Microbial Discovery Activity

Which Food Does Yeast Like Best?
A Guided Inquiry Lab
Using Yeast Fermentation to Engage Young Students in the Scientific Method

Author

Pamela A. Marshall – Pamela.marshall@asu.edu
Arizona State University, Phoenix, AZ

Intended Audience

K-4	X
5-8	
9-12	

Activity Characteristics

Classroom setting	X
Requires special equipment	X
Uses hands-on manipulatives	
Requires mathematical skills	
Can be performed individually	
Requires group work	
Requires more than one class period (45 minutes)	
Appropriate for students with special needs	

Acknowledgement

I appreciate the help of Ms. Amanda Conrad, second grade teacher at Copperwood Elementary School, Glendale, AZ, Peoria Unified School District No 11. This activity was field tested in fall of 2012 with her second grade students.

American Society for Microbiology
Education Department
1752 N Street, NW
Washington, DC 20036
Education@asmusa.org

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Introduction

Description

This activity utilizes a common yeast and sugar fermentation activity and includes guided inquiry to help students use the scientific method to determine which foods cause the yeast to grow, as assessed by carbon dioxide production.

Abstract

This activity turns a classic student observation activity of yeast generation of gas into a guided inquiry lab. Rather than give the students one sugar, we give them a range of foods to taste for developing hypotheses based upon their analyses of the foods. The students then design the experiment with appropriate controls and carry it out using gas generation in a closed system with a balloon to measure yeast fermentation.

Core Themes Addressed

Microbial Cell Biology	X
Microbial Genetics	
Microorganisms and Humans	X
Microorganisms and the Environment	
Microbial Evolution and Diversity	
Other – Common properties of life; cellular components	

Interdisciplinary Themes Addressed

Nutrition: discussing yeast as an additive to food and discussing artificial versus natural sweeteners.

Keywords

Scientific method, critical thinking, inquiry based activity, fermentation, growth, yeast, sugar, metabolism

Learning Objectives

At completion of this activity, the learner will be able to:
1. Describe the scientific method and how it is utilized to design experiments.
2. Describe how humans use microorganisms in their daily lives.
3. Utilize the scientific method to determine which foods cause yeast to produce carbon dioxide (CO_2) more effectively.

National Science Education Standards Addressed

Science as Inquiry
-develop a hypothesis and an experimental design
-ask a question
-plan and conduct an experiment
-employ simple equipment to gather data and extend the senses

-use data to construct a reasonable explanation
-communicate results
-use mathematics in all aspects of scientific inquiry

<u>Physical Science</u>
-properties of matter and chemical reactions
-materials can exist in different states
-chemical reactions occur all around us
-chemical reactions can involve changes of matter
-chemical reactions can occur quickly or slowly

<u>Life Science</u>
-students understand microorganisms are living things
-organisms (even yeast!) have basic needs like food and water
-an organism's behavior is influenced by external cues
-most cell functions involve chemical reactions
-an organism's behavior is related to its environment

Teacher Handout:
Which Food Does Yeast Like Best? A Guided Inquiry Lab Using Yeast Fermentation to Engage Young Students in the Scientific Method

Student Prior Knowledge

Students should be understand three of the states of matter: solid, liquid and gas. Students should be familiar with the scientific method. They should know what an experiment is and what results are. Students should be aware of the differences between living and nonliving things.

Teacher Background Information

In the National Science Standards, inquiry is a required topic, even in the youngest grades. I designed this experiment for young children to be able to use the scientific method in an authentic way. In working with kindergarten and first and second grade teachers, it became clear to me that there are not many "experiments" available in which the results are not already known. I worked with a second grade teacher to develop this lab and field-tested the activity in a second grade class in fall of 2012, allowing the students to use the scientific method to perform a version of the well-known yeast fermentation lab.

