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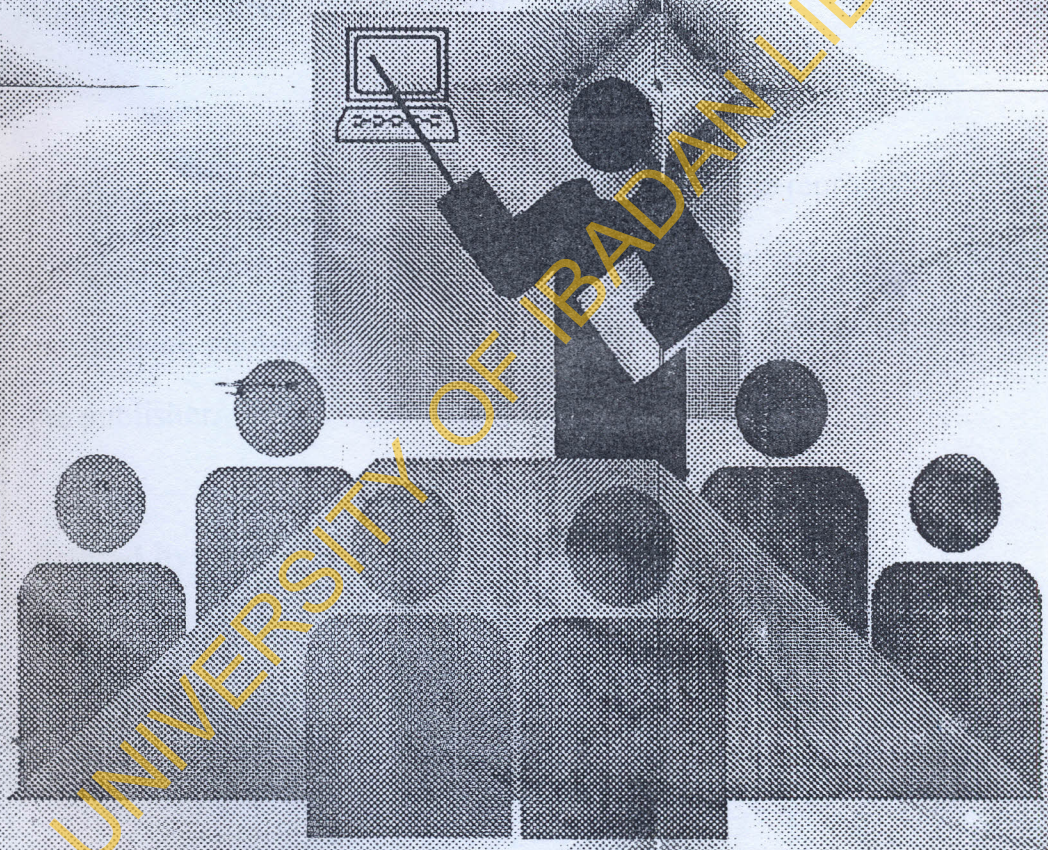

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APPLICATION OF A COMPUTER SOFTWARE TO EDUCATIONAL MEASUREMENT

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Abstract

The paper discussed the computer system features, user's application programmes and packages. Computer system application to educational measurement using Scorbatt programme with reference to case study on achievement test (multiple choice test items) was discussed.

Introduction

A computer is an electronic device which accepts data, processes the data and transfer the processed data to an output device using ***IPO*** device; where ***IPO*** devices mean Input, Process and Output devices.

The input device is made up of the keyboard and/or the mouse, the process device is made up of the central processing unit and the output device is made up of the monitor and a printer.

Computer is preferred because of the following attributes (although they are not exhaustive):

(a) Speed: Modern computers perform simple arithmetic operations and so on with high speed measured in number of cycles (oscillations) per second. The unit is in hertz. There are computers varying from **20MHz** to **450 CELERON** as at today.

(b) Accuracy: If the data are entered correctly and the programme of operation are written correctly, it can be postulated that the output will be about 100 percent accurate.

(c) Reliability: Computer will give the same result at different hours of the day or at any given time if the data are entered correctly and the

programme of operation are written correctly.

A computer is made up of the hardware and the software. Hardware is the name given to the physical component of a computer, for example; the keyboard, monitor, central processing unit, hard disk drive *(HDD)*, hard disk itself, mother board etc. Software is the programme written whose function is to instruct the hardware components and make them work.

The Software

There are two major types of software, these are: system software and applications software. System software is a set of programmes that are written by or for a user in other to accomplish a specific task. The applications software is the concern of this workshop therefore emphasis shall not be on the system software, but it is important to note that, without system software, computer system can perform very limited tasks. Under applications software there are user's applications programme and software package.

User's Application Programme

User's applications programmes are those written by the user in order that some specific jobs are performed by the computer for the user. Such programmes are written in a variety of programming languages.

