FCE 3900
EDUCATIONAL RESEARCH
LECTURE 2
Basic and Applied Research
Qualitative and Quantitative
BASIC AND APPLIED RESEARCH
Basic research

• Basic (aka *fundamental* or *pure*) research is driven by a scientist's *curiosity* or interest in a scientific question. The main motivation is to *expand man's knowledge*, not to create, apply, or invent something. There is no obvious commercial value to the discoveries that result from basic research.

• Basic research is concerned with the underlying processes, with the hypothesis usually expressed as a theory.

• Example:
  • To refine the Big Bang theory of Universe creation,
  - What are protons, neutrons, and electrons composed of?
  - What is the specific genetic code of the fruit fly?
Applied research

• Applied research is designed to solve practical problems of the modern world. The goal of the applied scientist is to improve conditions by examining the effectiveness of educational practice.

• May or may not investigate the degree to which certain theories are useful in practical settings.

• For example, applied researchers may investigate ways to:
  ❖ improve agricultural crop production
  ❖ treat or cure a specific disease
  ❖ improve the energy efficiency of homes, offices, or modes of transportation
Basic research

- Also known as pure research
- Merely to increase human knowledge - new knowledge
- Research that has the purpose to develop knowledge of intellectual
- This research is based on a desire to know something
- Research about the universe around it without a specific purpose to solve a problem
- Include research on the earth, the sea, outer space and celestial

Applied research

- To acquire new knowledge for the benefit and the benefit of mankind.
- Aims to collect information that will be used next.
- Always use the theory as a starting point and the theory is born of basic research.
- Aims to resolve difficulties in the practice of the local situation.
- Certain actions may be taken in respect of a practice problem.
- Example: To identify effective teaching methods to teach BI among secondary school students in Malaysia.
Basic research

- Static if the theory is found cannot be tested by researchers and applied research. If tested and true / accurate, the researchers will conduct basic research all basic research to improve the models or theories.
- Emphasizes in-depth study of theories of education available.
- Basic research goal is to collect empirical data that can be used to develop and evaluate a theory.
- Less emphasis on problem solving practices.

Applied research

- Basic research and applied research is a research complement each other
- Researchers applied research using the theory developed in basic research to formulate hypotheses
- Basic research depends on the applied research to confirm a theory
- Example: Scientists discover the physics of the atomic structure of the nucleus, protons and neutrons (Basic). Other scientists use the knowledge of atomic structure to build an atomic bomb (Applied)
QUANTITATIVE AND QUALITATIVE RESEARCH
Definition ....

Quantitative Research
- A kind of educational research whereby questions to be asked are specific and concise; collect numerical data from the respondents; analyze data using statistics; make an unbiased conclusion based on objective, based on the assumption that the world is a single reality made of the factors being investigated

Qualitative Research
- A kind of educational research where researchers rely heavily on their opinion; use general and broad question; collect textual data (words), clarify and explain these words according to the theme and formulate a subjective and biased nature
Definition quantitative

A study that aims to quantify attitudes or behaviours, measure variables on which they hinge, compare, and point out correlations. It is most often conducted via a survey on a sampling that must be representative so that the results can be extrapolated to the entire population studied. It requires the development of standardised and codifiable measurement instruments (structured questionnaires).
Overview the quantitative research

- The objective of quantitative research is to develop and employ mathematical models, theories and hypotheses pertaining to natural phenomena.
- Measuring is key in quantitative research because it shows the relationship between data and observation.
- Quantitative Research options have been predetermined and a large number of respondents are involved. By definition, measurement must be objective, quantitative and statistically valid.
- The sample size for a survey is calculated by statisticians using formulas to determine how large a sample size will be needed from a given population in order to achieve findings with an acceptable degree of accuracy.
Characteristic quantitative research

- Done to get an overview of a phenomenon.
- Stressed to the group, not an individual (Thomas Kuhn, 1970).
- Quantitative research asked the question 'what' and not 'why'.
- As a result, the meaning of a phenomenon interpreted by the researchers and not by the subjects.
- To approach theory (truth).
- Data are considered as empirical evidence in the form of figures or numbers obtained by measuring and testing hypotheses.
- Researchers must assume the evidence before the data was collected.
Characteristic quantitative research

