WORKSHOP ON EFFECTIVE CONDUCT OF RESEARCH

FOR

WEST AFRICAN EXAMINATION COUNCIL (WAEC) STAFF

Training Service Provider
Institute of Education,
University of Ibadan,
Ibadan, Nigeria

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MODULE FIVE

DEVELOPING QUANTITATIVE INSTRUMENTS FOR RESEARCH PURPOSES AND DATA COLLECTION PROCESS

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Preamble

The development of instruments is an essential component of research because without these instruments, data inputs in the form of raw information that will be used to analyse the participants' responses, views/opinions and knowledge in the particular area of study will not be there. It is also important that a research has the knowledge base on available instruments that can be used for data collection, as well as the skills in the development of these instruments to ease the processes of analysis and interpretation. Instruments constructed must be used to collect data systematically to ensure reliability and validity of the information gathered. Otherwise, the researcher could make error of judgement while interpreting the results. In view of this, module 2 has been divided into three units viz: developing instruments in the cognitive domain, developing instruments in affective and psychomotor domains and data collection process.

Objectives of the Module

By the end of this module, participants should be able to:

1. comprehend the principles of quantitative instruments development for research purposes,
2. develop instruments for obtaining information in the cognitive domain,
3. develop affective capturing instruments, and
4. develop instruments for obtaining information in the psychomotor domain.
5. identify and describe how to use three techniques of data collection.

Unit 1: Developing Instruments in the Cognitive Domain

The major instrument for obtaining information in the cognitive domain is the achievement test. Achievement test can be classified into many types (Refer to figure1). However, we shall focus our discussion on the construction of objective tests. Activity 1: Discussion on Figure 1

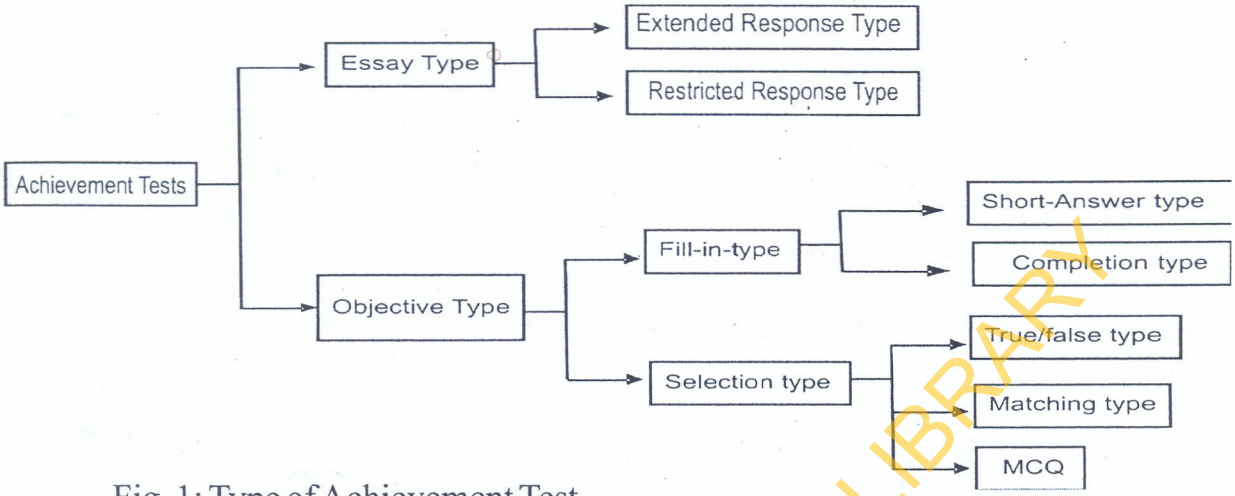

Fig. 1: Type of Achievement Test

Unit 2: Developing Instruments in Affective and Psychomotor Domains

Questionnaire

Questionnaire is a self-reporting instrument, used to collect information on attitude, opinion or interest of the individual. The response format could be open-ended or closed-ended. The closed-ended type is sometimes preferred because of ease of analysis.

Guidelines for Writing a Good Questionnaire

- Consider the advantages and disadvantages of using questionnaire before use.
- Know the objective of the questionnaire
- Decide on the response format
- Break down the content of the issue of interest into relevant components.
- Write good items on each of the components
- Use 'always' and 'never' with caution rather use 'almost always' and 'almost never'.
- Do not use negatives in statements to avoid confusion. Use positive statements. Also, bold, underline or capitalize if you must use it.
- Express one idea in each statement.
- Make the option exhaustive.
- Sparingly the 'don't know' as an option.
- To draw respondents' attention to important items, bold, italicize or underline.
- Also carefully consider the use of 'yes' and 'no'.
- Avoid putting a blank space in the middle.
- When one choice is to be selected make it mutually exclusive.
- Use open-ended questions sparingly.