Software Packages

Software package are generalized programmes for solving problems. As it is possible to have people with different problems and they are categorized according to their problems and solutions are proffered to each category of the people, so also many computer users have varying reasons why they want to use computer. Their reasons are categorized, for example: there are those who want to produce document like letter, store and manipulate data, publish books or journals, perform accounting tasks, solve some mathematical problems, play games, produce graphs and charts or perform statistical analysis. Each category of the people is satisfied with one or more software packages as seen below.

Task	Software Package
Produce documents like letter, contract estimate etc.	WordStar, WordPerfect, Microsoft (MS) word, MS work etc
Store and manipulate data	Spreadsheets
Publish newspapers, journals books etc.	Desk Top Publishing (DTP)
Perform accounting task	Accounting Packages
Solving mathematical problems	Mathematical Packages.
Play games	Solitaire etc.
Produce graph	Harvard Graphics, Draw Perfect, Core Draw etc.
Perform Statistical Analysis	SPSS, SAS, MSTART, SCORBATT etc.

The main thrust of the discussion on software package in this paper is the **SCORBATT** Software Package.

Scorbatt programme

Scorbatt is used to mean battery of test scores where battery in this wise is used to mean collection of test items of the programme

There are three files in this software. These are:

1. Scorr. exe
2. Kad.exe
3. Filter.exe

Scorr.exe file was designed to prepared the raw data (subjects' responses) in such a way that, it will be possible to perform some statistical

analysis on the data. Kad.exe file allows the statistical analysis to be done with the aid of some required information like the data processed by the scorr.exe file, test key, test scheme, number of classification, number of alternatives for each test item, number of the sub tests, and so on.

Test

Tests are valuable measuring instruments for educational research. A test is a set of stimuli presented to an individual in order to elicit responses on the basis of which a numerical score can be assigned. This score, based on a representative sample of individual's behaviour, is an indicator of the extent to which he possesses the characteristics being measured (Ary, et al, 1974)

One of the essential requirements of a test is objectivity, showing a maximum level of agreement among scores. Once the scoring key is prepared for an objective test, the scoring can be accomplished by an untrained person or by a machine. The following are some of the types of test.

- achievement test
- intelligence test
- aptitude test

Intelligence test differ from the achievement test in that the latter attempts to measure specific skills, whereas, the former attempts to measure some general skills. Intelligence tests attempt to assess subjects' ability to perceive relationships, solve problems and apply knowledge in a variety of contexts.

Farrant (1980) described the three types of tests as follows:

1. Achievement test as the test where each test seeks to measure the child's ability in a specific skill and relate to tables of norms for children of different age.
2. Intelligence test as the test in which assessment is made from the various mental skills considered relevant to intelligence, in order to find the intelligence quotient **(I.Q)** of the child
3. Aptitude test is one in which the specific abilities considered important for a particular role or task are carefully measured, so as to build up a profile of the individual in terms of these abilities.

Uses of the Tests

Intelligence and aptitude tests have been found to be widely used when selection is being made, especially into institutions of higher learning in some countries. General intelligence tests are sometimes given on individual basis to verify previous test results or when no previous scores are available. Aptitude tests are designed to predict how well a student will do in future. Scholastic aptitude tests are, thus, not concerned primarily with current levels of knowledge, the attempt to measure how well the student can use common knowledge and skills in new and different ways is the basis for predicting future scholastics performance. However, Downie (1968) summarised the following as the uses of tests:

1. to provide information for effective educational and vocational counselling.
2. to provide information for grading students, promoting students, and for making meaningful reports to parents
3. to discover problems associated with learning
4. to evaluate the student's capacity to learn
5. to appraise the effectiveness of teaching method
6. to select students for various curricula or for admission to Colleges or Universities or to some other educational, vocational, industry or military programmes.
7. it can also be used in administration, so as to determine who is to be promoted or selected for special duties

Educational Measurement

Okunrotifa (1977) defined educational measurement as the assignment of a number of express in quantitative terms, the extent to which a pupil or an object possesses a given characteristic. He explained further that educational measurement provides data which may be useful. Falayajo (1988) defined educational measurement as an undimensional operation - simple assignment of numbers to some attribute of objects according to some rules - it does not matter what one is measuring. Okpala and Onocha (1994) explained that educational measurement as a process of assigning numerical values to quantities. In a school setting, educational measurement is generally used in quantitative description of students' be-

haviours and it does not imply value judgement concerning the worth of the behaviour measured. Teachers and school authorities are usually faced with such questions as: What is the performance of students in a standardized physics achievement test? Providing answer to a question of this magnitude would lead to a measure of the students' individual scores, means score, highest and lowest scores, range and standard deviation scores.

Application of Scorbatt Programme to Educational Measurement

Scorbatt is a term to mean battery of test scores and battery is used to mean the collection of test items. This programme can be used to determine text characteristics, item characteristics and individual subject's score. The first two functions of this software (test and item characteristics) has to do with testing while the last one (scores) has to do with educational measurement i.e. assigning a numerical value to an entity.

