Honing your research topic and questions

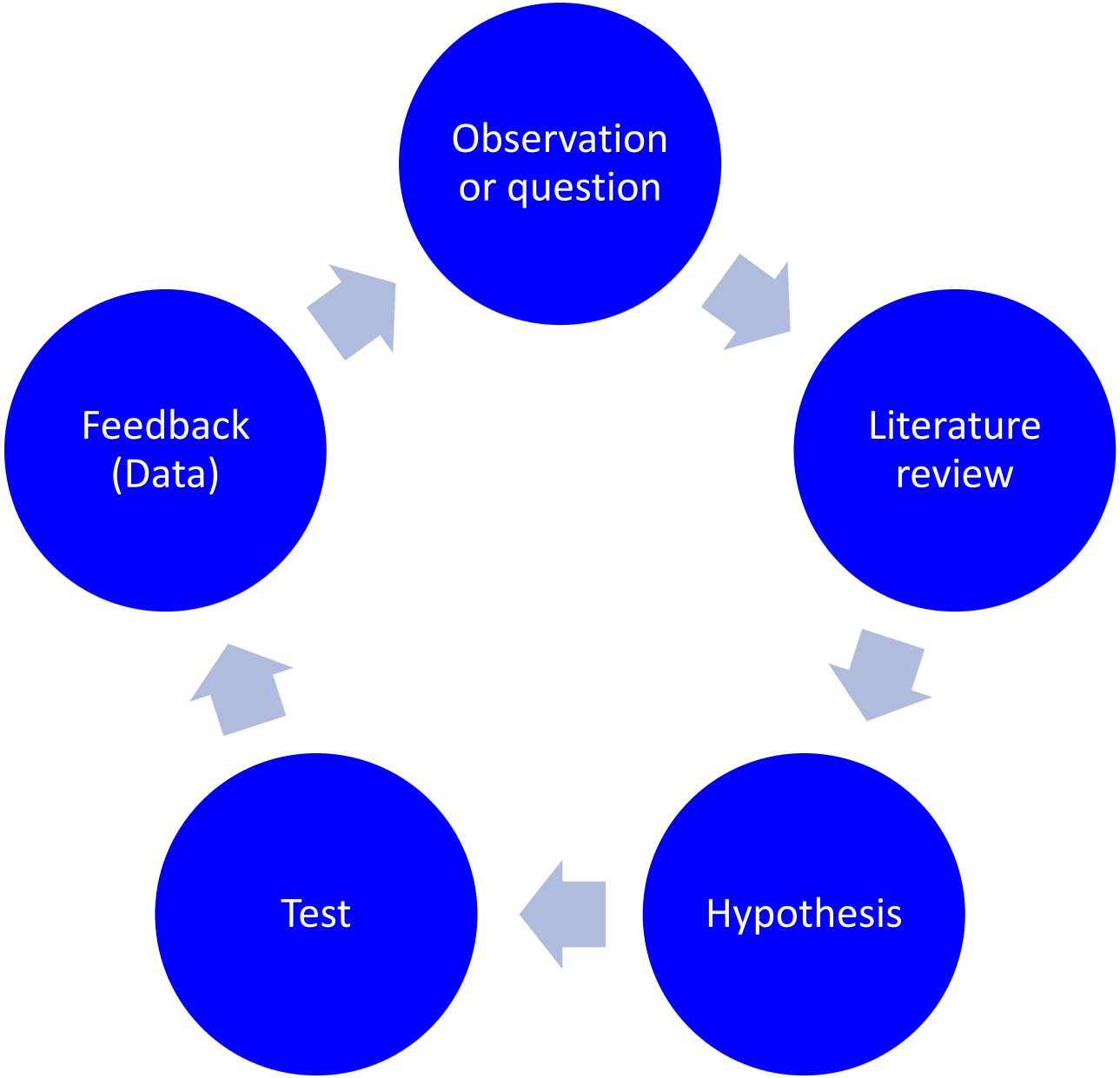
What are you going to learn?

- The iterative process and the scientific method
- The Novelty Principle
- The research gap and how to find it
- Research Questions Algorithm
- Research questions, aims, objectives, or hypotheses

The iterative process & the scientific method

The iterative process & the scientific method

- **Iterative process:** The process of improving and refining something through small changes that are rigorously tested to provide feedback for improvements.
- **All evolution is iterative:** Small changes (hypotheses) are tested against the environment and provide feedback whether the hypothesis was correct
- **Scientific method is iterative:** Your observations are turned into hypotheses that are tested; the feedback helps you refine the hypothesis