- Use items that require ranking sparingly.
- Give the questions to another person/teacher to review them
- Revise the items/questions in the light of criticisms/suggestions made
- Test the instruments on a sample of respondents, analyze and select only the good items.

Advantages

- ❖ Easy to construct
- ❖ Could be administered on a large sample with ease
- ❖ Used to assess students' affective behaviours
- ❖ Assures anonymity of respondents.

Disadvantages

- ❖ Appropriate for use with learners who are proficient in the language used.
- ❖ Easily susceptible to falsehood
- ❖ Refusal to respond to some items
- ❖ Tendency to respond in a particular direction e.g ticking 'undecided' or 'disagree'

Rating Scales

Rating scales are used to systematically record the presence of a trait or behaviour. It is used when one is interested in the quality of the trait or attribute. It could be used to assess many aspects of school life e.g. honesty and dedication of staff to duty or the introduction of an innovation or training. There are different types such as **numerical** or **graphical rating scales**. Respondents are requested to rate the appropriate response that shows the level to which they agree with the statements describing the traits. The number of response levels in a rating scale varies from three to five, e.g – very honest (5); honest (4); not sure (3); dishonest (2) and very dishonest (1) Or satisfactory (1), good (2), excellent (3). An example of a rating scale is as presented.

Uses of Rating Scale

- Assesses personal characteristics that are social in nature e.g. punctuality, neatness, carefulness, cooperation etc.
- It is also used to rate practical work e.g. cooking, moulding, sewing etc.

Example

To rate a teacher on the **'level of instructional competence'** - for instance, area of interest could be sampled as follows:

	Ratings					
	0	1	2	3	4	5
A. Planning B. – objective well stated C. – content is adequate D. – sequenced E. – provision for learning materials is made. F. – varied and relevant learning materials is available. **B. Instructional Delivery** – introduce the lesson. – stating from known to unknown. – review previous lesson. – stimulates students interest. – demonstrates mastery of content. – uses learning materials						

Advantages of Rating Scale

- ❖ Easy to construct and easy to complete
- ❖ Specific traits and behaviours can be rated
- ❖ Flexible and can be used in natural and simulated settings
- ❖ The quantitative scale provides basis for rating students on same set of categories

Disadvantages

- ❖ It may be difficult to generate comprehensive traits that adequately assess the behaviour of interest.
- ❖ Raters may have difficult in having the same understanding of the stated traits.
- ❖ Susceptible to the problem of 'halo effect' (When a rater's general impression of a trait influences his/her ratings).
- ❖ Raters may be strict, lenient or take a neutral position.

Checklists

Checklists are simple record keeping tools that help the school administrator keep track of individual staff, school learning or materials. Depending on the non-cognitive aspect of teaching one is interested in assessing, a comprehensive listing of traits is done, and the rater simply checks in the traits as they are exhibited by the teacher or learner.

An example of how to draw up a checklist is as follows: 'Availability of science materials in the school'.

Materials in Science Lab.	Available/ No	Not Available	In good Condition/No	Not in good Condition/No
1. Conical flask 2. Round bottom flask 3. Pipette 4. Burette 5. Bunsen burner 6. Clamp 7. Clamp hold er etc.				

Advantages of Checklist

- Easy to construct and easy to complete
- Specific traits and behaviours can be assessed
- It is flexible, and can be modified when the need arises

Disadvantages of Checklist

- The teacher might leave out important trait inadvertently.
- It could be subjective.
- Cannot be used in isolation.

Another Example of a Checklist

Please give your opinion on the following attributes

S/N	Trait	V. Important	Important	Not sure (Indifferent)	Undesirable
1	Good looks				
2	Kindness				
3	Money				
4	Dependability				
5	Sense of humour				
6	Ambition				

Attitude Scale

Attitude is a personality trait. It is "a state of readiness, a tendency to act or react in a certain manner to stimuli". Attitudes are positive or negative feelings about something and are expressed when we speak or when the object of the attitude is aroused. Otherwise they are usually dormant in the person. Attitudes often attract strong feelings (intensity). Attitudes are reinforced beliefs which mean that they have cognitive component, emotional component and the action or behaviour tendency component.

