

Virtual Field Trip Program Materials

Dear Teacher,

We are looking forward to our interactive virtual field trip with you and your learners. During the program your learners will have the opportunity to explore the unique animals of the Pacific Ocean with one of our Aquarium Educators.

In order to better prepare your learners for their virtual field trip, we have compiled both pre- and post-program materials. These materials will provide your learners with fun, engaging activities that will enrich their knowledge of ocean life and challenge what they learned. Feel free to look through all the materials for your scheduled program and use any or all of the activities that you deem appropriate for your current curriculum.

Squid Dissection (Grades 6-12)

- Labeling a Squid Pre or Post
- Mollusc Dichotomous Key Pre or Post
- Rocket Squid Pre or Post

You may find additional activities for your learners in pre/post materials from other programs.

Thank you for your interest in our programs, we are excited to connect with you!

Sincerely,

The Aquarium of the Pacific Education Staff



Teacher Resources

Vocabulary Word Bank

Cephalopod: Group of molluscs whose appendages attach to their head.

Mollusc: Invertebrate animals who have an unsegmented, soft body, and may or may not have an external shell.

Gonads: The reproductive organs responsible for creating sperm or eggs, and producing the sex hormones.

Mantle: The body wall that covers the visceral mass and internal organs of a mollusk. In shelled molluscs it creates the shell.

Tentacle: A flexible, mobile, elongated organ present in some species of animals, most of them invertebrates. In cephalopods tentacles only have suckers at the end of the limb.

Arm: Used interchangeably with tentacle, in cephalopods arms contain suckers along most the length of the limb, like with an octopus.

Siphon: A long tube-like structure that is present in certain aquatic molluscs. Used for a mode of fast swimming (referred to as jet propulsion) as well as the release of waste.

Dichotomous key: A key for the identification of organisms based on a series of choices between alternative characters.

Gastropod: Mollusks (such as snails and slugs) usually with a univalve shell or none and a distinct head bearing sensory organs.

Bivalve: Mollusks (such as clams, oysters, or scallops) that have a 2-valved hinged shell, are usually filter feeders, and lack a distinct head.

Scaphapod: The tusk-shell or tooth-shell animals, members of a class of shelled marine molluscs.

Polyplacophora: The chitons. Chitons are marine molluscs of varying size with oval bodies

Testes: Male gonad that produces sperm cells.

Eggs: Female reproductive cell.