The scientific method is a loose framework for students to use to design and test questions of interest. Everything we know in science we know because experiments were run at some point. Students need to become comfortable with what science can and cannot tell us about the natural world and how to design and carry out experiments to test questions. This activity allows students to utilize the scientific method to design their own hypothesis about the question being asked. Often, scientific experiments performed by students have a predetermined answers that teachers are looking for; however, this activity is open ended enough that students can design their own experiments within the confines of the question.

In this exercise, students learn about controls, independent variables, and dependent variables. Variables are the items that change in the experiment. Independent (sometimes called manipulated) variables are the things the scientist themselves change. Dependent variables are the results the scientists record. Scientists run controls or control experiments, usually done by running the experiment without the independent variable. Controls are important for students to understand, as unexpected results can occur. In this experiment, for example, both salt and stevia actually stop the yeast from fermenting at all (no balloon inflation) while water alone allows the yeast to ferment a little (a small amount of balloon inflation). Without a control of water and yeast only, the student scientist would not be able to see that salt actually inhibits the yeast's carbon dioxide generation.

Yeast are single-celled eukaryotic organisms that are utilized in society as an agent to ferment, for example, for helping bread to rise or for making alcohol. Yeast are also used as a nutritional additive, as they are rich in B vitamins. Yeast, such as Fleischmann's Active Dry yeast, can be purchased at a grocery store in small packets or at a warehouse club in pound bags. Yeast described as "active dry" are alive but are not metabolically active due to the lack of moisture.

Yeast grow by developing a small bud on the mature cell, which then increases in size until it breaks, or buds off. Yeast, as eukaryotes (single-celled organisms with a cell structure like that of humans and unlike that of bacteria), utilize metabolic pathways similar to those of humans and will "eat" or ferment sugars like we do. When dry active yeast is added to water and a sugar (or other carbon source) they will begin to use the sugar to grow and divide, fermenting the sugar and giving off carbon dioxide in the process. This CO_2 can be collected and measured to determine the ability of the yeast to utilize (eat) the food.

The process yeast use to metabolize, or eat, sugar is called fermentation. This process uses any of a number of sugars to generate carbon dioxide gas and energy (in the form of ATP). Fermentation also produces alcohol (ethanol or ethyl alcohol), which is why yeast is used to make beer and wine. Yeast also make alcohol when bread rises, but the alcohol is evaporated off in the process of baking the bread.

One may wonder why scientists all over the world study and use yeast in their labs if they are not interested in fermentation. Yeast, especially the species *Saccharomyces cerevisiae*, is a model organism. Yeast is cheap and easy to grow and has all the cellular structures (organelles) human cells have. Many genes discovered in yeast, which have been implicated in cellular pathways, have later been found in humans. For example, in the early 1970s Dr. Leland Hartwell used yeast to study how cells divide in a process called the cell cycle. He found many genes involved in the cell cycle that later were found in humans and found to be altered in some types of cancers. Hartwell (along with others) won the 2001 Nobel Prize for his work on yeast.

For teachers who wish to utilize a more extensive version of this lab or use the lab in older grades, I recommend the following ASM Microbial Discovery Curriculum Activity by Heather Thiel Cobbey: Taste Test: Can Microbes Tell the Difference? (http://www.asm.org/images/Education/K-12/mda-taste%20testbwpdf.final.pdf)

Class Time

This lab as described is done over the course of 6 days, using about 45 minutes per period. We did the experiment over the course of 6 weeks, on Friday afternoons. For older students with more ability to focus, the lab could be completed in a more compressed time allotment; however, we found that approximately 45 minutes was as long as we could hold the attention of second graders.

Day 1 (approximately 15 – 30 minutes): The teacher should outline the scientific method, what dependent and independent variables are, and what controls one could use (yeast only, water only, yeast and water). An example I used was cleaning my shower. We discussed how to clean a glass shower stall with different cleaners. I asked the students if we should mix all the cleaners together to see what cleaner worked best. They were able to work through that we should test each cleaner on a small patch and see which one removed the most soap scum, so that we could use the one that was most effective. We did talk about variables at this point. Students in the early grades can grasp the concept of variables. We talked about what changed in the experiment. The independent variable is each cleaner, the variable we have control over or the input. The dependent variable is the result or the output (i.e., how clean was the shower door in each patch?).

