

## Lesson Plan Contest 2018

### Growing Food for Our Classroom Animals:

#### Exploring Hydroponics

Grades PR-K - 2<sup>nd</sup>

#### Standards

#### SCIENCE

Life and Environmental Sciences: Students in the Diocese of Madison will demonstrate an understanding of the characteristics and structures of living things, the processes of life, and how living things interact with each other and their environment.

#### SCI.2.W. Plants and Animals

2. Compare and contrast how seeds grow in different materials.
3. Illustrate food chains to show how living things depend on each other.

#### SCI.2.X. Ethics

1. Demonstrate how to protect God's creation.

**CATECHETICAL STANDARDS AND BENCHMARKS:** Catholic school/religious education students in the Diocese of Madison will know and understand the fundamental teachings of Jesus Christ in His Church, according to the articles of our Profession of Faith.

CAT.2.A. Understand revelation as God's action to make Himself known: in creation, in his relationship with Israel, and in the Person of Jesus Christ.

1. Connect how the goodness of creation reflects the perfect truth, goodness, and beauty of the Creator. (CCC 41)

**Materials:** 2 guinea pigs (hereinafter "piggies")  
Cage and all the necessities for them  
*Kitchen Essentials Herb Planter (from Uncommongoods)*  
which includes: Tall, slim glass  
Growing medium  
Activated carbon  
Parsley seeds  
(Additional parsley seeds can be purchased so that  
this project remains active throughout the school  
year.)

**Teacher background information about growing plants hydroponically using a simple passive hydroponic system**

Definition - What does *Passive Hydroponics* mean?

Passive hydroponics is the growing of plants without an organic medium like soil, bark, compost, or leaves. The primary function of passive hydroponics is to grow the plant entirely using a nutrient solution flowing over the plant's roots.

Generally when we think about growing plants hydroponically we think about complex setups with water pumps, air pumps, artificial lights, environmental control and greenhouses. However, it has been shown through many controlled experiments and experiences that hydroponics can be made in a much less fancy way, so simple in fact that pumps and other such appliances that consume electricity can be effectively and totally eliminated from the growing system without the need to lose a significant amount of crop quality or yield. Here are some of these extremely simple setups that can effectively and efficiently grow a hydroponic crop with low cost and absolutely no usage of electrical power. Traditionally hydroponic systems - especially in developed countries - have been extremely dependent on electricity to make them work properly. Water pumps are used to carry fresh nutrient solution towards the plants and air pumps are used to keep the nutrient solution saturated with oxygen. However the truth is that such complicated setups are actually NOT necessary for successful

hydroponic growth if adequate system design is actually made. People in less developed areas of the world such as South America, China and India have been

experimenting with completely passive hydroponic setups to replace the more traditional energy intensive hydroponic growth and they have done tremendous progress to achieve this goal.

Many of you are probably already thinking about all the possible problems this might have. You might be thinking that this might work for small plants - like lettuce and some herbs - but never for nutrient hungry plants such as tomatoes, pumpkins, watermelons, etc. The fact is that these entirely passive non-recirculating systems work for ALL of these plants, providing adequate growing conditions and high yields typical of hydroponic systems. Right now it is not a matter of opinion or discussion if it can be done as MANY studies and controlled experiments already show this is a reality.

The questions now become, how is this possible and how can you do it? The answers are pretty simple. Passive hydroponics without any electricity can be done for large or small plants given that the following conditions are met

- Enough space for roots is available
- Enough nutrient solution is available for all the crop's life (or it is replenished)
- Enough oxygen is available for the plant's roots

If this three conditions are met you will be able to build a passive hydroponic growing system that needs NO air or water pumps to give a good yield. How can you make such a system? The systems that have given the best results up until now are those that follow a very simple design scheme. The plant is put in an absorbent nutrient media and placed to float or stand just above the initial nutrient solution level. The level of nutrient solution slowly falls down in the beginning (due to evaporation) and then quickly as the plants start to absorb water and nutrients. As the level of nutrient solution lowers the plant roots become exposed to layers of air from which they can absorb oxygen, allowing them to effectively absorb nutrients from the below stagnant solution without those roots dying.