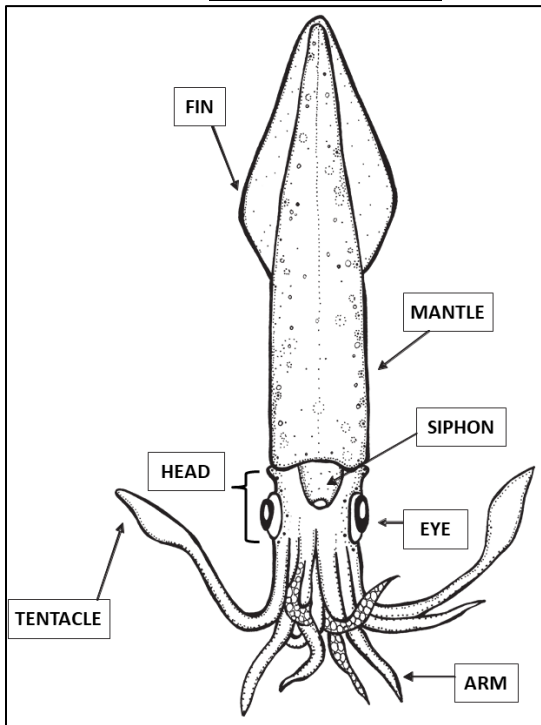
Activity Notes for Teachers

Labeling a Squid

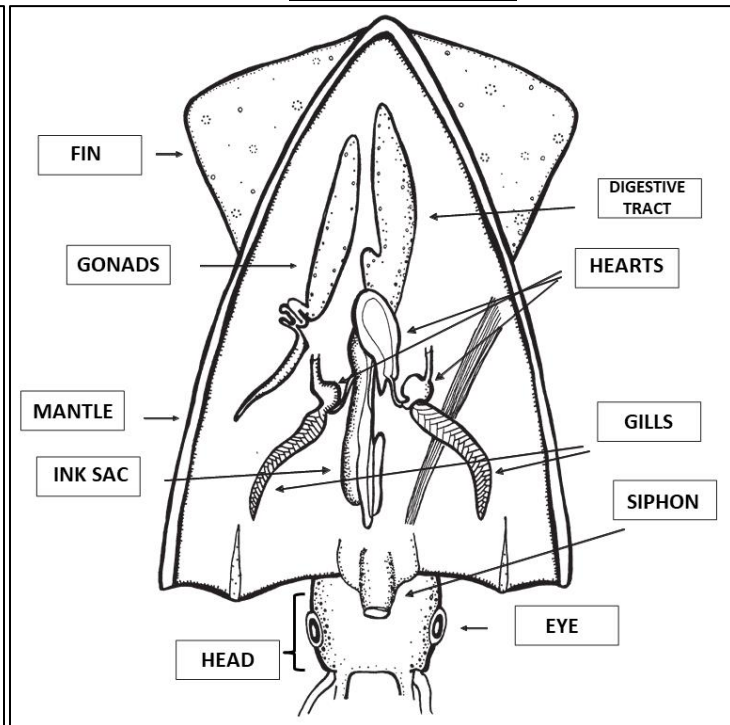
For this activity you can have learners complete this before or after your program with the Aquarium. During the dissection, our educator will begin by having the learners make observations of the outside of a squid, discussing adaptations of the squid, and answering learners' questions. For the dissection and internal examination our educator will show your learners how to open the squid and then examine the various organs that are visible. We will also show the comparison between male and female internal anatomy. With time permitting additional dissection activities can include extracting the jaw, removing the pen from the squid, removing the lens of the eye, and opening the ink sac.

Answer Key for Labeling a squid

External Anatomy



Internal Anatomy



Mollusc Dichotomous Key

This activity can be done before or after your program and will explore specific characteristics of molluscs. Learners must answer the questions in sequence in order to identify each of the types of cephalopods. Questions are in a yes/no design with each question either progressing the process of elimination or resulting in the unknown animal's identity.

