

**ATTITUDE OF LEVEL 100 STUDENTS OF BAUCHI STATE UNIVERSITY GADAU
TOWARDS UTME COMPUTER-BASED TESTING (CBT)**

BY

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CHAPTER ONE

INTRODUCTION

1.1 Background to the study

The development of modern technology in the world today, had impacted on all human endeavour i.e. social, economic, educational, environmental and sundry. In education arena it had brought the new device in the aspect of teaching and learning, testing skills and assessment. And such technological innovation are being adopted due to their enormous benefits in terms of accuracy, economy, precision and being good alternative to human effort.

For decades in Nigerian educational system, the Joint Admission and Matriculation Board (JAMB) had been using paper and pencil test (PPT) technique for admitting students who had completed their secondary school education into higher institutions of learning such as Universities, Colleges and Poly techniques. The criteria had been applied for decades. However, with the recent global technological innovation in terms of computer education and Information and Communication Technology (ICT), what brought the emergence of the Computer-Based Testing (CBT). Where the olden procedure of paper-and-pencil criteria is being replaced with the sophisticated device that entails the application of the computer designed test taking, administration, scoring and interpretation.

But, this trend as newly introduced into Nigerian system in (2013) requires an educational research work in all its ramifications such that all the stake holders concern would coordinate effort towards effective adoption of the system as well as addressing the rising problems and challenges posed by its application. College and University students do experience anxiety when using computer for the first time, particularly if they are asked to demonstrate their computer skills through an electronic only testing activity (CBT).

Since the inception of Computer-Based Testing in the country, the Bauchi State University Gadau. Had been admitting its level 100 students based on their CBT performance/scores. This had prompted the researcher to undertake an educational survey with regards to the students' attitude towards the CBT. Some literature revealed that students who had sat for the CBT had experienced difference psycho-social behavioural characteristics such as; anxiety, fear, attitude change etc.

Moreover, many researcher have proposed that positive attitudes towards computers, high computer, and self-efficacy and lower computer anxiety levels could be important factors in helping students learn computer skills and use computers, (Busch, 1995 in Sam, Othman and Nordin, 2005). They further claimed that student's attitudes towards computers were critical issues in computer courses and computer based curricular. And that should be a continuous process if the computer is to be used as teaching and learning tool and being employed as means of applying standardized task like the CBT.

1.2 Statement of the Problem

The application of computer-based test (CBT) had been adopted across the globe, as technological device for testing students for school admission, placement or other aptitude skills assessment and had brought the end of the perennial paper-and-pencil mode. In Nigeria, the system was adopted in 2013. Since then, the final year students of secondary school had been taking the test before they were admitted into the tertiary level.

Even though, the curriculum of Nigerian education had contained computer education, Information and Communication Technology of which the teaching and learning of the computer skills and its application are there in. However, since the inception of the computer-based testing (CBT) in the country and stopping of the traditional paper-and-pencil mode. The test takers

(students) had been featuring some characteristics including; low performance, anxiety, perception and attitude change. These characteristics and others are among the developmental features that stake holders are observing and considering which are in one way or the other affecting the test takers performance and reducing interest in adopting the new system. Scores of the researchers have identified many problems being encountered by the students who had undergone the (CBT), even though, difference results of findings was obtained.

Moreover, there are other technical issues in CBT that affect students' response and performance and influence their attitude towards it. These include; use of the mouse, font size, screen clarity, screen size, screen resolution, display rate and scrolling, time span and duration of the test, power stabilizing and other technical logistics which are inherent with the CBT. In line with that, the researcher intends to measure the attitude of level 100 students of the Bauchi State University Gadau, who were admitted via JAMB/UTME Computer-Based Testing Examination in 2016/2017 academic session.

