Research Question and Methodology

Sequence, 6 sessions, 1 week

This sequence of sessions supports students to define a strong research question and formulate the study design and methods that will enable them to address it effectively. CARTA designed these steps for doctoral students in public health, but you can adapt them for many other fields of study.

Download the curriculum for this sequence of sessions.

Sessions

Session 1. Overview of the Research Process | 2 hours

Explain and discuss the doctoral research process and the steps involved. Students identify their own areas of strength and areas where they need to develop or acquire skills.

Outcomes

By the end of the session, students can:

- Describe and analyse the research process.
- Identify which skills they need to develop further.

Preparation

- Watch and read the resources for this session. Prepare introductions and follow-up questions (Step 1).
- Create a presentation to explain the research process, with follow up questions (Step 2).
- Print copies of this article for students or share the link:
  Sim, K. N., & Butson, R. (2017). Visualizing the Doctoral Research Process: An Exploration into Empirical Research Processes of Emerging Researchers. International Journal of Learning, Teaching and Educational Research, 42–59.

Further open-access reading for you as facilitator and for your students:

- Alon, U. (2009). How To Choose a Good Scientific Problem. Molecular Cell. September 24. Cell Press.
- Niraula, S.R. (2019). A review of research process, data collection and analysis. Insights in Biology and Medicine, 3(1), 001–006.

Self-assessment

Each student identifies their own doctoral research process, areas of strength and capacities that need further development.

Steps

Time	Step	Who
30 minutes	1. Introduce the research process	Videos
30 minutes	2. Form disciplinary teams	Facilitator
30 minutes	3. Discuss the steps	Students in pairs
30 minutes	4. Present 'easy' and 'difficult' steps	Each student to the full group

Step 1. Introduce the research process

30 minutes

Introduce this YouTube video, screen it and ask follow-up questions:

- Waller, L.R. (2021). RESEARCH 1 – 2 – THE RESEARCH PROCESS.

Step 2. Explain the research process

30 minutes

Use a PowerPoint presentation as the basis for a short lecture on the research process. Invite students' questions and comments.

Step 3. Discuss the steps

30 minutes

Students pair up to read the Sim and Butson article – A review of research process, data collection and analysis. They discuss which steps they find easier and which ones more difficult.

Step 4. Present 'easy' and 'difficult' steps

30 minutes

In the full group, each student takes a turn to explain which step/s in the research process they find easier and which more difficult, and why.

Suggest that it is not necessary to repeat what someone has already said. Encourage discussion. For example, after someone presents, ask:

- Who else has difficulty with this step?
- Can anyone in the group suggest how to overcome this difficulty?
- What strategies can we use to overcome this?
- Does anyone know of a good resource to assist with this?
- Does anyone have a reading or textbook chapter to suggest to solve this problem?
- How can you find a solution?
- Should we search now and see what we can find?

Make clear that neither you as the facilitator nor the PhD supervisors have all the answers. The point is to identify what students need and help them find ways to meet that need. Other PhD students, especially in a multidisciplinary group, may have answers. Encourage students to see each other as a resource and to set up ways to meet in person or virtually throughout their PhD journey.

Session 2. A Research Question and Objectives | 6 hours

Each doctoral student develops and revises their PhD research question (quantitative or qualitative). To support this process, they review and apply the PICOT and SPIDER frameworks.

Outcomes

By the end of these steps, students can:

- Describe how to develop a quantitative-research question using the PICOT(S) framework.
- Use the SPIDER framework to develop a qualitative-research question.
- Develop their research questions and specific aims.

Preparation

Read these resource articles:

- Vandenbroucke, J.P., & Pearce, N. (2018). From ideas to studies: How to get ideas and sharpen them into research questions. Clinical Epidemiology, 10, 253–264.
- Mitchell, R.D., O'Reilly, G.M., Phillips, G.A., Sale, T., & Roy, N. (2020). Developing a research question: A research primer for low- and middle-income countries. African Journal of Emergency Medicine, 10, S109–S114.
- Riva, J.J., Malik, K.M.P., Burnie, S.J., Endicott, A.R., & Busse, J.W. (2012). What is your research question? An introduction to the PICOT format for clinicians. The Journal of the Canadian Chiropractic Association, 56(3), 167–71.
- Methley, A. M., Campbell, S., Chew-Graham, C., McNally, R., & Cheraghi-Sohi, S. (2014). PICO, PICOS and SPIDER: a comparison study of specificity and sensitivity in three search tools for qualitative systematic reviews. BMC health services

research, 14(1), 1-10.