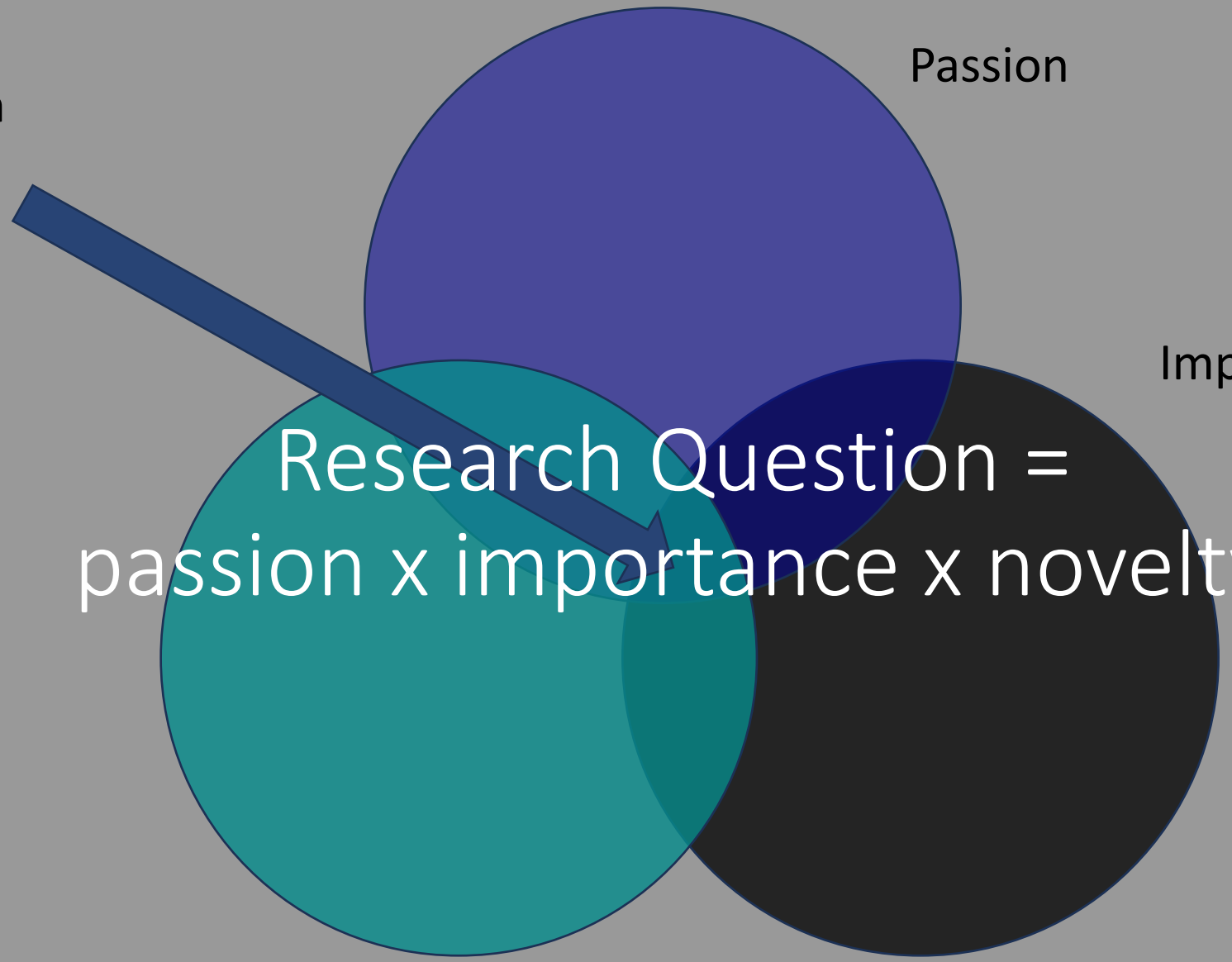

Observation or question
Literature review
Hypothesis
Test
Feedback (Data)

The iterative process & the scientific method

1. Start with a question or an observation.
2. Read literature on the topic to learn what other researchers have done.
3. Use the reading to form a hypothesis.
4. Test the hypothesis through an experiment.
5. Obtain feedback (results).
6. Iterate the initial observation or question.

The Research Question Equation

Your research question



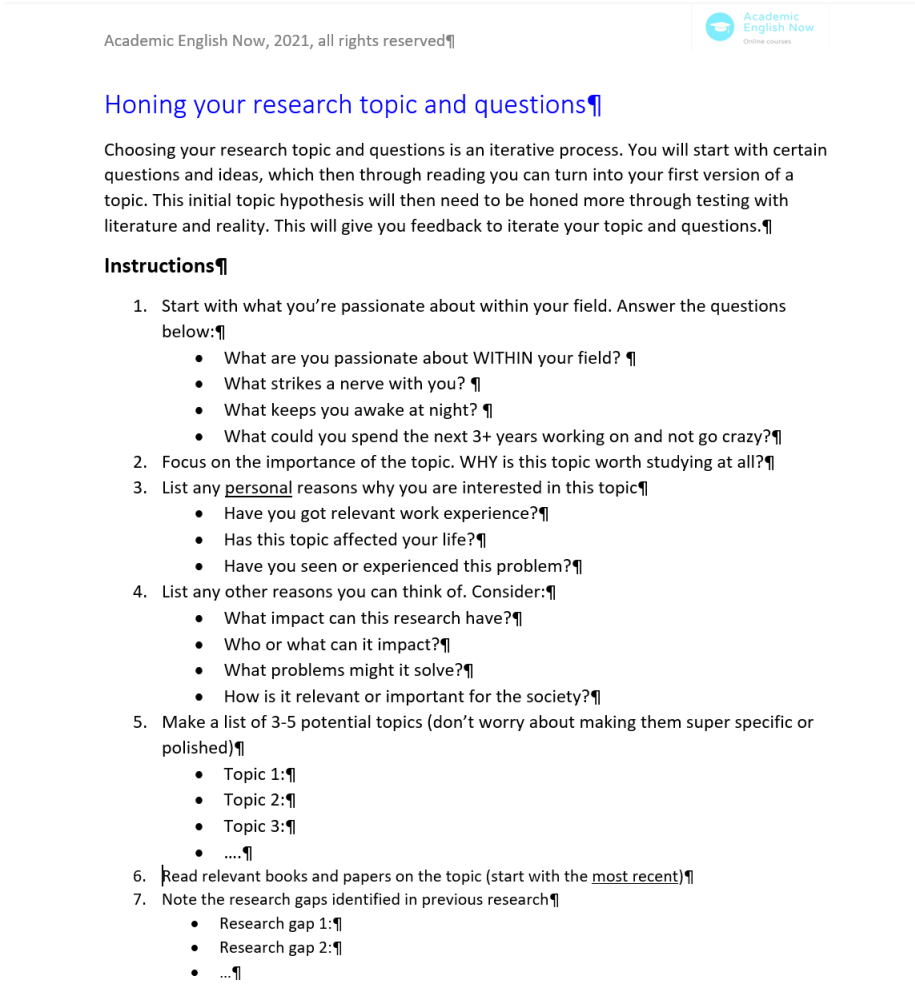
Research Question = passion x importance x novelty

