Fundamental of Research Methods
What is Research?

What is the process?

What are the basic elements of research?

What do I really need to know for my collegiate journey?
What do you think about when you consider research?

What are some words that surface as you contemplate the process?

What relevance does research have for you?

How would your family benefit from research?
Five Educational Pillars

- Academics
- Research
- Practical Experience
- Leadership
- Community Service

The Five Pillars of Higher Education
Research: Its Basic Components
What is Research?

- It is the process of making claims and then refining or abandoning some of them.

- Research seeks to develop relevant true statements ~ ones that help explain a situation.

- Data, evidence, and rational considerations shape knowledge

- Being objective is an essential component inquiry

- Research is:
  - Systematic Verification
  - Valid and Reliable
  - Variety of Forms

- Types of Research
  - Basic (theory development)
  - Applied (solve educ. problems)
  - Evaluation (decision making)
Research as a Continuum

Qualitative

Mixed Methods

Quantitative
Alternative Positions: Which One?

- **Post-positivist Worldview**
  - Deductive Reasoning, Quantitative, Cause and effect, Reduce ideas, Object reality, Verify truth

- **Social Constructivist Worldview**
  - Inductive Reasoning, Use for qualitative research, People have subjective meaning of their world, Narrow to complex, Asks open-ended questions, Look at historical contexts

- **Advocacy and Participatory Worldview**
  - Dialectical, Unsatisfaction, Give voice to marginalized population, Start out qualitative, use to inform quantitative, Social justice, political agenda, reform, Participants become apart of research process

- **Pragmatic World View**
  - Emphasize actions, situations and consequences, Emphasize problem and find different ways to understand/solve problem, Use mixed methods, Freedom and needs, Rationale for mixing data
Three Types

- Qualitative: Theory development, defining important variables, hypothesis generation, and studying new phenomena. What is a meaning of a phenomena.

- Quantitative: Test predictions and theories; already established way to measuring a phenomena

- Mixed Methods: Combination of both qualitative and quantitative research.
### What is the Difference?

<table>
<thead>
<tr>
<th>Quantitative (Positivist)</th>
<th>Qualitative (Constructivist)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laws that govern the world are stable and predictable</td>
<td>All meaning is situated in a particular perspective and context</td>
</tr>
<tr>
<td>Claims about the world are meaningless unless measurable</td>
<td>Multiple meanings in world none more valid than other</td>
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<tr>
<td>Predetermined/Deductive</td>
<td>Emerging methods</td>
</tr>
<tr>
<td>Instrument based</td>
<td>Open ended questions</td>
</tr>
<tr>
<td>Performance, Attitudinal data, observational, census</td>
<td>Many variables over time</td>
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<tr>
<td>Statistical Analysis</td>
<td>Inductive reasoning</td>
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Merging Design and Methods

**Quantitative**

- Experimental
  - Random assignment
  - Control IV
- Non-experimental
  - Survey
  - Correlational
    - Relationship between intelligence and self esteem
  - Causal-Comparative
    - Ex post fact
    - NO RANDOM ASSIGNMENT
    - Cause already occurred or cannot be manipulated
      - Gender, height, year in school, heavy smoking

**Qualitative**

- Narratives
- Ethnographies and Case Studies
- Grounded theory
- Case Studies
- Observations
- Interviews
- Document data
- Audiovisual data
- Text and image analysis

- **Mixed Methods**
- Cross section vs. Longitudinal
General Steps to Research

- **Recognize and identify a topic to study**
  - A topic is a question, issue, or problem that can be examined or answered through collecting and analyzing data

- **Describe and execute procedures to collect information**
  - Identify participants, strategies to collect data, and activities of how, when, and from whom data will be collected

- **Analyze the collected data**
  - Quantitative, numerical, statistical
  - Qualitative, field studies, narrative, tape recordings, observations

- **State the results or implications based on the analysis of data**
Questions to Consider in the Process

- Does it address a meaningful problem?
- Do I have the necessary resources?
- Am I really interested in the topic?
- Will the results interest others?
- Does the study fill a void, replicate, extend or develop new ideas?
- How will the project relate to my career goals?