Watch the YouTube videos and select which ones to screen:

- Binghamton University Libraries. PICO: A Model for Evidence-based Research
- Clinical Information Sciences. Creating a PICO question
- Aliria Muñoz Rascón. (2021). Introducing PICO(T) Questions
- Swarna, R. (2019). Various Techniques for Formulating the Research Questions-SPIDER
- MeanThat & Authentic Data Science. (2016). 1.7 Research Aim, Questions and Objectives

With reference to these resources, develop PowerPoint presentations for Steps 2 and 5.
Test all physical equipment and/or web-based platforms.

Self-assessment

Each student:

- Develops their own doctoral research question and objectives.
- Participates in giving, receiving and discussing feedback from facilitators, other students and their supervisor.

Steps

Time	Step	Who
30 minutes	1. Screen videos: PICO(T) and SPIDER frameworks	Facilitator to full group
30 minutes	2. Present on developing a research question	Facilitator
1 hour, 30 minutes	3. Present research questions for feedback	Students in groups
30 minutes	4. Screen videos on stating research objectives	Facilitator to full group
30 minutes	5. Present on research objectives	Facilitator
2 hours, 30 minutes	6. Present research questions for feedback	Students in groups
Afterwards	7. Revise research questions and objectives	Individual students

Step 1. Screen videos: PICO(T) and SPIDER frameworks

30 minutes

Introduce and screen the YouTube video/s you have selected. Ask follow-up questions.

- Binghamton University Libraries. PICO: A Model for Evidence Based Research.
- Clinical Information Sciences. Creating a PICO question.
- Aliria Muñoz Rascón. (2021). Introducing PICO(T) Questions
- Swarna, R. (2019). Various Techniques for Formulating the Research Questions-SPIDER

Step 2. Present on developing a research question

30 minutes

Deliver your PowerPoint presentation to the group and invite questions for discussion.

Step 3. Present research questions for feedback

1 hour, 30 minutes

In groups, each student presents their research question for feedback from peers first and then facilitators. Key guiding questions:

- Is the research question clear and focussed?
- Is the question researchable?
- Does the research question speak to the real problem?

Step 4.Screen videos on stating research objectives

30 minutes

Introduce and screen the videos:

- Swarna, R. (2019). Various Techniques for Formulating the Research Questions-SPIDER
- MeanThat & Authentic Data Science. (2016). 1.7 Research Aim, Questions and Objectives

Ask and invite follow-up questions.

Step 5. Present on research objectives

30 minutes

Give a short lecture, using your PowerPoint. Invite students' follow-up questions and facilitate discussion.

Step 6. Present research questions for feedback

2 hours, 30 minutes

In groups, each student presents their research questions for further feedback from peers first and then facilitators. Discuss whether the research question has improved. Refer to the guiding questions:

- Is the research question clear and focussed?
- Is the question researchable?
- Does the research question speak to the real problem?

Step 7. Revise research questions and objectives

Afterwards

Equipped with the information from this process and feedback on their own drafts, each student revises their own research question and specific objectives.

Session 3. The Concept of the Research Gap | 8 hours

Students identify the research gap that their own doctoral research will aim to fill. As part of this process, students conduct extensive literature searches around the research gap.

Outcomes

By the end of these steps, students can:

- Describe the use of theory in identifying research gaps.
- Discuss the use of systematic reviews in identifying research gaps.
- Define the research gap that their doctoral research will fill.