Variable 1: Your passion

- **Passion:** if you have no passion for your topic or an aspect of it, you'll be thoroughly miserable while writing your thesis
- **Tackle difficulties:** if you're researching something you're passionate about, difficulties will be easier to tackle
- **Maintain motivation:** when your motivation dips, it will be easier to re-establish it
- **Feel self-fulfilled:** if at least part of your research project matters to you personally, you will feel more self-satisfaction

Action time

Use the worksheet to get started forming your research topic.



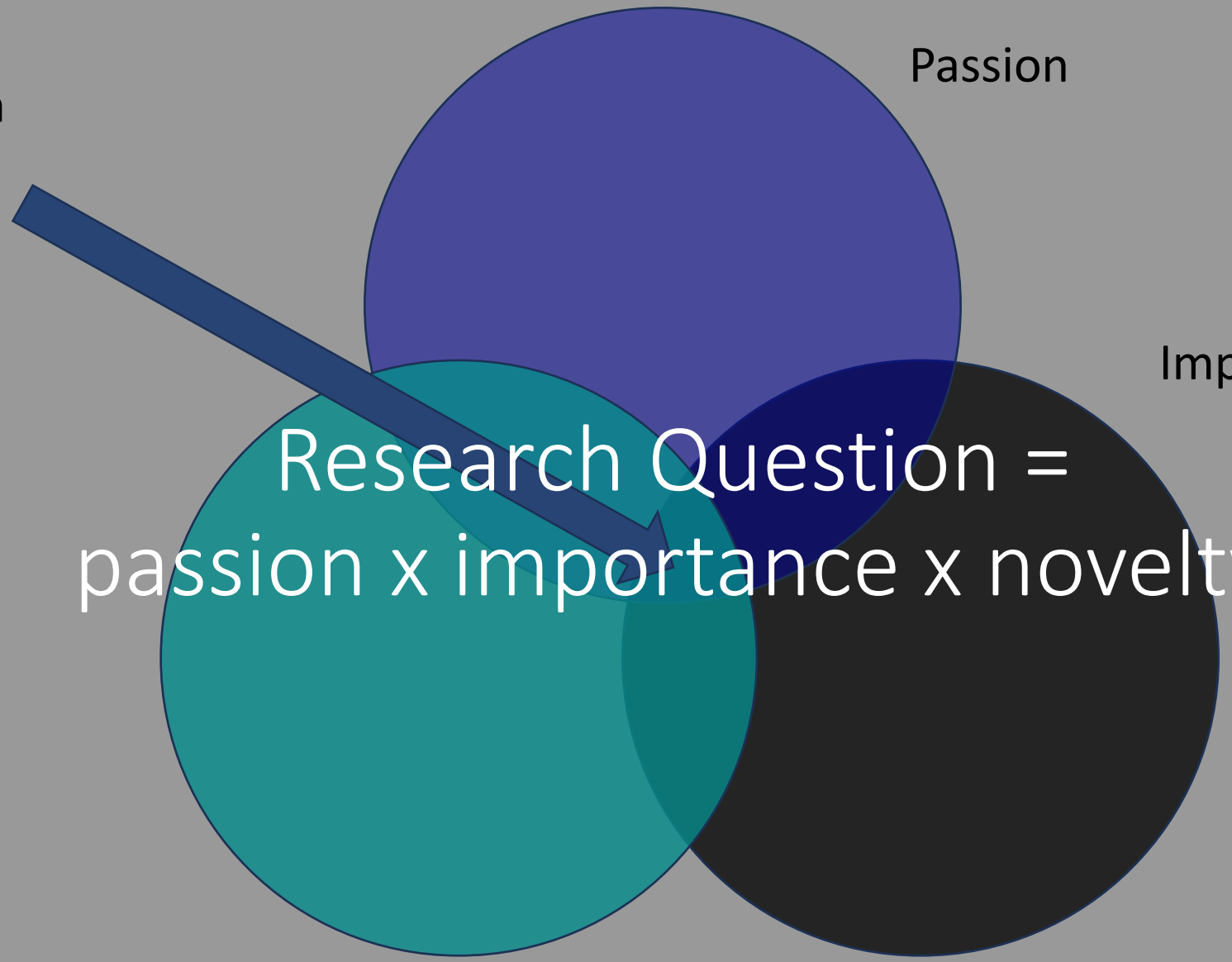
Honing your research topic and questions¶