(From *Science in Hydroponics* 2017 Article, Outdoor Hydroponics, Passive Systems August 24, 2010 admin, <http://scienceinhydroponics.com/2010/08/completely-passive-non-recirculating-hydroponic-systems-yes-its-possible.html>)

The students will set up a simple passive hydroponic system to grow parsley for the "piggies".

### **Step #1**

#### **Questions for the students (Pre-K-2<sup>nd</sup>)**

1. Do you think it is possible to grow plants without soil?
2. How do you think we can do this? (\*Define and discuss a simple passive hydroponic system.)
3. Where will the plants get the nutrients they need to grow?
4. What can we grow in our set up?
5. Can you think of some things we can grow that would benefit our "piggies", Moxxie and Bell? (Gather small amounts of these foods for the next step.)
6. Should we be sure that the guinea "piggies" will eat what we grow? How can we test this out?

### **Step #2**

#### **Initial Instruction**

1. Divide the class in half.
  - a) Half of the students will be interacting with the "piggies" and giving the "piggies" samples of the foods we think they will eat so as to ascertain what foods the "piggies" will eat that we can grow for them. \*Students should wash their hands before and after their interactions with the "piggies".
  - b) Meanwhile the other half of the students will be reading about and coming to understanding how to set up a passive hydroponic system and assist in the "construction" of the system.

- c) Switch groups so that all of the students have a chance to interact with the "piggies" as well as work with the passive hydroponic system. \*Again, students should wash their hands before and after their interactions with the "piggies".
  
- d) Ask the students what they discovered about the foods the "piggies" will eat and if it is possible for us to grow some food for them. Also ask if the students can give any information or details about a passive hydroponic system, its set up and workings.

**Step #3** (Depending on the age of the children, the setting up of the passive hydroponic system might best be done by the teacher prior to planting the seeds. The seeds can be planted with the whole class. *Judgement call by teacher.*)

**Set Up**

1. Talk through the set-up of the passive hydroponic system.
2. Allow individual students to plant the seeds.

**Step #4**

**Monitoring plant growth**

1. Two students will check the growth of the parsley and record their findings on the *Class Grow Chart* on page 6 of lesson.
2. Whole class discussion will center on when the parsley will be ready for harvesting.

Class Grow Chart  
Parsley

#Days since planting	Height (in cm)
7	
14	
21	
28	
35	
42	
49	
56	
63	
70*	
77	
84	
91*	

*\* Most parsley plants will be ready to harvest from within 70 to 90 days after you initially plant them. Wait until the leaf stems have three segments. Check the stems. If the stems have three or more clusters of leaves, they are mature enough to harvest. Stems with one or two segments should be left alone.*

### Step #5

#### Harvesting the parsley

1. Use a pair of scissors and cut at the base of the plant. Cutting the plant at the base of the plant will encourage the plant to produce more stems.
2. Cut the leaves from the outer portion of the plant.
3. Harvest continually because the plant will continue to grow new leaves.

\*Purchasing parsley seeds for replanting will guarantee a continual harvest in case the original plant ceases to produce leaves.

### Step #6

#### Feeding the "piggies" (Set up a rotating schedule)

1. Carefully wash the parsley before feeding it to Moxxie and Bell.
2. \*Students should wash their hands before and after their interactions with the "piggies".

### Step #7

#### Wrap up

1. Discuss the success and possible problems with growing our own vegetables for our classroom "piggies".
2. Make recommendations/suggestions for improvement.
3. Every student will create a final project. Contents of this project are:
  - a. Copy of class grow chart
  - b. Description of individual student's participation in project (1-2 paragraphs)

- c. Listing of pro's and con's for this project.
- d. Draw a picture of the "piggies" and his/her interaction with them.