1.3 Objectives of the Study

The study was guided by the following objectives

- i. The attitude towards JAMB computer-based testing of level 100 of science and arts students of Bauchi State University Gadau
- ii. The attitude towards JAMB computer-based testing of males and females of science students of level 100 of Bauchi State University Gadau
- iii. The attitude towards JAMB computer-based testing of males and females of arts students of level 100 of Bauchi State University Gadau
- iv. The performances in JAMB computer-based testing between arts and sciences students of level 100 of Bauchi State University Gadau

1.4 Null Hypotheses

The following hypotheses were tested at .05 level of significance:

HO₁: There is no significant difference between science and arts students of level 100 of Bauchi State University Gadau in attitude towards JAMB CBT

HO₂: There is no significant difference between males and females within science students of level 100 of Bauchi State University Gadau in attitude towards JAMB CBT

HO₃: There is no significant difference between males and females within arts students of level 100 of Bauchi State University Gadau in attitude towards JAMB CBT

HO₄: There is no significant difference of performance in JAMB computer-based testing between arts and sciences students of level 100 of Bauchi State University Gadau.

1.5 Significance of the Study

Among the major important benefits of this research work; it will offer test developers the opportunity to improve their productivity and lead to innovation in their fields. The research work will create more awareness and interest in conducting tests using CBT for its standardization and easiness nature this in particular will help much Examination bodies, Teachers and other stakeholders like WAEC, NECO, JAMB, Ministries of Education, and Educational Institutions and so on.

Computer – based test (CBT) delivery is gaining popularity due to several potential advantages that it offers, such as immediate scoring and reporting of results, more flexible test scheduling, the opportunity to include innovative item formats that are made possible by the use of technology, and reduce cost of test production, administration and scoring. Therefore, this will also benefit parents and students for decision taking for continuation of studies or seeking for a job.

Therefore knowledge is inevitable; this research will expound knowledge that is applicable outside of the research setting with implication that go beyond the group that has participated in the research.

Similar research may be carrying out with the intention to justify the authenticity of this research work. It may also be expand and improve the research. This research will create general awareness, increase more knowledge, and will encourage government agencies in introducing computer-based test (CBT) in both Primary and Secondary Schools this include Ministry of Education (MOE), State Universal Basic Education Bauchi (SUBEB) and School administrators.

1.6 Scope and Delimitations

The study covered all the students that seek admission into Bauchi State University Gadau via UTME computer-based testing for 2016/2017 academic session. The study was limited to only students that were given admission into the faculties of science and art of the university. Therefore, it was delimited to Faculties of Education and Social Sciences and other levels (i.e. levels 2, 3, and 4) in the faculties of science and art.

The study is also delimited to other tertiary institutions in Bauchi State.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter is structured under the following sub-headings; conceptual framework where some concepts related to the research topic were discussed, such as test, types of test, computer-based testing (CBT), advantages and disadvantages of CBT, test administration, review of empirical studies and summary and uniqueness of the study.

2.2 Conceptual Framework

2.2.1 Test

L. J. Cronbank, in his book *Essential of Psychological Testing* (1970) defines a test as a systematic procedure for observing and describing one or more characteristics of a person with the aid of either a numerical scale or a category system.”

A dictionary of education (1981) gives the following definition: “A test is a compact task or series of tasks designed to ascertain the merit or quantity of something. Educational tests constitute a series of items for which a score is obtained. Depending on how they are constructed, they can serve a purpose”.

The International Dictionary of Education (1981) explains test as any method by which the presence of quality or genuineness of anything is determined or is an examination to evaluate the performance and capabilities of a student or class (e.g. knowledge of a subject), or a procedure for eliciting responses upon which appraisal of the individual can be based (e.g. intelligence). And Process of detecting the presence of an ingredient in a compound, or of determining the nature of a substance.

A test may be defined as a device or procedure confronting a subject with a standard set of questions or tasks to which the student is to respond independently and the results of which can be treated in such a way as to provide a quantitative comparison of performance of different students.

The nature or type of a test is determined by the particular purpose of measurement. Various authors have given different classifications of tests. A number of categories in these classifications may appear to overlap. These classifications give a broad idea of the extensive field of testing.

