Penulisan Proposal
CII4A2

Research Methodology

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Creswell, J. W. Educational research: Planning, conducting, and evaluating quantitative and qualitative research. Upper Saddle River, N.J: Merrill.

Objective

Categories of Research

Why Research?

Steps in Conducting Research

Research Method Categories

Research methods are generally categorised as either

- Quantitative
  - Concentrates on collecting and analysing subjective data
  - Usually the perceptions of the people involved
  - Intention is to illuminate perceptions and, thus, gain
    - Greater insight (explain why) and
    - Knowledge (reproduce or recognize).
- Qualitative
  - Concentrates on what can be measured.
  - Involves collecting and analysing objective data
  - Usually involves some form of math
    - Statistical
    - Calculus
    - Discrete

	Qualitative Research	Quantitative Research
Type of reasoning	Inductive (infer general from specific)	Deductive (infer specific from general)
Link with concepts	identifies concepts from situation	Has predetermined concepts and investigates relationships
Action	Usually only describes the action in a situation	Tests relationships between concepts on performing an action
Outcome	illuminates the situation by adding examples	accepts or rejects proposed theory
Approach to validity	truth seen as context bound (socially constructed)	truth seen as objective and universal

Why Research?

- Research is conducted to solve problems
  - Descriptive (find facts)
  - Exploratory (identify patterns)
  - Analytical (explain why or how)
  - Predictive (forecast the likelihood of particular events)
  - Problem Solving (improve current practice)

Descriptive Research

- Purpose: to describe the way things are or were accurately.
- Two main types
  - Surveys: two reasonable ways of doing it.
    - Questionnaire: Relies on carefully composed questions
    - Interview
      - Face-to-face
      - Electronically (phone, chat, email, etc.)
  - Observations
    - Set up a situation and talk to people about what they are doing when they are dealing with the situation.
    - You are not a participant
    - Setting can be
      - Naturally occurring
      - Simulated
      - Something in between

Exploratory Research

- Done when a problem is not clearly defined
- Exploratory research helps determine the best
  - Research design,
  - Data collection method and
  - Selection of subjects.

Analytical Research

- Seeks to explain the reasons behind a particular occurrence by discovering causal relationships.
- Once causal relationships have been discovered, the search then shifts to factors that can be changed (variables) in order to influence the chain of causality.
- You poke at it to see what makes it tic!

Predictive Research

Seeks to forecast the likelihood of a particular phenomena occurring under the given circumstances.

Problem Solving Research

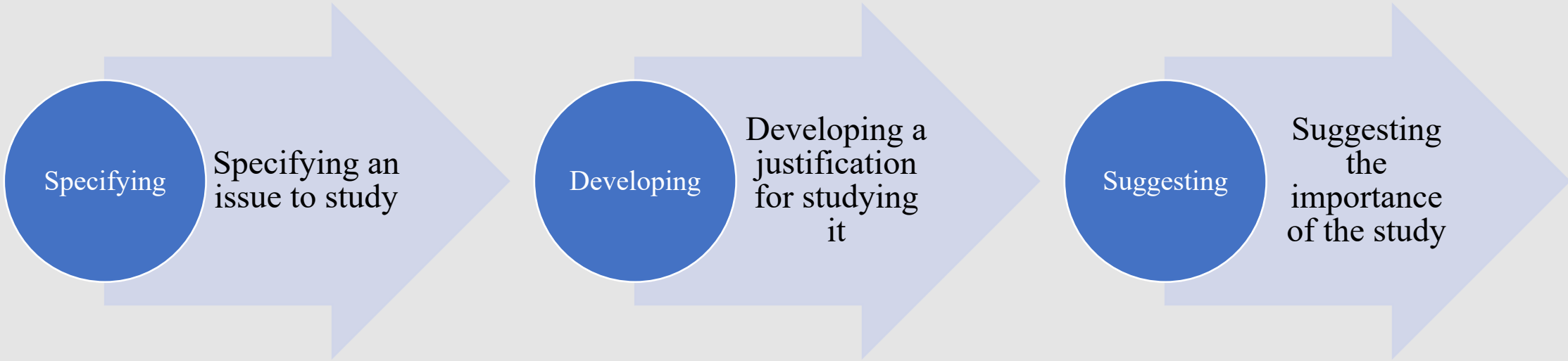
- A form of problem solving based on increasing knowledge through observation and reflection, then following this with a deliberate intervention intended to improve practice.

