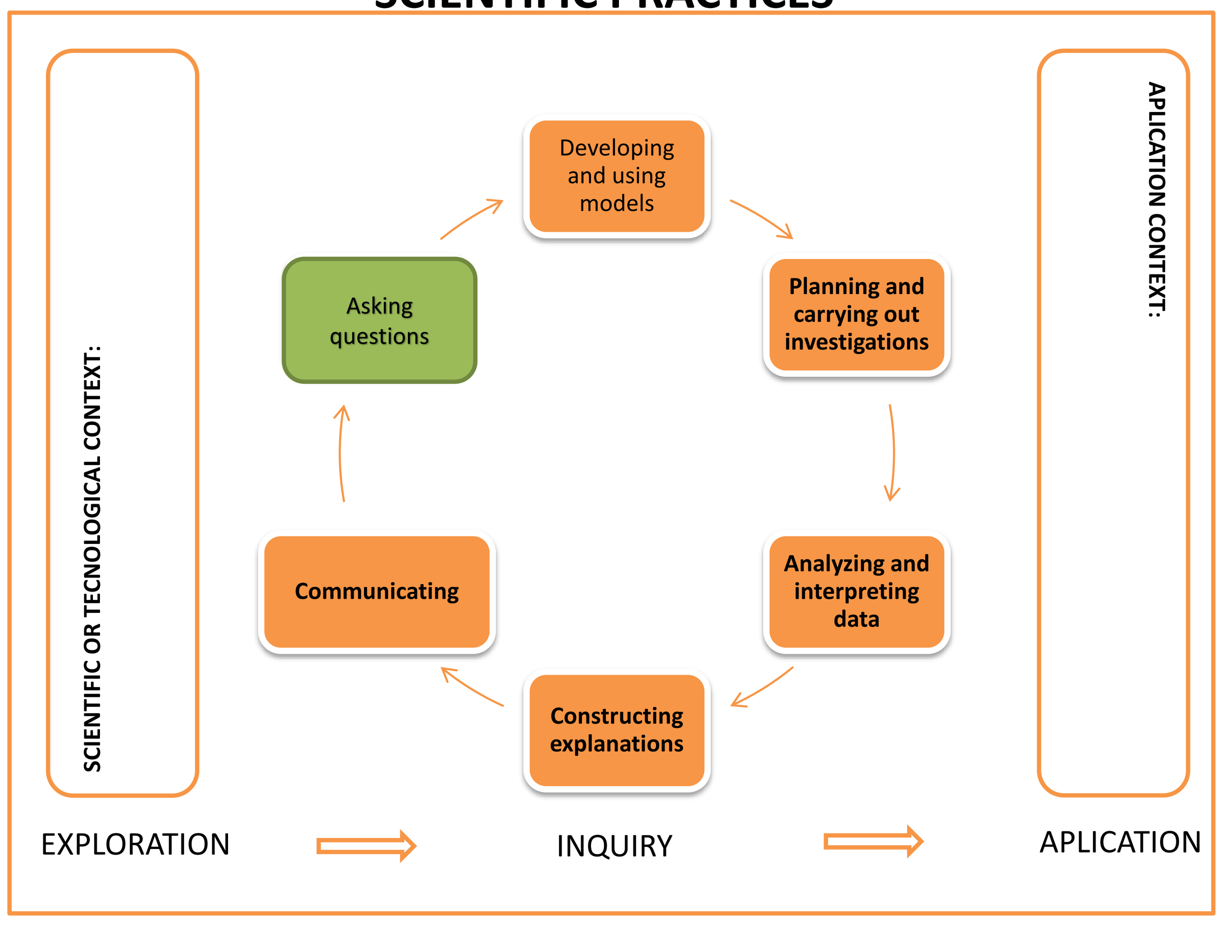