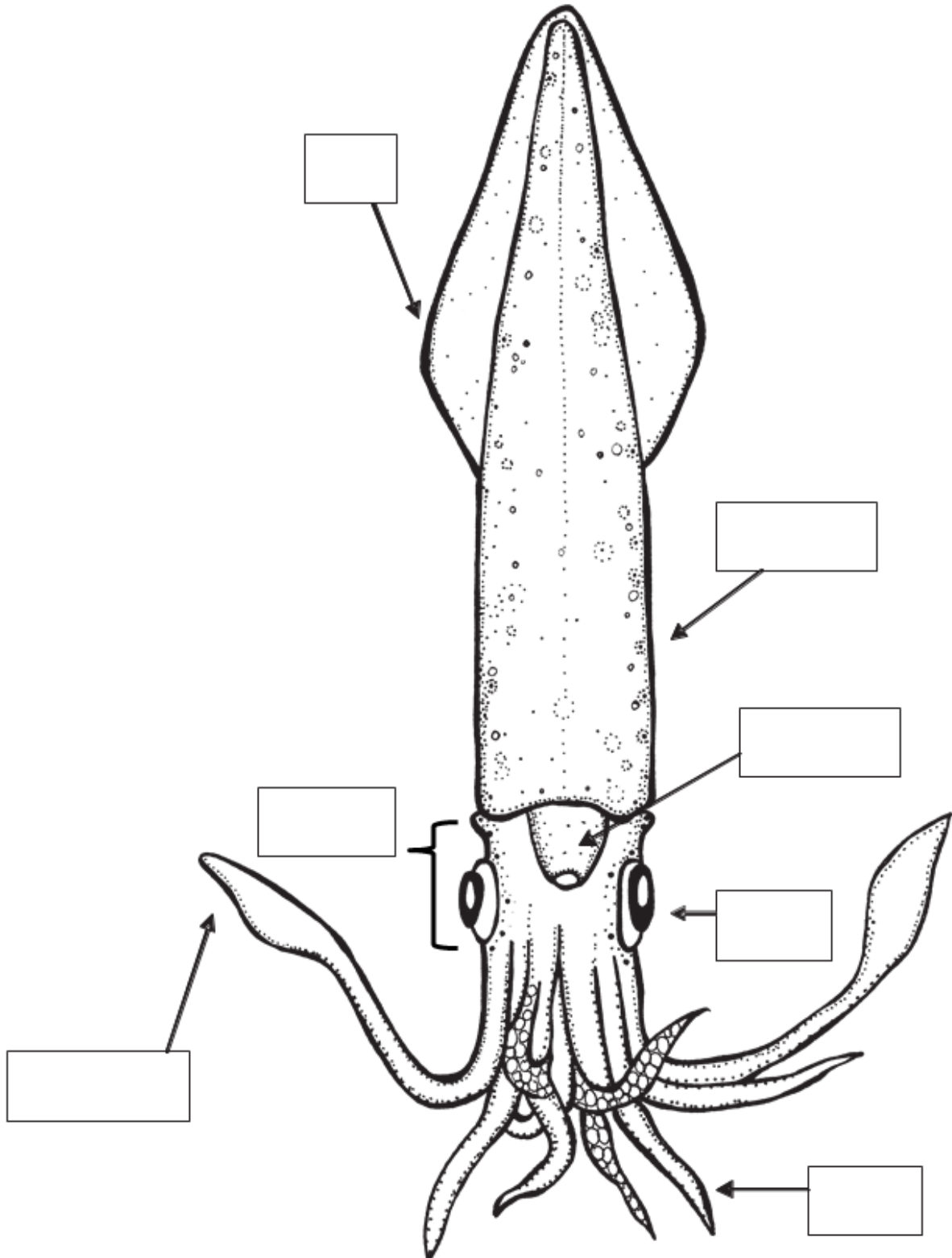
Rocket Squid

This is an optional lab activity that can be done before or after your program to show students how rocket propulsion works in squid and octopus. Cephalopods all have siphons, certain species can use it to propel themselves faster than others, but they all use them as part of their motion to escape predators.

Labeling a Squid

Using the diagram provided, label the external anatomy of a squid.

