The role of mathematics in higher education in STEM: a hands-on course in phenomenography, 2nd lecture

Anna Eckerdal
Today

• Discuss homework
• Something more from the theoretical foundation:
  • Something about ontology and epistemology
• Something about Data collection in phenomenographic studies
• Something about Data storing
• About the pilot study
Exercise 1: homework with your neighbourg

- What did you read?
- Comments on the articles you read
- *Questions on the articles you read*

- Why do phenomenographic research?
- Why is phenomenogaphy useful?
- When do phenomenenographic research?
- When is phenomenegraphy useful?
- When is phenomenography *not* a good reseach approach?
Something more from the theoretical foundation:

• Something about ontology and epistemology
Ontology and Epistemology

“Epistemological and ontological views of the researchers [in education] are the key factors affecting the process of research design...

In educational research, ontology refers to the “nature of reality” or in other words it is the study of how researchers approach the reality and how they aim to determine the reality existing in the universe ...

Epistemology, on the other hand, refers to the knowledge of knowledge or “nature of knowledge” (p. 294-295) [my italics]

Ontology and Epistemology in phenomenographic research

Ontologically speaking, phenomenography believes that “an individual cannot experience without something being experienced” (Marton and Pang, 2008, p. 535). This means that phenomenographic researchers do not treat a phenomenon separately from people who experience it.

Ontology and Epistemology in phenomenographic research

Turning toward the epistemological stance, which reflects a person’s view on the nature of knowledge, phenomenography is grounded in the “intentionality” of human behaviors, which is characterized by purposefulness and consciousness, involving different foci of an awareness of a phenomenon.


Interested in reading more? See:

Figure 1: Phenomenography: defined using points of departure

Our phenomenographic study

Interviews with teachers on their conceptualisations of the role of mathematics within their disciplines.

Questions today:
Will we do research?
Do we need to apply for ethical approval?
Will we ask participants for sensitive data?
Will we get personal data?
Do we need a data management plan?
Where should we store the interviews?
How do we do phenomenography?

Similar for many research approaches:

1. **Research question and Data: type and method**

2. **Data Collection:**
   a) Data management plan?
   b) Ethical approval?
   c) Personal data? Personal data assistant agreement (Personuppgiftsbiträdesavtal)
   d) Find your participants
   e) Collect the data: consent form, interview script
   f) Store the data

3. **Analyses**

4. **Present your research**

See [https://mp.uu.se/sv/web/info/forska/forskningsdata/](https://mp.uu.se/sv/web/info/forska/forskningsdata/)

See [https://mp.uu.se/web/info/stod/dataskyddsförordningen](https://mp.uu.se/web/info/stod/dataskyddsförordningen)
1. How do we do phenomenography: Research question and Data: type and method

**RQ:** What are teachers’ conceptualisations of the role of mathematics within the knowledge structure of their disciplines?

**Data type:** text and audio

**Method:** Semi-structured interviews
How do we do phenomenography?

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"A data management plan contains responses to questions about the management of research data... The idea is for the data management plan to help the researchers comply with the FAIR principles... FAIR is an English acronym for findability, accessibility, interoperability, and reusability."

See https://mp.uu.se/web/nyheter/-/abc-i-datahantering

"När det gäller datahanteringsplaner så har UU vad jag vet inga generella krav på en sådan. Det är oftare, som du skriver, ett krav hos externa finansiärer."

Do we need a data management plan? (No, but might be a good idea anyway)
2b. Data collection in phenomenographic research: ethical approval?

Do we do research? (Yes)

   If RQ, method, researchers, intention to publish

Do we need to apply for ethical approval? (No)

   If we study e.g. sensitive personal data, or collect biological material, ...

What is sensitive personal data?

   E.g. Ethical background, Political opinions, Religious or philosophical beliefs, Trade union membership, Health, Sex life or sexual orientation, Genetic data, Biometric data that uniquely identify a person.

https://etikprovningsmyndigheten.se/vanliga-fragor/ (In Swedish)
How do we do phenomenography?

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2c. Data collection in phenomenographic research: Personal data?

What is personal data? Any information relating to an identified or identifiable person, e.g.:

- a name
- an identification number
- location data or an online indicator
- one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that person.

Recorded voices are personal data

More info and application form for processing of personal data at:
https://mp.uu.se/en/web/info/stod/dataskyddsforordningen
dataskyddsombud@uu.se
2c. Data collection in phenomenographic research: Personal data assistant agreement?

"A data processor is someone who processes personal data on behalf of a data controller. As the data controller, the university must have an agreement (personal data assistant agreement) with each organization (the data processor) that processes personal data for which the university is responsible."

https://mp.uu.se/web/info/stod/dataskyddsforordningen/gdpr-och-underbitraden
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2d. Data collection in phenomenographic research: 
Find your participants 

- **Voluntary participation**... =>?

- **Purposeful Sampling of participants in phenomenographic studies:**

  “samples should be *heterogeneous*, within a target range of 10 – 20. This assumes that data collection will be done using one-to-one interviews.” Trem, K. R. (2017). Selecting an appropriate research sample for a phenomenographic study of values.

  “The sample should capture as broad a range of relevant population characteristics as possible (e.g. background, prior experience, gender, age). These characteristics should be representative of the group under investigation, as well as of other similar groups in different educational settings” Stamouli, I., & Huggard, M. (2007). Phenomenography as a tool for understanding our students. In *International Symposium for Engineering Education* (pp. 181-186). Ireland.
2d. Data collection in phenomenographic research: Find your participants

“The aim of the data collection for a phenomenographic researcher is to collect a pool of meaning centred around certain phenomena. What is wanted is a maximum of variation in the ways of conceptualizing the phenomena.”