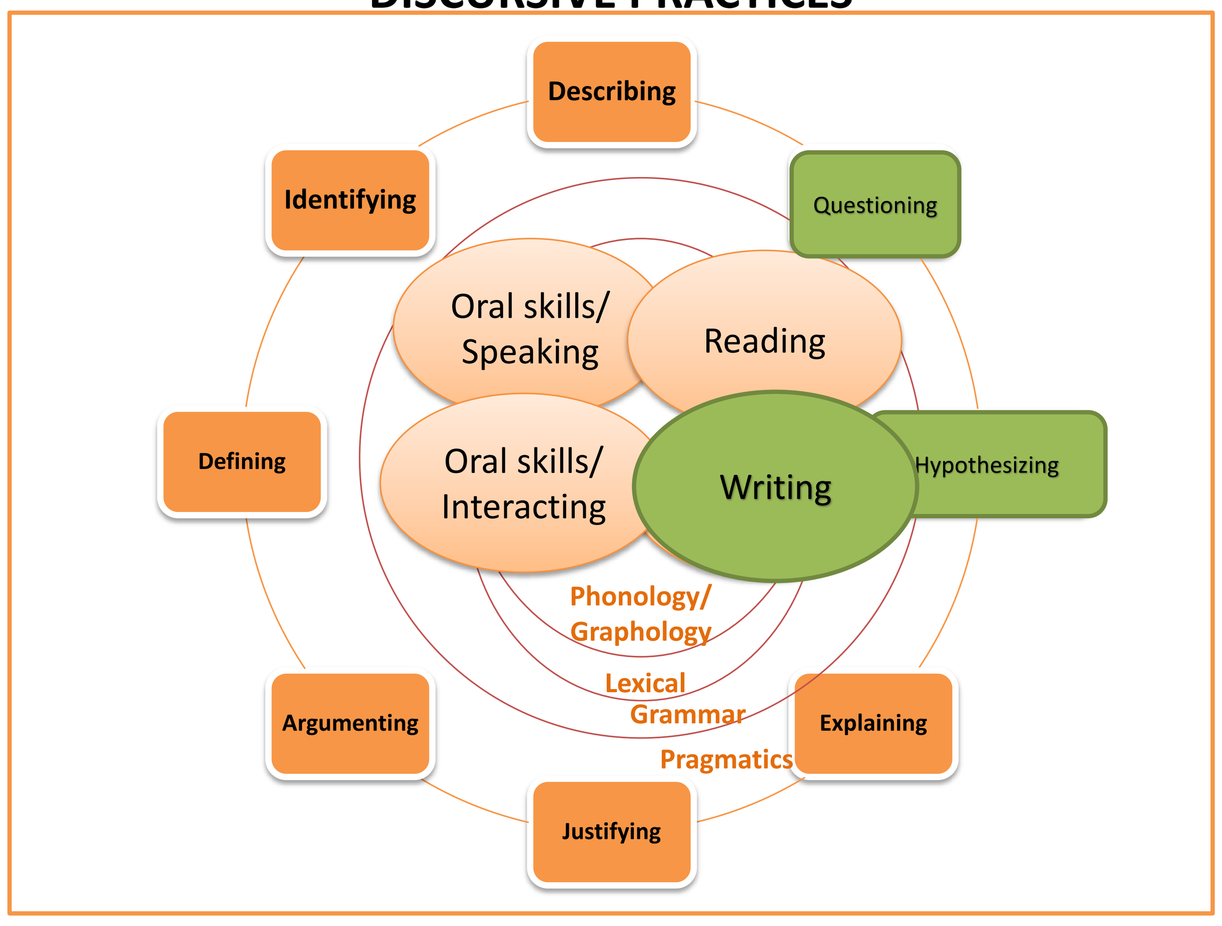
IBS&E: ANIMALS, WATER AND SOUND