Choosing your research topic and questions is an iterative process. You will start with certain questions and ideas, which then through reading you can turn into your first version of a topic. This initial topic hypothesis will then need to be honed more through testing with literature and reality. This will give you feedback to iterate your topic and questions.¶

Instructions¶

1. Start with what you're passionate about within your field. Answer the questions below:¶
   - What are you passionate about WITHIN your field? ¶
   - What strikes a nerve with you? ¶
   - What keeps you awake at night? ¶
   - What could you spend the next 3+ years working on and not go crazy?¶
2. Focus on the importance of the topic. WHY is this topic worth studying at all?¶
3. List any personal reasons why you are interested in this topic¶
   - Have you got relevant work experience?¶
   - Has this topic affected your life?¶
   - Have you seen or experienced this problem?¶
4. List any other reasons you can think of. Consider:¶
   - What impact can this research have?¶
   - Who or what can it impact?¶
   - What problems might it solve?¶
   - How is it relevant or important for the society?¶
5. Make a list of 3-5 potential topics (don't worry about making them super specific or polished)¶
   - Topic 1:¶
   - Topic 2:¶
   - Topic 3:¶
   - ....¶
6. Read relevant books and papers on the topic (start with the most recent)¶
7. Note the research gaps identified in previous research¶
   - Research gap 1:¶
   - Research gap 2:¶
   - ...¶

Your research question



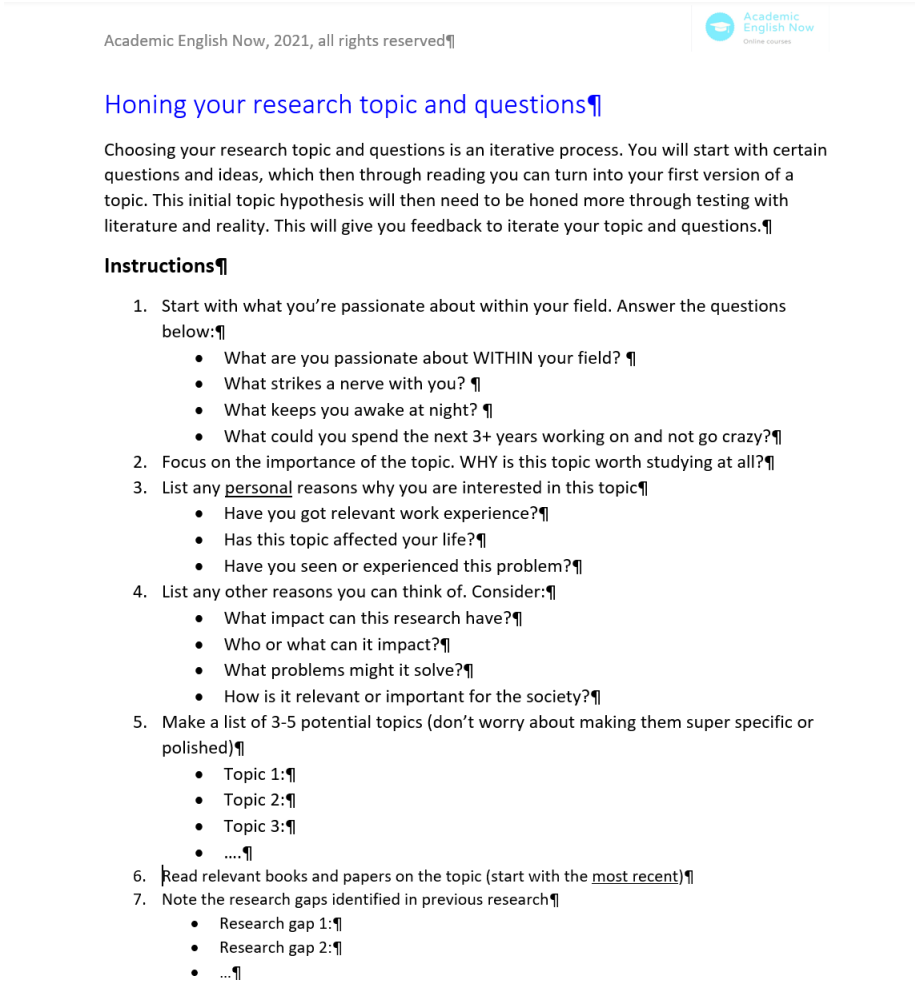
Research Question = passion x importance x novelty

Variable 2: Importance

- **The big why:** Ask yourself WHY this topic should be studied at all? What's the point anyway? Who's going to care?
- **Wider impact:** It's important your topic has some relevance to the wider field, the society, people's lives, etc.
- **Justification:** It provides a solid justification for why you're doing what you're doing

Action time

Use the worksheet to get started forming your research topic.