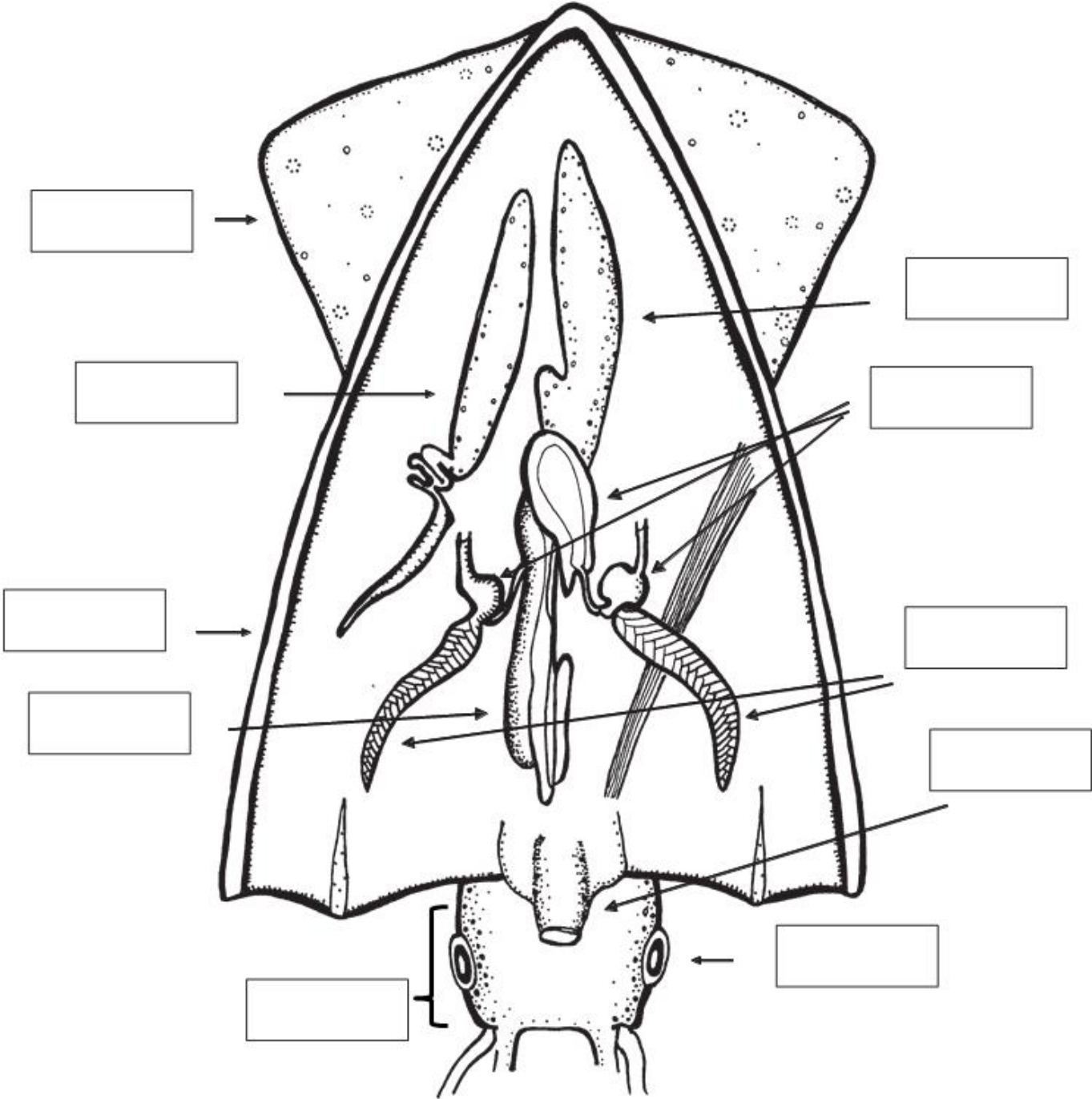
External Anatomy



Labeling a Squid

Using the diagram provided, label the external anatomy of a squid.

Internal Anatomy of a Male Squid



Mollusc Dichotomous Key

Scientists often use dichotomous keys to identify and classify different types of animals.

1. Use the dichotomous key below to identify the animal to the right and the ones on the following pages.
2. Select one animal at a time and answer each of the “questions” below as you observe each animal.

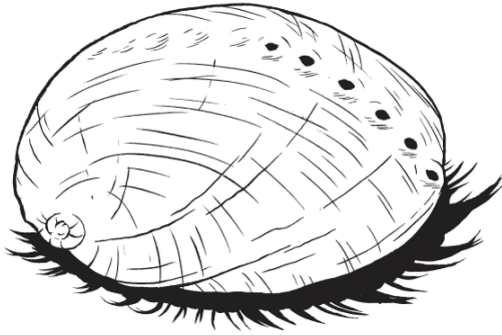


- | | |
|---|-------------------------|
| 1A. No shell apparent _____ | go to 2 |
| 1B. Hard shell _____ | go to 5 |
| 2A. Arms or tentacles present _____ | go to 3 |
| 2B. No arms or tentacles present _____ | Sea Slug (gastropod) |
| 3A. 8 arms and 2 tentacles present _____ | go to 4 |
| 3B. 8 arms and no tentacles present _____ | octopus (cephalopod) |
| 4A. Long, finger-like mantle _____ | squid (cephalopod) |
| 4B. Rounded mantle _____ | cuttlefish (cephalopod) |
| 5A. Single shell _____ | go to 6 |
| 5B. Shell has multiple parts _____ | go to 8 |
| 6A. Single shell spiral shape _____ | snail (gastropod) |
| 6B. Single shell is not spiraled _____ | go to 7 |
| 7A. Shell is concave _____ | abalone (gastropod) |
| 7B. Shell is elongated and tapered _____ | tusk shell (scaphopod) |
| 8A. Two distinct shells, hinged on one side _____ | clam (bivalve) |
| 8B. Multiple plates _____ | chiton (polyplacophora) |

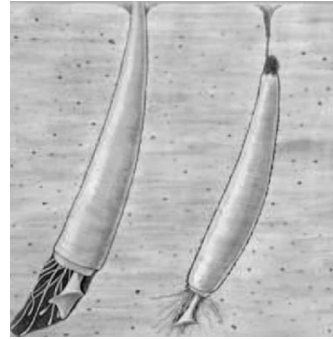
Mollusc Dichotomous Key

Unknown Animals to Identify

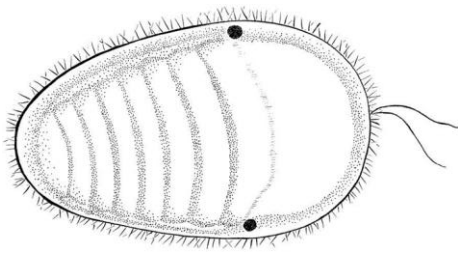
1.