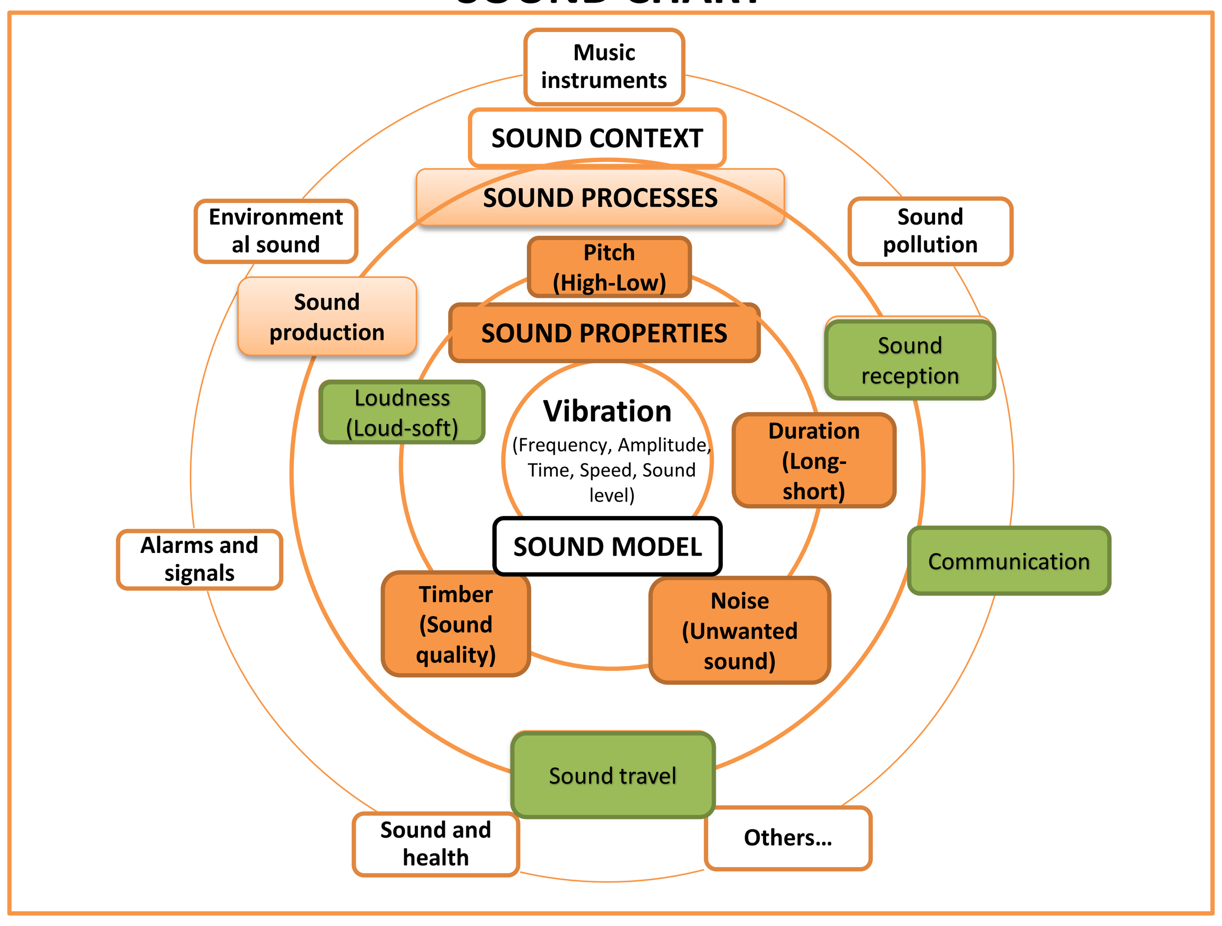
SCIENTIFIC PRACTICES



DISCURSIVE PRACTICES



SOUND CHART



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1. What do we know about SOUND? Choosing a topic.

In order to start the project we decided to follow one of the steps included in the **Design For Change** movement. In this activity we gave students the name of the topic (sound) and, in small groups, they wrote ideas or sentences related to it. These ideas came from their **previous knowledge** about sound. Using post-its, they built a **collaborative concept map** where all the ideas were grouped into sub-topics. Once the map was completed, students **voted** for the sub-topic they wanted to base their investigation on.

This way of introducing the topic helped students to be more **involved** and **engaged** in the following steps. It also helped us to **focus** on which aspects of sound we were going to work on.

2. Writing a good scientific question.

Curiosity is the mother of Science

What makes a good scientific question?

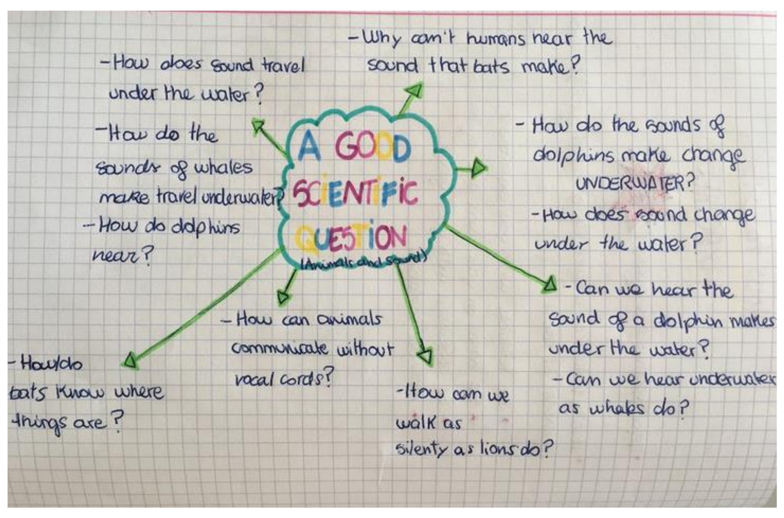
× It can't be answered without carrying out an experiment or observation.