Other qualities or characteristics of attitudes include:

- ❖ attitudes are abstractions even though they are real to the individual who holds them.
- ❖ they may or may not be present in the sample a researcher is interested in.
- ❖ attitudes cut across many of human endeavours such as politics, war, peace, marriage, religion, education, child bearing, food habit.
- ❖ they are not entirely expressed or measured in a continuum or straight line, but this is done only to make attitude measurement easy.
- ❖ attitudes once held are difficult to change, though not impossible to change.

Attributes of Attitudes

i. Attitudes have intensity e.g. stronger feeling or lesser feeling.

ii. Some attitudes are more enduring than others. For instance, political and religious beliefs.

iii. Attitudes are related to one another 'across' the same level e.g. racial/ethnic prejudice against one minority group.

Guidelines for Writing Attitude Statements

- ❖ Do not use double barrel statements e.g. "A mother is one who loves her children but can sometimes show displeasure when they misbehave";
- ❖ Avoid double negatives e.g. "None but fools says there is no God"
- ❖ Attitude statement should be short, not windy so as not to confuse respondents.
- ❖ Do not use jargons or proverbs and well known sayings.
- ❖ Sometimes we may not want the purpose of our inquiry to be obvious. The way out is to avoid statements that are too direct, and write, indirect or oblique statements. Example – 'attitude to using the library'. A direct statement is "I hate going to the library". An oblique statement is a better statement "I wish the library did not have so many silly rules and regulations". Note that the second statement is more subtle than the first. Another example: "I don't always trust the doctors in

this hospital" better still write: "I wish my own doctor could look after me here."

- ❖ Balance the number of positive and negative items.
- ❖ Do not write too many items to cover mostly the extreme ends of strongly agree and strongly disagree.
- ❖ Randomly place the items in the list before using them.

Put some inoffensive items first. These could help to motivate an unwilling respondent to respond.

Instruction: Respond to these statements using these keys. **SA**=Strongly Agree; **A**= Agree; **D**=Disagree; **SD**=Strongly Disagree. There are no wrong or right answers.

Table 4: Attitude to Healthy Eating Habits

Statement	SA	A	D	SD
1. I love eating well cooked dishes.				
2. Whenever I see good food, I find my mouth watering.				
3. Eating anything that comes one's way could be harmful to health.				
4. I eat only when I am hungry.				
5. It is a good habit to always eat a balanced diet.				
6. Children should be taught good eating habit from a young age.				
7. Eating every uncooked food can sometimes be harmful.				
8. I eat to stay alive.				
9. Eating freshly cooked meals is enjoyable.				
10. I hardly ever have time to sit to eat a good meal.				
11. Eating outside of home is unappealing.				
12. I am mindful about where I eat.				

General Procedures for Developing Quantitative Research Instruments

The development of quantitative instruments requires the adoption of some basic procedures. These procedures are discussed below:

- Translate the indicators into observable and measurable entities. These indicators enhance the reliability, validity and objectivity of the instruments. These qualities also render the data so obtained with the instrument analysable.
- Determine the most appropriate format(s) for the instrument. Determine if the instrument will require scaling and the appropriate scaling to use. It should be noted that not all instruments are scaled. However, a given instrument might adopt a variety of formats.
- The instrument should not be too long or too sketchy. Too long an instrument may be too boring to respondents while too long instruments may not be completed within the available time. Too sketchy an instrument may contain only skeletal information. Following the rule of thumb of 1-3 pages may suffice.
- The stem of each item should be specific and unambiguous. Avoid double-barrel statements, as these will give rise to difficulty in the analysis of ensuing data. Data obtained from double-barrel statements may also be confounding.
- The proposed mode of data analysis should reveal the structure of the items. While preparing instruments, the proposed mode of data analysis should be borne in mind. If this is not taken into account, the ensuing data may not be analysable.
- Include plausible filters where applicable. This is necessary especially where responses require options. Since it is usually possible to include the universe of filters, provision is made for the respondents to indicate other possibilities.
- Keep language simple and easy to comprehend. Assumption should not be made about the respondents since you may not be physically present to guide them.
- Always leave space for additional comments, because item options, where these are applicable, might in fact not be exhaustive.
- The name and the signature of the respondents **may** be required.