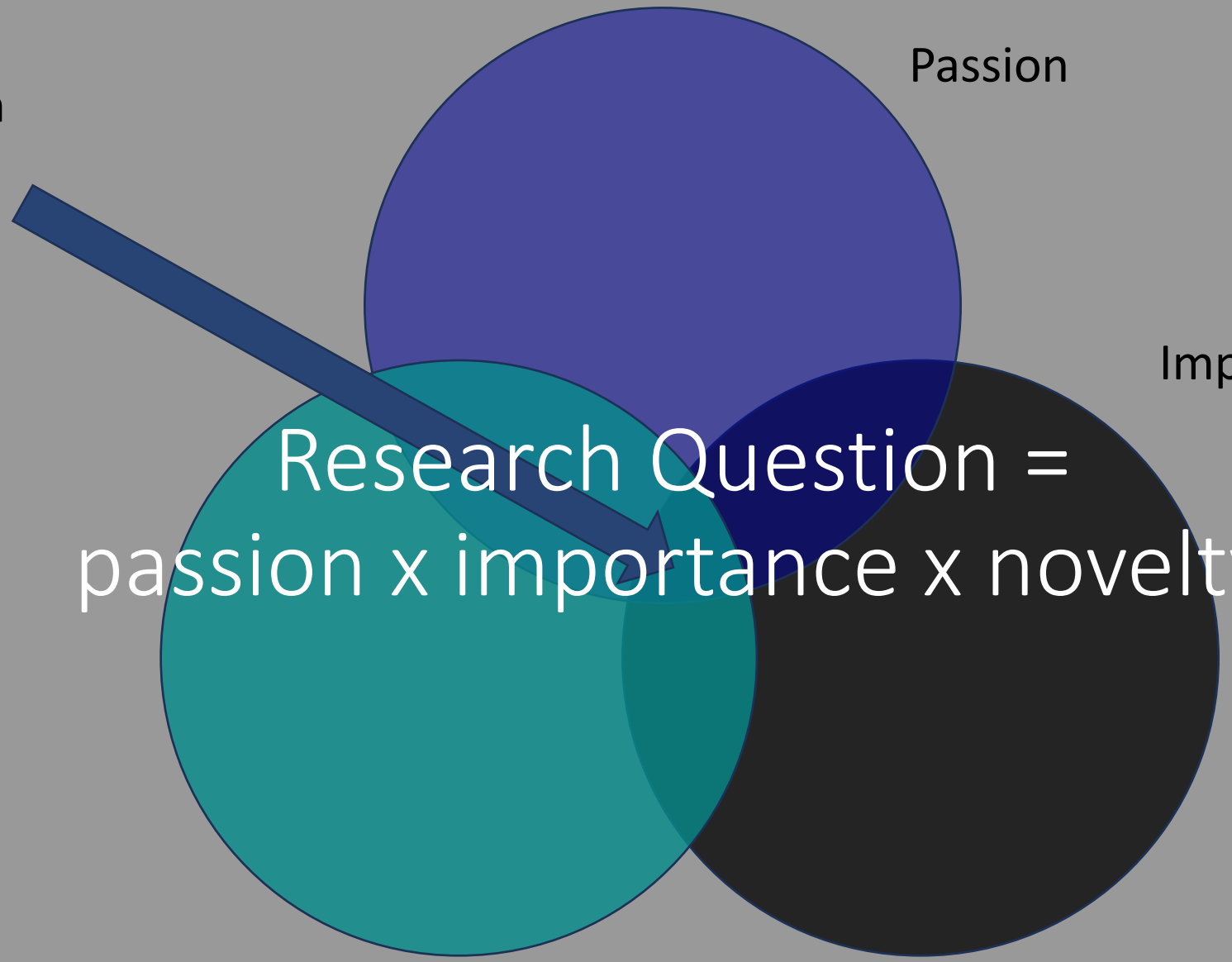
Honing your research topic and questions¶

Choosing your research topic and questions is an iterative process. You will start with certain questions and ideas, which then through reading you can turn into your first version of a topic. This initial topic hypothesis will then need to be honed more through testing with literature and reality. This will give you feedback to iterate your topic and questions.¶

Instructions¶

1. Start with what you're passionate about within your field. Answer the questions below:¶
   - What are you passionate about WITHIN your field? ¶
   - What strikes a nerve with you? ¶
   - What keeps you awake at night? ¶
   - What could you spend the next 3+ years working on and not go crazy?¶
2. Focus on the importance of the topic. WHY is this topic worth studying at all?¶
3. List any personal reasons why you are interested in this topic¶
   - Have you got relevant work experience?¶
   - Has this topic affected your life?¶
   - Have you seen or experienced this problem?¶
4. List any other reasons you can think of. Consider:¶
   - What impact can this research have?¶
   - Who or what can it impact?¶
   - What problems might it solve?¶
   - How is it relevant or important for the society?¶
5. Make a list of 3-5 potential topics (don't worry about making them super specific or polished)¶
   - Topic 1:¶
   - Topic 2:¶
   - Topic 3:¶
   - ....¶
6. Read relevant books and papers on the topic (start with the most recent)¶
7. Note the research gaps identified in previous research¶
   - Research gap 1:¶
   - Research gap 2:¶
   - ...¶

Your research question



Research Question = passion x importance x novelty


The Novelty Principle

The Novelty Principle

- **Novelty Principle:** The factors that together make your research new and unique
- **Its characteristics:** Novel participants/materials, methodology, study setting, specific topic, research tools or procedures, etc.
- **Why is it important?** If your research or findings aren't novel, you won't be able to write your thesis
- **How do we find it?** Through the iterative process of making observations, reading literature, forming topic hypotheses and testing them against previous research


