CONCEPTUALIZATION, OPERATIONALIZATION, AND MEASUREMENT

Adapted from a presentation by Stephen Marson, University of North Carolina-Pembroke

MEASURING ANYTHING THAT EXISTS

* Measurement: careful, deliberate observations in order to describe objects and events in terms of attributes

* Often, variables of interest do not have a single, unambiguous meaning

* Often, these variables do not exist in nature

* We make up terms and assign meanings to them

CONCEPTIONS, CONCEPTS, AND REALITY

* Conceptualization: process of coming to agreement about meaning of terms
* Concept: result of conceptualization process
* Language & communication work as long as there is some overlap in our own mental images
  + Our mental images are unique; Similarities represent societal agreements
  + ∴ must specify what exactly counts when measuring
* Can measure anything that is real!

CONCEPTS AS CONSTRUCTS

- 3 things that scientists measure:
  - Direct observables
  - Indirect observables
  - Constructs

- **Construct:** theoretical creation based on observations but cannot be observed directly or indirectly

- **Concept:** construct derived by mutual agreement from mental images (conceptions)

CONCEPTS AS CONSTRUCTS

* Constructs have no intrinsic value
  + Often, fall into trap of believing they do

* Reification: regarding constructs as real

* Constructs, although not real, can be measured!

* Constructs are useful ; help us organize, communicate about, and understand things that are real; help make predictions about real things

    - Constructs have definite relationship to things that are real and observable

CONCEPTUALIZATION

* Process through which we specify what we mean when we use particular terms in research

* "Working" agreements
  + Do not need to agree that a particular specification is ultimately the best one

* Produces a specific, agreed-upon meaning for a concept
  + Describe indicators used to measure the concept and different aspects of the concept, **dimensions**

INDICATORS AND DIMENSIONS

* Indicator: sign of the presence or absence of the concept

* Discover disagreements and inconsistencies when try to specify what we mean by concepts

* Dimension: specifiable aspect of a concept

* Complete conceptualization includes specifying dimensions and identifying various indicators for each

* Different dimensions of a concept often lead to more sophisticated understanding

INTERCHANGEABILITY OF INDICATORS

- If disagree on the value of specific indicators $\Rightarrow$ study all of them

- If several different indicators represent the same concept, then all of them will behave the same way that the concept would behave if it were real and could be observed

REAL, NOMINAL, AND OPERATIONAL DEFINITIONS

Real: mistakes a construct for a real entity

Nominal: definition is assigned to a term without any claim that the definition represents a "real" entity

- Arbitrary
- More or less useful
- Represents consensus, or convention, about how
  a term is used

REAL, NOMINAL, AND OPERATIONAL DEFINITIONS

- **Operational:** specifies precisely how a concept will be measured (operations we will perform)

    - Nominal

    - Advantage of clarity of concept meaning in

      context of study

    - Can specify a working definition for purposes of
inquiry

CREATING CONCEPTUAL ORDER

- Clarifying concepts is ongoing process

- Researcher's interests become increasingly focused

- Refinement of concepts may occur throughout research process
  - Occurs in all social research methods
  - Should address conceptualization at beginning of study design (esp. for surveys and experiments)

CREATING CONCEPTUAL ORDER

✖ Important to be conscious of and explicit about conceptual starting points

  ✚ Can refine during data collection & interpretation

    (less-structured research methods)

• Progression of measurement steps:

Conceptualization $\rightarrow$ Nominal $\rightarrow$ Operational $\rightarrow$ Measurements

                     Definition   Definition   in the Real World

DEFINITIONS IN DESCRIPTIVE & EXPLANATORY STUDIES

* Distinction has important implications for definition & measurement

* Definitions are more problematic for descriptive than for explanatory research

* Consistent patterns of relationships in human social life result in consistent research findings (explanatory)
  + This consistency is not found in descriptive situations; changing definitions almost always result in different descriptive conclusions

OPERATIONALIZATION CHOICES

- ✖ Different choices are intimately linked
- ✖ Operationalization does not proceed through a systematic checklist

- ✖ <u>Range of variation</u>
  - ✚ To what extent are you willing to combine attributes in categories?
  - ✚ Do not measure the FULL range of variation in every case
    - ✖ Consider on a study-by-study basis whether you need to
    - ✖ Be pragmatic!!!
    - ✖ Decisions on the range of variation should be based on the expected distribution of attributes among the subjects of the study

OPERATIONALIZATION CHOICES

- Variations between the extremes
  - Degree of precision
  - How fine you will make distinctions among the various possible attributes
    - E.g., Measures of age – look at purpose & procedures of study & decide whether fine or gross differences in age are important
    - Same holds for other variables

- Useful guideline: when in doubt about level of detail to pursue in a measurement, too much is preferred to too little!
  - Can combine precise attributes into more general categories but cannot do the reverse

OPERATIONALIZATION CHOICES

* Dimensions
  + Be clear about which dimensions of a variable interest you

  + Risk measuring something different than what you really wanted to

DEFINING VARIABLES AND ATTRIBUTES

- Variables must have 2 qualities:

