

Introduction and Principles of Quantitative Research

EDUC 641: Intro

TBD

Roadmap

Research is a <u>partnership</u> of questions and data		What types of data are collected?	
What kinds of questions can be asked of those data?		Categorical data	Continuous data
		<ul style="list-style-type: none"> How many members of class have black hair? What proportion of the class attends full-time? 	<ul style="list-style-type: none"> How tall are class members, on average How many hours per week do class members report studying, on average?
	Questions that require us to <u>describe</u> single features of the participants	<ul style="list-style-type: none"> Are male-identifying students more likely to study part-time? Are PrevSci PhD students more likely to be female-identifying? 	<ul style="list-style-type: none"> Do people who say they study for more hours also think they'll finish their doctorate earlier? Are computer-literate students less anxious about statistics?
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Features of scientific research

- 1. Data-based**
- 2. Systematic**
- 3. Objective**
- 4. Defined sample and population**
- 4. Contextualized**
- 5. Reliable and valid**
- 6. Disprovable**
- 7. Peer-reviewed**

Three facets to research

Design

- Where will you conduct research?
- Population of interest?
- Sample?
- Variables to examine?

Analysis

- How will you process the data?
- How will you display results?
- How will you communicate findings?

Measurement

- How will you collect data?
- Who will be observer?
- How will measurement be valid?

Types of data

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How we collect and quantify the data informs the kind of analysis we will conduct.

Levels/scales of measurement

What is measurement? assigning numbers based on a set of rules

Levels of measurement: how categories/numbers are defined

Each type of measurement has a set of properties which determines the appropriate analysis.

Four levels/scales of measurement

1. Nominal
2. Ordinal
3. Interval
4. Ratio

Nominal scale

No hierarchy among levels of a variable

Levels are unordered, representing labels

A variable defining whether someone is an omnivore, vegetarian, vegan or fruititarian is on a nominal scale

Most demographic variables are nominal:

- Hair color
- Race
- Ethnicity
- Gender

Ordinal scale

Levels are logically ordered; a higher level indicates "more"

Distances between levels are not necessarily equal

Level 1 < Level 2 < Level 3 < ... (monotonicity)

Examples:

- Grades (A - F letter grades)
- Competition (1st place, 2nd place, 3rd place)
- Likert scale (on a scale of 1 to 10 with 1 being *very unhappy* and ten being *very happy*, how happy are you today?)

Interval scale

Represents *quantity* and has *equal units*

Ordinal scale + equal measurement units

There is no absolute zero

Examples:

- The Fahrenheit temperature scale
 - The difference between 20 F and 30 F is the same as the difference between 60 F and 70 F
 - 0 does not represent "no temperature"
 - There is no concept of dividing or multiplying values on the scale. There are no ratios. We can't describe 50 F as half as hot as 100 F or twice as hot as 25 F

Ratio scale

Interval scale + True zero point

True zero means a point where the thing being measured does not exist

Examples:

- Height
- Mass
- Distance
- Length of a piece of wood
- Test score (?)

Levels of measurement

	Indicates difference	Indicates direction of difference	Indicates amount of difference	Has absolute zero
Nominal	X			
Ordinal	X	X		
Interval	X	X	X	
Ratio	X	X	X	X

Categorical variable

- Nominal and ordinal measures
- Use labels to describe

Continuous variable

- Interval and ration measures
- Data with arithmetic properties

Synthesis and wrap-up