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| Worksheet 5: Scientific Inquiry |

**Exercise A – Pre-listening Vocabulary**

**Instructions:** Work with a partner or small group to match the words to their definitions. For the words with more than one definition, which definition do you predict will be in a listening about the “The Scientific Method”?

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| --- | --- | --- | --- | --- |
| Fundamentally | Logical | Prediction | **Ri**gorously | Systematic |
| Initiate | Pathway | Progressive | Spiral | Valid |

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| **Spiral** | - a shape or design, consisting of a continuous curved line that winds around a central point, with each curve further away from the centre  - a continuous harmful increase or decrease in something, that gradually gets faster and faster |
| **valid** | - based on what is **logical or true**  - (computing) that is **accepted by the system** |
| **Logical** | (of an action, event, etc.) seeming **natural, reasonable or sensible** |
| **systematic** | done according to a system or plan, in a complete, efficient or determined way |
| **prediction** | a statement that says what you think will happen; the act of making such a statement |
| **Rigorously** | - with a lot of attention to detail with a lot of energy  - by strictly following particular rules or processes |
| **Initiate** | - to make something begin  - to explain something to somebody and/or make them experience it for the first time  - to make somebody a member of a particular group, especially as part of a secret ceremony |
| **Progressive** | - in favour of new ideas, modern methods and change  - happening or developing steadily |
| **Fundamentally = basically** | - in every way that is important; completely  - used when you are introducing a topic and stating something important about it (=basically) |
| **pathway** | - a track that serves as a path  - a plan of action or way of achieving something |

Definitions from:

Oxford Advanced Learner’s Dictionary online (2020), Oxford University Press: <https://www.oxfordlearnersdictionaries.com>

**Exercise B – Pre-listening Discussion**

**Instructions:** Discuss the following questions with a partner or small group.

1. What is something that you worked on rigorously in your life? What was the experience like? Positive? Negative? Successful?
2. For each of the following situations, which option seems the most logical? Why?

e.g. You want to get a high mark on the test. Should you study hard or play video games?

**Studying hard is more logical.**

1. You want to eat spicy food for dinner. Should you go to a Mexican restaurant or a British restaurant?
2. You need to wake up early tomorrow. Should you go to bed early or stay up late watching TV?
3. For each of the following situations make a prediction for what you think will happen next. Use the verb “predict” or the noun “prediction”.

e.g. You dropped your dad’s favourite coffee mug and it broke.

**I think he will be angry. That’s my prediction.**

**I predict that he’ll be angry.**

1. The sky is dark and cloudy this morning.
2. You have been playing music on your phone all day.
3. You can’t find your wallet. Where is it?

**Exercise C – Taking Notes While Listening**

**Instructions:** Only the main headings are provided in the notes below. [Watch the video](https://www.coursera.org/lecture/emergence-of-life/1-3-scientific-inquiry-vs-scientific-method-z4bw2) and write point form notes with interesting details and example for each section. Afterwards, work with a partner to compare your answers and fill in what you missed.

Scientific Inquiry/research/asking questions vs. Scientific Method

Introduction

* \_\_\_Surprises\_\_\_\_Something that is surprising\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_the environment, human medicine, geology, history, every aspect of our life \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Science

1. \_\_\_reproducible – can do again and again and get the same results\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. \_\_\_\_\_predictive – can predict the future. E.g. the weather forecast/report \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The Process

* \_\_systematic \_\_\_not a straight line \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_it is a spiral = repeated\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_closer and closer to the truth, more and more insights and ideas \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Scientific Inquiry

1) Initiate Curiosity

* \_\_\_Use our mind, the super computer on our shoulder to think in 3D and in time
* \_\_\_\_\_\_think about questions\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_think about what is valid\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2) Reason, Plan, and Hypothesize

* \_\_\_\_Ask if our question is answerable\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_Can I form a hypothesis?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3) Experiment

* \_\_\_\_\_takes a lot of time and money so we need to be ready \_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4) Synthesize, Interpret, and Discuss Results sync

* \_\_synthesize or combine into a format that you can analyze \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5) Communicate Results

* \_\_\_\_\_speaking\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_writing\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_formal presentation \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
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6) Modify, Re-Think, Re-Initiate Curiosity

* \_\_\_\_\_look at what’s new, what is worthwhile to study more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
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Important to Note/aspects/remember

* \_\_\_\_\_can’t jump = systematic\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Conclusion

* \_\_\_\_\_\_\_\_\_a dynamic template for answering important questions for the survival of the planet earth. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Exercise D – Intonation Practice**

**Instructions:** With a partner, draw arrows above the underlined words to guess which intonation patterns you think the speaker used. Use “may” or “maybe” while you talk to each other.

e.g. “I think the intonation **may rise** here because it’s a question.” / “**Maybe** this part has falling intonation because it’s at the end of a sentence.” / “This part **may** have rise-fall intonation because it’s before a comma.”

1. These have to do with the environment, human medicine, ancient geological history.

Why? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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2. Every aspect of our lives is full of surprises and we want to understand them better.

Why? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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3. Another definition of good science is: is it predictive?

Why? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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4. Is it capable of giving you the ability to make predictions into the future and have those

predictions be accurate?

Why? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Instructions:** [Watch parts of the video again](https://www.coursera.org/lecture/emergence-of-life/1-3-scientific-inquiry-vs-scientific-method-z4bw2) to listen to the intonation that the speaker uses. With a partner, check your answers and discuss why the speaker chose to use that intonation. Repeat the sentences and try to imitate the speaker’s intonation.

**Exercise E – Using Modals of Certainty to Make Predictions**

The last two videos have mentioned making hypotheses and predictions. The modals **might, may, could,** and **must** can all be used to express different levels of certainty in the present tense (useful for scientific truths).

**Might, May, Could**

* If you’re not sure and **you’re just guessing**, use **might, may, or could.**
* This is useful when you’re talking to your group members, brainstorming ideas.

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| Why are cities often warmer than the small towns/villages nearby? |
|  |

* It may be **because of** [all the people] (who are) living so close together.
  + **It may be because many people live so close together.**
* Maybe it’s **because of all the people** (who are) living so close together.
* Maybe many people live so close together.
* It **might be** because people build cities in warmer areas.
* It **could be** because of pollution.

**Must**

* If you’re making your best guess, use must.
* This is useful when you have some strong observations or evidence that make you think you have the answer (but you’re still not 100% sure).

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| Why are cities often warmer than the towns nearby?   * Someone told me about something called **the urban heat island effect**. ***It must have something to do with that****. =* ***It must be related to that****.* |

**Present Tense**

* If you are 100% sure because you know the answer, you can use the **present tense.** E.g. The reason that cities are warmer than villages **is related to** the heat island effect.
* Hypotheses are often written in the present tense even before they are tested. It is a statement that you will test to see if it’s true.
* This is useful for making a hypothesis and for discussing the final results.

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| Why are cities often warmer than the towns nearby?   * Hypothesis: Cities are warmer than nearby towns because all of the dark buildings and concrete hold heat longer than dirt, grass, and trees do. |

**Instructions:** In a small group, use modals of certainty to answer the following questions. Even if you know the real answer, make up some sentences that could use the other modals.

1. Why are ducks able to float on water?

2. Why does Vancouver get so much rain in the winter?

3. Why do camels have a hump on their backs?

4. Why are internet speeds often slower in the evening?