Exercise 2: Discuss with each other what factors we want to vary for max heterogeneous. Suggestions: gender, how long they have been teaching, and how long have they been doing research
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2e. Data collection in phenomenographic research: collect data

Collect your data:

• Often interviews, or films, or artifacts (not common)
  • Semi-structured interviews: a script
• Consent form: we will provide an example

Transcribing audio: issues
Behovet av att anlita externa tjänsteleverantörer kan t.ex. handla om att det finns intervjamaterial... Behovet uppstå för att UU inte erbjuder någon central tjänst för ändamålet...
De handlar också om anlitandet av en dylik tjänst räknas som ett utlämnande av personuppgifter...
Om personuppgifter inte skyddas i enlighet med GDPR kan den personuppgiftsansvarige (UU) tilldömas sanktionsavgifter upp till 10 MSEK av Integritetsskyddsmyndigheten...
Jag rekommenderar att UU upphandlar en central tjänst från Vetenskapsrådet/Sunet som heter ”Tal-till-text” som central tjänst för transkribering ...
Från Dataskyddsombudsman
2e. Data collection in phenomenographic research: collect data

”A **semi-structured interview** is a method of research used most often in the social sciences. While a structured interview has a rigorous set of questions which does not allow one to divert, a semi-structured interview is open, allowing new ideas to be brought up during the interview as a result of what the interviewee says.”

From wikipedia
Semi-structured interviews
https://www.nature.com/articles/s43586-022-00150-6/tables/1

From:

See also:

<table>
<thead>
<tr>
<th>Type of question</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introductory</td>
<td>Can you tell me about … (something specific)?</td>
</tr>
<tr>
<td>Follow-up</td>
<td>Non-verbal cues: mmm... nod</td>
</tr>
<tr>
<td></td>
<td>Verbal cues: repeat back keywords to participants, ask for reflection</td>
</tr>
<tr>
<td></td>
<td>or unpacking of point just made</td>
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<tr>
<td>Probing</td>
<td>Can you say a little more about X?</td>
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<tr>
<td></td>
<td>Why do you think X…? (for example, Why do you think X is that way?</td>
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<tr>
<td></td>
<td>Why do you think X is important?)</td>
</tr>
<tr>
<td>Specifying</td>
<td>Can you give me an example of X?</td>
</tr>
<tr>
<td>Abstract</td>
<td>How did you feel when X happened?</td>
</tr>
<tr>
<td>Indirect</td>
<td>How do you think other people view X?</td>
</tr>
<tr>
<td>Structuring</td>
<td>Thank you for that. I’d like to move to another topic…</td>
</tr>
<tr>
<td>Direct (later stages)</td>
<td>When you mention X, are you thinking like Y or Z?</td>
</tr>
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| Follow-up             | Non-verbal cues: mmm..., nod  
Verbal cues: repeat back keywords to participants, ask for reflection or unpacking of point just made |
| Probing               | Can you say a little more about X?  
Why do you think X…? (for example, Why do you think X is that way? Why do you think X is important?) |
| Specifying            | Can you give me an example of X?                                        |
| Abstract              | How did you feel when X happened?                                       |
| Indirect              | How do you think other people view X?                                   |
| Direct (later stages) | When you mention X, are you thinking like Y or Z?                       |
| Interpreting          | So, what I have gathered is that…                                       |
| Ending                | I have asked all the questions I had, but I wanted to check whether there is something else about your experience/understanding we haven’t covered? Do you have any questions for me? |
| Listening             | (non-verbal) We note that waiting and listening can also leave space for participants to open up or discuss more without verbal prompting |
| Silence               | (non-verbal)                                                            |
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2f. Data collection in phenomenographic research: store the data

**Data storage**, e.g. Allvis. See https://mp.uu.se/en/web/info/forska/forskningsdata/lagra-samarbeta

How to order a storage area in Dataportal Allvis, storage type project. You can order a personal area. We will have a common area. See https://mp.uu.se/web/info/stod/it-telefoniinfrastruktur/datalagring
Pilot study: interview each other

We will do a pilot study, which will not be included in the research study.

Record on one device, e.g. a laptop. Transcribe on another device, e.g. your mobile with e.g. Google Transcribe.

Purpose:
• Test the technique: Google Transcribe, Allvis.
• Test semi-structured interviews
• Possible to adjust the interview questions after this pilot study.
• Test phenomenographic analysis
2e. Data collection in phenomenographic research: data collection algorithm

- Go offline
- Record the interview and transcribe it at the same time with Google transcribe or Transkriptor
- Copy the transcribed interview to a local file on your mobile/computer
- Erase the transcribed file from Google transcrib / Transskriptor
- Go online
- Transfer the audio file and the text file to Allvis
- Erase the files from your phone/computer
- Edit the text file using the audio file.
- Erase the audio file from Allvis
Suggested questions related to the RQ
(to be edited)

Which is your discipline area? Which sub discipline are you in?
Where did you do your undergrad and PhD education?
How many years have you been teaching at HE?
How many years have you been doing research?
How do you understand the role of mathematics in your subject?
Which purpose has mathematics in your subject?
How do you think your colleagues understand the role of mathematics?
How would you explain the role of mathematics in our area to someone outside your area/someone who doesn’t know anything about your area?