IDEAS: Reflection #1

The Task – Watch Video 1 to see an introduction to the task: https://youtu.be/oMJ01ugKRU0
The video you watched showed about the need for fish to learn to detect predators. Your goal in this investigation is to figure out how we can tell if fish embryos are capable of learning to detect predators while they are still in the egg. The guiding question of this investigation is:

How do we know if fish embryos can learn to detect predators?

1.B. Discussion:

Things I **noticed**…

1.C. What else do you need to know?

Things I **wonder…**

IDEAS: Reflection #2

I.D. Initial Ideas

Watch Video 2 for more information about fish embryo learning:
https://youtu.be/tgZTRq7W1cY

Before you start this investigation, take a few minutes to think about fish embryos and how they learn to avoid a predator. Then write your ideas or draw a model in the space below that shows your ideas about how a design for an experiment to see if the embryos have learned to detect predators. Be sure to include labels to help explain your thinking.

Some **ideas** that I have…

1.E. What would be helpful to learn more about? In your group, discuss and writing down some information you think you need to learn more about to understand how fish learn.

Some **questions** we have now…

1.F. Share Ideas with group. Discuss within your group new ideas you have about the 2nd video, including things you wonder about. You should also discuss and write new things you wonder about.

Some **ideas** that I have…

1.G. How might you observe fish embryos to see if they have learned? In your group, discuss and write down your initial ideas about how you could design an experiment to see if fish can recognize predators.

Some **proposed answers** we have now…

STAGE 2: Ideas

Three "IDEAS" – Here are some **core ideas** that may help you understand the phenomenon you saw in the videos as you plan an investigation.

2.A. Read About Core Idea #1 – **Fish have an instinctive response to AC.**

Fish embryos can instinctively respond to the Alarm Cue (AC) – a chemical given off from cells near the spine of fish when the skin is broken, as in when they are attacked by a predator. Fish do not need to learn this cue, and when they smell the chemical, they become still to avoid being noticed. Sitting still when they sense a predator is the only way fish embryos can protect themselves from predators like sunfish.

Fish embryos move as they develop in the egg, mostly by rolling around in the egg. But when they detect a predator, their best defense is to be very still. This prevents predators from seeing movement, one of the main cues they use to find food.

2.B. Read About Core Idea #2 – **Predator fish give off scent cues in their urine that prey can detect.**

Fathead minnows are relatively small fish, so they are prey for many larger fish, including sunfish, bluegill, bass and pike. Predator fish have scent chemicals in their urine, and the young minnows can learn to recognize those chemicals. If they learn to associate those chemicals with danger, they should become still when they smell predator urine. This scent is the "Predator Cue" (PC).

2.C. Read About Core Idea #3 - **Pores in the chorion allow chemicals and water to reach the egg.**

Fish chorion (eggshell) is porous, and has small holes. This allows small chemicals in water to pass in and out of the egg, and reach the embryo. Alarm Cue (AC) and Predator Cue (PC) are both small enough to pass through the holes in the fish chorion. We call the chorion "semipermeable" because of its ability to allow smaller molecules to pass through.

STAGE 2: Ideas

Glossary of Terms

Adaptive – Helps a species survive. A trait is "adaptive" if it improves that species' chances of surviving to adulthood.

Alarm Cue (AC) – A chemical given off by cells in the skin near the spine of fish when they are injured or killed. This chemical is a signal to other fish that there is a danger to avoid.

Chorion – The outer shell of a fish embryo, the chorion is transparent and semipermeable to allow water and some chemicals in the water to reach the developing embryo

Embryo – A developing stage of many living things before they are born, hatch or sprout from a seed.

Generalist – Able to survive in a range of conditions. In biology, a generalist species is one that can be found in many different types of habitats or feed on a variety of foods.

Predator Cue (PC) – Any chemical given off by a predator species that can be used to identify the predator. In this investigation, the predator cue is in the urine of sunfish.

Semipermeable – Able to allow some materials to pass through. The chorion of a fish embryo has small pores that allow water and small molecules to pass in or out of the egg, like a screen door does for a house.

STAGE 2: Ideas

2.D. Discuss the new content ideas – How will these help you figure out an answer to the driving question?

Some Ideas You Can Use: DCI #1: Fish have an instinctive response to AC.