- Quantitative research is about quantifying the relationships between **variables**.
  - We measure them, and
  - construct statistical models to explain what we observed.
- The researcher knows in advance what he or she is looking for.
- Goal: Prediction, control, confirmation, test hypotheses.
- Use random sampling.
- Often researchers using a structured questionnaire or observation schedules for the purpose of data collection
Cont.. Characteristic quantitative research

- All aspects of the study are carefully designed before data are collected.
- Quantitative research is inclined to be deductive -- it tests theory. This is in contrast to most qualitative research which tends to be inductive --- it generates theory.
- The researcher tends to remain objectively separated from the subject matter.
- Develop and employ mathematical models, theories and hypotheses pertaining to natural phenomena.
- Involve large samples of subjects; deal with cause/effect.
- Associated with positivism: that objective truth can be known with certainty, that it can be gained through rational methods.
Major Types of Quantitative Studies

- Descriptive research
  - Correlational research
  - Evaluative
  - Meta Analysis
- Causal-comparative research
- Experimental Research
  - True Experimental
  - Quasi-Experimental
Quantitative Data Collection

• Requires a specific protocol
• Protocol is specified in advance of data collection
• Population and sample should be large. The larger the better

DATA ANALYSIS

○ Statistical analysis
○ Describes trends, compares groups, relates variables
○ Compares your results with past research
Definition qualitative

• Qualitative Research is collecting, analyzing, and interpreting data by observing what people do and say. Whereas, quantitative research refers to counts and measures of things, qualitative research refers to the meanings, concepts, definitions, characteristics, metaphors, symbols, and descriptions of things.

• Qualitative research is more concerned with understanding situations and events from the viewpoint of participants.
Some features of qualitative research

• Purpose is to understand rather than measure
• Is holistic and accommodates the emergent properties of real-world situations
• Places findings in context – historical, cultural, political
Characteristics of Qualitative Research

- Emerged from the social sciences
- Provides researchers with methodologies and methods for understanding people and their actions within social and organisational settings
- Usually very contextual, focussed on the understanding of the richness and complexity of the settings within which people live, learn and work
- Takes place in the natural setting
- Uses multiple methods that are interpretive
Cont. Characteristics of Qualitative Research

- Is emergent rather than tightly prefigured
- Fundamentally interpretive (role of researcher as interpreter)
- Researcher views social phenomena holistically
- Researcher systematically reflects on who he or she is in the inquiry and is sensitive to how or her personal biography and how it shapes the study
- Researcher uses complex reasoning that is multifaceted, iterative, and simultaneous
- Researcher adopts and uses one or more strategies of inquiry
QUANTITATIVE VS QUALITATIVE
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Qualitative research</th>
<th>Quantitative research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>To understand &amp; interpret social interactions</td>
<td>To test hypotheses, look at cause &amp; effect, &amp; make predictions.</td>
</tr>
<tr>
<td>Group Studied</td>
<td>Smaller &amp; not randomly selected.</td>
<td>Larger &amp; randomly selected</td>
</tr>
<tr>
<td>Variables</td>
<td>Study of the whole, not variables.</td>
<td>Specific variables studied</td>
</tr>
<tr>
<td>Form of Data Collected</td>
<td>Qualitative data such as open-ended responses, interviews, participant observations, field notes, &amp; reflections.</td>
<td>Quantitative data based on precise measurements using structured &amp; validated data-collection instruments.</td>
</tr>
<tr>
<td>Type of Data Analysis</td>
<td>Identify patterns, features, themes.</td>
<td>Identify statistical relationships</td>
</tr>
<tr>
<td>Criteria</td>
<td>Qualitative research</td>
<td>Quantitative research</td>
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<td>--------------------------------</td>
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</tr>
<tr>
<td>Objectivity and Subjectivity</td>
<td>Subjectivity is expected.</td>
<td>Objectivity is critical.</td>
</tr>
<tr>
<td>Role of Researcher</td>
<td>Researcher &amp; their biases may be known to participants in the study, &amp; participant characteristics may be known to the researcher.</td>
<td>Researcher &amp; their biases are not known to participants in the study, &amp; participant characteristics are deliberately hidden from the researcher (double blind studies).</td>
</tr>
<tr>
<td>Results</td>
<td>Particular or specialized findings that is less generalizable.</td>
<td>Generalizable findings that can be applied to other populations.</td>
</tr>
<tr>
<td>Scientific Method</td>
<td>Exploratory or bottom–up: the researcher generates a new hypothesis and theory from the data collected</td>
<td>Confirmatory or top-down: the researcher tests the hypothesis and theory with the Data.</td>
</tr>
<tr>
<td>Criteria</td>
<td>Qualitative research</td>
<td>Quantitative research</td>
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<td>----------------------------------</td>
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</tr>
<tr>
<td>View of Human Behavior</td>
<td>Dynamic, situational, social, &amp; personal.</td>
<td>Regular &amp; predictable.</td>
</tr>
<tr>
<td>Most Common Research Objectives</td>
<td>Explore, discover, &amp; construct.</td>
<td>Describe, explain, &amp; predict.</td>
</tr>
<tr>
<td>Focus</td>
<td>Wide-angle lens; examines the breadth &amp; depth of phenomena.</td>
<td>Narrow-angle lens; tests a specific Hypotheses.</td>
</tr>
<tr>
<td>Nature of Observation</td>
<td>Study behavior in a natural environment.</td>
<td>Study behavior under controlled conditions; isolate causal effects.</td>
</tr>
<tr>
<td>Nature of Reality</td>
<td>Multiple realities; subjective.</td>
<td>Single reality; objective.</td>
</tr>
<tr>
<td>Final Report</td>
<td>Narrative report with contextual description &amp; direct quotations from research participants.</td>
<td>Statistical report with correlations, comparisons of means, &amp; statistical significance of findings.</td>
</tr>
</tbody>
</table>
Qualitative and Quantitative Research Contrasted