On the basis of types of questions i.e. Essay or free answer type, Short answer type, Objective or New type. On the basis of administration i.e. Individual vs Group Tests, Oral vs written Tests, Speed vs Power Tests. On the basis of standardization i.e. Non-standardised Tests, Teacher-made Informal objectives Tests, Standardized Tests. On the basis of scoring i.e. Amenable to qualitative scoring, Amenable to stencil or punch-board scoring, Amenable to machine scoring, On the basis of traits

Testing in school is usually done for purposes of assessment, to assign students grades (from tests in classrooms) or rank them in terms of abilities (in standardized tests). Yet tests can serve other purposes in educational settings that greatly improve performance. Yet tests are powerful educational tools that serve at least four functions. Tests help teachers evaluate students and assess whether they are learning what they are expecting them to learn. Well-designed tests serve to motivate and help students structure their academic efforts. Crooks (1988), McKeachie (1986), and Wergin (1988) report that students study in ways that reflect how they think they will be tested. Tests can help a teachers understand how successfully they are presenting the

material. Finally, tests can reinforce learning by providing students with indicators of what topics or skills they have not yet mastered and should concentrate on. Despite these benefits, testing is also emotionally charged and anxiety producing. Test comes in various types.

2.2.1.1 Type of Tests

According to Barbara (2009) type of tests are as follows; Multiple-choice tests. Multiple-choice items can be used to measure both simple knowledge and complex concepts. Since multiple-choice questions can be answered quickly, you can assess students' mastery of many topics on an hour exam. In addition, the items can be easily and reliably scored. Good multiple-choice questions are difficult to write.

True-false tests. Because random guessing will produce the correct answer half the time, true-false tests are less reliable than other types of exams. However, these items are appropriate for occasional use. Some faculty who use true-false questions add an "explain" column in which students write one or two sentences justifying their response.

Matching tests. The matching format is an effective way to test students' recognition of the relationships between words and definitions, events and dates, categories and examples, and so on.

Essay tests. Essay tests enable you to judge students' abilities to organize, integrate, interpret material, and express themselves in their own words. Research indicates that students study more efficiently for essay-type examinations than for selection (multiple-choice) tests: students preparing for essay tests focus on broad issues, general concepts, and interrelationships rather than on specific details, and this studying results in somewhat better student performance regardless of the type of exam they are given (McKeachie, 1986). Essay tests also give you an

opportunity to comment on students' progress, the quality of their thinking, the depth of their understanding, and the difficulties they may be having. However, because essay tests pose only a few questions, their content validity may be low. The reliability of essay tests is compromised by subjectivity or inconsistencies in grading. (Ericksen, 1969, McKeachie, 1986)

Short-answer tests. Depending on your objectives, short-answer questions can call for one or two sentences or a long paragraph. Short-answer tests are easier to write, though they take longer to score, than multiple-choice tests.

They also give you some opportunity to see how well students can express their thoughts, though they are not as useful as longer essay responses for this purpose.

Oral exams. Oral exams are rarely used for undergraduates except in foreign language classes. In other classes they are usually time-consuming, too anxiety provoking for students, and difficult to score unless the instructor tape-records the answers.

Performance tests. Performance tests ask students to demonstrate proficiency in conducting an experiment, executing a series of steps in a reasonable amount of time, following instructions, creating drawings, manipulating materials or equipment, or reacting to real or simulated situations. Performance tests can be administered individually or in groups. They are seldom used in colleges and universities because they are logistically difficult to set up, hard to score, and the content of most courses does not necessarily lend itself to this type of testing. However, performance tests can be useful in classes that require students to demonstrate their skills (for example, health fields, the sciences, education).

2.2.2 Computer-based testing

The computer is currently being used in many areas of testing and assessment. In addition to the already established uses of computers for test scoring, calculation of final grades and test scores reporting (Brezezinski, 1994; Turner, 1997), computers can also be used for the determination of test quality (Nelson, 1994), test item banking and test assembly (Hambleton, 1984), as well as for test administration (Ward, 1994; Millman, 1994).