The research gap

The Research Gap

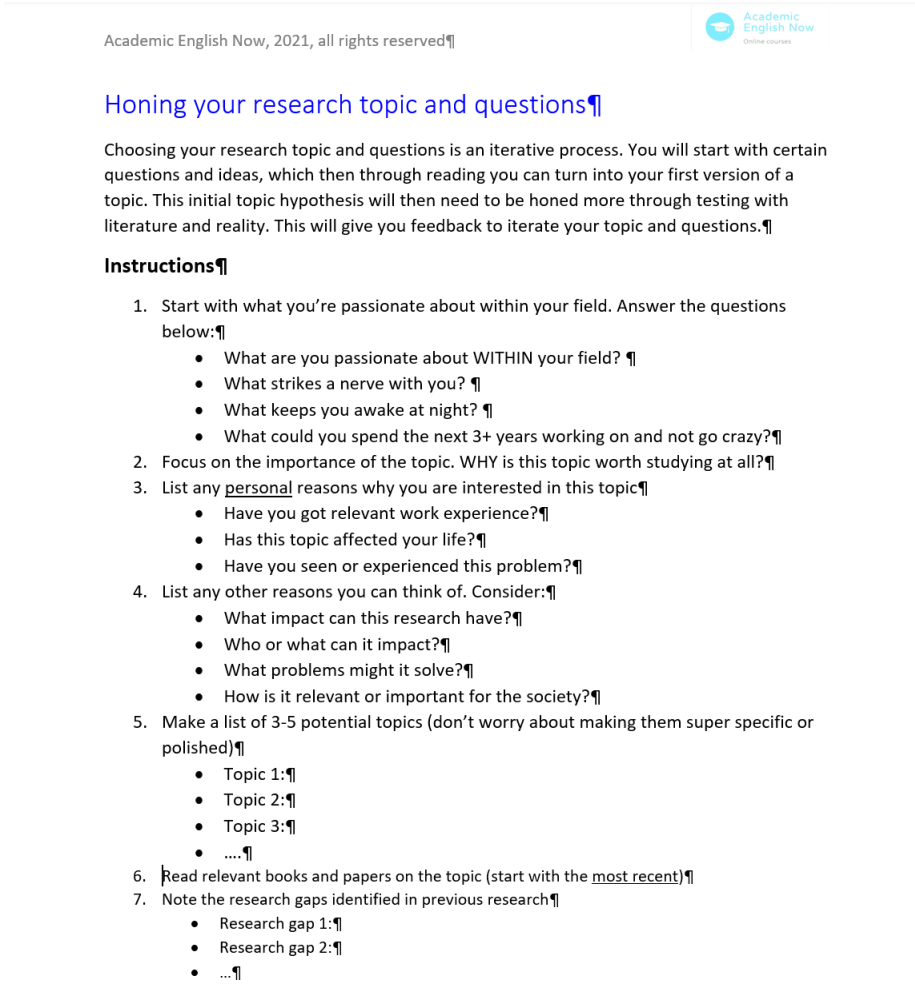
- **What is it:** the research gap is a place in the research where there are (almost) no other studies and/or there is currently a yet unexplained phenomenon.
- **Why you want it:** it ensures the novelty of your study and provides solid academic justification for your research.
- **How do we find it:** through an extensive literature review.

Example research gaps

- Lack of or insufficient research:
  - On a particular topic,
  - In a specific geographical area,
  - On a segment of the population or a specific material
  - Using a certain methodology, theory, approach
- Problems with previous studies (e.g. small sample size)
- A controversy or a lack of understanding

Action time

Use the worksheet to get started forming your research topic.



Honing your research topic and questions¶

Choosing your research topic and questions is an iterative process. You will start with certain questions and ideas, which then through reading you can turn into your first version of a topic. This initial topic hypothesis will then need to be honed more through testing with literature and reality. This will give you feedback to iterate your topic and questions.¶

Instructions¶

1. Start with what you're passionate about within your field. Answer the questions below:¶
   - What are you passionate about WITHIN your field? ¶
   - What strikes a nerve with you? ¶
   - What keeps you awake at night? ¶
   - What could you spend the next 3+ years working on and not go crazy?¶
2. Focus on the importance of the topic. WHY is this topic worth studying at all?¶
3. List any personal reasons why you are interested in this topic¶
   - Have you got relevant work experience?¶
   - Has this topic affected your life?¶
   - Have you seen or experienced this problem?¶
4. List any other reasons you can think of. Consider:¶
   - What impact can this research have?¶
   - Who or what can it impact?¶
   - What problems might it solve?¶
   - How is it relevant or important for the society?¶
5. Make a list of 3-5 potential topics (don't worry about making them super specific or polished)¶
   - Topic 1:¶
   - Topic 2:¶
   - Topic 3:¶
   - ....¶
6. Read relevant books and papers on the topic (start with the most recent)¶
7. Note the research gaps identified in previous research¶
   - Research gap 1:¶
   - Research gap 2:¶
   - ...¶

