Ministry of Education
REPUBLIC OF GHANA

THE WORLD BANK

GHANA EDUCATION SERVICE

GHANA SECONDARY EDUCATION IMPROVEMENT PROGRAMME - RESEARCH AGENDA

Capacity Building in Research Methods and Statistics for MOE/GES officers

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GEG

Outline of Course

- SRATEGIES FOR DATA COLLECTION, VALIDITY AND RELIABILITY –
  - Questionnaire
  - Observation,
  - Test,
  - Interview,
  - Validity
  - Reliability
  - Triangulation

Strategies for Data Collection

- In research, the quality of data is as good as the findings
- Data collection goes beyond the actual act of collecting data on the field. It covers:
  - Knowing who your participants are (i.e. unit of analysis)
  - Where to locate them
  - The techniques to select the participants (population, sample and sampling)
  - What measures or instruments or tools will help you to answer the research question (i.e., specifying the variable(s) in your research questions/hypothesis)
  - Identifying the permission needed for the study (consent forms and PIS also applies)

- For both quantitative and qualitative methods, there are various strategies/tools for data collection.

Strategies for Data Collection

Quantitative Data Collection

Types of data	Type of tests, instruments or documents	Definition of test, instrument, document
Measure of individual performance	Achievement test: norm referenced test Criterion-referenced test Intelligence test	Individual's grades are compared with a large group of test takers Individual's grades are compared to a criterion measures an individual's intellectual ability
Measure of individual attitude	Affective scale	Measures positive or negative effect for or against a topic
Observation of individual behaviour	Behavioral checklist	Used to record observations about individual behavior
Factual Information	Public documents or school records	Information from public sources that provides data about a sample/population

Strategies for Data Collection

Quantitative Data Collection Tools/Instruments

- Questionnaire (scale etc.)
- Observation guide/checklist
- Test

Questionnaire

- The design of a questionnaire should
  - **First address ethical issues:** Like all instruments, the use of questionnaire will always be an intrusion (time, privacy or level of threat/sensitivity)
  - **Clarify questionnaire's purpose:** It should be based on the specific purposes/objectives of the study
  - Translating the purpose into underlying construct/topic that relate to the central purpose

Strategies for Data Collection

Questionnaire…Cont.

- Developing the item relating to each of the issues (e.g., if 'confidence in math' is the underlying issue, what items would measure 'confidence in math')

- The set of items to measure a construct should be data driven (both theoretical and empirical)
  - What are the empirical indicators of the construct?
  - What kind of data is required to give evidence about the construct? etc.
- The set of items should be fairly exhaustive in it coverage
- Ask the most appropriate kinds of questions
- You can also use already designed questionnaires for your study (adapt or adopt)

Strategies for Data Collection

Variants of Questionnaire

- **Structured** – Questions are precisely decided in advance, closed and used for larger sample.
- **Semi-structure** - questions are structure and presented for the respondents to answer or comment on them in a way that they think best.
- **Unstructured** - Questions are open and used for relatively small sample

Kinds of questionnaire items

- Closed-ended -
- Open-ended -

Strategies for Data Collection

Scale of Data

- The design of the questionnaire must adopt a metric or scale (nominal, ordinal, interval and ratio)
  - Nominal data indicate categories;
  - ordinal data indicate order (e.g., high to 'low, first to last, smallest to largest, strongly disagree to strongly agree, not at all to 'a very great deal)
  - ratio data indicate continuous values and a true zero (e.g. marks in a test, number of attendances)

Forms of structured questions

1. Dichotomous questions – (e.g., yes or no, male or female)
2. Multiple questions – presents a range of options for respondents to choose from (No. of teaching experience "1-5", "6-14", "15-24", "25+").

Strategies for Data Collection

3. Rank ordering questions – presents multiple options and asks respondents to identify priorities (e.g., Please indicate your priorities by placing numbers in the boxes to indicate the ordering of your views: 1=highest priority 2= second highest, and so on)

Rating scales

- Used to differentiate the degree of intensity if responses
- Example, Likert scale, semantic differential scale, Thurstone scale etc.