Some **useful ideas** from what I read…

Some Ideas You Can Use: DCI #2 – Predator fish give off scent cues in their urine that prey can detect.

Some **useful ideas** from what I read…

STAGE 2: Ideas

Some Ideas You Can Use: DCI #3 - Pores in the chorion allow chemicals and water to reach the egg.

Some **useful ideas** from what I read…

STAGE 3: Plan

Plan Your Investigation

Prepare a plan for your investigation by filling out the chart below.

I am trying to answer the following **question**…

I will use the following **observations or measurements**…

I will **collect** these observations or measurements by…

I will **analyze** the observations or measurements that I collect by…

I approve of this investigation plan _____ Teacher's Signature _____ Date

STAGE 4: Do

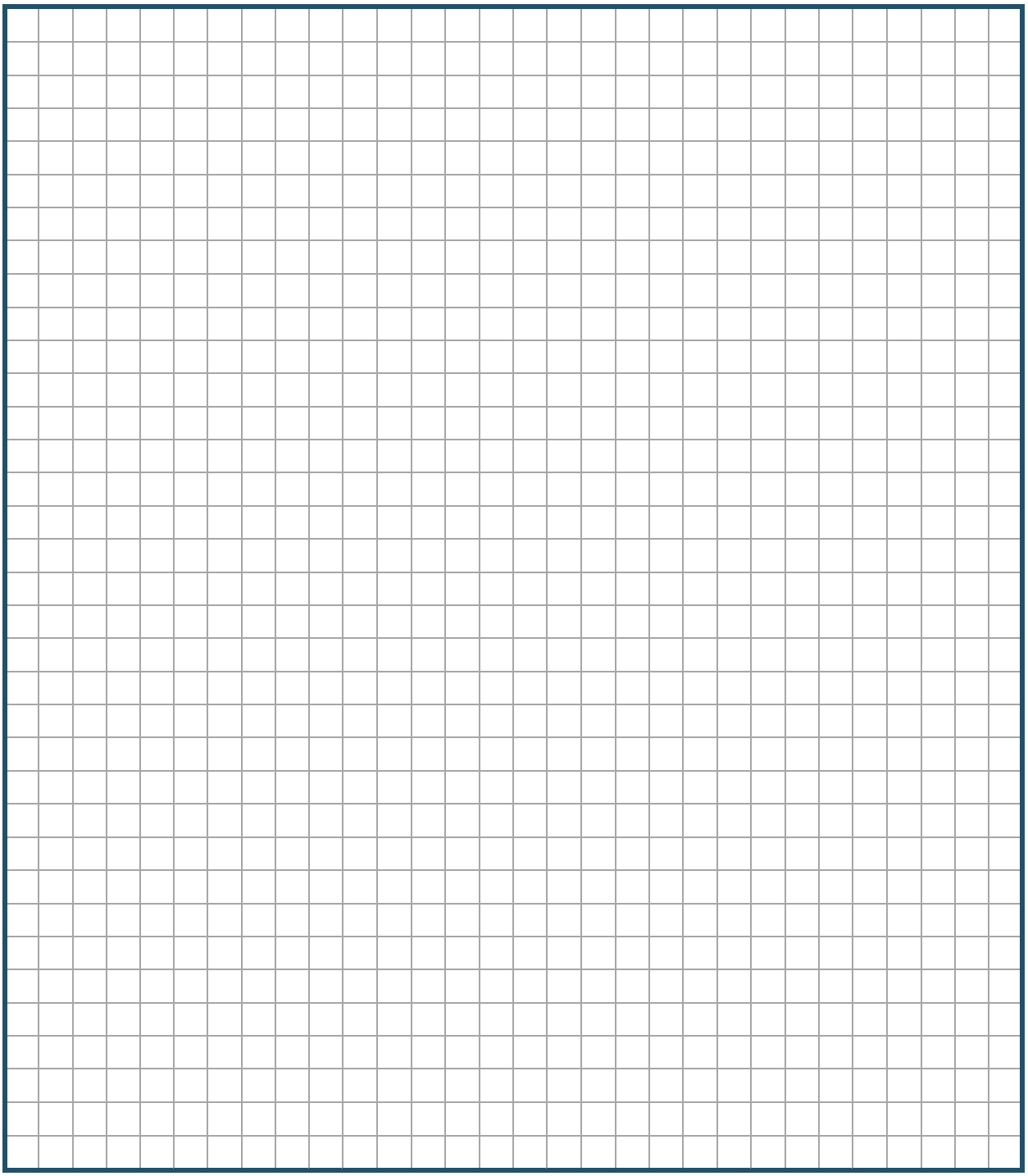
Collect Data – As you watch Video 3, record your observation data here.
https://youtu.be/eyjiBx7PERM
Keep a record of what you observe or measure during your investigation.