Preparation

Read the resource articles:

- Vandenbroucke, J. P., & Pearce, N. (2018). From ideas to studies: How to get ideas and sharpen them into research questions. Clinical Epidemiology, 10, 253–264.
- Hargreaves, S., et al. (2020). Identifying research questions for HIV, tuberculosis, tuberculosis-HIV, malaria, and neglected tropical diseases through the World Health Organization guideline development process: a retrospective analysis, 2008–2018. Public Health, 187, 19–23.
- Oldekop, J. A. et al. (2015). 100 key research questions for the post-2015 development agenda. Development Policy Review, 34(1), 55–82.
- Zhang, H., & Shaw, R. (2020). Identifying research trends and gaps in the context of COVID-19. International Journal of Environmental Research and Public Health, 17(10).
- Wintersberger, D., & Saunders, M. (2020). Formulating and clarifying the research topic: insights and a guide for the production management research community. Production, 30, 1–8.

Watch these YouTube videos and prepare introductions and follow-up questions for the screening session:

- PHILO-notes. (2020). How to identify a research gap?
- Academic English Now. (2020). 3 easy ways to identify the research gap.

With reference to these resources and beyond, develop a PowerPoint presentation for Step 2. Test all physical equipment and/or web-based platforms.

Self-assessment

Each student:

- Defines their own doctoral research gap.
- Participates in giving, receiving and discussing feedback from facilitators, other students and their PhD supervisors.

Steps

Time	Step	Who
1 hour	1. Screen and discuss videos	Facilitator, full group
1 hour	2. Present on the research gap	Facilitator
2 hour	3. Present research gaps for feedback	Small groups
4 hour	4. Revise research gaps	Individual students

Step 1. Screen and discuss videos

1 hour

Introduce and screen the videos:

- PHILO-notes. (2020). How to Identify a Research Gap?
- Academic English Now. (2020). 3 easy ways to identify the research gap.

Facilitate a follow-up discussion.

Step 2. Present on the research gap

1 hour

Deliver your PowerPoint presentation to the group and facilitate a follow-up discussion.

Step 3. Present research gaps for feedback

2 hours

In groups, each student presents their research gap for feedback from peers first and then facilitator/s. Key guiding questions:

- Is the research gap clear and focussed?
- Does the research gap bring out the problem?
- Is the research gap worth investigating and filling?

Step 4. Revise research gaps

4 hours

Equipped with the information from this process and feedback on their own drafts, each student goes on to revise the research gap that their own research study aims to fill.

Session 4. Quantitative Research and Methods | 4 hours

Doctoral students must select the most appropriate methods to address their research question. This session introduces three main types of quantitative method:

- quantitative description
- research that reveals causality
- research to assess interventions

Outcomes

By the end of these steps, students can:

- Explain different quantitative research designs and their application in the field of public health.
- Discuss the strengths, weaknesses, opportunities and limitations of quantitative health research methods.
- Discuss the appropriateness of different quantitative methods in answering specific research questions.

Preparation

As the facilitator

- Read all the references for this session.
- Prepare a lecture or video tutorial to introduce quantitative research (Step 1).
- Test all physical equipment and/or web-based platforms.

Students must read at least the abstracts for all the articles.

Essential reading – a cohort study

- Trang, N.H., Hong, T.K., Dibley, M.J. (2012). Cohort profile: Ho Chi Minh City Youth cohort – changes in diet, physical activity, sedentary behavior and relationship with overweight/obesity in adolescents. British Medical Journal Open. Feb 15;2(1):e000362.

Essential reading – case-control studies

- Akpalu, J. et al. (2011). Metabolic syndrome among patients with cardiovascular disease in Accra, Ghana. Ghana Medical Journal. December; 45(4): 161–166.
- Choi, Sun Mi et al. (2014). The impact of lifestyle behaviours on the acquisition of pandemic (H1N1) influenza infection: a case-control study. Yonsei Medical Journal. March. Vol 55, number 2.

Essential reading – cross-sectional studies

- Askarian, M., & Maharlouie, N. (2012). Irrational antibiotic use among secondary school teachers and university faculty members in Shiraz, Iran. International Journal of Preventative Medicine. December; 3(12): 839–845.
- Napolitano, F. et al. (2013) Public knowledge, attitudes and experience regarding the use of antibiotics in Italy. PloS 1, December, Vol 8. www.plosone.org

Additional reading

Doll, R., & Hill, B. H. (2018) Smoking and carcinoma of the lung. British Medical Journal, 1950,739-748.