2.



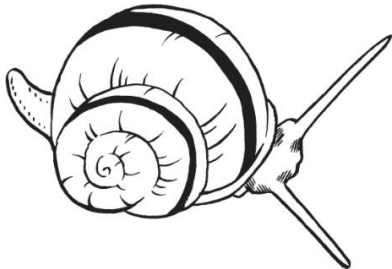
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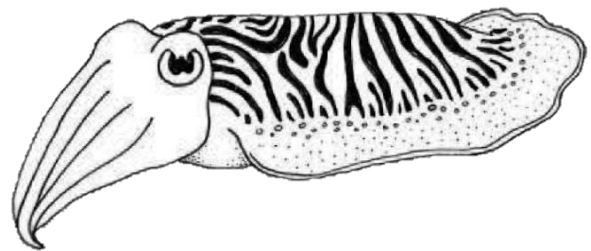
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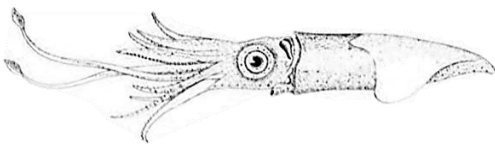
5.



6.



7.



8.



Rocket Squid

OBJECTIVES

- Learners will conceptualize mechanics of jet propulsion by using cephalopods as a natural model.
- Learners will understand structure and function of a living organism and how specific adaptations enable its survival.
- Learners will engineer a model to demonstrate Newton's Third Law of Motion (for every motion there is an equal and opposite reaction).

BACKGROUND

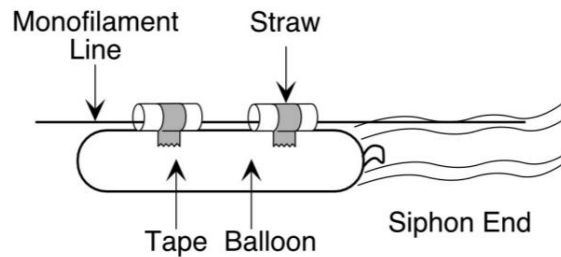
Cephalopods are one of the few animals that rely on **jet propulsion** as their primary method of locomotion. These invertebrates alternate between relaxing and contracting muscles along and around their body to allow water to enter the **mantle**, their large body cavity. As water enters the mantle, it passes over two sets of **gills** to help the cephalopods extract oxygen. As the mantle muscles contract, water is forced through the **siphon**, a small muscular funnel under the head and often behind the eyes. This physical process is remarkably energy-efficient and helps them retain a place higher in the food web and predator and prey. In this activity, learners will experiment with Newton's Third Law of Motion and engineer a model that solves a problem.

PREP TIME: 5 minutes

CLASS TIME: 20 minutes

MATERIALS

- String or fishing line
- Multicolored balloons
- Tape
- Straws
- Binder clips/Paperclips/other clip
- Markers



PROCEDURE

1. Have learners pair up. Each pair receives one balloon, one straw, and two pieces of tape.
2. Inflate the balloon, then pinch off the bottom of the balloon with a binder clip (don't tie off the balloon!)
 - a. If possible, you can decorate the balloon's siphon end to look like it has tentacles and arms
3. Tape the straw to the back of the balloon. Learners can cut the straw and tape the two pieces to the balloon or leave it as one piece-designers choice.
4. **Instructor:** Clear space in the classroom so that learners can line up on either end of the room-one learner will be holding their squid balloon. Cut the fishing line or string the length between learners. Give each pair a string. Instruct them to hold the string taught or as tight as possible.
 - a. The learner with the balloon will feed the fishing line or string into the straw and then remove the binder clip and let their balloon go when ready.
 - b. Pairs can go one at a time or all together to 'race' each other.
5. Sample questions to guide a post experiment discussion:
 - a. Do you think changing the balloon size would affect how fast it travels?
 - b. Do you think changing straw size would affect how fast the balloon travels?
 - c. Do you think adding accessories like arms or tentacles impact how fast the squid swam?