- Am I replicating the current research? Am I simply changing the sample?
- Am I extending the literature? What are they not studying? What do others don’t even know?
- Why is this topic important?
- What is creative and unique about my work?
Operationalization is the process of “transforming information from one level of abstraction to another” (Schensul & Schensul, 1999)

- Establish the boundaries to distinguish the particular phenomenon you are studying from others (define your domains, variables, and terms)

- Measurement: describe or measure the phenomenon

- Establishing validity: assessing whether or not you are measuring what you think you are measuring

- Establishing reliability: make sure that your measurement process is consistent.
Constructs and Variables: What are they?

- **Construct:**
  - It is an abstract concept that expresses the idea behind a set of particulars.

- **Variable:**
  - It is an event, category, behavior, or attribute that expresses a construct and has different values. Each variable must be defined operationally and subsequently categorized and measured.

- **Dependent:**
  - The outcome that is expected

- **Independent:**
  - The treatment or condition that is expected to produce an outcome

- **Control:**
  - Variables controlled in order to reduce any impact this factor might otherwise have on the interpretation (to control extraneous).
    - Could influence result (Covariance), sometimes personal variables
More Types of Variables

- **Control:**
  - Variables controlled in order to reduce any impact this factor might otherwise have on the interpretation (to control extraneous).
    - Could influence result (Covariance), sometimes personal variables

- **Intervening or mediating**
  - Stand between the IV and DVs
  - Directional IV $\rightarrow$ DV
  - Intervening $\rightarrow$ IV1 (IV2) $\rightarrow$ DV
    - Example
      - results on test, preparation or organization or both

- **Confounding**
  - Confounding or spurious
    - Exists but not studied
    - Identified after analysis
    - Were not or could not be easily assessed
Example

Confounding Variable

Quake

Dependent Variable

Control Variables

IQ

Gender

Independent Variable

Preparation

Intervening Variable

Organization

Academic Performance
Your Process

What are your variables?

What is the outcome variable?

What variables influence your DV?

What are you controlling or considering?
Detailed Steps to Research

1. Select a research topic
2. Formulate a research question
3. Review the literature addressing the research question
4. Develop one or more hypotheses based on the literature
5. Prepare a research plan that describes:
   - How many and what kinds of subjects will participate in the study
   - The variables and their associated values to be studied
   - How the variables will be studied
   - How the findings will be analyzed
6. Carry out a pilot study using a small number of subjects
7. Make any necessary changes in carrying out the final study based on the information obtained in the pilot study
8. Carry out the final study
9. Prepare to write a report of the final study
10. Disseminate the findings of the study
• Previous literature orients researcher on findings and gaps
• Current research highlights theories applicable to area of interest
• Findings in the literature help narrow interest, framework, and design

• RQs and hypotheses shape the purpose of the study
• They are predictions the researchers hold about the relationship among the examined variables
• Testing hypotheses employs statistical analyses
Literature Review: Sequential Steps

- Analyze the Problem
- Search and read primary and secondary research
- Select the appropriate index for a reference service or database
- Transform the problem statement into search language
- Conduct a manual search and computer search
- Read the pertinent primary literature
- Organize Notes
- Write the review
Technical Steps

- Identify descriptors - key words
- Identify sources
- Identity titles of relevant reports
- Delete non relevant reports
- Separate reports in order or into categories
- Prepare abstracts and summaries for reports
- Write the review
Types of Searches

Purpose

Computer Search Step

Standards of Adequacy

Types of Reviews

Literature Review

Review for Quantitative Search

Meta-analysis Reviews

Reviews for Qualitative Research

McMillan & Schumacher, 1997
Selecting Studies

- Peer reviewed journal articles
  - Research studies
    - Qualitative, quantitative
  - Conceptual articles
- The articles can span disciplines but must be relevant to topic
- Must include historical and up to date articles
- Treeing the References – back mapping
- Print all of your articles
  - Reading, review, categorizing, etc
Reviewing the Literature

