plan to have a pair of experimental conditions that differ in only one characteristic? Why is replication of an experiment needed?

-- Have the students interpret results, including the similarity and difference between replicates within each condition (reminding them of the reason replicates are needed),and specifically, differences in mold growth related to differences in experimental conditions.

-- If there is time, summarize experimental results on a succinct poster for sharing.

-- Define the best conditions for storing food, based on their results and additional information (if possible from other groups in their class)

ASSESSMENT

Assessment/Rubrics	Rubrics: Approaches to Learning. Did the students do the following: initiative and curiosity, engagement and persistence, reasoning and problem solving, flexibility, risk taking and responsibility, imagination, creativity and invention.
Assessments	Rate each report on the groups' experimental hypothesis, results, and interpretation for the rest of the class.
Accommodations for	
Individual Differences	preferential seating, modeling, simplified directions, reading directions, extra time, pairing visual with verbal information, pre-teaching vocabulary and concepts, repeated and simplified directions and chunking information
Self Evaluation/Reflection	Reflect on how the students work with one another.
	Where they attentive or off task?
	How did they demonstrate learning?
	Did it look and sound like a learning environment?
	Did the students relate any experiences during the Introduction activities?
	What percentage of participation did I receive from the class during closing activities?

Lessons 4, 5 and 6

Author: www.carrot museum.com

Based on lesson by: Hands on experiments

VITAL INFORMATION

Subject(s) Biology

Topic or Unit of Study: What can students learn from experimenting with a carrot?

Grade/Level: 6, 7 and 8

Start and End Time: 45 minutes per session

IMPLEMENTATION

Concept

Based on the observations and results of their experiments, students will generate testable questions about decomposition by soil microbes.

Objective: The students will be able to:

- follow precisely a multistep procedure to carrying out experiments or carrying out technical tasks.
- describe a controlled experiment that will
- test for the effects of a physical feature of the environment, such as the temperature or moisture level.
- describe some of the physical conditions that are favorable or unfavorable to contribute to changes in the carrots.

General and Domain Specific Vocabulary Terms:

1. *Soil*
2. *Osmosis,*
3. *Experiments,*
4. *Carrot root,*
5. *Absorption*
6. *Cross section.*

MATERIALS AND RESOURCES

PROCEDURE

Introduction: The students will engage in experiments on the carrot root, test carrot absorption and carrot root cross section.

Teacher Model: The teacher designs and demonstrates an experiment resulting in the final result of the experiment.

Developmental Activities

The web site carrot museum.com has jokes, puzzles brain teasers and games to peak student interest.

Science (Inquiry and Design)

When a carrot grows in the ground, its cells transfer the water in the ground up to the stalks and leaves above ground by a process called osmosis. You can see osmosis at work in this activity. Osmotic pressure has pushed water up into the straw. Osmotic pressure is a kind of pump for plants, helping water to move across cell walls.

Reading, Writing, Speaking and Listening (punctuation, capitalization, spelling and grammar)

Students will prepare a report on your experimental hypothesis, results, and interpretation for the rest of the class

Mathematics, (measurement)

Students will observe, measure and record the changes in the carrots samples

Guided Practice:

The students will be asked in this laboratory to design an experiment to evaluate how environmental factors influence the growth of carrots. This will be done in a small group setting. The teacher is to use this opportunity to assess as many students as possible with special attention to the struggling learners. If students are unsuccessful at this phase, the teacher can use this as an opportunity to model another lesson.

Cooperative Practice:

Students are asked to work in groups of two to demonstrate developing knowledge of the objective. The teacher uses the opportunity to circle the room assessing and assisting as many students as possible with special attention to struggling learners.

Independent Practice:

Students are asked to work independently to demonstrate knowledge of the objective to determine what students know and can do without assistance from the teacher, teacher assistant, or peers. If ,the students are unsuccessful in this phase, than students may benefit from exposure to the general and domain specific vocabulary and/or a second round of the gradual release process.

Homework:

The students will be asked to duplicate their theory and design with an experiment using other food items at home and record the results.

