IN THE END, I’M REALLY JUST STUDYING MYSELF

An introduction to engineering education, research design and research question development

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How did I become the engineer that I am today?

How does any engineer become who they are in their profession?
BRIEFLY SHARE ONE FORMATIVE EXPERIENCE THAT HAS IMPACTED YOUR JOURNEY
Today’s Goals

1. Exemplify how personal experiences can form the basis for scholarly engineering education research

2. Explore the relationship between personal experiences/observations, study topics, and root phenomenon

3. Develop research questions

4. Preview next steps to move from research questions to study design and execution
From formative life experiences to scholarly engineering education research
Root Phenomenon

Study Focus

Generalized Experience

Personal Experience/Observation

Engineering identity formation

Assessing engineers’ understanding of social responsibility

How did engagement in service affect other students/engineers?

How engagement in service had shaped my pathway in engineering and how I saw myself as an engineer
Example: Classes of phenomena for engineering education studies

Assessing Engineering Students’ Understanding of Personal and Professional Social Responsibility

- Engineering Identity Formation
- Pathways into, through, and out of engineering
- New Theories of Learning
- Pedagogical Assessment
- Diversity/Inclusion
Research Question Development  
Example 1: Social Responsibility

My Experience/Observation

- Service experiences outside of engineering influenced my view of my role in society.
- I had to work internally to connect engineering to my views of service.
- My views of my role as an engineer in society influenced my career pathway.

Questions about Generalized Experience

- What experiences shape how engineering students see their role in society?
- What are students’ beliefs and attitudes towards ideas of social responsibility?
- How are personal and professional social responsibility connected?
- How does engagement in engineering service affect the career pathways of alumni?

Study Design (later)
Research Question Development
Example 2: Engineers’ Conceptions of “the Public”

My Experience/Observation

- In development projects, the community provides critical local knowledge and context, key to project success.
- Students rarely interact with members of the public – the public or a client is often imagined in engineering problems if present at all.
- Tragedies like the water contamination in Flint, MI were first noticed by local residents, but did not stop right away.

Questions about Generalized Experience

- How do engineers perceive the public today?
- What formal and informal processes in engineers’ professional formation shape these perceptions?
- Do these perceptions present differently in engineers at different stages in their professional formation and, if so, what factors precipitate these differences?
- How are these perceptions expressed in practice and what impact might they have on engineers’ relationship with diverse publics?
Research question development

Chart your lived experience/observations and map them to research questions about a generalized experience

Share your research questions with a partner
From Research Questions to Study Design

You **must** have a plan

http://www.seoroadmap.org/
<table>
<thead>
<tr>
<th>From Research Questions to Study Design</th>
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<tbody>
<tr>
<td><strong>“Show and Tell” Education Research</strong></td>
</tr>
<tr>
<td>Data Collection</td>
</tr>
<tr>
<td>■ Tends to be convenience sampling, selected through easy access rather than as a larger strategy to “tell a story” – this is usually the start for the research</td>
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<tr>
<td><strong>Scholarly Engineering Education Research</strong></td>
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<tr>
<td>Data Collection</td>
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<tr>
<td>■ Follows a plan, predetermined populations to capture representative or generalized groups or outliers, based on study design</td>
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A Framework for Scholarly Study Design in Engineering Education

Experience/Observation
Research Questions
Theoretical Framework
Methodology

Methods
- Data Sources
- Sampling
- Analysis
A Framework for Scholarly Study Design

**Theoretical Perspective:**
the philosophical stance informing the methodology and thus providing a context for the process and grounding its logic and criteria.

The big picture view of your research intention:
1. Increasing understanding of people’s subjective experiences (interpretivism)
2. Critiques of social inequities and power relationships (critical theory)
3. Aims to deconstruct taken for granted ‘truths’ (poststructuralism & postmodernism)

A Framework for Scholarly Study Design

Theoretical Perspective:
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Methodology:
the strategy, plan of action, process, or design lying behind the choice and use of particular methods and linking the choice and use of methods to the desired outcomes.

This communicates intentionality in our study. Why we did what we did and what it can tell us.

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Example: Case Studies – “an in-depth study or examination of a distinct, single instance of a class of phenomena...”

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Methods:
the techniques or procedures used to gather and analyze data related to some research question or hypothesis.

Engineers’ Conceptions of “the Public”

Experience/Observation

Research Questions

Theoretical Framework

Methodology

Methods

• Data Sources
• Sampling
• Analysis

How do engineers perceive the public today?

What formal and informal processes in engineers’ professional formation shape these perceptions?

Do these perceptions present differently in engineers at different stages in their professional formation and, if so, what factors precipitate these differences?

How are these perceptions expressed in practice and what impact might they have on engineers’ relationship with diverse publics?
Social Imaginaries:
“The ways people imagine their social existence, how they fit together with others, how things go on between them and their fellows, the expectations that are normally met, and the deeper normative notions and images that underlie these expectations.”
- Charles Taylor
Engineers’ Conceptions of “the Public”

Embedded Single Case Study:
A single case (or issue) is studied. In this instance, the single case is engineers’ conceptions (or social imaginaries) of “the public”, what they are, how they develop and how they are expressed.
Engineers’ Conceptions of “the Public”

Data Sources:
• Professional Documents
• Interviews with engineers
• Interviews with members of the public

Sampling:
• Purposeful sampling from home institutions
• Snowball sampling from recommendations from other participants

Analysis:
• Emergent thematic coding

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Research Questions
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Methodology
Methods
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THANK YOU

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