- How do I review each article?
  - Summary each selected research article
    - Biography entry
    - Problem/Significance of Study
    - Hypotheses/Research Questions
    - Participants
    - Procedures
    - Results
    - Conclusions
    - Interpretation of what’s missing in the article
Annotated Bibliography—Finding Waldo

- **Citation (APA format)**
- **Problem Statement/purpose of study**
  - The purpose of this study is..., given that... usually found toward the end of the introduction.
- **Hypotheses/Research questions**
  - We predict, our research questions are... usually found after purpose.
- **Participants**
  - Method section, numbers, demographics (age, sex, race, ethnicity)
- **Procedures**
  - Method section, tools used, narration of what happened?
- **Results**
  - Read beginning and end of paragraphs, highlight major findings. Note the sentences after a statistical sentences. Go back to hypotheses, results usually address these predictions and whether or not they found it was true. Usually there is a paragraph explaining how the authors went about analyzing the data.
- **Discussions**
  - Review of study
  - explanation of highlighted results
  - Limitations
  - future directions/implications
Annotated Bibliography

- **APA citation:** author. Year. Title of article. Title of journal, volume, issue, pages.
- **Purpose of Study:** find sentences in the introduction that states “the purpose of this study is to...” “the objective of this study...”
- **Research Questions/Hypotheses:** “we predict that etc.”
- **Rationale:** What makes this study different from other studies? What is this study contributing? Find sentences that states, “past studies have done this...we are doing this...”, “Other studies have not address this... we will address...” What theory are the researchers using? Found also in introduction.
- **Methods:** How are researchers collecting data? Are they doing an experiment? Are they using surveys? What are their independent, dependent, control variables? How are they measuring each variable?
- **Participants:** Who are the participants? How many of them participated? Age? Gender?
- **Results:** What were the main findings of the study? How do different variables relate to one another? What are some hypotheses, research questions that were answered?
- **Discussion:** What are the implications of the findings? What can researchers do differently? Weaknesses of study?
Summary Directives

- Key words
- Library database/ new Keywords/ use your list of questions
- 50 articles/books
  - you may use conceptual article or research article.
- Skim initial group and sort out useful literature
- organized them useful literature (literature map, coding system related to your topic)
- Draft summaries of the most relevant--Annotated Bibliography
- Organize summary by themes and important concepts. How will your study fit into the literature?
Current Literature

What are the top five articles that relate to your study?

What are the variables the authors examine?

What design is implemented?

What is the sample?

How is your study the same or different?
Theory in Research

- Theory helps the researcher understand and organize facts. It helps the researcher make sense of the data collection process -- in observation, interviews, values, perceptions (Schensul, 1999)

- In terms of data collection and analysis, “theory is important because it helps us determine what to consider and what to leave out of our observation” (Schensul, 1999, p. 12)
Theory

- Interrelated set of variables (construct) formed into propositions, hypotheses, that specify the relationship among variables (Creswell, 2009)
- Can be used to: argue, discuss, rationalize
- Theory ties together variables
- It is developed when researchers test predictions over and over again
- It is an explanation to advance knowledge
Levels of Theory

- **Micro**: explains small parts of time, space, number of people
- **Meso**: link the Micro with Macro. How people (micro) interact with institutions (macro)
- **Macro**: larger aggregates ex: social institutions, cultural systems, whole societies
Forms of Theories

- Placed in hypotheses
  - Ex: this variable will increase when that variable decreases
- If-then logic statements
  - Ex: if this happens then this will happen because...
- Visual models
  - Use diagrams to visually represent relationship between variables
Visual Models of Theories

- Dependent on right of diagram, Independent of left
- One way arrows to indicate the relationship
- Strength through pluses and minuses (valence)
- Two-headed arrows → unanalyzed relationships not dependent on other relationships in model.
Hypotheses

- Null: no relationship
- Alternative hypothesis: there is a relationship
  - Directional hypothesis: expected outcome, there is meaning attached to the difference. Difference is identified. “Variable a is larger than variable b”
  - Non-directional—prediction is made without exact form of differences. “Variable a is different from variable b”
Hypotheses are to: have (1) sound reasoning, (2) reasonable explanation for predicted outcome, (3) clear explanations of expected relationships between variables, and must (4) be tested within reasonable timeframe.