Closure:

The students must demonstrate the understanding that a carrot itself is really what we call a "taproot." This is a big and main root that grows straight down into the ground. Along its sides, little roots grow, too. Some trees, plants and bushes have a major taproot;

others do not. Roots are really important! They hold a plant in place when it is windy. They keep soil around the plant. And most of all, roots conduct water from the soil up to the plant.

ASSESSMENT

Assessment/Rubrics Rubrics: Approaches to Learning. Did the students do the following: Display initiative and curiosity? Were they engaged and persistent with reasoning and problem solving? Was there flexibility within the group and appropriate risk taking ,while showing appropriate responsibility with imagination.

Assessments Rate each report on the group experimental hypothesis, results, and interpretation for the rest of the class.

Accommodations for Individual Differences preferential seating, modeling, simplified directions, reading directions, extra time, pairing visual with verbal information, pre-teaching vocabulary and concepts, repeated and simplified directions and chunking information

Self Evaluation/Reflection Reflect on how the students work with one another.

- Where they attentive or off task?
- How did they demonstrate learning?
- Did it look and sound like a learning environment?
- Did the students relate any experiences during the Introduction activities?
- What percentage of participation did I receive from the class during closing activities?

Think-Pair-Share Strategy

A strategy designed to differentiate instruction by providing students' time and structure for thinking on the topic; "What is your favorite /least favorite food?" Which should enable them to formulate individual ideas and share these ideas with a peer? In this project the classroom will participate by answering the questions and then provides an opportunity for all students to share their thinking with at least one other student-which, in turn, increases their sense of involvement in classroom learning. The teacher can circulate and listen to the conversations taking place and respond accordingly.

http://www.readwritethink.org/professional- development/strategy- guides/using-think-pair-share-30626.html

Lessons 7, 8 and 9
Author: Sylvia Cini • edited by: Amy Carson • updated: 10/25/2013

Based on lesson by: Three Cool Science Experiments with Bread Mold

Date created: June 13, 2014

VITAL INFORMATION

Subject(s) Biology and Chemistry

Topic or Unit of Study: Different types of molds

Grade/Level: 6, 7 and 8

Start and End Time: 45 minutes per session

IMPLEMENTATION

Concept Mold spores are everywhere--in the dirt, on doorknobs, on your clothes and in the air. They are spread around by air circulation and through contact with living organisms

Objective The students will be able to follow precisely a multistep procedure to carrying out experiments or carrying out technical tasks.

Students will be able to describe a controlled experiment that will

test for the effects of a physical feature of the environment, such as

temperature or moisture level.

Students will be able to describe some of the physical conditions that are favorable or unfavorable to contribute to changes in the carrots.

General and Domain Specific Vocabulary Terms:

Fungus, damp, decaying, organic matter

MATERIALS AND RESOURCES

Experiment #1: Grow Different Kinds of Mold

Materials: Bread, Water, Plastic zipper bag, Masking tape, Marker, Notebook, Pen, and a Camera

Experiment #2: Investigate the Effect of Moisture

Materials: 3 Slices of Bread, Water, 3 Plastic zipper bags, Metal tray, Masking tape, Marker, Notebook, Pen and a Camera

Experiment #3: Investigating the Effects of Temperature

Materials: 3 Slices of Bread, Water, 3 Plastic zipper bags, Glass jar, Masking tape, Marker,

Notebook, Pen and a Camera

PROCEDURE

Introduction:

The green stuff on your slice of bread is called mold. Mold is a microscopic, living organism in the Fungi kingdom, related to yeast and mushrooms. ***http://www.brighthubeducation.com/science-fair-projects/107513-bread-mold-science-experiments/***

Teacher Model: The teacher designs and demonstrates an experiment resulting in the final result of the experiment.

Developmental Activities

Locate a You Tube video to support this experiment like:

"Kid Zone: How Does Mold Grow?"? http://www.brighthubeducation.com/science-fair-projects/107513-bread-mold-science-experiments/#sthash.OBERSUaW.dpuf

Science (Inquiry and Design) students will review the first stage of a molds life cycle, and demonstrate how it lays dormant as a spore, a reproductive structure that is similar to the seeds of plants. When these spores find a warm, moist, nutrient-rich environment they set up a colony, mature and produce more spores. That's the growth that you see on your food--trillions of mold spores.