× It can't be too open.

So

1. It must be **TEASTABLE**.
2. It must be a **CLOSED** question.
3. It should contain **one factor (Variable) that you can change** and at least one factor (**Variable**) that you can **measure**.
4. It will usually start with... HOW? WHAT? WHICH? WHY? WHEN? WHO? WHERE?

BAD SCIENTIFIC QUESTIONS	GOOD SCIENTIFIC QUESTIONS
× What is water? × What floats?	✓ Which paper towel brand is the strongest? ✓ Does acid rain affect the growth of plants?



One of the most difficult steps of the scientific method is to write a **good scientific question**. This is why we gave students some **scaffolding** (guidelines and examples) so that their questions were written properly according to scientific standards.

Working in small groups helped our students not only with the **use of English** but also with the **complexity of the task**.

3. Making a hypothesis.

In this step we focused on teaching students that a hypothesis is not a guess but a tentative answer (or **educated guess**) to their problem/question. At first, students freely wrote their answer without any **justification** or **accuracy**. It was then that we gave them a **checklist**. This helped them to assess their hypothesis and complete it with all the missing information and the correct structure.

The use of checklists encourages **autonomy** and **self-assessment**.

Is your hypothesis testable with the experiment?	YES	NO
Is it based on your ideas and information?	YES	NO
Were you discussing your ideas in group?	YES	NO
Does it include an independent variable (the one we change) and a dependent variable (the one is fixed)?	YES	NO

HYPOTHESIS

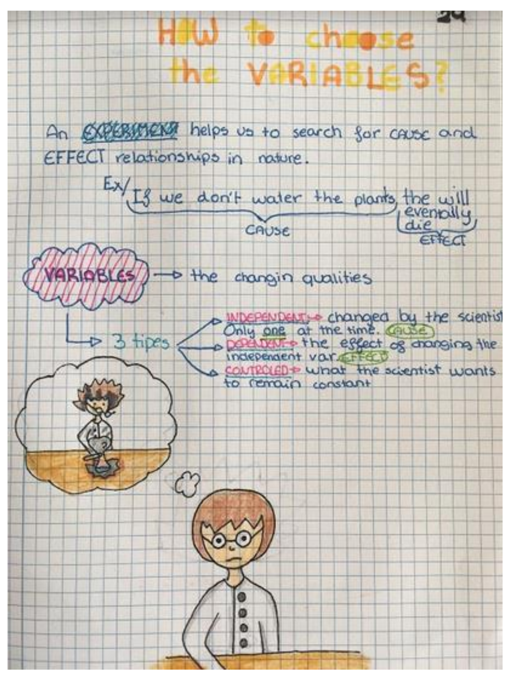
We know that:

Our ears are designed to hear in the air: the eardrum vibrates and that produces some reactions on ears' bones. This vibrations arrive to the outer ears and it is changed into electric impulses that travel to the brain.

When we are under the water, all of our head vibrates and both ears are affected at the same time. That's why it's very difficult to know where the sound is coming from.

So, we think that humans can hear under the water, but not so good as on the outside. Underwater, we will listen the animal's sound lower than outside and we will listened worst.

4. Designing an experiment: material, procedure and variables.



Once every group wrote their hypothesis it was time for them to **design an experiment** that helped them to demonstrate its validity.

In this step we focused on the importance of being **accurate** when writing the procedure so that any scientist could carry out the same experiment. We also introduced the different types of **variables** in any experiment so that they could identify them in their **procedure**.

5. Carrying out the experiment and recording results.

When carrying out their experiments, students had to **follow** the procedure steps that they had designed **very precisely**. They also had to make sure that the experiment was **repeated** several times so that the results would be **reliable**. Before the experiment, each group had to choose the best way to **record** the **results**. To do so, we gave them some helpful examples.

RESULTS (SOUND OF A WHALE)

1. Sound inside the water (clearness) ★★★★☆
2. Sound inside the water (clearness) ★★★★★
3. Sound inside the water (clearness) ★★★★★

6. Drawing and sharing conclusions.

The last part of the project was to give a **scientific explanation** to the results that our students obtained. When **sharing their conclusions** with the rest of the class, each group had to explain not only **what had happened** but also **why**. This step **ensured** our students **comprehension** of the topic and **widened** their **knowledge** about it.

Once this was done, we asked them to evaluate the whole process and to come up with ideas about what could be **improved** and any other **questions** that could be **investigated** in **future projects**.

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