

A Book of Reading in
**INSTRUCTIONAL
PEDAGOGY**



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Chapter 3

Classification and Types of Tests

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Introduction

Selection of the right type of test for assessing students aids in the achievement of the objectives of lessons. The topics treated in this chapter include classes and types of test, test usage in the classroom, categorization of test, Bloom's taxonomy (domains), principles of testing, test validity, threats to test, practical approach in ensuring content validity of a test and construction of a table using Bloom's taxonomy.

Behavioural Objectives

At the end of the presentation, the participants should be able to:

1. Explain the meaning of test
2. Describe at least any five types of test with their appropriate classes
3. Explain the functions of test and the principles of testing
4. Describe at least five major considerations each in writing essay and objective tests.

Meaning of Test

'Test' in the context of education is defined in different ways by different scholars. Kolawole (2010) defined test as problems or questions by which a person's knowledge, abilities, aptitude or character are assessed. Anikweze (2005) defined test as any kind of device for measuring ability, achievement, interest and other traits of individuals. These definitions point to the fact that

test is a means of assessment not assessment itself. Thus, educational testing is a process by which educators make inferences about student's knowledge, skills or affective status using student's responses (Popham, 2000). The term test, therefore, cannot be used alone except with a qualifying variable like "achievement" test in a course or programme, "driving" test which tests for driving skills, and "aptitude" test which tests for students' prognostic abilities, just to mention a few.

Classification of Tests

Tests may be classified according to certain criteria namely: Usage, Interpretation, Format, Standard, Personality traits, Administration, Techniques and Domains.

Test Usage in the Classroom: This simply entails what purpose test series serve in the classroom instructions. This enables test developer to categorize test into different types within the scope of classroom instruction as follows:-

Formative tests: These are tests conducted to assess progressive achievement of students in classroom instruction. Examples include continuous assessment tests, assignments, projects, *et cetera*.

Summative tests: These are tests meant to assess students' overall achievement at the end of instruction. These tests include sessional, semester and certificate examinations - WAEC, NECO, NABTEB, Diploma and Degrees.

Diagnostic Tests: These are tests developed in order to assess behavioural problems of learners in the classroom. Examples include Adaptive Behaviour Scale that are usually used to check inabilities to adapt to the environment like poor talking, walking, sitting, holding pen, *et cetera*.

Placement Tests: These are tests designed to place a student in the appropriate position or programme. Examples include, aptitude tests like UTME, TOEFL, GRE, *et cetera*.

Interpretation: By interpretation, tests are classified into two as follow:

Criterion Referenced Test (CRT). This is a test that reveals students' performance as compared to certain standard or criterion. A student is considered to have passed or qualified only if he/she was able to reach or attain

the set standard. For example, in UTME, the cut-off point of 180 or 200 stands as a criterion for determining pass or fail, qualified or unqualified for admission into tertiary institutions. Other examples include the conventional grading of A, B, C, D, E, F, and class of degree like First Class, Second Class, *et cetera*.

Norm Referenced Test (NRT). This is a test that determines students' performance compared to a norm group. The norm group may be professional, classmates, age group, gender and school mates. Examples of NRT tests are classroom achievement tests, general/professional examinations in which students are ranked as first, second and third positions in class.

Format: Format of a test refers to the nature of its design and appearance. Based on the format used, tests are classified as follows:

Essay Test: This is a test that demands a testee to freely express his views in a written form. Examples are:

- (a) Discuss briefly, any four classification formats of tests and give two examples of each; and
- (b) Differentiate between item difficulty and item discrimination.

Short Answer Test: In this format, the testee is restricted in the length of the answer. Direction and space are given to students to supply the required answer(s).

Example are:

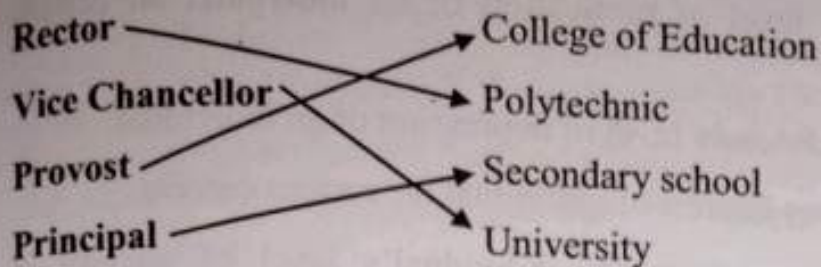
- (a)is a test that measures students' achievement in a class.
- (b) Two types of test validity are and

Objective Test: This is a test in which students are asked to select the right choice from given alternatives or options. The following are examples of objective tests:

True or false: In this type of test, a student responds "true" or "false" in answer to a question. Sometimes, "yes" or "no" is used. For example, Abuja is the capital of Nigeria (1) true (2) false.