Reading, Writing, Speaking and Listening (punctuation, capitalization, spelling and grammar)

Students will prepare a brief essay that demonstrates understanding of a molds life cycle, record results, and interpretation the findings to the rest of the class in the form of a presentation.

Mathematics, (measurement)

Students will observe, measure and record the changes in the carrots samples

1. **Guided Practice: The students will be guided through three experiments**
   - Grow Different Kinds of Mold -
   - Investigate the Effects of Moisture -
   - Investigate the Effects of Temperature -

Cooperative Practice:

Students are asked to work in groups of two to demonstrate developing knowledge of the objective. The teacher uses the opportunity to circle the room assessing and assisting as many students as possible with special attention to struggling learners.

Independent Practice:

Students are asked to work independently to demonstrate knowledge of the objective to

determine what students know and can do without assistance from the teacher, teacher assistant, or peers. If students are unsuccessful in this phase, than students may benefit from exposure to the general and domain specific vocabulary and/or a second round of the gradual release process.

Homework:
The students will be asked to duplicate their theory and design an experiment using other items at home and record the results.

2. **Closure:** Students must demonstrate the knowledge that spores are everywhere. They are spread around by air circulation and through contact with living organisms.

ASSESSMENT

Assessment/Rubrics	**Rubrics:** Approaches to Learning. Did the students do the following: initiative and curiosity, engagement and persistence, reasoning and problem solving, flexibility, risk taking and responsibility, imagination, and creativity **Assessments:** Grade each report on the group experimental hypothesis, results, and interpretation once presented to class body.
Accommodations for Individual Differences	Utilize pre-lesson strategies, modify seating, use modeling, simplified directions, reading directions, extra time, pairing visual with verbal information, pre-teaching of vocabulary and concepts, repeated directions and chunking information prior to lesson.
Self Evaluation /Reflection	Reflect on how the students work with one another. Were the students attentive or off task? How did students demonstrate learning? Did it look and sound like a learning environment? Did the students relate any experiences during the Introduction activities? What percentage of participation did I receive from the class during closing activities?

Annotated Bibliographies/Works Cited/Resources

Fry, T. (2013, February 3). *Should we eat living food*. Retrieved May 27, 2014, from living-foods.com.This website offered unique articles on carrots and other raw foods. In addition the website offered a site map with over 247 other related links.

McKeith, Gillian.*You Are What You Eat: The plan will change your life*. Plume,2006. This book will help enhance knowledge used in lectures and the Science Lab.

Patsalides, L. (2013, January 10). *How fast does mold grow*. Retrieved May 10, 2014, from Choosing a Science Project. This web site had useful hands on experiments for students of all grade levels.

Pennsylvania, D. J. (2011, October). *Hands on Activities for teaching Biology to high school or Middle School Students*. Retrieved June 1, 2014, from www.serendip.brynmawr.edu/sci_edu/waldron/. This website provided useful hands on experiments on Molds. This site has much to offer Middle to High School students.

PennsylvaniaCommonCoreStandards:http://static.pdesas.org/content/documents/PA_Common_Core_Standards_for_Reading_in_Science_And_Technical_Subjects_8-7-12.pdf

Poethig,Scott. University of Pennsylvania Teacher Institute Lectures.2014. The lectures from the Biology of Food have been instrumental to the development of this unit.

"Discover the Power of Carrots" ;website retrieved April 2014 http://www.carrotmuseum.co.uk This site will expose students to any and everything they would ever need to know about carrots and community activities, theme recipes etc.

The National Lunch Program Background and Development. Federal Education Policy History website. This gives background history on the School Lunch Program for research.

W., G. *Guderson Early Programs by States National School Lunch Program USDA.*

www.fns.usda.gov/.../national-school-lunch-p....

Content Standards

CC.3.5.6-8.A. Student will be able to cite specific textual evidence to support analysis of science in order to design an experiment that will help you answer a hypothesized scientific question

CC.3.5.6-8.B. Determine the central ideas or conclusions of a text; in order to have a pair of experimental conditions that differ in only one characteristic and to provide an accurate summary of the text distinct from prior knowledge or opinions.

CC.3.5.6-8.C. Follow precisely a multistep procedure when carrying out experiments, in order to discuss the results you obtained with your group