Module 1: Thinking about your research problem

Welcome to Research Skills for Engineering Students module 1, thinking about your research problem. In this section, you'll learn how to take your topic and break it down to main concepts and brainstorm keywords.

If you don't have a topic, you can find tips from UBC Library's Getting Started on Your Research.

Here, an example of an engineering problem will be used as a case study. Apply the strategies and techniques you learn here to your own research problems.

The problem

You are a co-op student working at Xcellent Engineering, a British Columbia-based engineering firm. You are a member of a multidisciplinary team responsible for contributing to local & provincial disaster response systems in the event of earthquakes, spills, floods, or any other disaster events.

You have been tasked with investigation of risks to engineering systems and structures within Richmond, B.C., specifically in the event of an earthquake.

Some of the questions you must investigate are as follows:

- What types of buildings or infrastructure are most susceptible to earthquake damage?
- What would the impact of an earthquake be to wired and wireless communication networks?
- What effects would an earthquake have on power, water, and gas supply?
- What are the risks of liquefaction?

The research you conduct and communicate via a technical report will be used as a basis for prioritization of earthquake prevention and mitigation efforts.

Brainstorming concepts and keywords

Before you begin searching for information about your problem, you first need to identify what the main concepts of your question are. This will help you determine the best places to look, and the best search terms to use.

Think about how your problem can be simplified to 2-3 main ideas or concepts. Can you ask the question in one sentence? What are the key terms? If you could find the perfect journal article, what would it be about? What would its title be?

Think about all the different ways you could describe your topic(s), such as:

- Synonyms
- Broader and narrower terms

As an example, let's look at the question

*What would the impact of an earthquake be to wired and wireless communication networks?*

Our main concepts might be:

`earthquakes AND communication networks`
We then want to think of the different ways we could describe these concepts:

- earthquakes
- seismic events
- seismic damage
- seismic reliability

AND

- communication networks
- communication service
- telecommunications
- emergency communication
- post-disaster communications

We might also want to look at wired and wireless communication networks separately and specifically, to find more detailed technical information about each. Wireless communication networks could also be called:

- earthquakes
- seismic events
- seismic damage
- seismic reliability

AND

- wireless communication
- mobile communication
- cellular communication
- satellite communication
- wireless sensor networks

Depending on the focus of your research question, there could be more or fewer terms to try.

As you research your topic, you will increase your knowledge and learn terms that could potentially give you better results!

If your topic is very specific and you’re not finding many resources, you may need to look at broader concepts. Then, you could support your report by extrapolating the broad information to your specific topic.

You should look for existing research about your topic to understand the past and current landscape of your engineering problem. What has already been done, and how can you take this further? Understanding the broader context of your problem will give you a deeper understanding of the problem itself, so that your work is truly innovative. You’ll also want to learn about the social contexts, so that you can acknowledge the potential experience of the end user and possible impact on the environment.

That concludes module 1, thinking about your research problem. In the next module, you’ll learn how to evaluate and identify the different kinds of engineering information that you may find.