# Experimental Inquiry Project

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Jan. 19, 2017

## A. Question and Predict:

1. Our question is what is the effect of oxygen depletion on goldfish? Our hypothesis is that the goldfish's breathing rate will increase when it is in water with a low amount of dissolved oxygen. The goldfish could also become stressed out and its' breathing rate could increase so much that its heart could stop. Another hypothesis is that the goldfish could have trouble breathing and its breathing rate could decrease. It could also affect the life span of the goldfish or its habits.

## B. Processing and analyzing data and information:

1. First we are going to observe the goldfish in their natural environment. We will also research their behaviour to help us see if the goldfish's breathing could change in the different waters. We are going to conduct our experiment by placing a healthy goldfish into a low oxygen water environment. We are then going to boil water to lower the dissolved oxygen level. Then we will cool the water to room temperature, to make sure that the water is suitable for a goldfish and won't damage it. We will then count how many times the goldfish pushes water over its gills. We will watch the gills move in and out and each time they move it will count as one breath. We will do this for one minute. After that, we will repeat the entire testing process three times and then with a second goldfish, to obtain conclusive data. We will combine and compare our data from the non-oxygenated water and the oxygenated water to determine if the goldfish will be impacted by less oxygen.

2. There are some risks of conducting our experiment. We could accidentally kill our goldfish by stressing them out from the transportation process or from the exposing them to different waters. Another risk could be that we could burn ourselves or the goldfish if we don't wait long enough for the water to cool to room temperature when we boil the water.

3. One of the biggest ethical concerns regarding our experiment is whether or not it is right to be conducting our experiment on living fish. It could be dangerous to them and a concern would be not knowing if we would be hurting them. We chose an experiment that we hope won't damage the goldfish but we won't know for sure until after we've finished. Some people could be offended by our experiment because they might think that we are keeping the goldfish in captivity and not letting them swim free. Others could think that the water that we are using could be either conserved or used for more important issues like in countries that need it.

4. For our experiment we will need a laptop to record data and water for the fish bowls. Shaylyn is going to buy two goldfish, goldfish food and bring two fish bowls from her house. Hannah is going to bring a kettle to boil the water and we are going to have to research goldfish using different websites and by observing the goldfish's behaviours.

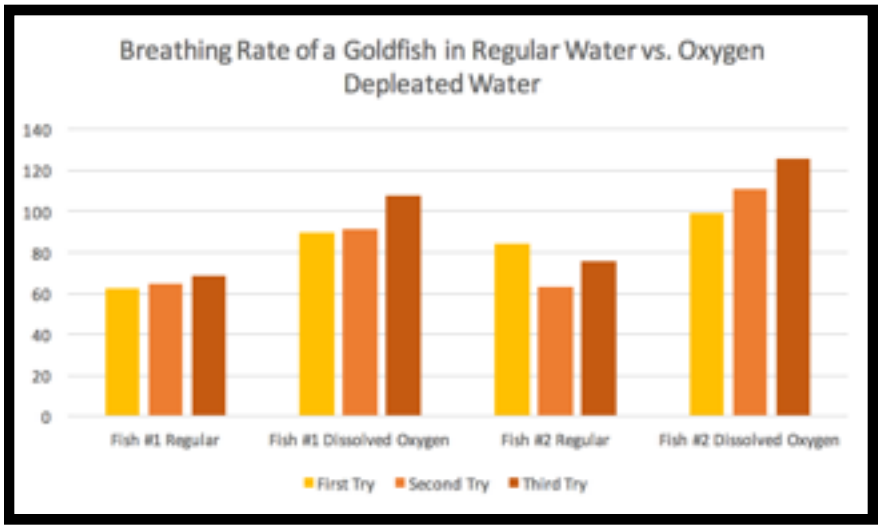
5. The safety concerns of conducting our experiment are that we could accidentally kill our goldfish wasting their lives, we could burn ourselves or the fish if we aren't careful, we could accidentally eat the goldfish food or while we are transferring the goldfish from one tank to the other we could drop the fish on the ground and the goldfish would probably die. The goldfish could also be emotionally scarred which could lead to depression or anxiety.

**C. Processing and analyzing data and information:**

1. One of the First Peoples perspectives that connected with our projects was: Learning involves recognizing the consequences of one's actions. When trying to get the results of this experiment we had to be very careful. Since we used living goldfish we had to be cautious of our actions since the consequences could have affected the health of our fish. Another principle that connects with this experiment is: Learning involves patience and time. When working on this experiment with these goldfish it took time for us to come up with the idea for the experiment. Certain aspects of this experiment took time and we had to be patient throughout the whole process.

2. Our variables were the two different kinds of water: the water with the dissolved oxygen and the regular water. The water with dissolved oxygen was boiled and then cooled. There weren't any inconsistencies in the water or the breathing of the goldfish.

3. We made a bar graph that shows the differences between the two goldfish when they were put in regular water and into the water with dissolved oxygen. The graph below shows our observations.




4. The bar graph that we made shows the large difference in how many times the goldfish breathed in the different waters. The yellow bars represent the first time that we timed the fish in the two types of water, the vibrant orange bars represent the second time and the dark orange bars represent the third time. As you can see there is a visible difference in how many times the goldfish breathed in a minute, in the regular water and in the water with dissolved oxygen.

5. In conclusion, we wanted to conduct an experiment on two goldfish to see if water with dissolved oxygen would affect the breathing of the goldfish. After conducting our experiment we discovered that for the regular oxygenated water, there was an average of 69.8 breaths in a minute. For the water with dissolved oxygen, there was an average of 104.2 breaths in a minute. The difference in their breathing was even more than what we had originally predicted.

6. When we put the goldfish into the water with dissolved oxygen, its' breathing rate increased significantly. It was evident that the goldfish had a harder time breathing in that water than the

regular water. It didn't harm the fish but we think that as the goldfish had trouble breathing properly, it became stressed and that also may have caused the spike in its breathing.

**D. Evaluate/ Conclude:**

1. Our hypothesis was, that a healthy goldfish would breathe more in water with dissolved oxygen than in regular oxygenated water. Our hypothesis was correct, the breathing of the goldfish increased significantly in the water with dissolved oxygen. The goldfish survived the experiment and they are both living happy healthy lives.

2.a) One of the things that made the experiment difficult was that the goldfish moved around, and when they would swim it made it difficult to see there gills move and to see them breathe. The goldfish are also very small so it was hard to see there gills move, the amount of times that we saw them breathe may not have been exact. We also had to recount once because one of the goldfish started swimming around the fishbowl.

b) There weren't any confounding variables, the amount of times that the goldfish breathed in both waters, in a minute didn't really change to much in the three times that we tested each one. The only major difference was between the first and second time that we tested fish #2 in the regular water.

c) We could have interpreted it instead of how the water affected their breathing, to how the water affected their behaviour. We could have also measured it by how much slower their breathing rate was in regular water to the water with dissolved oxygen. If we had done the experiment on more than two goldfish we probably would have had even closer and more conclusive results.

3. The experiment we chose was very difficult to record the data since the goldfish breathe so rapidly. One way we could have improved the quality of our data was that we could have tested the goldfish even more times than we did, to get a more accurate answer. Another way we could have improved the quality of our data would have been if we had two people watching the fish while we recorded the data. The last thing that could've helped make the data more accurate would have been if we tried with more than two fish.