These past years have seen the growing popularity of the Computer-Based Tests (CBTs) in various disciplines, for various purposes, although the Paper-and Pencil Based Tests (P&Ps) are still in use. However, many question on whether the use of CBTs outperform the effectiveness of the P&Ps or if the CBTs can become a valid measuring tool compared to the P&Ps. Ika (2015) in his investigation tries to present the comparison on both the CBTs and the P&Ps and their respective examinee perspectives in order to figure out if doubts should arise to the emergence of the CBTs over the classic P&Ps. Findings showed that the CBTs are advantageous in that they are both efficient (reducing testing time) and effective (maintaining the test reliability) over the P&P versions. Nevertheless, the CBTs still need to have their variables well-designed (e.g., study design, computer algorithm) in order for the scores to be comparable to those in the P&P tests since the score equivalence is one of the validity evidences needed in a CBT.

The interest in developing and using computer-based test (CBT) in educational assessment in schools and educational institutions has heightened in recent years. Delivering assessments via computers is becoming more and more prevalent in educational assessment domains as changes are made in assessment methodologies that reflect practical changes in pedagogical methods (Kate Tzu, 2012; Genc, 2012; Hsiao, Tu & Chung, 2012; OECD, 2010). CBT is seen as a catalyst for change, bringing transformation of

learning, pedagogy and curriculum in educational institutions (Scheuermann & Pereira, 2008). To establish a valid and reliable CBT, the International Guidelines on Computer-Based Testing (International Test Commission 2004) stated that equivalent test scores should be established for the conventional paper-based testing (PBT) and its computer-based mode. This set of testing standards is supported by the classical true-score test theory – the basis of computer-based and paper-based testing (Allen & Yen 1979). Under this theory, a test taker who takes the same test in the two modes is expected to obtain nearly identical test scores. The standards are also supported by empirical studies (OECD, 2010).

A test that is administered on computer might be delivered through any of several methods. The most common delivery method for CBT programs is linear, or fixed CBT. This approach to test delivery is the method that is most similar to paper-and-pencil testing; a fixed set of items is administered to examinees, in a fixed order. A variation on the fixed CBT method is the random CBT method. The random CBT method also administers a fixed set of items; however, in this method the order of the items is randomized, to provide a modest test security benefit. A very different approach to test delivery is offered in the adaptive CBT method, also known as the computer adaptive test, or CAT approach. In a CAT, items are individually selected for the examinee, based on his or her performance on earlier items in the test. While an adaptive CBT can result in a shorter test, it is more challenging to develop and can only be used by exam programs that have a large number of examinees.

During the past few years, technology has significantly reshaped the method of assessment. In many academic domains, educational measurement has been moving towards the use of computer – based testing (CBT). Computer-based test is defined as tests or assessments that are

administered via computer in either stand – alone or dedicated network, or by other technology devices linked to the internet or world wide web (www) most of them using multiple choice questions (MCQs), Jimoh, Yusuf, Akanmu, Enikuomehin, and Salman (2012). Researchers have performed large scale reviews of studies examining differences in performance of Computer-based test (CBT) which is similar in format to paper-based test (PBT), the research reveals that CBT has little if any effect on test performance (Darel 2003).

The early beginning of automation in public examination systems could be traced to the use of punch card machines by the West African Examination Council (WAEC) for handling all aspects of examination from the capture of candidates' registration information to the printing of certificates. The punch card machines were replaced in the 1970s with Optical Mark Reader (OMR), which not only shortened examination processing time but also increased the efficiency of scoring of multiple choice examination items. Thus by 2004, the National Examination Council (NECO) had introduced e-registration of candidates for its examination. With this development candidates were able to access their results from any part of the country with their mobile phones Godswill, Isma'il, Grace, (2013). Still in the bid to reform assessment practices in Nigeria in which the entrants into Universities, Polytechnics, Colleges of Education and related/similar institutions in Nigeria are selected through a nation-wide paper-and-pencil Unified Tertiary Matriculation Examination administered by government established body called Joint Admission and Matriculation Board (JAMB). In 2013, JAMB introduced computer-based test (CBT) version of this examination. Over the years, the UTME by JAMB has been in Paper and Pencil Testing form, and has been characterized by a lot of fraudulent practices ranging from leakage of examination papers, use of machineries of all sorts by candidates and so on. In order to eliminate or minimize incidence of the vices and other

reasons, JAMB in 2013 introduced CBT form of UTME, and gave massive publicity and sensitization on it. JAMB gave the advantages of CBT to include increased delivery of test items and improvement in the quality and standard of education in the long run (Monday, Akon, Blessing. (2014)). Therefore, this has called for research to determine the attitude and performance of CBT test takers.