Day 2 (approximately 45 minutes): The teacher should go over background information about yeast and tell students the question they are going to be answering, "What food does yeast like best?"

Days 3 and 4 (approximately 45 minutes each): The students are given samples of each food to taste and the recording sheet to record their observations about each food. We found that students could taste about 7 foods before losing interest. Since we used 14 foods, we performed the taste test over 2 days. Experiments conducted with fewer foods could be conducted in a one-day setting. At the conclusion of day 4, students should propose their hypotheses for "which food will make yeast grow best."

Day 5: Perform the experiment, mixing yeast with water and food. This day has a waiting period of about 30 minutes. Set aside the balloons without watching them for the 30 minutes, as the fermentation is a slow process. (Our students had an assignment to complete for class during the 30 minutes.) Record results.

Day 6: The students come together to discuss their hypotheses and which one was correct. The teacher reminds students (especially the younger ones, who want to be right) that disproving a hypothesis is part of science. As a follow up, students can propose new experiments they would do if they were to do the experiment again.

Teacher Preparation Time and Materials/Equipment

1. Teachers need to copy the student handouts.
2. If possible, teachers need to prepare the tasting samples ahead of time for days 3 and 4.
3. On day 5, tubes, bottles, or zip-top bags should be pre-labeled. Water should be pre-warmed to about 100-110F. Individual samples of yeast and food can be partitioned into small paper cups for ease of use.

Materials, Equipment

Materials:
1. Student handouts (one per student)
2. Foods (we used corn syrup, sugar [table sugar or sucrose], honey, agave nectar, fructose, NutraSweet, saccharin, stevia extract, Nectresse, sucralose, artificial sweetener with xylitol, turbinado sugar [Sugar in the Raw], and table salt). I purchased fructose and the turbinado sugar from a natural foods store, and the rest of the items from a regular grocery store. The amount required is enough for each student to have a small taste of each item and then about 2 tablespoons of the item for the experiment. Teachers should note that in any artificial sweetener that lists an ingredient like dextrose, D-glucose, or sucrose in addition to the artificial sweetener, there is generally enough real sugar to allow the yeast to ferment.
3. Containers to hand the foods out for the students to try. We found that the syrups handed out on individual spoons placed on a paper plate worked well. The artificial sweeteners worked best in individual packets. The remaining items were passed out in small paper cups to the individual tasters.
4. Active dry yeast
5. Warm water
6. Test tubes or empty 500-ml plastic bottles
7. Balloons
8. Alternatively, the experiment can be done in zip-top bags rather than tubes/bottles and balloons

Methods

Day 1: The students and teacher explore the scientific method. What are the steps? What does a scientist do at each step? How do scientists design experiments? What are dependent and independent variables? What is a control? Why do a control? This day is optional if the class is well versed with the scientific method. The teacher and I prefer this version of the scientific method, although there are many available: http://2.bp.blogspot.com/_81VJRUuIUJ0/TTuTBbobQII/AAAAAAAAAFg/a-P61cmzmu8/s1600/The+Scientific+method.png.

Day 2: Students are given the handout on yeast, and they discuss what yeast is used for. Let students discuss whether and how they have ever made bread or other foods in the kitchen. Students are told the question they will study in the experiment (which foods make yeast grow best?), and they talk about what growing will mean in this activity.

Days 3 and 4: This is the background research section of the scientific method. In order to develop their hypotheses, students need to research the foods that they will use to try to make yeast grow. Older students can certainly use their knowledge of glycolysis and internet research to determine which foods they think will work best. However, this experiment was designed for young children, so the best background research for them is hands on, or tasting the foods. We sent home a letter to the parents, in case students had some sort of sensitivity.