Activity 2

1. List 8 principles to aid your construction of affective instruments.
2. State 8 principles to avoid.
3. Using appropriate procedure construct the following instruments (10 + 15 items only)

i. Checklist
ii. Rating scale
iii. Attitude scale
iv. Questionnaire

Unit 3: Data Collection Process

Various data collection techniques can be used by a researcher. Examples are:
Test administration
Using available information
Documents
Interviews
Administering written questionnaire
Focus group discussion
Mapping and scaling
Observation

1. Test administration

This will be discussed through interaction with participants.

2. Using available information

School-based assessment usually provides a large amount of data for research. Sources of such information are class registers, teacher time book, teacher movement book, subject or class diary, mark sheets etc. Locating these sources and retrieving the information is a good starting point in any data collection effort.

Available information can also be obtained from **key informants** who are information about the school being visited. These are community leaders, principal, teaching and non-teaching staff and students who have factual information or privileged information about the school or any issue under investigation. Other sources of available data are **newspapers** and **case histories** such as record of acts of indiscipline recorded about an individual(s) or within a school. One advantage of using existing data is that collection is inexpensive but access to some required records or reports can sometimes be difficult. Also, some data may not always be complete, precise and may be disorganised.

3. Documents

In any research work various documents the researcher will have to read, understand, scrutinised, assessed, critically and analyse past works of other researchers. These documents can be other researchers' works, practitioners, be library-based, computer-based, policy or historical focused. The documents could also be primary or secondary

4. Interviews

An interview is a data-collection technique that involves oral questioning of respondents, either individually or as a group. Responses to the questions posed during an

interview can be recorded by tape- recording them and later having them transcribed or taking notes (either during the interview itself or immediately after the interview) or by a combination of both. Interviews can be conducted with varying degrees of flexibility using structured or unstructured questions.

High degree of flexibility can be maintained when sensitive issues such as sexuality, examination malpractice, income, or social class **are being investigated in which case** an unstructured or loosely structured method of asking questions can be used for the interview.

Low degree of flexibility can be achieved with less flexible methods of interviewing when the researcher is relatively knowledgeable about the expected answers or when the number of respondents being interviewed is relatively large. The **questionnaire to be** used should be a fixed list of questions in a standard sequence, which have mainly fixed or pre-categorised answers. Interviews should be used in conjunction with other instruments for data collection.

5. Administering written questionnaires

A written questionnaire (also referred to as self-administered questionnaire) is a data collection tool in which written questions are presented that are to be answered by the respondents in written form. A written questionnaire can be administered in different ways (IDRC, 2010; Blaxter, Hughes & Tight, 1998), such as by:

- Sending questionnaires by mail with clear instructions on how to answer the questions and asking for mailed responses;
- Gathering all or part of the respondents in one place at one time, giving oral or written instructions, and letting the respondents fill out the questionnaires; or
- Hand-delivering of the questionnaires to respondents and collecting them later.
- The questions can be either open-ended (free response) or closed-ended (with pre-categorised answers).

6. Focus group discussions (FGD)

This is another way of collecting data or any vital information on the topic of the research. It is a qualitative approach to data collection and it is a rapid appraisal method. It is rapid because you can quickly get information from a lot of people at the same setting. The researcher can also easily corroborate and authenticate the information gathered. This method of data collection can be used to gather information on sensitive issues such as examination malpractices, bullying and sexual harassment within the school system and

even the attitude of students to the state of indiscipline within the school system; and other issues. An FGD allows a group of between 6 - 12 informants to freely discuss the issues at stake with the guidance of a facilitator and/or reporter. Some features of 'FGD' are:

- It must consist of homogenous group,
- It should consist of a minimum of 6 people and a maximum of 12 people,
- There must be an FGD guide,
- There must be a facilitator and a recorder,
- There should not be domination from any group of persons,
- Equal participation of members should be encouraged,
- Ideal FGD should not take more than 1 ½ hours, and
- The whole discussion must be recorded and transcribed.

7. Mapping and Scaling

Mapping is a valuable visual technique for displaying relationships between and among things, events, content and resources e.g. distance of a school to neighbouring villages it serves could be mapped by the participants.

Scaling is a technique that allows researchers through their respondents to categorise certain variables that they would not be able to rank themselves. For example, students may be asked to list forms of examination malpractices and categorise them in other of prevalence in their school.

8. Observing

Observation is a technique that involves the systematic observation, selection, and recording of human behaviour and characteristics of objects or phenomena. It could either be **participant or non-participant observation. This technique will be discussed in detail elsewhere in another module.**

Activity 3

Describe three data collection techniques.
Explain the use of these techniques.
Explain three different methods of administering the written questionnaire.

References/Bibliographic Resources

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