

Questions drive research in STEM: Importance of finding research gaps

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Monday, July 10th, 2023

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Objective of this session

At the end of the session, students will be able to

1. Understand the meaning of “research question”
2. Differentiate between good and bad research questions
3. Recognize the steps to build good research questions

What is a Research Question?

A research question is a question that a study or research project aims to answer. This question often addresses an issue or a problem, which, through analysis and interpretation of data, is answered in the study's conclusion.

In most studies, the research question is written so that it outlines various aspects of the study, including the population and variables to be studied and the problem the study addresses.



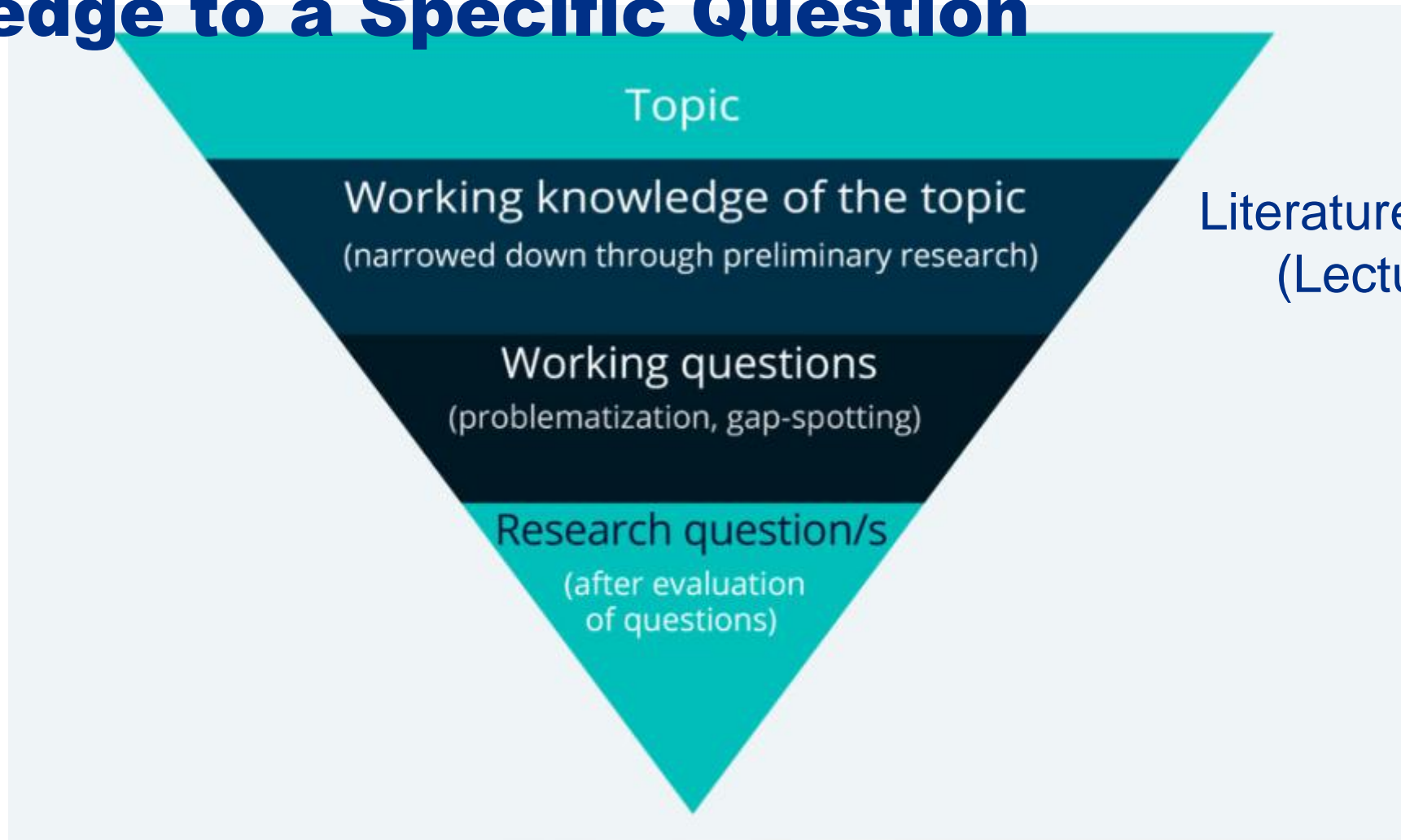
Research Questions are dynamic

Although a research question is often grounded on a research study and project, its formulation is dynamic. This means researchers can change or refine the research question as they review related literature and develop a framework for the study.

While many research projects will focus on a single research question, larger studies often use more than one research question.



The Path to a Research Question – from Broad Knowledge to a Specific Question



Literature Review
(Lecture 4)

Research.com

Importance of the research question

- ❑ A research question narrows down a broad research topic into a specific area of study (Creswell, 2014).
- ❑ Research questions, along with hypotheses, also serve as a guiding framework for research, setting limits of the study and ensuring cohesion.
- ❑ Commonly, the research question has a domino effect on the rest of the study.