These two days were the most complicated of the prep, as each student was allowed to taste each food item. Teachers can hand out the food in any way that works for them. We used small paper cups, individual packets of sweeteners, and spoons with syrups on them for tasting. Students like this day best, as they were "hands on" in the background research. Students filled out the observation table with notes for each item they tasted. We encouraged the students to use descriptive words like "tastes bitter," "tastes like caramel," "tastes like medicine," etc., in the flavor column (rather than words like bad or good). In the sweetness column, many students developed a system of pluses or checks to describe how sweet an item was.

Once all of the items were tasted, students developed their own hypotheses for which food they thought would cause the yeast to grow best. Hypotheses included "honey because it tasted the best," "turbinado sugar because it was the sweetest," "table sugar because it's used in bread making." Any suitable hypothesis that showed the students were synthesizing what they knew about yeast and the tasting they did was accepted.

Students also filled out the handout in the control and experimental sections. They needed help understanding why we would make a mix of just yeast and water, but once it was explained that we couldn't be sure it was the foods unless we made one without the foods, students understood the reason why. We also proposed the controls of water only and yeast only.

Day 5: In our class, we allowed each student to do one of the experiments. For a large class, if there are more students than foods, duplicates could be done or students could work together.

The experimental design will depend on the apparatus used. There are three easy ways to do this experiment:

Test tube and balloon

Empty plastic bottle and balloon

Zip-top bag

In each case, the apparatus can be pre-labeled and the yeast can be added by the teacher. About a tablespoon of yeast should be added, unless small test tubes are used, and in that case, about a teaspoon (5 ml) should be added. Then each student or group adds 30-50 ml (0.25 cup) of warm water (100-110°F/38-42°C) and about the same amount of food as yeast. Then each apparatus is sealed to catch the CO_2, and the students have to wait.

After 20-30 minutes, the apparatus is checked and results are tabulated. For our class, students themselves developed a 0-4 scale to describe how much the balloon had blown up. Our results were as follows:

Our Data:

Food or Control	Yeast Fermentation
Nothing	0
Water Only	0
Yeast Only	0
Yeast and Water Only	2
Sweet'N Low	2
Artificial Sweetener Aspartame	3
Artificial Sweetener	1
Stevia	0
Nectresse	0
Salt	0
Table Sugar	1
Turbinado Sugar	3
Fructose	2
Honey	1
Agave	2
Corn Syrup	3

Key:

0 = no inflation

1 = little inflation

2 = medium inflation

3 = lots of inflation

For older students, they could develop their own experimental design, such as amounts they want to use or temperature of the water, but for the second graders, we found it best to develop the experimental methods for them, so it would be consistent and work smoothly.

In the end, our experiment looked like this:

Figure 1: Students Analyzed Balloon Size as a Measure of Yeast Growth. Balloons were organized into four categories, with “3” demonstrating the most growth and “0” no growth, as measured by balloon size. Students grouped the tube/balloons from “3” (left most in test tube rack) to “0” (on right side).

Note: This experiment is very messy to clean up. The balloons are under pressure at the end of the experiment and need to be dismantled outside. The trash should be collected and disposed of separately from the regular classroom trashcan because yeast give off a pungent aroma when metabolizing sugar.

Delivery

We utilized discussion in the second grade setting. After they filled out their hypothesis sheets, students then shared and explained why they proposed their hypotheses. In the picture above, students worked together to rate the food sources on scale from 0 to 4, where 0 was no balloon inflation and 4 was the most. Students came up with this method of analysis on the fly. They also used day 6 to discuss the results and why they thought the experiment turned out the way it did.

Technology Utilization

NA

Microorganism

Saccharomyces cerevisiae (dry active, food-grade yeast purchased in the grocery store) is the microorganism used.

Safety Issues

Safety issues include student sensitivity to any food tasted or an allergy to yeast. An additional safety issue would be if a student had diabetes and thus could not consume sugar. A letter to parents (see sample letter in the appendix) is sent home before the experiment begins.