Likert scale [named after Rensis Likert (1932)]

- provides a range of responses to a given question or statement

Strategies for Data Collection

- **Examples**

- How important do you consider work placements for secondary school students?
  1= not at all
  2= very little
  3= a little
  4= quite a lot
  5=a very great deal

- All students should have access to free higher education.
  1 = strongly disagree
  2= disagree
  3= neither agree nor disagree
  4= agree
  5= strongly agree

Semantic differential

- is a variation of a rating scale which operates by putting an adjective at one end of a scale and its opposite at the other. **For example:**

How informative do you consider the new set of Mathematics textbooks to be?

1 2 3 4 5 6 7

Useful – – – – – – – Useless

Strategies for Data Collection

Observation

- Offers an investigator the opportunity to gather 'live' data from naturally occurring social situations.
- Observation can focus on:
  - Fact - the number of books in a classroom, the number of student in a library
  - Event - the extent of teacher and student talk, rate of school attendance
  - Behaviour – friendliness of teachers, the degree of aggressive behaviour etc.

Types of Observation

1. **Structured** – systematic and enable researcher to generate numerical data
   - Uses observable schedule/guide or check list to collect by noting the incidence under study

Strategies for Data Collection

Types of Observation ….Conti.

- With the structured observation, investigator assumes a passive, non-intrusive role

2. Naturalistic and Participant observation

- **Complete participation** – investigator takes an insider role (may hide his identity)
  - Has ethical implications but useful to unravel the true situations in natural setting
- **Participant-as-observer** – Investigator is naturally part of a social group and document incidence for research purposes.
- **Observer-as participant** – Investigator is known by the group as a researcher

Strategies for Data Collection

Some bias in Observations

1. Selective attention of the observer – the accuracy of what we look, see, how we look at it, at what time, the state of our mind at the time of observing
2. Reactivity – the behaviour of people when they know they are being observed
3. Attention deficit – what if the observer looks away and misses an event?
4. Validity of construct – what counts as valid evidence for judgement. E.g., is a smile a relaxed smile, a nervous smile, a friendly smile, a hostile smile?
5. Expectation effect – the influence of having expected findings on observation
6. Number of observations and decisions on how to record

Strategies for Data Collection

Tests

- Collects data of numerical kind rather than verbal kind

Critical issues in collecting test data

- What are we testing (e.g., achievement, aptitude, attitude, personality, intelligence, social adjustment etc.)?
- Are we dealing with parametric or nonparametric tests?
- Are they norm-referenced or criterion referenced?
- Are they available for you to use (e.g., WASCCE results) or you will have to develop home produced tests?
- Do they involve self-reporting or are they administered tests?

Planning A Research

Constructing a test

- Consider the purpose of the test (e.g., to diagnose students' strength, weakness and difficulties; to measure achievement; to measure potential etc.)
- Identify the test specifications (must relate to the purpose of the test or study)
- Consider the content of the test (what is being tested and the test items are?)
- Write the test items – involves items analysis (discrimination and difficulty)
- Consider format of the test (its layout, instructions, method of completion)
- Consider issues of validity and reliability of the test
- Provision of a manual of instruction for administration
- Plan scoring (marking) and data treatment

Strategies for Data Collection

Interview

- An interchange of views between two or more people on a topic, with specific purpose
- Is a flexible tool to collect data through multi-sensory channels (i.e., verbal. non-verbal, spoken and heard)

Types of Interview

- Structured interview - The interviewer asks a set of standard, predetermined questions about particular topics, in a specific order.
  - Respondents select their answers from a list of options
  - It can be used in survey research

Strategies for Data Collection

- Semi-structured interview - Uses a set of predetermined questions and the respondents answer in their own words
  - Uses interview schedule/guide to ensure that all respondents provide information on the same topics
  - Allows interviewer to probe or ask supplementary question
  - Useful when there is the need for in-depth information

- Unstructured interview - Has no specific guidelines, restrictions, predetermined questions, or list of options.
  - interviewer asks a few broad questions to engage the respondent in an open, informal, and spontaneous discussion.
  - Allows interviewer to probe or explore inconsistencies to get in-depth data
  - useful for getting the stories behind respondents' experiences or when there is little information about a topic.