Types of Hypotheses
- Inductive – based on observations
- Deductive – from theory
- Null, Alternative, Directional and Non Directional

Types of RQs
- Descriptive (Variance)
- How does it affect
  - What is the academic performance of low SES students?
  - Low SES does not influence performance (null)
- Inferential
  - Relational
    - How does SES influence performance?
    - SES has a positive relationship. (directional)
  - Difference
    - To what extent/degree does SES influence performance
    - SES influences performance by 30%
- How does SES influence performance?
- SES has a positive relationship. (directional)
- Difference
Questions

- What is the role of a literature review?
  - What are the primary findings?
- What is the role of theory in research and why work from a theoretical framework?
  - What theory will you use to examine your RQ?
- What factors will help you formulate your RQs and hypotheses?
  - Are they directional, correlational, casual?
- What will guide your RQs and hypotheses?
In research, many scholars use these models to lay out their variables and the understanding of the topic of interest.

Researchers use figures and lines to explain relationship between variables and present a visual diagram for others to understand a process and the factors involved in it.
Heuristic Model

- IV $\rightarrow$ DV
- Arrow means theory

- Your theory is telling you how the IV will influence the output/DV

- Draw a model for each of your studies

- Teacher student relationship $\rightarrow$ Academic Performance
  - Self fulfilling prophecy, the label the teacher is putting on the student influences performance
- Level of mentoring, involvement $\rightarrow$ Academic Performance
Developing Heuristic Models

1. Have a clear sense of the phenomena you are researching
2. Identify your *domains, factors, variables, and items*, which are your basic building blocks for developing your theoretical model (operationalization)
3. Construct your model
Planning Out Your Study

Who will you study?

How will you measure your variables?

What about ethics, validity and reliability?
Ethics:
- You are to protect your participants and ensure their anonymity. They have the right to withdraw from the study at any given time and their participation is completely voluntary.
- Codes of professional conduct for researchers in commentaries about ethical dilemmas.

(See institutional review board unit at UCI http://www.rgs.uci.edu)

Informed Consent Form
- Right to participate voluntarily and right to withdraw
- Purpose of the study
- Procedures of the study, know what to expect
- Right to ask questions
- Obtain a copy of results
- Have privacy respected
- Benefits to study
- Signature of both participant and researcher
Sampling

- **Sampling** is the process of identifying from a large population a smaller group which not only shares the former’s characteristics but are manageable to study.

- **Non probable Sampling**
  - Convenience
  - Purposive
  - Chain Referral Selection (Snowball effect)
  - Quota

- **Single or multi-staged**
- **Reputational case**
  - Experts

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**Probable Sampling**

- **Random Sampling**
  - All equal change to be selected
- **Stratified sampling**
  - Identified subgroups are represented
- **Cluster sampling**
  - Randomly selects groups and not individuals (e.g. classrooms)
- **Systematic sampling**
  - Every kth name
  - Could be seen as random
Measuring Variables

• Measurement
  ○ Nominal – Classification, categorical (yes/no)
  ○ Ordinal – ranking (letter grades, abilities, traits)
  ○ Interval – nominal and ordinal characteristics with equal intervals (survey)
  ○ Ratio – highest level of measurement. All properties of previous three types with an absolute zero (distance, weight, temperature)
Validity

- Appropriateness of the interpretation of the results
- Accuracy with which a measure truly captures the meaning of a concept

- Single Subject Designs
  - Internal:
    - The ability to draw conclusions about causal relationships from data
    - Extent to which the outcomes result from the variables manipulated
  - External:
    - Extent to which results can be generalized

4 primary types test validity
- Content
  - Degree to which a test measures an intended content area
- Criterion-Related
  - Concurrent
    - Degree to which scores on one test correlate to scores on another when both tests administered simultaneously
  - Predictive
    - Degree to which test can predict how well individual will do in a future situation.
- Construct
  - What is the test really testing?
  - The adequacy of the operational definition of variables
  - Extent instrument measures intended construct
- Consequential
  - Consequences from the tests
Reliability

- Dependability or trustworthiness

- Degree to which a test consistency measures whatever it is measuring

- A valid test is always reliable but a reliable test is not always valid.

