DEVELOPMENT AND STANDARDIZATION OF THE READINESS TEST FOR UPPER BASIC EDUCATION BASIC SCIENCE AND TECHNOLOGY

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Abstract

The purpose of this study was to develop and standardize a Basic Science and Technology Readiness Test (BSTRET) for Upper Basic Education Basic Science and Technology Curriculum. The population comprised of all the Junior Secondary Secondary one (JSS I) students in Enugu State, Nigeria. Purposive sampling technique was used to select two hundred and twenty five (225) JSS One students totaling 3825 students from the seventeen (17) Local Government Areas in the state. Three research questions guided the study. The instrument for data collection was researchers constructed 50 multiple choice items. Kuder-Richardson formula 20 (K-R 20), Mean and Standard Deviation were used the answer the research questions. 75 norms were also provided for 15 distinct groups for both inter-group and inter-individual comparison of examinees' performance. The BSTRET was recommended for use in both research and counseling.

Key Words: Basic Science and Technology, Development, Standardization, Readiness Test, Upper Basic Education

Introduction

The Federal Government of Nigeria instituted the Universal Basic Education (UBE) to cater through appropriate forms of complementary approaches to the promotion of basic education. The basic education provided by Nigerian government is compulsory, free, universal and qualitative. It comprises of 1-year of pre-primary education, 6 years of primary education and 3 years of junior secondary education. Basic education is the education given to children aged 0-15 years. It comprises the Early Child Care and Development Education (0-4) and 10 years of formal schooling. Basic education helps in the reduction of drop-out from formal school system through improved relevance, quality and efficiency. Moreover, basic education ensure the acquisition of appropriate levels of literacy, numeracy, communicative and life skills, as well as the ethical, moral, security and civic values needed for the laying of a solid foundation for life-long learning (Federal Republic of Nigeria - National Policy on Education, 2013).

The major aim of basic education is to ensure that the students having successfully completed the 6 years of Primary Education and 3 Years of Junior Secondary Education should acquired basic numeracy,

literacy and life-long skills; acquired the basic skills in science, technology and IT; acquired the basic rudiments for creative thinking; developed the foundation for technical, vocational and entrepreneurship culture and imbibed high moral values and positive ethical standards. For effective implementation of the Universal Basic education programme (UBE) in Nigeria. the federal government came up with the 9-Year Basic Education Curriculum (BEC) developed by the Nigerian educational Research and Development Council (NERDC) in 2006, as directed by the National Council on Education (NCE). The revised 9-Year Basic Education Basic Science and Technology consists of four different subjects in the old curriculum now called themes. These subjects have now been combined to form one subject. These themes which constitute the revised Basic Science and Technology Curriculum are: Basic Science, Basic Technology, Physical and Health Education and Information Technology.

Basic Science and Technology is a subject that is very important in everyday life of students. The importance of Basic Science and Technology in everyday life can never be over emphasized as it serves as the bedrock of all the science subjects at the senior secondary school level. It prepares students in the upper basic education level for the study of core science subjects at the senior secondary school (Ani, 2016). this implies that for a student to be able to study any sing science subject at the senior secondary school level successfully, such a student has to be well grounded in Basic Science and Technology at the upper basic education level. It is the fundamental knowledge acquired through the study of Basic Science and Technology at the upper basic education level that leads to the transformation of the world through advances in different fields like Electronics and Aeronautics, Medicine, Engineering, Nursing, Geology, Computer Science, etc.

Despite the importance of Basic Science and Technology, research has shown that there are poor performances of students in Basic Science and Technology in both internal and external examination. Oral reports from the Chief Examiner of Basic Education Certificate Examination (2017) in Enugu State revealed that students poor performance in Basic Science and Technology is inadequate due to poor knowledge of subject, shortage of Basic Science and Technology teachers, unavailability of teaching materials, non standardization of test instruments etc. Omebe and Omiko (2015) contended that the result of Basic Science and Technology has not been encouraging due to poor teaching methods. Moreover, Nnamani and Oyibe (2016) opined that the boys and girls have equal performances in all the subjects at the early stage, but boys become more interested in science related courses while girls become interested in art subjects. Also, Ani (2016) found that the male students achieved more significantly better than their female counterpart in theoretical and practical Basic Science and Technology. According to Ezenwafor (2016), the influence of gender differences in students' performance is a complex task, studies appear to be contradictory. Thus, some studies found that there are no significant differences in male and female science performance at any level while most identified gender differences (Joseph, John, Eric, Yusuf & Olubunmi, 2015).