Multiple Choice: In multiple choice tests, students are given a range of options (A-E) to select or choose from. Example, one of the followings is a type of test validity. (1) content (2) holistic (3) split-half (4) diagnostic (5) achievement.

Matching-type Test: This is a test in which a testee is given a set of items and required to match each item with the correct answer from a given list. For example, match the following leaders with their corresponding institutions.



Lines are usually drawn to indicate the right matching, and it is advised to add an additional option to distract testees from guessing the last answer.

Completion Type Test: In this format, a testee is asked to complete or fill in the gaps in a question. A word or phrase is usually needed to complete the sentence in a question. Alternatives are usually given. Example is: The current President of Nigeria is

- (1) Gen. Abdulsalam Abubakar
- (2) Gen. Ibrahim B. Babangida
- (3) Gen. Sani Abacha
- (4) Gen. Muhammadu Buhari.

Standard of Test: Standard signifies the quality of a test. By standard, a test may be said to be teacher-made or standardized.

- (1) *Teacher-Made Test:* This comprises all tests developed by teachers in schools which do not undergo any process of standardization, e.g. classroom tests and school examinations.
- (2) *Standardized Test:* This is a test developed by experts and refined through rigorous processes of standardization. Examples are WAEC, NECO, NABTEB, British Ability Scale, Cognitive Abilities Test, Graduate Record Examinations, Stanford Achievement Test, Multidimensional Aptitude Battery, *et cetera*,

Personality Traits Test: Tests are classified based on the personality traits they measure. Examples of personality trait tests include:

Interest scale - assesses level of interest of an individual on certain events or objects

Aggression scale - assesses level of one's anger in situations

Self-esteem scale - assesses individual's self-esteem on certain phenomena

Motivation scale - assesses level of motivation of an individual on certain phenomena

Beck Depression Inventory - assesses level of depression of an individual

Career Interest scale - assesses interest of individual on various careers

State Trait Anxiety Inventory - assesses individual's level of anxiety in situations

Test Administration: Tests are classified based on how they are given or administered on the testees or learners as follow:

1. **Individual Test:** This is a test given to an individual alone at a time. Examples are interviews, personality tests, *et cetera*.
2. **Group Test:** This is a test given to a group of testees at a time. This includes all tests and examinations written in a group like semester examination, mid-semester and continuous assessment tests.

Test Domains: Learning objectives are usually developed based on three domains namely: cognitive, psychomotor and affective domains. Generally, tests are developed to assess students' achievement in these domains. These include:

1. **Cognitive Domain Test:** This is any test that measures learner's achievement in remembering, understanding, applying, analysing, evaluating, and creating. Examples are achievement tests, aptitude tests and IQ tests, cognitive ability tests, *et cetera*.
2. **Psychomotor Domain Test:** This comprises of tests that measure individual's motor skills. e.g., manipulation, movement, writing, drawing skills. Examples are performance tests, tests of skills.
3. **Affective Domain Test:** This test measures behaviour or traits. Examples are interest, attitude, perception tests and other personality tests.

Technique: Tests are classified based on the techniques or methods used during the test administration as follow:

1. **Closed-Book Test:** Tests written without allowing the testees to use any material to supply the answers.
2. **Open-Book Test:** This is a test written with relevant materials like textbooks, note books, *et cetera*. to respond to test questions. In this test, students are allowed to check materials for answers.
3. **Take-Home Test:** This is a test given to be taken away, answered and submitted on a specified date e.g. homework, assignments, projects, *et cetera*.

Functions of Tests

Tests are developed or designed to suit certain purposes. Based on such purposes, the following are some functions of tests in academics:

1. **Placement function:** This enables teachers and administrators to place students into appropriate groups, classes or positions depending on their performances. For example, performance in Junior Secondary School Certificate Examination enables the placement of students into Science and Arts classes at senior secondary level.
2. **Diagnostic function:** This enables teachers to identify problems and difficulties of learners. For example, achievement test unveils students' deficiency. Maladaptive tests filter students with maladaptive behaviour such as deficiency in speech, movement, holding a pen, *et cetera*.
3. **Motivational function:** This usually helps in inspiring learners to improve their performance. Sometimes, students concentrate on study because of tests and examination. In the absence of testing, students may not be motivated to study effectively.
4. **Reporting function:** This provides report of performance of students to examiners and also provides feedback to learners, parents, stakeholders, administrators and teachers.

Principles of Testing

Testing of students' knowledge and abilities is a systematic process that has to follow some guiding principles. Hills (1981) as cited in Kolawole (2010) stated the principles as follow:

1. The testee must be aware of the test in order to prepare and get ready for it. Thus, it is not a good practice for teachers to give 'snap short' tests to

students as punishment for certain behaviours like lateness, absenteeism and so on.

