**Mushroom Cultivation and Culinary Use: From Farm to Fork**

***An Inquiry to Classroom Mushroom Cultivation***

Mushrooms already have STEMs, now you can easily incorporate them both into your Agriculture or FACS classroom.

**Background**

 Mushroom, the original recycler and decomposer, remains one of the most unique organisms in our ecosystem and food system. Neither a plant nor animal, mushrooms are part of their own kingdom known as Fungi. To feed nine billion people in the year 2050, superfoods like the mushroom, must be cultivated and incorporated into daily meals to provide substantial nutritional benefits.

 Mushrooms require unique environmental conditions to grow. Once a grower satisfactorily grows this crop, mushrooms can be marketed to consumers for their versatility and unlimited nutritional power.

 As space for traditional crops continues to dwindle with pressure on farms for building and other uses, crops like mushrooms that can be grown by unconventional means can be a great alternative. As more and more of society lives in urban and suburban spaces, growing with limited space but high yields are attractive options for people wanting to bring a piece of their farm to their dwellings. Growing mushrooms indoors, like a classroom, provides limitless platforms for teaching students about this nutritious organism.

**Objectives**

FACS

*Foods II Technology*

3.01 Understand the functions of water in food.

3.02 Understand the functions of nutrients in food.

3.03 Understand the functions of enzymes and phytochemicals.

6.01 Understand non-microbial food hazards and allergen labeling.

7.01 Understand “farm to table” as related to food production.

7.02 Compare organically-produced foods to conventionally-produced foods.

Agricultural Education

*Agriscience Applications*

5.03 Understand basic environmental principles and practices.

6.02 Understand basic agricultural engineering principles and practices.

*Biotechnology and Agriscience Research I*

9.02 Outline procedures for achieving and maintaining aseptic conditions during biotechnology laboratories.

10.01 Describe the proper name of, and use for, common biotechnology laboratory equipment.

10.02 Demonstrate approved safety practices while conducting scientific experiments in a biotechnology laboratory.

11.01 Explain the difference between viruses and prokaryotic cells in order to distinguish characteristics of life.

11.04 Apply laboratory skills in the culturing of microorganisms and cells.

**Materials and Supplies**

The foundation of this curriculum is the cultivation of Oyster Mushrooms available through the purchase or gift of this Tee Pee (toilet paper) kit.

* 1 small Oyster Mushroom Tee Pee Kit (available from Field and Forest <http://www.fieldforest.net>)
* 12 pack of toilet paper (Cheapest kind available- no lotions, perfumes. Get this from your school, if possible)
* Refrigerator
* Space in cabinets to house mushroom bags, space on counter that gets light (not direct light) in a classroom or lab between 65-75F

**Primary Lesson Plan**

Begin with the Mushroom Cultivation Inquiry Lab. Use some or all of the activities to supplement lessons you already have in place or put them in order to create one continuous farm to fork unit plan for your classroom.

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| **Component of Mushroom Cultivation Inquiry Lab** | **Time allotted** | **Materials needed** | **Teacher’s Responsibility** |
| Question/Interest Approach | 5 -10 minutes | Package of mushrooms from the grocery store or a food item containing mushrooms. | Guide the students through the discussion. Possible questions include:* How many of you like to eat mushrooms?
* What about mushrooms make people not like them?
* How are mushrooms grown?
* Have you ever seen a mushroom growing? If so, where?
* Do mushrooms pose any dangers?
* How are mushrooms added to foods?
* How are mushrooms processed for foods?
* How many different types of mushrooms do Americans eat?
* What does a mushroom do for your diet?
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| Creating their own question | 20- 30 minutes | Mushroom Tee Pee Kit and Tee Pee Kit instructionsMushroom Cultivation Inquiry Student Sheet | 1. Students will be split into 5 teams. The teacher will give each student a copy of the Tee Pee Mushroom Kit growing instructions.
2. The teacher will explain that he or she will be cultivating mushrooms on tee pee and so will they. The teacher is responsible for growing the mushrooms according to the directions (do this to two rolls).
3. Students will come up with a treatment or variable to grow the mushrooms. Maybe they will choose to change temperature, lighting, time or humidity variables. Students direct their question and learning. Each group will create their own question. “What will happen to our mushroom tee pee if we…”
4. Students can take some time to research mushrooms and the growing conditions in which they flourish or flop. There are plenty of resources available on the web or use the publication provided.
5. Students will set up and write their protocol for what they plan to do and their hypothesis.
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| Mushroom Cultivation Lab | 20 minutes | Mushroom Tee Pee Kit (bags, rubber bands, Oyster mushroom grain spawn), boiling water in a stock pot, tongs, cooling rack, and toilet paper | 1. Teacher will demonstrate how to submerge their toilet paper roll in boiling water. Allow tee pee to drain and return to room temperature.
2. Inoculate with Oyster Mushroom spawn inoculated in grain provided by the kit (following directions on the Tee Pee Oyster Kit directions page).
3. Seal the growing bag. Place at least two of the mushrooms in darkness for at least three weeks.
4. After three weeks, place in a refrigerator (still sealed) for at least two days. Take out of the refrigerator and place in light (not direct sunlight) and observe what occurs.
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| Mushroom Growth and Life Cycle Monitoring | 10-20 minutes per observation | Mushrooms on Tee Pee | 1. Take time to observe the mushrooms. After being placed in darkness for three weeks, the toilet paper roll will be covered with mycelium. After removing it from the refrigerator, primordia and then the mushroom fruiting bodies will begin to form.
2. Continue to follow the directions from the Tee Pee kit for care. The process can be repeated until the toilet paper no longer exists (as the hyphae of the fungus continues to eat or feed from the carbon source). Several cycles of fruiting can occur. Extensions to this lesson are limitless.
3. Students can harvest mushrooms and weigh them, count the mushrooms, etc.
4. Students should record their data in a manner that they have chosen (photographs, drawings, weights, etc).
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| Analysis | 20-30 minutes | Mushrooms on Tee Pee | 1. Students should determine whether there was evidence or data to support their hypothesis.
2. Students should create conclusions and suggestions for future study of mushrooms.
3. Students should also relate this inquiry study to at least one facet of their everyday life and examine how this organism could benefit our world (ex: mushrooms are natural decomposers, could have limitless potential to remove trash on our earth).
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| Additional Activities | Time varies | See Activities List Below | 1. Use the list of activities below to build upon the initial inquiry lesson about mushrooms.
2. Lessons vary based upon course.
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**Activities**

Foods II Technology

1. An Inquiry to Classroom Mushroom Cultivation (this sheet)
2. 3.01 Mushrooms: What makes up most of that fungus?
3. 3.02 Mushrooms: The Superfood
4. 3.03 Mushroom Enzymatic Browning Lab
5. 5.01 Fungus Amongus Recall Letter
6. 5.01 Mold Multimedia Infographic
7. 6.01 FDA BBB Poisonous Mushrooms
8. 7.01 Follow the Fungi: From Farm to Fork

**Assessment**

* Use questions from the test banks related to the objectives listed.
* Work with students to come up with their own inquiry assignment dealing with fungi cultivation or experimentation.