Stability
- Test-retest:
  - Scores for same test consistent over time
  - The more similar the scores, the more stable

- Equivalence
  - Two forms measure same variable

Equivalence and Stability

Internal Consistency
- Split half
  - Breaking test into two halves
- Kuder-Richardson and Crohnbach Alpha Reliability
  - All items on a test relate to all other test items and to the total test

- Scorer/Rater Reliability
  - Inter-judge (2) and intra-judge (1) reliability
What are the processes you want to examine?

What will you help others understand that they already don’t know?

What are the particular elements of the phenomena that you are wanting to understand?

What specific design and methods will facilitate the collection of this data?

Details on Methods
Survey Research

- Survey research by questionnaires includes measures that are reliable at a .70 alpha.
  - The items in these measures are close-ended and the simplicity/reading level of the questions is 5th grade level. The most common scale used in the social sciences is the Likert scale (1 – 5, strongly disagree to strongly agree, respectively).

- Response Set and counterbalancing
  - A tendency to respond to all questions from a particular perspective rather than to provide answers that are directly related to the questions. RS can affect the usefulness of the data obtained.

- Response Rate: \[
\frac{\text{# that answered}}{\text{# you contacted}} = \text{RESPONSE RATE (RR)}
\]

- If you get a low response rate, your study can suffer from non-response error. To increase RR, send a notice letter, explain why response is important, enclosed self-address envelop, send post card 7 days after mailing, hand address the envelop, and include a token of incentive.
Survey Research

- **Mail surveys:**
  - Sent to homes or businesses. Low response rates. Needs follow-up

- **Internet:**
  - Placed in search engines, sometimes goes directly to SPSS

- **Interviews:**
  - Interaction with people, more likely to answer than mailings
    - Potential bias - interviewer bias showing approval or disapproval lead them to what they are looking for in the study probe in certain responses and not others

- **Face to face, phone, and focus groups**

- **Captured audience**
Interviews

- Information collected by talking with and listening to the people.
  - This can be face to face or over the phone. (quantitative or qualitative, structured, closed or opened ended)
  - If quantitative, respondents will have options to pick from for their response.
  - If qualitative, it is essential to develop a list of questions or interview guide.
    - The questions are to be open-ended allowing the participant to answer more than yes and no questions.
Semi-Structured Interviews

- Unstructured and open-ended with the direction of an agenda
- Questions pre-formulated and open ended
  - Further clarify domains
  - Operationalize variables
  - Develop hypotheses
  - Develop base for follow-up
- Make sure the questions use terms familiar to interviewees (5th grade level)
- Avoid questions that lead to bias
- Avoid double-barreled questions
- Avoid negatively worded questions - do you agree or disagree
- Avoid that people rank order information
- No yes, no questions
Order of Questions

- Temporary - from earlier events to recent
- Complexity - simpler to more complex
- Topic of domain - group them
  - most concrete to most abstract
- In accordance to threat level - from least sensitive to most
Focus Groups

- Use of group processes to collect information.

- The ideal number of participants for a focus group is 6-8 people.

- While questions for focus groups need to be prepared to guide and focus the discussions, the responses are often free-ranging, as the participants are encouraged to explore the issues at hand in an in-depth way.

Obtain information about
- norms, behaviors, culture, attitudes, innovations

Target
- groups familiar with belonging to phenomenon

Procedure
- interviewer led group
- Transcripts of conversations
Focus Groups

- Generate a considerable amount of data in a short period of time
- Allow the researcher to record data, behaviors, and interactions, also reactions to ideas
- Explore themes
- Identify differences of opinions
- Create comparisons
- Want representative sample (gender, age, ethnicity, class, major)
- Appropriate place, comfortable, cool, noise level, convenient

- Informal vs. formal
- Time spontaneous vs. timed carefully
- Interview takes place in a naturalistic setting vs. planned setting
- Size not controlled vs. size controlled
- Not an incentive vs. always an incentive
- Researcher relationship with group vs. no relationship
Facilitators

- Good observers
- Good listeners
- Pay attention to detail
- Summarize suggestions
- Language match respondents
- Introduce recorder, set ground rules and expectations

- Obtain audio, visual record of events, interviews, and program activities
- Target
  - Groups with expertise in research topic
  - Small classroom setting, special events
- Procedures
  - Camera recorded events
  - Purchase good quality video tapes
  - Mark all tapes clearly
  - Store original tapes in safe place
More Data Collection

- **Observations:** Collecting information through seeing and listening. Observations may be structured and unstructured.