In order to carry this task out, we need the three users' application files, these are: the data file, the key file, and the scheme file. Data file should contain at least two sets of information (there is another set of information which is optional): the subject background information, the criterion variable and the subjects' responses to the test either achievement, intelligence or aptitude test. The subjects' background information contain the following: the state (if within a country), the local government areas, school code, school location, school type, subject identification number, sex, age socio-economy status of the subjects, etc. The criterion variable is used in case we are interested in establishing the validity (concurrent) of our test items. Thisvariable is obtained from the subjects' passed records. The last set of information on the data files is the subjects' responses to each of the test items. Subjects respond to the test items by picking any of the 4 or 5 options provided usually A, B, C, D as in JAMB and A,B,C,D,E as in WAEC. These letters are recorded so that A=1, B=2, C=3, D=4, and E=5.

The second file which is the key contains the correct answers (keys) prepared by the test developer.

The last file is the scheme file, it contains information about the classification of each of the test items. For example, in Mathematics Achievement Test ***(MAT)*** may have 3 classification schemes using Bloom's Taxlomy of Educational Objectives (knowledge, Comprehension,Application, Analysis, Synthesis and

Evaluation) as one classification level, branch of Mathematics like Algebra, Geometry Statistics, etc as the second classification level and lastly, worded and mechanical as the third classification level. This means that, each item can be classified into three.

Procedure

The first step is to prepare the data such that it will be easier for the programme to work on it. Scorr-exe does the data preparation in an acceptable manner for the programme to perform. The following are some of the commands given.

C/\>cd scbt (enter)
C:\SCBT>scorr (enter)
Enter input data filename: ... (enter)
Enter input data format: ..... (enter)
Enter output data filename:.....(enter)
Number of test item: .....(enter)
Do you wish to specify a criterion value (Y/N)?: .... (enter)
C\:SCBT>kad .....(enter)
Number of test item:? .....(enter)
Enter input data filename:? ...(enter)
Enter output data filename:?...(enter)
Enter test key filename:?.....(enter)
Enter scheme filename:? .....(enter)
Number of classification scheme (< = 6 or 6?: .....(enter)
Number of alternative for each question:? .....(enter)
Number of subtest:?.....(enter)
Is this a group (G) or subgroup (S) test:?..... (enter)
Do you wish to specify a criterion value (Y/N):? ...(enter)
Do you wish to weight item responses (Y/N):? ..... (enter)
Do you wish to print individual scores (Y/N):? ..... (enter)
Do you wish to produce standard t-scores (Y/N):? ..... (enter)
Do you wish to save score file (Y/N):? ..... .(enter)
Enter scores filename:? ..... (enter)
Enter test names:? ..... (enter)

Enter number in data set:? ..... (enter)
Enter data set title:? ..... (enter)
At the end of the commands, the data will be processed, and the results can be shown on two separate files. For example, the outfile and scorefile. The outfile shows the test and item characteristics while the scorefiles shows the scores of individual subjects according to the subtests.

Note if you did not specify that the score file should be saved, it will not do so, the same thing applies to the test and item characteristics.

Case Study

Normally, we ought to discuss the three types of test mentioned earlier (i.e. achievement test, intelligence test and aptitude test) but we shall only discuss one of the tests as only one test was developed by investigator and most intelligence and attitude test have copy rights. The test to be discussed is the achievement test.***Achievement Test***

Physics achievement test developed and administered by the investigator on a sample of 1029 ***SSI*** students in a randomly sampled six Local Government Areas ***(LGA)*** of Oyo State in 1996 shall be used as case study. The test was constructed by Farombi (1990). There were 200 items, but they were reduced to fifty items in 1996 using the analysis carried out in 1990. Test and item characteristics were used as the initial method of reducing the test items. Fifty items with almost equal distractive indices, high and positive discriminating values and difficulty indices between 0.40 and 0.60 were therefore selected. With the help of one higher degree student in Evaluation and an experienced secondary school physics teacher, the test was pretested on 206 SS1 physics students. Item and test characteristics were carried out on the responses of these 206 students. At the end of this, 39 items satisfied the condition adopted in the initial method. The 39 items were given to three experts: two university lecturers and one secondary school Physics teacher to examine the content of the items (content validity). At the end, 30 test items emerged. Moreover, a Kunder Richardson formula 20 was used to establish an internal consistancy 0.78 for the test.

Interpretation

Two important operations were performed here. These are item

characteristics and test characteristics. In item characteristics, the following were determined:

- item difficult or facility indices
- item discrimination indices
- item distractive indices
- average test difficulty

In test characteristics the following were determined:

- test validity
- test reliability
- mean
- standard deviation and
- standard error of the mean

Conclusion

This programme is robust and useful in determining test and item characteristics. In a large sample size where the subjects' responses to any test (multiple choice test), the tendency that one will be tired when marking it is high, moreover, if one works, with a machine like computer it is likely that one will be fascinated, and boredom will be reduced, therefore, the use of a computer software (scorbatt) for marking objectives tests is faster, reliable and accurate.

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