2. The test instruments must be constructed in a skilful manner. This means that test items are not mere selection of items based on choice.
3. Evaluation of testee's responses must be with a well-defined marking scheme. Scoring a test should not be an arbitrary activity, regardless of test type. Marking scheme should always be available to guide the teacher during test scoring for objectivity.
4. The result of the response must be used for the predetermined objectives. In other words, if a test is meant to place or promote students in a class, it should not by any reason be changed to something different i.e. it should not deviate from its purpose; else it will affect the test validity entirely.

In any testing therefore, violation of these principles can erode test validity and make the whole exercise worthless.

Test Validity

Validity of a test is the ability of the test to measure what it is supposed to measure. Test must be valid in order to achieve the purpose for which it is constructed. It is therefore, a mandate upon any test developer or teacher to follow strictly, the procedures to enrich the validity of any given test.

Types of test validity

These are the types of test validity: face validity, content validity, predictive validity and construct validity.

Face validity:

Face validation judges at the face value the appropriateness of a measuring instrument. To achieve face validity, it is essential to make sure that the following are adhered to:

- (i) the items contained in the instrument must be appropriate to measure what it intends to measure,
- (ii) all words and items should be free from ambiguity.

Content Validity:

Content validity is the extent to which the items contained in an instrument represents the content and behaviours specified by the theoretical concept being measured (Nkpa, 1997). It can be estimated by comparing the sample of the items with the content and behaviours which it should represent, and if the sample of the items cover all aspects of the content and behaviours then a high degree of content validity have been achieved (Uzoagulu,1998).

Concurrent Validity:

Concurrent validity is obtained when two sets of instruments are involved. A correlation coefficient can be computed between a test score and the performance score on a criterion measure. The concurrent validation involves collection of data on the two measures, test and criterion at or about the same time (Wiersma, 1969 in Uzoagulu, 1998). The concurrent validity established is based on an existing situation. For instance, if a new instrument is developed, the instrument can be administered concurrently with the old instrument within a short period. The scores are correlated to establish that the new instrument can be used instead of the previous one. If a researcher is dealing with equivalent forms of instrument, this validity is very essential. It is not needed for survey studies that require only collection of data.

Predictive Validity:

Predictive validity is the ability of an instrument to predict some future event or events. If a student got eight distinctions in National Technical Certificate (NTC) examination and enrolled in tertiary institution such as polytechnic or university, it is expected that he will perform well in his diploma or degree results. If his performance is very good, then the NTC certificate result had a high degree of predictive validity. According to Osuala (1982), predictive validity is obtained by computing the correlation coefficient between a distribution of test scores obtained at an earlier time and a distribution of scores on some later criterion measure. He further stated that predictive validation involves:

- (a) data collection on the criterion measure after an intervening period.
- (b) data collection (e.g. test scores) from the test being validated.
- (c) the two scores which should be correlated to obtain a correlation coefficient.

Predictive validity is relevant when test results form the basis for selecting people to fill particular positions.

Construct Validity:

Construct validity refers to qualities that exist among individuals. It is the attributes that an individual possesses. This enables individuals to explain some aspects of behaviour in a person such as creativity, intelligence, attitude, anxiety, endurance, *et cetera*. Construct validity also means congruent validity.

In conducting construct validation, there is the assumption that the performance of a student in a test reflects his attitudes towards that subject or course. Therefore, the test score obtained from a student's Basic technology test reflects his attitude towards Basic technology. The establishment of construct validity is difficult when compared to other types of validity.

Threats to Test Validity: There are factors that threaten the validity of any test. These include:

- i. Unclear direction, i.e. no specification of what is expected of testee
- ii. Confusing and ambiguous test items i.e. using words with more than one meaning
- iii. Difficult test sentences - full of words that are highly grammatical which baffle testees
- iv. Inconsistent scoring methods - using different marking schemes for a single test
- v. Failure to follow procedures for test administration

All these affect both the test and the interpretation of the result, thereby eroding the validity of the test.

Practical Approach to Ensuring Content Validity of a Test: For a teacher or test developer to achieve content validity of a test, it is advised that early stage procedures in item construction be strictly followed. A test blue print is the first stage in item construction. Test blue print otherwise called table of specification is a table that displays how items are developed from topics distribution in line with learning objectives. It is a major way of establishing content validity of a test.

The following are the stages involved in constructing Table of Specification:

1. Identify the purpose of the test, that is to say, why the test? What should be tested? Is it students' aptitude, skill or achievement?