Field Testing

This activity was field tested in the fall of 2012 in a second grade classroom at Copperwood Elementary School in Glendale, AZ (Peoria Unified School District No 11). It was also tested in a summer workshop for rising freshmen at Arizona State University, West campus, in fall 2012.

Assessment and Evaluation of Activity

We utilized a class discussion of the experiment and had the students fill out a handout describing what happened and proposing additional experiments that they wanted to do to follow up on their results. I have included also a worksheet that teachers can use to determine if the learning objectives were met.

Supplementary Materials

Possible Modifications: The possibilities are endless. For a unit on nutrition, students can do research on food they would like to use and then bring those in. Yeast can use some oils, amino acids, and other substances as carbon sources, and these could be used in place of the sugars. The time required for the experiment will increase with this type of carbon source.

Another possible modification with older students would be to have them research bread recipes to determine common ingredients. These ingredients are liquid (water and/or milk), sugar, flour, salt, and butter or margarine. Students could propose which ingredients would allow the yeast to ferment most effectively and then test their hypothesis.

Ways to incorporate more math skills in the activity:

- Balloon diameter can be measured with tape measures to quantitate.
- All students could use the same ingredient and vary the amounts. Students should confer on which ingredient they wish to use after research or taste testing. Then students could graph the amount of food added versus the balloon diameter.
- Students could use the same ingredient and vary the temperature of the water. Students then could graph the temperature of the water added versus the balloon diameter.
- Students could perform a time course, measuring diameter at different times and then plots these as a graph.

Shortening of the Lab Activity: This description is of a multi-week lab in which students spend two class periods just tasting the different foods to test. For teachers who wish to perform this activity in two or three class periods, significant truncation of the lab could occur by limiting the number of foods to be tasted. To do this, the teacher could bring in sugar and stevia, for example, and allow the students to taste these two items and propose a hypothesis based on a few foods, rather than the extensive list we used. Sugar and stevia are two best foods to use since sugar allows for robust fermentation and stevia does not. Also plain stevia tastes pretty terrible, so students would be able to propose a hypothesis based on taste.

Alternatively, foods could be sent home for tasting or no tasting could occur and the teacher could explain that yeast ferment sugar, and that stevia extract, for example, is not sugar.

Students who are well versed in the scientific method do not need a two-week lesson on the scientific method and experimental design. The first two lab periods could be condensed into one in which students review the scientific method and learn about yeast.

Additionally, if the teacher wanted to condense the tasting and experiment into one lab period, the experiment could be started and students could taste the food and be developing hypotheses while the balloons are inflating.

References

Cobbey, H. T. 2008. Taste Test: Can Microbes Tell the Difference? (Microbial Discovery Activity in the Curriculum Library for K-12 Education) American Society for Microbiology, Washington, DC.

Scientific Method Image. http://2.bp.blogspot.com/_81VJRUuIUJ0/TTuTBbobQII/AAAAAAAAAFg/a-P61cmzmu8/s1600/The+Scientific+method.png. Accessed 14 September 2012.

The Accidental Scientist, The Science of Cooking. Yeast-Air Balloons. http://www.exploratorium.edu/cooking/bread/activity-yeast.html. Accessed 14 September 2012.

Appendix:

Letter home to parents:

Parents of XX Students:

I am pleased to be able to write to you today letting you know that I will again be assisting in the science curriculum for our class. XX and I have some exciting activities planned. For the start of the fall, I thought we should begin with a bang. Today I went over the steps of the *scientific method*. For the next few weeks, students will be proposing hypotheses and developing methods to answer the question of which compound (food) when added to yeast causes them to grow best. We will be doing a variation of a common yeast/sugar experiment (see for http://www.exploratorium.edu/cooking/bread/activity-yeast.html more information).

Science Question: Which food item added to yeast will cause the yeast to grow most quickly (as measured by blowing up a balloon)?