Students' poor performance in Basic Science and Technology will result in non realization of one of the goals of Basic Education which is the acquisition of appropriate levels of literacy, numeracy, communicative and life skills, as well as the ethical, moral, security and civic values needed for the laying of a solid foundation for life-long learning. If this goal of Basic Education is not achieved, manipulative skills needed for manpower, scientific and technological development of the nation will be lacking, hence the need for the study. It becomes very crucial to investigate the quality of teaching and how ready the students were for the subject. Hence, the need to look at the prerequisite skills students had in Basic Science and Technology at their entry point into the subject. The extent of possession of prerequisite skills for an activity indicates the degree of readiness for such activity. Determination of such readiness is very crucial as well as a valid evaluation of students performance in Basic Science and Technology in upper basic education level. Studies in Basic Science and Technology should require a Basic Science and Technology Readiness Test (BSTRET) to ascertain the degree of readiness of the subjects for this Basic Science and Technology. Therefore, the need to develop a reliable and valid test of readiness for the Upper Basic Education level of education in Nigeria and establishment of norms for

such test to enhance comparison of performance among examinees. Hence, the researchers deemed it necessary to develop and standardize Basic Science and Technology Readiness Test (BSTRET) in order to produce reliable data on readiness for Basic Science and Technology at the Upper Basic Education level in Nigeria.

The purpose of the study is to develop and standardized a readiness test for Upper Basic Education Basic Science and Technology Readiness Test (BSTRET). Specifically, to ascertain the degree of readiness for and prospects in the approved Basic Science and Technology Curriculum for Upper Basic Education level in Nigeria.

Research Questions

The following research questions were formulated to guide the study.
1. What is the content validity of the Basic Science and Technology Readiness Test (BSTRET)?
2. What is the reliability of the Basic Science and Technology Readiness Test (BSTRET)?
3. What is the difference between male and female students' performance in Basic Science and Technology Readiness Test (BSTRET)?

Methodology

Participants

The study adopted instrumentation research design since the study geared towards developing an instrument for determination of the psychometric properties of the Basic Science and Technology Readiness Test (BSTRET) in Upper Basic Education. The population of the study comprised of the entire junior secondary one (JS I) students in public secondary schools in Enugu State, Nigeria. Purposive sampling technique was used to sample two hundred and twenty five (225) JSS One students totalling 3825 students from the seventeen (17) Local Government Areas in the state. The instrument for data collection was researchers constructed 50 multiple choice items titled Basic Science and Technology Readiness Test (BSTRET). Kuder-Richardson formula 20 (K-R 20), Mean and Standard Deviation were used the answer the research questions. 75 norms were also provided for 15 distinct groups for both inter-group and inter-individual comparison of examinees' performance. The BSTRET was recommended for use in both research and counseling.26 students each from the 56 public schools in the zone totalling one thousand six hundred and twenty four (1624) JS II students.

Materials

A 50-item four option multiple choice in titled Basic Science and Technology Readiness Test (BSTRET) made up of learning about our environment, understanding basic technology, basic human movement and basic computer operations and concepts was used for data collection. The BSTRET was developed following the guideline outlined by Nworgu (2015) which include: identification of objectives to be tested, creating test description, developing a test blue print or table of specification, construction and review of initial items, trial testing, determination of all the statistical properties of the items, conducting validity and reliability of final version of the test and administration of the test following the guideline. The BSTRET items were constructed based on the test blue print developed using the Basic Science and Technology Curriculum with different themes as infused inside the revised 9-Year Basic Education Curriculum for Basic Science and Technology Curriculum (NERDC, 2013). Kendall Coefficient of Concordance was used to establish the content validity of the instrument by two experts in Basic Science and Technology and one expert in Measurement and Evaluation from Enugu State University of Science and Technology Enugu. The estimate of reliability of the BSTRT was determined through Kuder-Richardson formula 20 (K-R 20). The K-R 20 helped to establish the reliability/internal consistency of the BSTRT. The final version of the test was administered to the sampled students with the help of research assistants and scored right (1) or wrong (0).

Results

Research Question 1: What is the content validity of the Basic Science and Technology Readiness Test (BSTRET)?