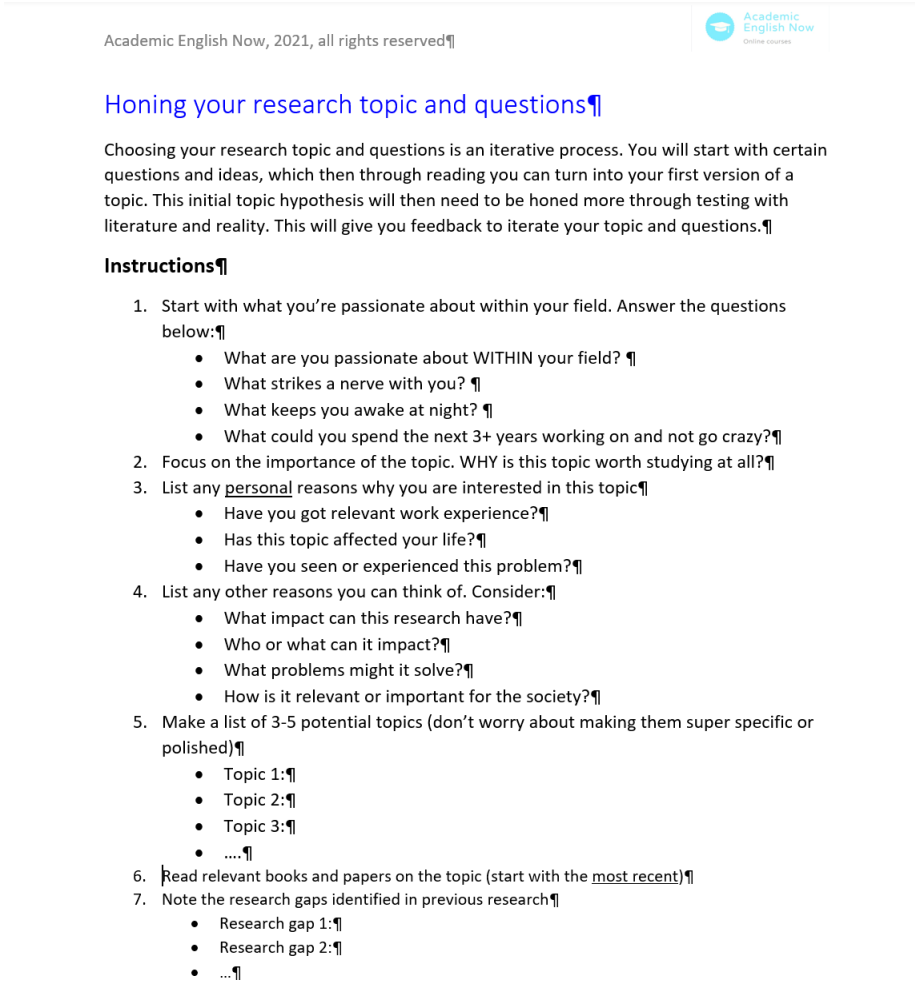
The Research Question Algorithm

The Research Question Algorithm

- **What is it:** a scientific iterative method of formulating research worthy research question
- **The Algorithm:** a research question must be focused, researchable, measurable, specific
- **Why it's important:** gives you a repeatable and proven process to formulate solid research questions

Action time

Use the worksheet to get started forming your research topic.



Honing your research topic and questions¶

Choosing your research topic and questions is an iterative process. You will start with certain questions and ideas, which then through reading you can turn into your first version of a topic. This initial topic hypothesis will then need to be honed more through testing with literature and reality. This will give you feedback to iterate your topic and questions.¶

Instructions¶

1. Start with what you're passionate about within your field. Answer the questions below:¶
   - What are you passionate about WITHIN your field? ¶
   - What strikes a nerve with you? ¶
   - What keeps you awake at night? ¶
   - What could you spend the next 3+ years working on and not go crazy?¶
2. Focus on the importance of the topic. WHY is this topic worth studying at all?¶
3. List any personal reasons why you are interested in this topic¶
   - Have you got relevant work experience?¶
   - Has this topic affected your life?¶
   - Have you seen or experienced this problem?¶
4. List any other reasons you can think of. Consider:¶
   - What impact can this research have?¶
   - Who or what can it impact?¶
   - What problems might it solve?¶
   - How is it relevant or important for the society?¶
5. Make a list of 3-5 potential topics (don't worry about making them super specific or polished)¶
   - Topic 1:¶
   - Topic 2:¶
   - Topic 3:¶
   - ....¶
6. Read relevant books and papers on the topic (start with the most recent)¶
7. Note the research gaps identified in previous research¶
   - Research gap 1:¶
   - Research gap 2:¶
   - ...¶

Research Questions, Aims, Objectives or Hypotheses?

Research Questions, Aims, Objectives or Hypotheses?

- **Myth:** they're fundamentally different
- **Truth:** they're one and the same way of telling us what the goal of your study is and what you want to find out

Research aim

- Start with the general aim
- Add a more specific aim or aims of the research

The subject of this work is an alternative approach, in which the stable 12C beam is entirely replaced with its radioactive isotope 11C (T1/2 = 20.4 min). […] More specifically, this work focuses on the production system (highlighted in red, in Fig. 1) tailored for high intensity 11CO beams.

[adapted from Stegemann, S. et al. 2020. Production of intense mass separated 11C beams for PET-aided hadron therapy. *Nuclear Inst. and Methods in Physics Research B* 463, pp. 403–407]

Research questions

- Typically, the overall aim is stated first
- This is followed by the specific research questions

Bearing this in mind, this study aims to investigate native speakerism in Poland. More specifically, there are five research questions this project aims to answer:

1. How do students, teachers and recruiters understand and define the term ‘native speaker’?
2. …

[from Kiczkowiak, M. (2018). *Native Speakerism in ELT: Voices From Poland.* [PhD]. University of York.]