I plan to bring in several food items next week, including different sugars, honey, agave nectar, and artificial sweeteners. All of these items will be purchased at a grocery store (not brought from my lab). My plan is to allow the students to taste the items so they can better develop a hypothesis about which food would allow yeast to grow. For example, students may decide that sweetness is a factor in their hypothesis and so they think the sweetest food would cause the yeast to grow best. Or perhaps they will decide that flavor is more important and propose that the most flavorful food will cause the yeast to grow best. If your child has food allergies or sensitivities or is diabetic, please let me know. We will not be eating the yeast, only tasting the sweeteners.

If you wish to allow your child to do background research for this project, some good questions to pursue are: What is yeast? What does yeast do in the recipe for bread? Why is sugar commonly added to bread recipes? What is sugar?

Thank you!

Sincerely yours,

Student Handout:
Which Food Does Yeast Like Best?

Introduction
Students will use the scientific method to explore which foods yeast like best. Students will taste foods and propose a hypothesis of which food will make yeast grow best based upon their investigation of the flavors of the foods. Students will analyze yeast growth as carbon dioxide production in a closed test tube.

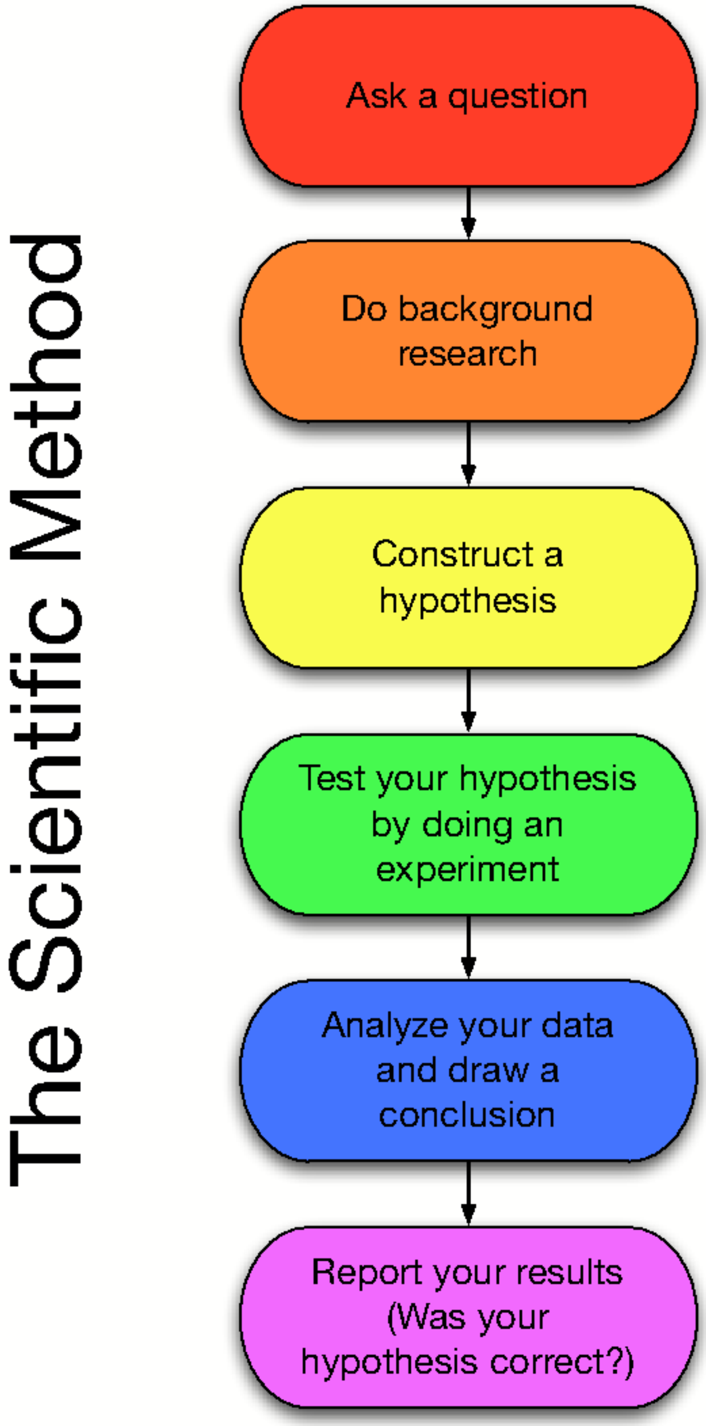
Vocabulary
Scientific method: procedure scientists carry out to ask and answer questions
Control: part of an experiment in which the scientist does not add the variable
Experimental: part of the experiment in which the scientist adds the item to be tested (variable)
Variable: item that can change in an experiment
Independent Variables: items we add to an experiment that we can change (like different foods)
Dependent Variables: items that change, but that we have no control over (the size of the balloon)