Morris, S. (2018). Measuring health equity in small areas. Findings from Demographic Surveillance Systems. INDEPTH Network, 2006/2018

Internet resources for students to explore

- The Research Methods Knowledge Base
- BMJ Resources for readers (Not open access but your institution may have access.)

Assessment

Focus on students' ability to demonstrate their understanding of quantitative methods.

Steps

Time	Step	Who
40 minutes	1. Introduce quantitative methods	Facilitator
1 hour, 20 minutes	2. Read and analyse articles	Small groups
2 hours	3. Present and review reading reports	Groups to full group

Step 1. Introduce quantitative methods

40 minutes

In this didactic session, define relevant terms and distinguish between quantitative methods that:

- Give a quantitative description.
- Reveal causality.
- Assess intervention/s.

Suggest the advantages and disadvantages of the different methods and when to use them.

Step 2. Read and analyse articles

1 hour, 20 minutes

Students form groups. Each group reads a different article from the list and then prepares a brief presentation.

In their report, the group identifies the quantitative method used in the paper they read (quantitative description, causality or intervention assessment) and addresses these questions:

- Was that quantitative approach the best option?
- Was there any alternative?
- What were the strengths and weaknesses of the design?

Step 3. Present and review reading reports

2 hours

Each group presents the report on the article/s they read to the full group. They receive feedback from peers first and then facilitators: Did the group capture the quantitative methods used, the possible alternatives and the strengths and weaknesses of the design?

Session 5. Qualitative Research and Methods | 4 hours

Qualitative research methods are increasingly important to answer social questions and address complexity, so students need to learn about them and conduct their own qualitative research.

This session introduces qualitative research to students with little or no prior knowledge of its basic concepts and approaches. It asks:

- What is qualitative research and what are its philosophical foundations?
- Why conduct qualitative research?
- When is it appropriate to use qualitative research?
- What are the key characteristics of qualitative research and how do these differ from those of quantitative research?
- How do qualitative researchers think?

Outcomes

By the end of these steps, students can:

- Describe their understanding of qualitative research in terms of research paradigms and worldviews.
- Demonstrate thinking like a qualitative researcher.
- Explain when qualitative research is the right method to choose for a study.
- Distinguish key characteristics of qualitative research from those of quantitative research.

Preparation

- Read the references for this session.
- Prepare a lecture or video tutorial to introduce qualitative research.
- Select a photograph for Step 2. It could show any scene, such as a marketplace, school, lecture room, or hospital.
- Test all physical equipment and/or web-based platforms.

Essential reading for students

- O'Brien, B.C., Ruddick, V.J. & Young, J.Q. (2016). Generating Research Questions Appropriate for Qualitative Studies in Health Professions Education. Academic Medicine. Vol. 91, No. 12. e16
- Busetto, L., Wick, W., & Gumbinger, C. (2020). How to use and assess qualitative research methods. Neurological Research and practice, 2, 1-10.
- Tenny, S., Brannan, G. D., Brannan, J. M., & Sharts-Hopko, N. C. (2017). Qualitative study. NIH.

Assessment

Individual assessment: Draft then rewrite paragraphs describing the photograph.
Group assessment: Make categorisations from the group exercise.

Steps

Time	Step	Who
40 minutes	1. Introduce qualitative methods	Facilitator
30 minutes	2. Describe a photograph	Individual students
2 hours	3. Distinguish between qualitative and quantitative research	Small groups
50 minutes	4. Share feedback	Full group

Step 1. Introduce qualitative methods

40 minutes

Address the question: 'Why study the world using qualitative methods?' Give examples of qualitative research in the health sciences (or your field). Invite and discuss questions.

Step 2. Describe a photograph

30 minutes

Give each student a copy of or link to the photograph of a scene or human activity and ask them to write a paragraph describing what they see.

