

Whybricks lessons

Notice and Wonder



Whybricks
Giving physical science form



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A message to educators

There's a common misunderstanding that studying science is basically the same thing as studying history: there are an established set of facts one simply memorises and then repeats.

This is not the case!

Science isn't just a list of facts. It's an active process. It's a way of thinking about, and questioning, the world. There are always new questions to ask and new answers to discover.

The Notice and Wonder sheet set is designed to help your students with sciencing (because science is a verb now!) and engineering investigations and projects. These templates are designed to work alongside the other Whybricks materials, offering a place for students to note observations 'I notice ...' and capture questions 'I wonder ...' throughout their learning.

There are four sheets in the set:

- A 'Notice' only page (with prompts)
- A 'Wonder' only page (with prompts)
- A notice + wonder 'T graph'¹
- A 'Now I wonder' page (with prompts)

Whybricks projects will indicate key moments where Notice or Wonder sheets should be used, but it is recommended you help students build the habit of making observations and noting questions on their sheets (or in a Notice and Wonder journal) as they happen throughout an investigation or project.

¹ Some students, especially younger students, may find it easier to keep their observations ('notice') and queries ('wonder') on a single page to distinguish between the two. The 'T graph' layout may be easiest to use in this instance.

A special note about the Wonder sheets

In general, the Whybricks projects and investigations are designed to explore specific areas of physical science and engineering. Your students are likely to come up with similar and expected questions to the ones the lessons are designed to explore. They are also likely to come up with a range of other questions that time and context won't allow you to delve into in your class.

The goal of the Wonder sheets is **NOT** to get students to 'land on' the 'correct' question. It is to help them to practice the critical skill of asking questions. Their questions should always be honoured, even if time will not allow you to explore them all.

A good exercise is to categorise questions that students come up with into groups. The groups might include:

- **Fact-check questions** – These are questions that are easy to look up in a book or online resource. (Example: I wonder what is the gravitational constant on Earth?)
- **Scientifically testable questions** – These are questions which can be investigated using scientific and engineering practices. You and your students will only be able to investigate the testable questions for which you have the equipment, supplies and measurement devices available. (Example: I wonder if changing the slope will change how far it slides?)
- **Beyond science questions** – These are questions that are connected to other subject areas and are not testable using science. (Example: I wonder if the ancient Romans understood gravity?)

You can also highlight questions that can be explained after the investigation has been conducted using the **Claim, Evidence, Reasoning (CER) framework** (with a claim about the answer that is

supported with evidence from the research conducted and reasoned out based on the model established).

What about the student questions you don't explore?

Dan Meyer (of Three-Act Maths and Desmos) brilliantly describes the issue of managing student-generated questions:

How do you ask students for their questions while knowing, in the back of your head, the question you're going to pursue? I know some teachers will ask for student questions and then 'wait for' or 'nudge students towards' the question they want to ask. I suspect this drives students crazy. It drives *me* crazy, this sense that there's some question the teacher wants me to ask even while she's insincerely asking me for *my* questions.

The quick way around this is to say, "Great. Love these questions. I hope we get to all of them. Here's one I'll need your help with first."²

This strategy works wonderfully with the Whybricks lessons and Wonder sheets. Asking students to share the questions they have come up with as a class, adding them all onto a 'wonder wall' or similar device, categorising questions to help students see where they can get answers from, even asking students 'who else finds this question interesting?' when a student shares a question you think is great ... these are all strategies that demonstrate to your students that their questions have value, even if you cannot cover all of them inside the class.

² <https://blog.mrmeyer.com/2013/teaching-with-three-act-tasks-act-one/>

So, too, does circling back to the questions that weren't covered. Looking back at questions that weren't the focus of a lesson at the end of the investigation you may be surprised to see what other answers were discovered along the way. You may also be able to provide answers to some of the questions which will now make sense to your class given what they've discovered. For other questions, you may now be able to show your students how they could find answers.

There may also be questions for which you don't know the answer. How fantastic! Tell your students the truth – that you don't know – and ask how together you might find out more.

Likewise, by the end of a lesson, students will probably have new questions that have come to mind. Encourage them to capture these and use the power of questioning to carry them into new explorations.