- **Other data collections means include:** photos, diaries, logs, document analyses.
Data Analysis

- **Quantitative**
  - SPSS
  - Chi-Squares
    - Nominal data
  - Mean Comparisons
    - ANOVAs
    - MANOVAs
  - Regressions
    - Stepwise
    - Hierarchal
  - Correlations

- **Qualitative**
  - means of figuring out what to do with the mountain of data.
  - Reviewing field notes, logs, maps, drawings, charts, photos, videos, and tapes.
  - Some will have short-open ended questionnaires
  - Must be organized, coded, reduced and patterned into themes
    - Some numerical, spss, excel, tables, and matrices
    - NUDIST
    - Color coding, words and quotes
Statistics and Research Questions

- Identify stats that will be used to answer research questions and rationale
  - T-test: one categorical independent variable, one continuous dependent variable
  - ANOVA: one or more categorical independent variable, one continuous dependent variable
  - ANCOVA (Analysis of Covariance): one or more categorical variable, one continuous variable, with one control variable.
  - Chi-Square: one categorical independent; one categorical dependent
  - Pearson Correlation: one continuous independent; one continuous dependent
  - Multiple Regression: two or more continuous independent; one continuous dependent
  - MANOVA: one categorical independent; multiple dependent variables; control for correlation between the DVS
Data Analysis: Qualitative

- Organize and prepare data: transcribing interviews, typing up field notes, arranging into piles based on respondent and sources
- Read through all data
- Coding: organize into chunks or segments of text and labeling them, separating them into categories
  - Can create a qualitative code book, with themes and abbreviations.
  - Can use computer software: MAXqda, Atlas.ti, QSR NVivo etc.
- Use codes to come up with themes, descriptions, categories
- How will these themes be represented? Quotes, illustrations, multiple perspectives?
- Interpretation: what does the data mean? What were the lessons learned?
What do I investigate?

How is my research different?

What do I uniquely contribute?

What do I want you to consider in your own work?

Dr. Castellanos’ Research
Psychosociocultural Approach

Psychological

Social

Cultural

Validation

Self-Efficacy

Connectedness

Ethnic Identity

Family

Mentors

Persistence

Gloria & Rodriguez, 2000; Castellanos & Gloria, 2007
Redefining and Reorienting Success

- Different elements moderate student experiences
  - Process vs. Outcome

- Intermediary elements of success
  - Interpersonal relationships
  - Attitudes and Values
  - Knowledge and Skills
Redefining and Reorienting Success

Interpersonal Relationships

Attitudes and Values

Knowledge and Skills

Mentors

Family

Cultural Congruity

Validation & Meaning

Research Opportunities

Professional Development

Incremental Persistence and Success

Castellanos & Gloria, 2007
Incremental Persistence: Educational Success

- Educational “micro-successes”

- Incremental building of small successes toward end success
  - Aggregation over time

- Attending student org meeting
- Studying with peers
- Feeling confident about exams
- Attending all classes for week
- Returning for another year

Castellanos & Gloria, 2007
### Why Research?

- Not simply to develop analytical skills
- Answers questions and addresses real problems for my community
- Provides insight to our culture, practice, values and community concerns
- Makes impact and community change
- Assists student scholars to learn the value of knowledge
- Meaningfulness to scholarship
- It reenergizes me in my own profession
  - Community collaboration, student contact and cross-agency opportunities
What is your goal as a scholar and researcher?

How can your research assist your community?

What specific insight do you want to contribute to the literature, academy and the field?

Application