Safety Considerations
Sensitivities to food or yeast or diabetic.

Materials Checklist
Foods
Test tube
Water

Procedure
This experiment was designed for second grade classes. Second graders have a hard time reading experiments, so we talked them through the experiment. They received a test tube with the sugar and two cups, one with yeast and one with water. The students were then told to add the yeast and then water, cap the tube, and shake vigorously. We then removed the caps and added the balloon. Older students could be given written directions, but second graders could not.

Follow-up Questions/Homework
See attached.



(taken from http://2.bp.blogspot.com/_81VJRUuIUJ0/TTuTBbobQII/AAAAAAAAAFg/a-P61cmzmu8/s1600/The+Scientific+method.png)

Our question: Which food will make yeast grow best?

Background research:

What is yeast?

Yeast is a small microorganism that is used to make some types of food. Its scientific name is *Saccharomyces cerevisiae*. Each cell of the yeast is about the size of a red blood cell. It looks like this under a microscope:

Why use yeast to make bread?
In bread recipes, we often will add yeast. Yeast allows the bread to rise, giving the bread a softer, spongier texture. Without yeast, bread would be flat and tough. Rising bread dough means that the dough gets bigger. The dough gets bigger because the yeast grow and produce carbon dioxide gas (just like us – that's what we breathe out). The gas causes little pockets in the dough, sort of like blowing up a balloon, or like a roll of bubble wrap, making the dough lighter and larger before we bake it.

What do we add to our bread recipes to make the yeast grow?
Most recipes add table sugar (white sugar; its scientific name is sucrose). A few recipes add honey, agave nectar, or other food containing sugar. The sugar in the bread recipe allows the yeast to grow. Yeast cannot use the other ingredients of bread, like flour, to grow.

Student homework assignment
Additional research:

Please go home and ask your parents to help you find a website about yeast.
Find three facts about yeast and write them below.

1.

2.

3.

Do you eat food with yeast? If so, what are they?

Observation Table for Background Research:

Food	Description (sugar, salt, or artificial sweetener)	Consistency (liquid, powder, grains)	Flavor	Sweetness

My hypothesis is

(name one specific food we tried) is going to cause the yeast to grow best.

Why do you think this?

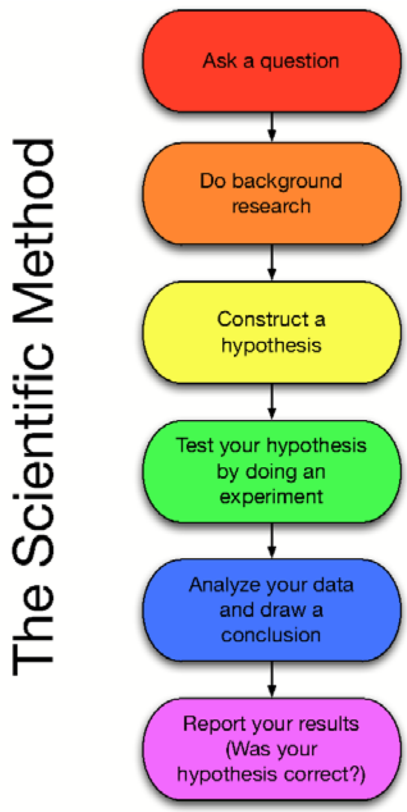
Experimental method. A very important part of the experiment is to design it so it answers the question you are trying to ask and to include a control. It is also important to make sure your independent variables are correctly used. An independent variable is an input, or what you add. Here our independent variables are the foods we are going to test. A control or control experiment is generally run without adding any variable at all.