Using the sheets

The four sheets that follow are intended to be provided to students for their use in their projects and investigations. You can print off as many as you need – there is no set minimum or maximum number of observations or questions students should be limited to making.

Happy discovering!

The Notice and Wonder sheets are adapted from the PQRST approach developed by DaNel Hogan and Brooke Meyer: <https://stemazing.org/pqrst/>.

With great appreciation and heart-felt thanks for your collaboration for constructive disruption.

I notice...

What do you observe? These should be statements, not questions.
Write and draw.

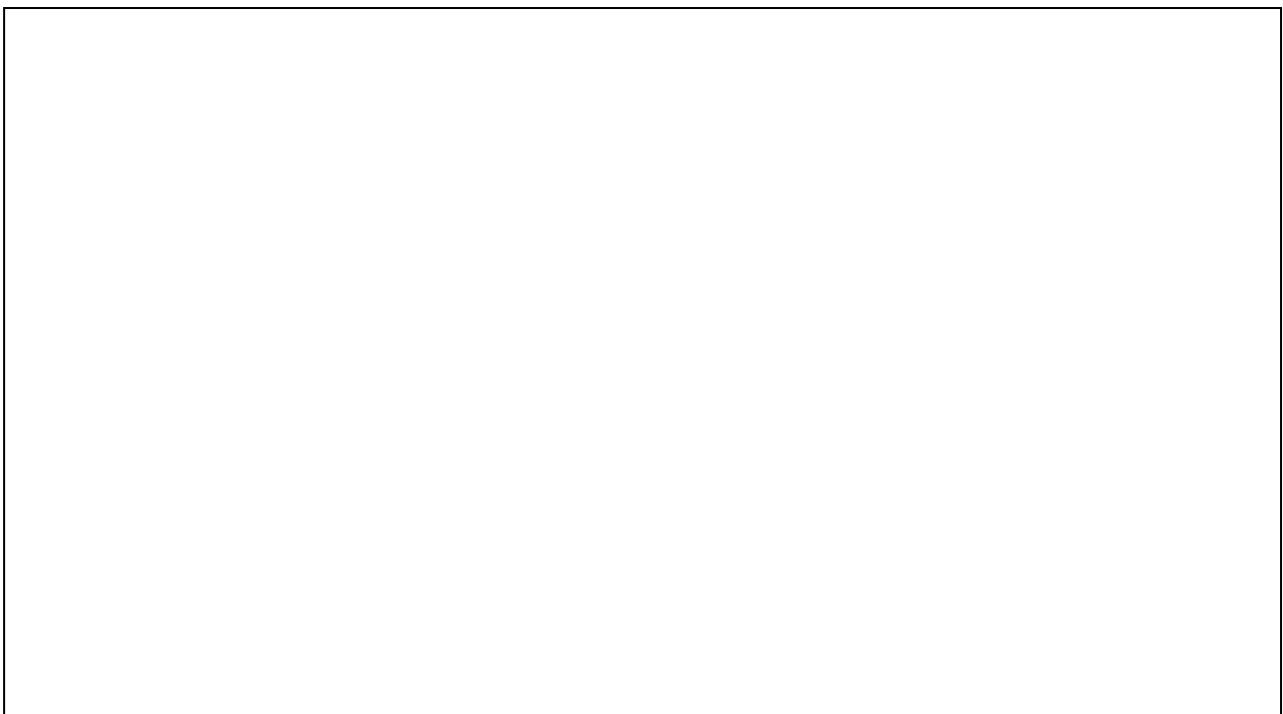
I notice

I notice

I notice

I notice

Draw and label:



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I wonder...

What questions do you have? I wonder why...? I wonder if...? I wonder what...? I wonder how...? I wonder what would happen if...?

I wonder _____



I notice...	I wonder...



Now I wonder...

Having finished your investigation, what new questions do you have? Because (I noticed..., I found..., I discovered..., I tried...) I wonder why...? I wonder if...? I wonder what...? I wonder how...? I wonder what would happen if...?

Because _____

I wonder _____

Because _____

I wonder _____

Because _____

I wonder _____

Because _____

I wonder _____