Table 1: Computation of Basic Science and Technology Readiness Test (BSTRET).Print or Table of Specification for Content Validity

Contents/Topics	Cognitive Objectives						
	Knowledge (20%)	Comprehension (30%)	Application (10%)	Analysis (20%)	Synthesis (10%)	Evaluation (10%)	Total (100%)
Learning about our Environment (20%)	2	3	2	1	1	1	10
Understanding Basic Technology, (10%)	1	2	1	1	0	0	5
Basic Human Movement (40%)	4	6	4	2	2	2	20
Basic Computer Operations and Concepts (30%)	3	4	3	1	2	2	15
Total (100%)	10	15	10	5	5	5	50

Table 1 shows a very good distribution of the Basic Science and Technology Readiness Test (BSTRET) items which indicated a high degree of agreement among the four judges on the percentage of weight assigned to the objectives in the cognitive domain and content areas of the junior secondary school basic Science and Technology Curriculum respectively. The degree of agreement was high and significant with the use of Kendall Coefficient of Concordance. An index of 0. 85 for cognitive objectives and 0.75 for content areas were obtained. The result shows that all the objectives and the content areas were all covered. Therefore, the agreement among the four judges and the distribution of items to the cognitive objectives and content areas are enough evidence that the Basic Science and Technology Readiness Test (BSTRET) have a high content validity.

Research Question 2: What is the reliability of the Basic Science and Technology Readiness Test (BSTRET)?

Table 2: Basic Science and Technology Readiness Test (BSTRET) estimate of Reliability Using Kuder-Richardson Formula 20 (K-R 20)

No of Students	No of Items	$\sum pq$	$\dot{X}$	SD	SD^2	Rf	SEM
3825	50	25.14	63.6	22.4	501.8	0.97	5.6

Data in Table 2 revealed the internal consistency of the Basic Science and Technology Readiness Test (BSTRET) using Kuder-Richardson formula 20 (K-R 20). The BSTRET is a single multiple choice objective test with expected response of either pass (1) or fail (0). A reliability estimate of 0.97 was obtained which helped to establish the internal consistency of the BSTRET. Thus, the result shows that the BSTRET has a high reliability and very good to be used in the study. A standard error of measurement (SEM) of 5.6 was obtained which is low and indicated that the BSTRET is highly reliable.

Research Question 3: What is the difference between male and female performance Basic Science and Technology Readiness Test (BSTRET)?

Table 3: Mean and Standard Deviation of Students Performance in BSTRET by Gender

Gender	No	Mean	Standard Deviation
Male	2142	16.98	7.54
Female	1683	15.53	6.19
Total	3825		

 Table 3   shows that the mean performance score of male students in the Basic Science and Technology Readiness Test (BSTRET) is 16.98 with a standard deviation of 7.54 while that of female students is

15.53 with a standard deviation of 6.19. thus, indicating that the mean performance male is higher than that of the female students in Basic Science and Technology Readiness Test (BSTRET).

Discussion of Findings

Result in research question 1 showed that the distribution of Basic Science and Technology Readiness Test (BSTRET) items to the cognitive objective and content areas has a high content validity. This finding is in line with Nworgu (2015) that contented that the extent to which an instrument is able to adequately cover a specified content domain must be well defined using the curriculum or syllabus. The result is also in agreement with the findings of Osadebe (2015) who found that content validity should be expressed on clearly defined scale. The internal consistency estimate of Basic Science and Technology Readiness Test (BSTRET) (0.97) as shown in Table 2 has a high reliability which is provided by a low value of the standard error of measurement (SEM) which is in line with Thorndike (1971) that opined that a measure is reliable if there is low standard error of measurement. Results in research question 3 that the mean performance score of female students appear higher than their male counterparts. The finding is in line with Ani (2016) who found that the male students achieved more significantly better than their female counterpart in theoretical and practical Basic Science and Technology.

Conclusion

The study achieved its purpose of developing and standardization of Basic Science and Technology Readiness Test (BSTRET) for both the teachers, counselors and test users. The test should be used to diagnose Basic Science students' areas of difficulties in different themes in Basic Science and Technology Curriculum since it has a high validity and reliability that meet the standards set by experts in the field of Measurement and Evaluation. Gender was not a significant factor in student achievement in Basic Science and Technology Readiness Test (BSTRET.

Recommendations

The following recommendations were made based on the findings of study:
1. Basic Science and Technology teachers should always identify students' readiness in different themes in Basic Science and Technology using BSTRET
2. BSTRET should serve as reference point for both teachers and testees.
3. Students should avail themselves the opportunity offered by the developed Basic Science and Technology Readiness Test (BSTRET) to assess their ability and skills in the themes covered Basic Science and Technology curriculum.

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