My **observations or measurements…**

STAGE 4: Do

Make Sense of Your Data

Use the space below to perform the calculations that you need or create any tables or graphs that will help you make sense of the available observations or measurements.



STAGE 5: Share

Draft Argument

Develop an argument on a whiteboard. It should include:

1. A *claim* that answers the guiding question,
2. *Evidence* in support of the claim that provides an analysis of the data and a description of what the analysis means,
3. A *justification of the evidence* that explains why your group thinks the evidence is important.

The Guiding Question:	
Our Claim:	
Our Evidence:	Our Justification of the Evidence:

Argumentation Session

Share your argument with your classmates. Be sure to keep track of any ideas that you can use to revise your argument and make it better in the space below.

Some possible ways to **improve** our argument…

STAGE 6: Reflect

6.A. Discuss the core ideas – Are there ways to do it better? Sources of errors or variation?

Reflective Discussion
You can keep track of any ideas from the discussion that you think are important or will be useful in the future in the space below.

Some **notes** for future me…

6.C. Progress Check – What is the biggest takeaway from this stage? (student writing, group discussions, whole class or jigsaw format, exit tickets or mini-writing, etc)

STAGE 7: Create a Report

Draft Report

Prepare a report to share what you figured out during your investigation.

Investigation Title **Group Members**

Introduction

We have been studying _____ in class. Before we started this investigation, we explored _____

_____

_____

We noticed _____

_____

_____

Our goal for this investigation was to figure out _____

_____

_____

The guiding question was _____

_____

_____

Method

To answer this question, _____

_____

_____

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_____

Argument

We figured out _____

_____

_____

_____

The _____ below includes information about _____

_____

_____

_____

Insert image, data table or other representation of your analysis.

This analysis suggests _____

_____

_____

_____

This evidence is based on some important ideas. The first is _____

_____

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Report Peer Review Guide and Teacher Scoring Rubric

Report by _____ Project ID #

Author: Did the reviewers do a good job? 1 2 3 4 5 Rate the quality of review

Reviewed By: _____ Reviewer ID # _____ Reviewer ID # _____ Reviewer ID #

Look at the Introduction. Do you think:	Reviewer Rating			Teacher Score
1. There is a good overview of the phenomenon?	☐ No	☐ Somewhat	☐ Yes	0 1 2
2. The task and guiding question are clear?	☐ No	☐ Somewhat	☐ Yes	0 1 2
3. It is clear why it is important to complete the task?	☐ No	☐ Somewhat	☐ Yes	0 1 2
Reviewers: Please explain how the author could improve this part of the report.	**Author:** What changes did you make to your report based on the feedback from reviewer?			

Look at the Method. Do you think:	Reviewer Rating			Teacher Score
4. There is a good overview of the phenomenon?	☐ No	☐ Somewhat	☐ Yes	0 1 2
5. The methods make sense for the investigation?	☐ No	☐ Somewhat	☐ Yes	0 1 2
6. It is clear enough to allow others to do the same?	☐ No	☐ Somewhat	☐ Yes	0 1 2
Reviewers: Please explain how the author could improve this part of the report.	**Author:** What changes did you make to your report based on the feedback from reviewer?			

Look at the Argument. Do you think:	Reviewer Rating			Teacher Score
7. There is a clear and reasonable claim?	☐ No	☐ Somewhat	☐ Yes	0 1 2
8. The analysis info is clear and supports the claim?	☐ No	☐ Somewhat	☐ Yes	0 1 2
9. The report justifies the claim and evidence?	☐ No	☐ Somewhat	☐ Yes	0 1 2
Reviewers: Please explain how the author could improve this part of the report.	**Author:** What changes did you make to your report based on the feedback from reviewer?			