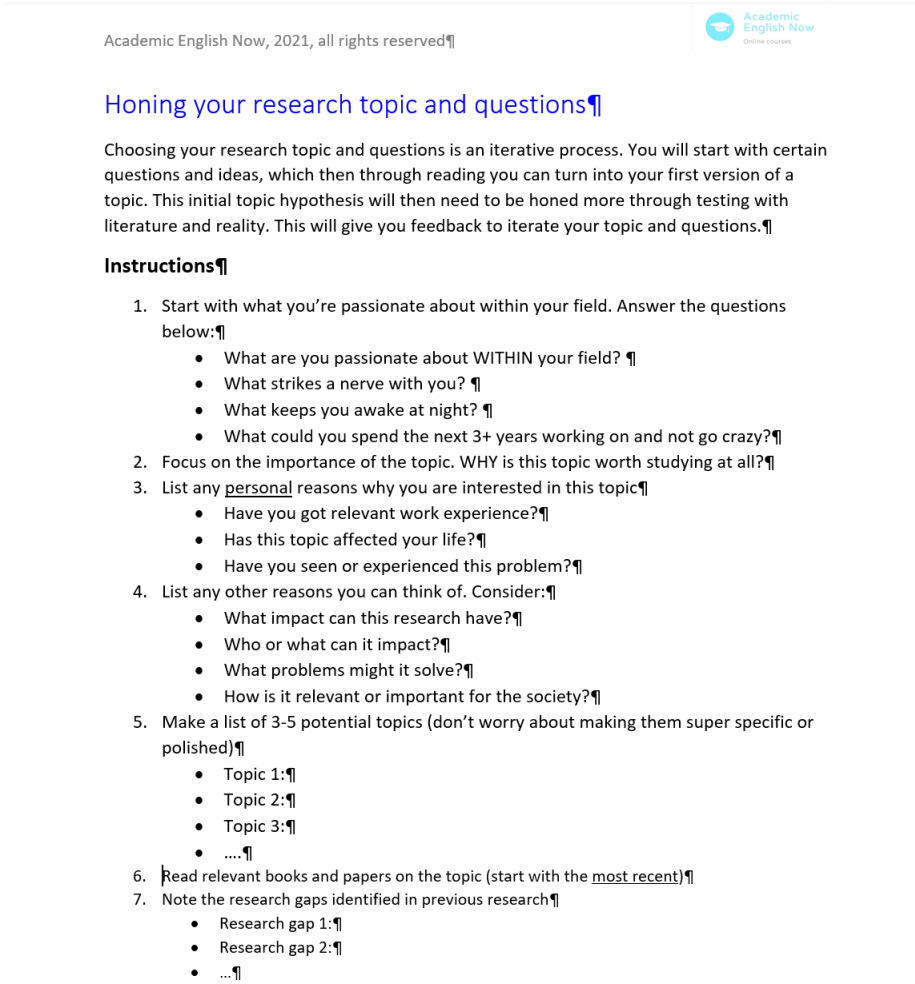
Research hypothesis

The hypothesis being put forward is that the barrier role of cell walls during digestion of enclosed starch granules in common beans changes as the processing intensity (i.e., time) used to isolate individual cells is modified. Such change of the barrier role is hypothesised to be a result of different process-induced cell wall permeability degrees affecting enzyme accessibility to the substrate to different extents.

[from Pallares Pallares, A. et al. 2018. Process-induced cell wall permeability modulates the in vitro starch digestion kinetics of common bean cotyledon cells. Food Funct., 9, 6545]

Action time

Use the worksheet to get started forming your research topic.



Honing your research topic and questions¶

Choosing your research topic and questions is an iterative process. You will start with certain questions and ideas, which then through reading you can turn into your first version of a topic. This initial topic hypothesis will then need to be honed more through testing with literature and reality. This will give you feedback to iterate your topic and questions.¶

Instructions¶

1. Start with what you're passionate about within your field. Answer the questions below:¶
   - What are you passionate about WITHIN your field? ¶
   - What strikes a nerve with you? ¶
   - What keeps you awake at night? ¶
   - What could you spend the next 3+ years working on and not go crazy?¶
2. Focus on the importance of the topic. WHY is this topic worth studying at all?¶
3. List any personal reasons why you are interested in this topic¶
   - Have you got relevant work experience?¶
   - Has this topic affected your life?¶
   - Have you seen or experienced this problem?¶
4. List any other reasons you can think of. Consider:¶
   - What impact can this research have?¶
   - Who or what can it impact?¶
   - What problems might it solve?¶
   - How is it relevant or important for the society?¶
5. Make a list of 3-5 potential topics (don't worry about making them super specific or polished)¶
   - Topic 1:¶
   - Topic 2:¶
   - Topic 3:¶
   - ....¶
6. Read relevant books and papers on the topic (start with the most recent)¶
7. Note the research gaps identified in previous research¶
   - Research gap 1:¶
   - Research gap 2:¶
   - ...¶

What you learned today

- How the iterative process works
- The Novelty Principle
- The research gap and how to find it
- Research Questions Algorithm
- Research questions, aims, objectives, or hypotheses