Step 3. Distinguish between qualitative and quantitative research

2 hours

In groups, students read two articles.
Quantitative research:

- Constantine, M.G., Wallace, B.C., & Kindaichi, M.M. (2005). Examining contextual factors in the career decision status of African American adolescents. Journal of Career Assessment, 13(3), 307–319.

Qualitative research:

- Tucker, E. L., Smith, A. R., Daskin, M. S., Schapiro, H., Cottrell, S. M., Gendron, E. S., ... & Maass, K. L. (2019). Life and expectations post-kidney transplant: a qualitative analysis of patient responses. BMC nephrology, 20(1), 1-10.

Next, ask each student to read out the paragraphs they wrote about the photograph in Step 2 to the rest of their group. With the insights they gained from the readings, the group categorises each paragraph as 'qualitative' or 'quantitative'.

Now that they have a sense of how qualitative researchers think, invite students to redraft their initial description of the photograph. This time they incorporate as many of the characteristics of qualitative research as possible. Alternatively,

give students a different photograph to describe from a qualitative way of thinking, drawing on their insights from the assignment so far.

Step 4. Share feedback

50 minutes

In the full group, invite students to share their paragraphs and categories (either quantitative or qualitative). They give each other feedback, focusing on the ability to identify the different elements of quantitative and qualitative research.

Session 6. Research Design and Methodological Choices | 4 hours

A design for qualitative research describes:

- The purpose of the research.
- The role of the researcher/s.
- The stages of research.
- The method of data analysis.

In this set of steps, students learn how to develop a problem statement from a topic of interest and to craft research questions and aims. Discuss how all of this adds up to objective-driven design. To help students to decide on an approach for their own research, introduce and explain five of the most common qualitative research designs.

Outcomes

By the end of these steps, students can:

- Distinguish between the different designs used in qualitative research.
- Define a central phenomenon in qualitative research.
- Write a good qualitative purpose statement and a good central question.
- Select a research design that appropriately addresses the research question.

Preparation

- Read the references for this session.
- Prepare a lesson or video tutorial to introduce the five most common designs for qualitative research (Step 1).
- Prepare a lesson or video tutorial explaining how to identify a central phenomenon, develop a good qualitative purpose statement, and a central question (Step 3).

Essential (re)reading

- O'Brien, B.C., Ruddick, V.J. & Young, J.Q. (2016). Generating Research Questions Appropriate for Qualitative Studies in Health Professions Education. Academic Medicine. Vol. 91, No. 12. e16
- Busetto, L., Wick, W., & Gumbinger, C. (2020). How to use and assess qualitative research methods. Neurological Research and practice, 2, 1-10.
- Tenny, S., Brannan, G. D., Brannan, J. M., & Sharts-Hopko, N. C. (2017). Qualitative study.NIH

Self-assessment

Individual assessment

Write short explanations of designs identified in a selected article journal.

Group assessment

Identify purpose statements and research questions.

Steps

Time	Step	Who
40 minutes	1. Introduce qualitative methods	Facilitator
30 minutes	2. Describe a photograph	Individual students
2 hours	3. Distinguish between qualitative and quantitative research	Small groups
50 minutes	4. Share feedback	Full group

Step 1. Introduce qualitative methods

40 minutes

Explain the five most common designs for qualitative research:

- ethnography
- grounded theory
- case studies
- narrative
- phenomenology

Step 2. Match journals with designs

30 minutes

Guide students to access various academic journals and locate examples of studies representing each of the five designs. Each student then answers these questions:

- What types of journals carry each of the qualitative methods above?
- For one of the qualitative designs, select at least one representative article. What research topic, research purpose and questions did it include?

Step 3. Identify strengths and limitations of designs

1 hours

In groups, students discuss each of the five designs, pointing out strengths and limitations of each one.

Step 4. Explain central phenomenon and purpose statement

30 minutes

Explain the process of identifying a central phenomenon and developing a good qualitative purpose statement and a central question.

Step 5. Write central statements and questions

40 minutes

Ask students in their groups to write a paragraph of a central phenomenon, a good qualitative purpose statement, and a central question.

Step 6. Tie it all together

40 minutes

Invite feedback and discussion from students as you review and summarise the learning from this session. Explain how everything in this process relates to objective-driven design.