Since the early 2000s, much has occurred in CBT. CBT seems to have advantages over paper and pencil testing, both for states that run the assessment programs and for the students who participate in them. These advantages are recognized by the U.S. Department of Education, which in one of its major initiatives (Race to the Top Assessment Program), encouraged the development of CBT. There currently is strong interest in CBT and advocates have identified many positive merits of this approach to assessment including: efficient administration, student preference, self-selection options for students, improved writing performance, built-in accommodations, immediate results, efficient item development, increased authenticity, and the potential to shift focus from assessment to instruction (e.g., Becker, 2006; Salend, 2009; Thompson et al., 2002). CBT also allows new ways of assessing students that move beyond the traditional multiple choice and constructed response items. For example, innovative assessments are now being developed that enable students to manipulate data and role play. Yet, as states move forward with CBT they are discovering that it is important to consider not only the positive benefits, but also potential negative unintended consequences. These include, for example, the possibility that additional training will be needed for students with disabilities to interact successfully with computers and the challenges of determining the best way to present some accommodations such as screen readers.

Despite the fairly dramatic increase in attention to CBT, accessibility challenges continue to have the potential to reduce the validity of the assessment results and to exclude some groups of students from assessment participation. In the early years of CBT many fairly basic design issues baffled testing companies and states as they sought to transfer paper and pencil tests onto a computer-based platform (Thompson, Quenemoen, &Thurlow, 2006). Many of those issues have been resolved. Some states also believe that CBT may be more efficient to administer than paper and pencil based tests, and new test designs may have the potential to improve the assessment of students with disabilities. For example, some accommodations can be embedded in computer-based tests and there may be less variability in how some accommodations are delivered (for example, a screen reader may deliver the read aloud accommodation more consistently than a human reader). However, students with disabilities may be at a great disadvantage if their wide range of access needs are not considered from the beginning of the development process (Thompson et al., 2002).

2.2.3 Advantages and Disadvantages of Computer-Based Testing

The potential benefits of administering conventional tests by computer ranges from opportunities to individualize assessment, to increase in the efficiency and economy with which information can be manipulated; several of these advantages offered by computer-based test administration over printed test administration have been described by ward (1994), Fletcher and Collins (1996), and Wise and Plake (1999).

Much of educational testing has traditionally been managed on a mass production basis. Logistical considerations have dictate that all examinees be tested at one time. The computer as test administrator offers an opportunity for more flexible scheduling; examinees can take test individually at virtually any time. During testing, examinees can also be given immediate feedback on the correctness of the responses to each question. Computer-based tests, and

particular computer adaptive tests, have been shown to require less administration time than conventional test (English, Reckase, & Patience, 1997; Olsen et al, 1999). Olsen et al reported that the computer adaptive tests required only one-fourth of the testing time require by the paper-and-pencil administered tests, while the computer-based tests required only half to three-quarters of the testing require by the paper-and-pencil administered tests. Hence, when computerized tests are used, students can spend more time engaged in other instructional activities, and less time taking tests.

Another advantage of computer-based test is the capability to present items in new, and potentially more realistic ways (Wise &Plake, 1999). A printed test has display limitations. While it can present text and line drawings with ease, it cannot provide timing of item presentation, variable sequencing of visual displays, animation or motion. The graphics and animation capabilities of computers provide the possibility of presenting more realistically simulated actions and dynamic events in testing situations.