Control: I am going to add

Experimental: I am going to add

Independent Variable:

Dependent Variable:



Question: Which food will make yeast grow best?
Background research: information about yeast and taste testing of food
Hypothesis:

__________________________________ will make yeast grow the best.

Experimental Design:

What will be in the control tubes?

What will be in independent variable (experimental) tubes?

How will we measure the growth?

Draw a picture of the experimental design:

Data Table (should be modified for foods used in each classroom):

Food or Control	Size of Balloon
Nothing	
Water only	
Yeast only	
Yeast and water only	

Conclusion Section:
Question: What food will make yeast grow best?

Hypothesis: My hypothesis was that ____will make yeast grow best.

Results: What were the results of the experiment? Please write them in sentence form.

What experiments could we do next if we wanted to ask more questions about what food makes yeast grow best?

Assessment:

Matching (match each part of the scientific method with the correct description):

1. hypothesis	A. the item we are changing in the experiment
2. experiment	B. what happened in the experiment
3. independent variable	C. what we are asking about
4. control	D. what we propose is going to happen in the experiment
5. background research	E. an experiment we run without any changes
6. results	F. what we carry out to ask our question
7. question	G. what we would do before we design the experiment to gather more information

Multiple choice

8. Which of the following is a question we can test with an experiment done in the classroom?

A. Why is the sun hot?

B. How many channels does my TV have?

C. How do volcanoes work?

D. What happens to earthworm behavior when we change the temperature?

9. Which of the following is a control experiment?

A. We add yeast, sugar and salt, and see what happens.

B. We add only yeast and water to the tube to see if anything happens.

C. We taste the foods to see which tastes best.

D. We measure the balloons after the yeast ferment.

10. Which of the following is a hypothesis?

A. Yeast make bread.

B. Sugar tastes sweet.

C. Yeast will ferment best when we add sugar to them.

D. Salt makes bread taste better.

11. Which of the following is not an independent variable in the experiment?

A. sugar

B. salt

C. air

D. stevia

12. Are yeast living things?

A. yes

B. no

13. Which of the following is an example of results for this experiment?

A. Yeast smell funny.

B. Yeast make the least gas when stevia is added.

C. We used test tubes to hold our yeast.

D. I liked to use the yellow balloons best.

14. Which of the following is not an example of background research you could do for this experiment?

A. reading a book on making bread

B. looking on the internet for websites about yeast

C. watching a cooking show about making bread

D. going to the store

15. You do an experiment about what foods earthworms like to eat. Which of the following is not a result from that experiment?

A. earthworms are slimy

B. earthworms will eat potatoes

C. earthworms will not eat salt

D. when I placed a piece of bread in front of an earth worm, it crawled away

16. Why did the balloons get bigger in the experiment?

A. The yeast got bigger.

B. The water heated up.

C. The yeast utilized the sugar and then gave off CO_2.

D. The air in the test tube got bigger.

17. What were the yeast doing in the test tube after you added water and sugar?

A. nothing

B. growing larger

C. making bread

D. fermenting

18. What state of matter is making the balloon larger?

A. gas

B. liquid

C. solid

D. none

Answers:

1. D
2. F
3. A
4. E
5. G
6. B
7. C
8. D
9. B
10. C
11. C
12. A
13. B
14. D
15. A
16. C
17. D
18. A