**QUALITATIVE**
- Theory developed during study
- Meaning of concepts
- Process oriented
- Control unimportant
- Rich descriptions
- Basic element of analysis is words
- Uniqueness
- Trustworthiness of findings

**QUANTITATIVE**
- Theory developed a priori
- Measurement of variables
- Outcome oriented
- Control important
- Precise measurement of variables
- Basic element of analysis is numbers
- Generalization
- Control of error
Steps in Quantitative & Qualitative research

**FIGURE 6.1 STEPS IN QUANTITATIVE AND QUALITATIVE STUDIES**

**QUANTITATIVE**

- Linear
  - Define a Research Problem/Question
  - Review the Literature
  - Formulate Hypothesis or Refine Question
  - Make Operational Definitions
  - Design or Select Instruments for Data
  - Obtain Ethical Approval
  - Collect Data
  - Analyze Data
  - Interpret Findings — Refer to Literature Again
  - Determine Implications — Draw Conclusions

**QUALITATIVE**

- Cyclical
  - Select a Social Content and Research
  - Write Final Report
  - Determine Implications — Draw Conclusions
  - Review Literature
  - Establish Scientific Rigour of Findings
  - Collect Empirical Data in the Field
  - Analyze Data
  - Concept Formation and Modification
    - Description
    - Hypothesis Generation
    - Theory Development
  - Explicate Researchers Beliefs — (Bracketings)
  - Obtain Ethical Approval
  - Select Participants

What Is Mixed Methods Research?

• A mixed methods research design is a procedure for collecting, analyzing, and “mixing” both quantitative and qualitative research and methods in a single study to understand a research problem.
When to Use Mixed Methods Designs

- When both quantitative and qualitative data, together, provide a better understanding of your research problem than either type by itself
- When one type of research (qualitative or quantitative) is not enough to address the research problem or answer the research questions

- To incorporate a qualitative component into an otherwise quantitative study
- To build from one phase of a study to another
  - Explore qualitatively then develop an instrument
  - Follow-up a quantitative study qualitatively to obtain more detailed information
Identifying a Mixed Methods Study in the Literature

- The title includes words such as “mixed methods” or “multimethod,” etc.
- Data collection section indicates both qualitative and quantitative data were collected.
- Purpose statement and/or research questions indicate that the researcher intends to collect both quantitative and qualitative data during the study.

- Priority or weight: Qualitative, quantitative, or both equally
- Sequence of collecting quantitative and qualitative data is indicated
- Analyze both data sets
  - Combined in one analysis (integrated)
  - Separate analysis
Reasons for “mixing”

• The insufficient argument – either quantitative or qualitative may be insufficient by itself
• Multiple angles argument – quantitative and qualitative approaches provide different “pictures”
• The more-evidence-the-better argument – combined quantitative and qualitative provides more evidence
• Community of practice argument – mixed methods may be the preferred approach within a scholarly community
• Eager-to-learn argument – it is the latest methodology
• “It’s intuitive” argument – it mirrors “real life”
Thank you ...