- You examine current practices and change them (not necessarily for the better)

Steps in Conducting Research

Identifying	Identifying a research problem
Reviewing	Reviewing the literature
Specifying	Specifying a purpose for research
Collecting	Collecting data
Analysing and interpreting	Analysing and interpreting the data
Reporting and evaluating	Reporting and evaluating research

Identifying a research problem



Reviewing the literature

- Identify key terms to use in your search for literature.
- Locate literature about a topic by consulting several types of materials and database.
- Critically evaluate and select the literature for your review.
- Organise the literature you have selected by abstracting or taking notes on the literature and developing a visual diagram of it.
- Write a review that reports summaries of the literature for inclusion in your research report.

Specifying a purpose for research

Identifying the major intent or objective for a study and narrowing it into specific research question or hypothesis.

- Purpose statement: a statement that advances the overall direction or focus for the study.
  - Quantitative, example
    - The purpose of this study is to examine the relationship between use of internet communication between teachers and parents in a Midwestern school district and student achievement on tests in high school social studies
  - Qualitative, example:
    - The purpose of this study is to explore parent stories regarding Internet communications with teachers about their students in one Midwestern school district.
- Research questions: questions that narrow the purpose statement to specific questions that researchers seek to answer.
  - Quantitative, example
    - Do (to what extent) parent-teacher Internet communications affect student performance in the classroom?
  - Qualitative, example:
    - What types of Internet experiences do parents have with teachers about the performance of the parents' children?

Specifying a purpose for research

- Hypothesis: statements in quantitative research in which the investigator makes a prediction or a conjecture about the outcome of a relationship among attributes or characteristics.
  - Traditionally used in experiments.
  - Used like research questions, to narrow the purpose statement to specific predictions.
  - Example:
    - Students in high school X in which parents and teachers communicate through Internet will have higher grades than students whose parents and teachers do not communicate through Internet.

Specifying a purpose for research

- Research Objective: a statement of intent used in research that specifies goals that the investigator plans to achieve in a study.
  - Example:
    - To describe the frequency of Internet communication between parents and teachers regarding the parents' children in high school social study class.
    - To identify the types of tools or devices used by the parents and teachers used when communicating through Internet
    - To identify the effect of the use of Internet by the parents and teachers with regards to the students' grade.

Collecting data

- Specify the population and sample
  - Probabilistic
    - Simple random sampling
    - Systematic sampling
    - Stratified sampling
    - Multistage cluster sampling
  - Nonprobability Sampling
    - Convenience sampling
    - Snowball sampling
- Obtain informed consent
- Choose types of data and measures

Analysing and interpreting the data

- Analyse the data to address the RQs or hypothesis:
  - Describe trends in the data
  - Compare two or more groups on the independent variable in terms of the dependent variable
  - Relate two or more variables
  - Test hypothesis
    - Identify Null and Alternative Hypothesis
    - Set the level of significance (alpha level) for rejecting null hypothesis
    - Collect data
    - Compute the sample statistics
    - Make a decision about rejecting or failing to reject null hypothesis
- Drawing conclusions
- Summarise the result
  - Presenting in tables and/or figures (explain them)
- Explaining the conclusions in words to provide answer to your research questions.

Reporting and evaluating research

- Purpose of a research proposal
  - To help an investigator think through all aspects of the study and anticipate problems
  - Typical content:
    - Title
    - Abstract
    - Intro:
      - Background and motivation
      - Research purpose, Research Questions, and/or Hypothesis
    - Review of the literature
    - Methods
    - Timeline, budget (if relevant)
    - References

Reporting and evaluating research

Research report structure example

- Title
- Abstract
- Introduction
  - Background and motivation
  - Purpose statement
  - Research questions/hypothesis
  - Report structure
- Review of the literature
  - Review of the previous research
  - Summary of major themes
  - How present study will extend literature

Methods

Sample/site

Instrument and their reliability and validity

Data collection procedures

Analysis of the data

- Result/Findings
  - Data analysis result
  - Relation to or address the questions/hypothesis
- Evaluation and Discussion
  - Evaluation process and findings
  - Summary of major result
  - Limitation of the study
  - Implication for future research
  - Overall significance of the study
- References
- Appendices

Computer Science Contribution to Research Methods

- Experimental Computer Science (ECS)
- ECS is the creation of, or the experimentation on HW/SW systems
  - Known as computational artifacts (CA), e.g., computers, phones, robots, compilers, editors, programming languages, architectures, protocols, and methodologies (object-orientation, ...).
- Process:
  - Form a hypothesis
  - Construct a model
  - Make a prediction
  - Design an experiment
  - Collect data
  - Analyse results with respect to prediction

- What if the result does not match the prediction?
  - Change the predictions based on the evidence
  - Do nothing
  - Learn something

Challenges

Thank you!