Importance of the research question

- ❑ Questions act as a starting point for scientific inquiry and exploration.
- ❑ They help identify **gaps in knowledge** and areas that require further investigation.
- ❑ Questions inspire **curiosity**, which drives scientists and researchers to **seek answers and push the boundaries of knowledge**.



Developing great research questions

- ❑ A research question is a narrow, challenging question addressing an issue, problem, or controversy that is answered with a conclusion based on the analysis and interpretation of evidence.
- ❑ The proposed research must meet important professional and societal goals, fit with the mission of the organization, garner administrative support, and be accomplished with available resources in a reasonable time frame.



Developing great research questions

- ❑ A good research question challenges researchers to see matters from a new perspective and to learn something new.
- ❑ Practice research questions are evaluated by the probability of achieving their goal, along with the potential impact and feasibility of the project.
- ❑ Properly formulated questions yield findings to inform decisions that enhance practice, transfer to other settings, and make efficient use of resources



Classification of Research Questions based on the type of research to be done

- ❑ Quantitative research questions are precise, including all details of the research design to be used. Quantitative research questions also establish a link between the research question and the research design. They are usually framed and finalized at the start of the study. These questions are not answerable with “yes” or “no” responses.
- ❑ Quantitative research questions usually seek to understand particular processes that occur in a particular context and/or location.



Classification of Research Questions based on the type of research to be done

- ❑ **Qualitative research questions** can include more broad areas of research or more specific areas of study. Similar to quantitative research questions, qualitative research questions are linked to research design.
- ❑ Qualitative research questions are usually adaptable, non-directional, and more flexible (Creswell, 2013). As a result, studies using these questions generally aim to “discover,” “explain,” or “explore.”



Quiz: What kind of research question is the following, and Why?

Which are the factors that increase the likelihood of childhood anxiety?

Mixed-methods studies

- ❑ Mixed-methods studies typically require a set of both quantitative and qualitative research questions.
- ❑ Separate questions are appropriate when the mixed-methods study focuses on the significance and differences in quantitative and qualitative methods and not on the study's integrative component (Tashakkori & Teddlie, 2010).
- ❑ Researchers also have the option to develop a single mixed-methods research question. According to Tashakkori and Teddlie (2010), this suggests an integrative process or component between the study's quantitative and qualitative research method

Steps to Developing a Good Research Question

- Start with a broad topic.
- Do preliminary research to learn about topical issues.
- Narrow down your topic and determine potential research questions.
- Evaluate the soundness of your research question.

F – Feasible

E - Ethical

I – Interesting

R - Relevant

N – Novel

- Construct your research question properly

Quiz – Examples of Good and Bad Research Questions

Identify the good and bad research question:

Q#1: How does social media affect people's behavior?

Q#2: What effect does the daily use of YouTube have on the attention span of children aged under 16?

Quiz/Answer – Examples of Good and Bad Research Questions

Identify the good and bad research question:

Q#1: How does social media affect people's behavior? **Bad**

Q#2: What effect does the daily use of YouTube have on the attention span of children aged under 16? **Good**

Q#1 is considered bad because of the vagueness of “social media” as a concept and the question’s lack of specificity. A good research question should be specific and focused, and its answer should be discovered through data collection and analysis. You can also hone your ability to construct well-worded and specific research questions by improving reading skills.

Quiz – Examples of Good and Bad Research Questions

Identify the good and bad research question:

Q#1: Has there been an increase in childhood obesity in the US in the past 10 years?

Q#2: How have school intervention programs and parental education levels affected the rate of childhood obesity among 1st to 6th-grade students?

Quiz/Answer – Examples of Good and Bad Research Questions

Identify the good and bad research question:

Q#1: Has there been an increase in childhood obesity in the US in the past 10 years? **Bad**

Q#2: How have school intervention programs and parental education levels affected the rate of childhood obesity among 1st to 6th-grade students? **Good**

The first research question is not ideal because it's too simple, and it's easily answerable by a yes/no. The second research question is more complicated; to answer it, one must collect data, perform in-depth data analysis, and form an argument that leads to further discussion.

Important Points to Keep in Mind when Creating a Research Question

- ❑ The development of a research question is an iterative process that involves continuously updating one's knowledge on the topic and refining ideas at all stages.
- ❑ Remain updated on current trends, state-of-the-art research studies, and technological advances in the field of study you are pursuing.
- ❑ Make the research question as specific and concise as possible, to ensure clarity.
- ❑ Seek the input of experts in the field, mentors, and colleagues.



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Do not forget!

- ❑ We initiate a line of thinking that helps expand our understanding by asking these questions.
- ❑ Each question can lead to advanced knowledge in a topic.
- ❑ As physicist/optical engineer, my knowledge in geology is limited, but we can still approach this topic through questioning.





Discussion

- Have you heard about research questions?
- From your knowledge in your topic, do you know any research gap?

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