2. Outline the learning objectives, the topics treated and the periods taken per topic;
3. Decide the format of the test that will measure such objectives since evaluation depends on the objectives of learning;
4. Write the topics and the periods or weeks taken to teach those topics so as to get the total number of periods, weeks or days;
5. Get the loading of the topics by dividing the topic period by the total number of periods taken;
6. Decide the total number of questions needed and multiply by the loading of each topic to get the number of question(s) per topic;
7. Depending on the domain tested, for example cognitive domain, you can use Bloom's taxonomy which contains six levels of cognition consisting of knowledge, comprehension, application, analysis, synthesis and evaluation to develop your Table;
8. Write the topics across the six levels of objectives and distribute the number of items based on the previous calculation for each level until they tally with the total number of questions targeted.

Worked Examples

The purpose of the test is to measure the academic achievement of students in Biology in a mid-term test.

All the learning objectives are within the cognitive domain and seven topics were taught in 15 weeks.

The format of the test is multiple choice format to enable wide coverage of the topics.

The topics and the time spent in teaching them are as follows:-

Table 1. Scheme of Work

TOPIC		PERIOD
i. Autotrophs	-	1 week
ii. Heterotrophs	-	2 weeks
iii. Food chain & web	-	3 weeks
iv. Energy flow	-	2 weeks
v. Energy transformation	-	2 weeks
vi. Ecological pyramids	-	3 weeks
vii. Carbon cycle	-	2 weeks
Total number of weeks	=	15 weeks

5. You can now get the loading of each topic as follows:-

Table 2: Percentage of Questions per Topic

Autotrophs	=	$1/15 \times 100$	=	6.7%
Heterotrophs	=	$2/15 \times 100$	=	13.33%
Food chain & web	=	$3/15 \times 100$	=	20%
Energy flow	=	$2/15 \times 100$	=	13.33%
Energy transformation	=	$2/15 \times 100$	=	13.33%
Ecological pyramids	=	$3/15 \times 100$	=	20%
Carbon cycle	=	$2/15 \times 100$	=	13.33%

Total = 99.8 approx. 100 %.

You can now extract the predetermined number of questions e.g. 40, by multiplying the loadings by 40 as shown below:-

Table 3: Number of Questions per Topic

1.	Autotrophs	=	$6.7/100 \times 40$	=	2.7
2.	Heterotrophs	=	$13.33/100 \times 40$	=	5.3
3.	Food chain & web	=	$20/100 \times 40$	=	8
4.	Energy flow	=	$13.33/100 \times 40$	=	5.3
5.	Energy transformation	=	$13.33/100 \times 40$	=	5.3
6.	Ecological pyramids	=	$20/100 \times 40$	=	8
7.	Carbon cycle	=	$13.33/100 \times 40$	=	5.3

Total = 39.9 approx. 40.

You can approximate the decimal points to get whole numbers where necessary. In case of incomplete number of questions due to decimal points or fractions, one can arbitrarily add a question to any topic as to make them complete as designed.

Construction of Table of Specification Using Bloom's Taxonomy and the Stated Topics

Table 4: Table of Specification

CONTENTS	KNOWLEDGE	COMPREHENSION	APPLICATION	ANALYSIS	SYNTHESIS	EVALUATION	TOTAL
1. Autotrophs	1	-	1	-	-	1	3
2. Heterotrophs	2	1	-	1	1	1	6
3. Food chain & web	2	2	2	1	1	-	8
4. Energy flow	1	1	1	1	-	-	4
5. Energy transformation	1	1	-	2	1	1	6
6. Ecological pyramids	2	2	2	-	-	1	7
7. Carbon cycle	1	1	1	1	1	1	6
Total	10	8	7	6	4	5	40

Using a table of specification like the one above, one can proceed to item writing without stress.

Exercises

1. Explain the meaning of test,
2. Give any five classes of test with examples
3. Explain the principles of testing
4. Develop a table of specification using any subject or course as example following the stages involved.

References

- Anastasi & Urbina (1997). *Psychological testing*. Seventh edition. United States: Prentice Hall Inc.
- Anikweze, C. M. (2005). *Measurement and evaluation for teacher education*. Enugu: Sneap Press Ltd.
- Fredrick, L. C. (2006). *Statistics: A Gentle Introduction*. California: Sage publications.
- Gravelter, F & Wallhem, L. B. (2005). *Essentials of Statistics for the Behavioural Sciences*. United States: Thomson Learning Incorporated.
- Kolawole E. B. (2010). *Principles of test construction*. Revised edition. Lagos: Bolabay Publications.
- Nkpa, N. (1997). *Educational Research for Modern Scholars*. Enugu: Fourth Dimension Publishers
- Osuala, E. C. (1982). *Introduction to Research Methodology*. Onitsha: Africana-Feb Publishers Ltd
- Popham, W. J. (2000). *Modern Educational Measurement: Practical Guidelines for Educational Leaders*. United States: A Pearson Education Company.
- Uzoagulu, A. E. (1998). *Practical guide to Writing Research Project Reports in Tertiary Institutions*. Enugu: John Jacob's Classic Publishers.