LECTURE - I
SYNOPSIS

- What is Research?
- How to think like a Scientist?
1. What is Research?

- Information, Science, Knowledge.
- Research for Knowledge.
- Sources of Knowledge.
  - Superstition
  - Intuition
  - Authority
  - Tenacity
  - Rationalism
  - Empiricism
  - Science
- **SUPERSTITION**
  Subjective feelings, belief in chance or belief in Magic. (Breaking of Mirror, No. 13, Three times)

- **INTITUTION**
  Ideas just comes (Gut feeling).

- **AUTHORITY**
  Respected or Famous person tells us. (Parents, Some Teachers, Aqwal).
TENACITY
Hearing so often that one begins to believe and stick stubbornly to it despite counter evidence.

RATIONALISM
Logical reasoning.

- All humans are moral
  I am a human,
  Therefore I am good.

- Attractive people are good.
  Neillie is attractive,
  Therefore Neillie is good.
EMPIRICISM
Objective observations and experiences of senses. (5 senses, Aristotle, long list)

SCIENCE
- Empiricism + Rationalism
- Hypothesis = Prediction Variable.
- Theory = Outcome Organized System of assumptions and principles which explains phenomena. (Darwin, Einstein).
2. How to Think Like a Scientist.

2.1 PROCESS

- Think Critically.
- Systematic Empiricism.
- Transparent Public Verification.
- Solvable Problems.
2.2 GOALS OF SCIENCE

- Description
- Prediction.
- Explanation.
- Basic and Applied Research.
1. Identify a piece of information from each source of knowledge.

1. Argue which is important? Basic or Applied Research.

3. Why is it compliment to a scientist to be called skeptic?
LECTURE - II
1. Getting started with Research.

2. Research Ideas.
GETTING STARTED WITH RESEARCH

- Research Ideas.
  - Reviewing the Literature.
    - Library Research.
    - Journals.
    - Abstracts.
    - Proceedings.
    - Personal Communications.
Reading a Journal Article  what to Expect?

- Abstract.
- Introduction.
- Method.
- Results.
- Discussion and Conclusions.
ABSTRACT

- Less than 120 words.
- Describes problem, purpose, methodology, results/findings with Statistically significant levels.
- Conclusions.
- Implications of study.
- Application of Study.
- Key words.
- For published article, the abstract goes to subject Abstracts.
INTRODUCTION

- Introduction to the problem.
- A review of relevant previous research, only main works.
- Purpose and rationale of study.
METHOD

- How study was conducted.
- Sufficient details so that reader can replicate the study.
- Materials / Apparatus.
- Product.
- Manipulations
- Special Control Features in design.
RESULTS

- Summary of data collected.
- Type of statistics used.
- Analysis of data.
- Statistical Test used.
- Data Analysis.
- No discussion here.
DISCUSSION

- Evaluation of Results.
- Interpretation of Results.
- Restatement of the Predictions of the study.
- Whether the predictions were supported by results?
- Implications of future research.
- Conclusions / Predictions.
Select a topic of interest in your subject. Find FIVE relevant articles, write their references and present their abstracts.
LECTURE - III
Defining, measuring and manipulating variables.

Reliability

Validity
VARIABLES

- Defining Variables/Operational Variable.
  - Measurable Inter dependent or independent factors in a phenomenon.
  - Exercise Vs Blood Pressure
    - Time of Exercise
    - Heart rate
    - Type of Exercise
  - Concrete Vs. Non-Concrete
INTERDEPENDENT VARIABLES

PROPERTIES OF MEASUREMENT

- **IDENTITY**
  
  Same variable from different provenance receive different score.

- **MAGNITUDE**
  
  Ordinarily; Ordering of numbers reflects the variable being measured.

- **EQUAL UNIT SIZE**
  
  When difference of I is considered as same all over.

- **ABSOLUTE ZERO**
  
  Zero may not mean Zero, when it is not absolute.
VARIABLES : SCALE OF MEASUREMENT

- **NORMAL**
  Objects assigned Categories and no numerical value.

- **ORDINAL SCALE**
  Objects given categories and categories given ascending or descending scales.

- **INTERNAL SCALE**
  Intervals of measurement are equal but not proportionate in effect.