Strategies for Data Collection

Methods of interviewing

- Face-to-face interview
- Telephone interview

Planning an interview

- Define your objectives
- Choose the type of interview
- Choose your respondents (depending on the type of interview)
- Decide how (method) of interview (face-to-face or telephone)
- Decide how to select participants

Strategies for Data Collection

- Decide how to record the interview (use written notes, voice recorders etc.)
- Design the schedule based on the type of interview and the purpose of the research
- Decide on analysis and reporting

Tips during Interview

- Introduce yourself and initiate friendly conversation
- Explain the purpose of the study, its importance and the expected duration of the interview
- Tell the respondent how the interview will be recorded and seek consent
- Keep the focus of the topic of inquiry within context during interview
- Ensure proper recording

Strategies for Data Collection

Tips after Interview

- Transcribe depending on the purpose of the study or the type of interview
- Verify or undertake member-checking
- Prepare transcripts for analysis

Validity and Reliability

- Threats to validity and reliability of research (instrument) can not be completed ridded, but their effects can be attenuated by paying attention to validity and reliability issues

Validity

- An invalid research is worthless
- Validity is the demonstration that a particular instrument (or research) measures what it purports to measure.

Validity in Quantitative research

- In quantitative research, validity is addressed through sampling, appropriate instrumentation and appropriate statistical treatment of data
- It is impossible to get a 100% valid research; there is always an inbuilt measure of SE

Validity and Reliability

Kinds of validity

- **Content validity** – concerned with content adequacy or representation
- **Construct validity** – concerned with clearly operationalizing constructs, consistent with what is generally known about the construct,
- **Internal validity** – concerned with a demonstration of events, or set of data can actually be sustained by the data (i.e., the findings must describe accurately the phenomena being investigated.
- **External validity** – concerned with the degree to which the results could be generalized.
- **Face validity** – concerned with the instrument measuring exactly the purpose of the study.
  - This kind of validity is achieved through piloting of research instrument (e.g., questionnaire)

Validity and Reliability

Reliability in Quantitative Research

- Used to mean dependability, consistency and replicability
  - over time,
  - Over instruments and
  - Over groups of respondents
- It concerned with precision and accuracy
  - For example: height can be measured precisely but musical ability cannot
- Reliable research produces similar results when carried out on similar group of respondents in similar context.

- **Three types of reliability:** stability, equivalence and internal consistency

Validity and Reliability

- **Reliability as Stability**
- The measure of consistency overtime and over similar sample
- For example: a leaking tap which leaks 1 litre each day is leaking reliably whereas a tap that leaks 1 litre today and 2 litres tomorrow is not leaking reliably.
- In survey or experiment research, a test and a retest is reliable if the produce similar results within an appropriate time span.
  - Time period is critical: not too long or not too short

- Reliability as stability can also be achieved over a similar sample
  - a test or a questionnaire administered simultaneously to two groups of students (with closely matched significant characteristics) should obtain similar results

Validity and Reliability

Reliability as equivalence

- Using equivalent form of test to achieve reliability; the result must be similar
- May also be achieved through inter-rater reliability; more than one researcher working on a research are likely to build greater consensus on data.

Reliability as internal consistency

- Test/instrument is split into two to achieve reliability; result for each half must be similar

Validity and Reliability

Reliability in Qualitative Research

- Lincoln and Guba(1985) prefer to replace ‘reliability’ with
  - credibility
  - neutrality
  - confirmability
  - dependability
  - consistency
  - applicability
  - trustworthiness and
  - transferability

Validity and Reliability

Triangulation

- The use of two or more methods of data collection
- It attempts to map out, or explain more fully, the richness and complexity of a topic
- It uses both quantitative and qualitative data sets
- It may resolve issues of bias and gives greater accuracy, increasing researcher's confidence

THANK YOU FOR YOUR ATTENTION & TIME