    - (1) Attributes must be **exhaustive**

    - (2) Attributes must be **mutually exclusive**

LEVELS OF MEASUREMENT

× **Nominal measures**
  + Variables whose attributes have **only** characteristics of exhaustiveness & mutual exclusiveness

  + E.g., gender, religious affiliation, political party affiliation, birthplace, college major, hair color

  + Offer names or labels for characteristics

  + All can say about 2 people is that they are either the same or different

LEVELS OF MEASUREMENT

* **Ordinal measures**
  * Variables with attributes that can be **logically rank ordered**; different attributes represent relatively more or less of the variable

  * E.g., social class, alienation, prejudice, intellectual sophistication

  * Can say if 2 people are same or different & can say 1 is "more" than the other

LEVELS OF MEASUREMENT

* Interval measures
  * Variables with attributes that have meaningful distance separating the attributes; **logical distance** between attributes can be expressed in meaningful standard intervals

  * E.g., Fahrenheit temperature scale, constructed measures such as standardized intelligence tests (IQ scores)

  * Can say 2 people are different (nominal), 1 is more than another (ordinal), and "how much" more

LEVELS OF MEASUREMENT

* **Ratio measures**
  * Variables with attributes based on a **true zero point**

  * E.g., Kelvin temperature scale, age, length of residence in a given place, # of organizations belonged to, # of times attended religious services during a period of time

  * Can say 2 people are different (nominal), 1 is more than the other (ordinal), how much they differ (interval), and the ratio of 1 to another

IMPLICATIONS OF LEVELS OF MEASUREMENT

- Differences between levels of measurement have practical implications for the analysis of data

- Different levels of measurement used in variables
  - Tailor analytical techniques accordingly
  - Draw research conclusions appropriately

- Variables of higher level of measurement can be treated as lower level

  Ratio $\rightarrow$ **Interval** $\rightarrow$ **Ordinal** $\rightarrow$ **Nominal**   Highest

  Lowest

  Order   Order

IMPLICATIONS OF LEVELS OF MEASUREMENT

- Level of measurement for a variable is determined by analytical uses planned for a given variable
    - Some variables are inherently limited to a certain level

    - If going to use variable in a variety of ways (different levels of measurement), the study should be designed to achieve the highest level required

    - When in question, seek the highest level of measurement possible

    - Can always convert higher level to lower level but NOT the reverse!

SINGLE OR MULTIPLE INDICATORS

* Some variables have obvious, straightforward measures

(Single indicator can measure a variable)

  + Can be measured by a single observation
  + If can get 1 piece of information, you have what you need

* Sometimes, no single indicator can give measure of a variable

  + Make several observations for a given variable
  + Combine the several pieces of information to create a composite measurement

MEASUREMENT QUALITY

* Evaluate our success or failure in measuring things

* Precision and accuracy
  * **Precision:** fineness of distinctions made between the attributes that compose a variable
    * In general, precise measurements are preferred to imprecise measurements
    * Exact precision is not always necessary or desirable
  * Do not confuse precision with accuracy

MEASUREMENT QUALITY

- Reliability
  - Matter of whether a particular technique, applied repeatedly to the same object, yields the same result each time (consistency)

  - Does not guarantee accuracy

MEASUREMENT QUALITY

+ Problems:
  × Whenever a single observer is source of data (subjectivity)
  × Different interviewers get different answers from respondents

+ To create reliable measures:
  × If need to ask people for information, ask them things that are relevant to them, things they are likely to know the answer to, and be clear about what you're asking!

MEASUREMENT QUALITY

- Techniques for cross-checking reliability of measures
  - <u>Test-Retest Method</u>
    - Make same measurement more than once

  - <u>Split-Half Method</u>
    - Interchangeability of indicators; each set (1/2) should provide a good measure of whatever concept interested in and the 2 sets should classify people the same way

  - <u>Using Established Measures</u>
    - Use measures that have proven reliability in previous research

MEASUREMENT QUALITY

+ Reliability of Research Workers
  - × Interviewer unreliability – have someone else verify selected responses from a subsample

  - × Replication – several coders could independently code

  - × Clarity, specificity, training, and practice

VALIDITY

- Extent to which an empirical measure adequately reflects the real meaning of the concept under consideration

- Criteria for making measurements that are appropriate to agreed-upon meanings of concepts:

  (1) Face validity

   - Empirical measures have something to do with the

   concept

  (2) Criterion-related validity (predictive validity)

   - Based on some external criterion

VALIDITY

(3) <u>Construct validity</u>

    - Based on logical relationships among variables

(4) <u>Content validity</u>

    - How much a measure covers the range of

    meanings included within a concept

RELIABILITY & VALIDITY

✖ Want measures to be reliable <u>and</u> valid

✖ Trade-off
  ✚ More variation and richness of meaning for a concept $\Rightarrow$ less reliability

✖ Remember:
  ✚ Reliability is a function of consistency ("tight pattern")
  ✚ Validity is a function of being close to target