- **RATIO SCALE**
  Order + equal units + Absolute Zero. (All 4 Properties) Age, Height, Weight.
# Features of Scales of Measurement

<table>
<thead>
<tr>
<th>Scales of Measurement</th>
<th>Nominal</th>
<th>Ordinal</th>
<th>Interval</th>
<th>Ratio</th>
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</thead>
<tbody>
<tr>
<td><strong>Examples</strong></td>
<td>Ethnicity</td>
<td>Class rank</td>
<td>Temperature (Fahrenheit and Celsius)</td>
<td>Weight</td>
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<td>Religion</td>
<td>Letter grade</td>
<td>Many psychological tests</td>
<td>Height</td>
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<td>Sex</td>
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<td>Magnitude</td>
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<td>Equal unit size</td>
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<td>Absolute zero</td>
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<tr>
<td><strong>Mathematical operations possible</strong></td>
<td>None</td>
<td>Rank order</td>
<td>Add</td>
<td>Add</td>
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<td>Subtract</td>
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<td>Multiply</td>
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<td>Divide</td>
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VARIABLES: DISCRETE AND CONTINUOUS

- **DISCRETE**
  Whole number units; Species, Gender, No fractions.

- **CONTINUOUS**
  Continuous scale; allows fractions Tree diameter classes 1-4, 4-8, 8-12.

- **TYPES OF MEASURES**
  - Self Report Measures
  - Tests
  - Empirical Measures
  - Physical Measures.
SELF RESPONSE MEASURES

- Questionnaires
- Interviews
- Behavioral (doing)
- Cognitive (Think)
- Affective (doing)
TESTS

- Blood Test
- Psychological Test
- PH Test
- Air and Water Test.
- Show difference in various samples and areas.
EMPIRICAL MEASURES

- Observations on wildlife in a Forest.
- Traffic Behaviors
PHYSICAL MEASURES

- Use of equipment.
- Weight, Blood Pressure Temperature.
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<tr>
<th></th>
<th><strong>Self-Report</strong></th>
<th><strong>Tests</strong></th>
<th><strong>Behavioral</strong></th>
<th><strong>Physical</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Questionnaires</td>
<td>A measurement instrument used to</td>
<td>Careful observations and recordings</td>
<td>Measures of bodily activity</td>
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<td></td>
<td>or interviews</td>
<td>assess individual differences</td>
<td>of behavior</td>
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<td><strong>Examples</strong></td>
<td>Behavioral</td>
<td>Ability tests</td>
<td>Counting behaviors</td>
<td>Weight</td>
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<td></td>
<td>self-report</td>
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<td>Cognitive self-</td>
<td>Personality tests</td>
<td>Classifying behaviors</td>
<td>EEG recordings</td>
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<td>report</td>
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<td>Affective</td>
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<td>GSR recordings</td>
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<td>self-report</td>
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<td>Blood pressure</td>
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<tr>
<td><strong>Considerations</strong></td>
<td>Are participants</td>
<td>Are participants being truthful?</td>
<td>Is there reactivity?</td>
<td>Is the individual skilled at using</td>
</tr>
<tr>
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<td>being truthful?</td>
<td></td>
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<td>the equipment?</td>
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<tr>
<td></td>
<td>How accurate</td>
<td>How reliable and valid are the tests?</td>
<td>How objective are observers?</td>
<td>How reliable and valid is the</td>
</tr>
<tr>
<td></td>
<td>are participants’ memories?</td>
<td></td>
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<td>measuring instrument?</td>
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</table>
RELIABILITY

- Measure to assess if the method is correct.
- Consistency and Stability of instrument.
- Error Score.

Observed Score = True Score + Error

Reliability = \[
\frac{\text{True Score}}{\text{True Score} + \text{Error}}
\]
VALIDITY

A measuring instrument measures what it claims to measure.

- **Content Validity Test**
  Covers a representative sample.

- **Criterion Validity Test.**
  Concurrent, Prediction.

- **Construct Validity Test.**
  Extent to which a measuring instrument accurately measures a theoretical construct or trait that it is designed to measure. Horse Power of an Engine, Power of Computer.
Reliability and validity go together.