Computer-administered tests offer potentially significant reductions in several classes of measurement error (Bunderson, Inouye, & Olsen, 1999). A mark-sense sheet commonly used in manual testing requires the examinee to code each response by associating it with the item numbers and alternative numbers or letters not only takes time but may produce errors. The elimination of answer sheets in computer-administered tests can eliminate some traditional errors such as penciling in the answer to the wrong item number, failing to erase an answer completely, and inadvertently skipping an item in the test booklet but not on the answer sheet. By presenting only one item per screen, the computer automatically matches responses with the item number; examinees can also focus on one item at a time without being distracted, confused, or intimidated by the numerous items per page for paper tests. Computer-based tests

may therefore provide more accurate measures of performance for students who have lower reading ability, lower attention span, and higher distractibility. Moreover, convenient features for changing answers can replace time-consuming erasing on printed answer sheets.

The administration of tests by computer also allows the collection of data about examinee response styles. These include information such as which items are skipped, how many answers are changed, and response latencies. The latter may refer to the time it takes an examinee to answer an item; analysis time for any complex drawing, graph, or table; reading time for each option; response selection time, or response speed. Precise measurement of any of these latencies is virtually impossible with paper-and-pencil tests.

Other attractive advantages of computer-based testing include more standardized test administration condition and immediacy of score reporting. Within a few minutes after completing the test, the examinee or the test administrator can receive a score report and prescriptive profile. It also increases test security (Bunderson, et al 1999). There are no paper copies of the tests or answer keys to be stolen, copied or otherwise misused. The computer-administered test can include multiple levels of password and security protection, to prevent unauthorized access to the testing materials, item banks or answer keys.

Despite the many advantages associated with computer-based tests, potential problems exist as well. Use of the response entry device, whether keyboard, touch screen, or mouse can introduce error, pressing a wrong key in response to a question results in an error, and the validity of the individual's results is compromised. The amount of printed text that can be shown on a monitor screen can limit both the length of the question and possible responses. The need for multiple computer screens to read lengthy comprehension items might introduce a memory component into the construct being measured (Bunderson, Inouye, and Olsen, (1999).

Another problem involves the time lag between an individual's answer to an item and the resulting response from the computer. Long time lags between responses can result in negative user attitudes, anxiety and poor performance (Miller, 1997). Another shortcoming of computer-based tests, especially in psycho-diagnostic assessment, concerns the use of norms in the interpretation of tests scores. Most of the tests that are currently administered by computer were originally developed for a traditional paper-and-pencil approach. Differences in mode of administration may make paper-and-pencil norms inappropriate for computer-based tests.

There is also measurement problems associated with the use of computer-based tests. These are related to item types, item contamination that arises from certain test design strategies, and the non-equivalence of comparison groups in item analyses (Servela& Noonan, 1998). With regard to item type, difficulties arise when constructed-response items (such as fill-ins and short answers) as compared to selected-response items (for example multiple-choice, matching and true/false) are developed for the computer. It becomes almost impossible to program all the possible correct answers, when considering alternative correct answers, wording, spacing, spelling errors. A tremendous amount programming is involved for even a partial subset of all possible correct answers. There are psychometric implications as well. Students could supply correct answers that simply are not recognized by the computer; the result could be lower reliability and poorer discrimination indices. Because of these reasons, computer-based tests are mainly restricted to multiple-choice items. Another psychometric issue in computer-based testing is the problem of item contamination if instructional design capabilities are incorporated. It is then possible to allow students to preview test items, receive feedback on the correctness of their answers while items are still being presented, or retake items which were drawn randomly from an item pool. In this situation, items which are dependent upon each

other (for example, an item which requires the student to use the result from item 3 to compute item 4) would be contaminated if a student receives feedback after each item. Or, the correct answer for one item could subtle clues to the correct answer on another item. There are motivational concerns as well, if a student is consistently answering items incorrectly, the negative feedback might be detrimental to motivation on future items. Likewise, a series of correct answer feedbacks can promote greater motivation in future items. The problem is in the differential effects of item feedback across high and low achieving students. One other contamination problem results from the practice of selecting item randomly from an item bank for a particular test. There is a possibility that a student may see the same items on a second or third try. This problem is exacerbated when item feedback is given. If item feedback is provided, subsequent attempts at tests should contain new items.

In some of the studies investigating the difference between methods in terms of gender, race and age (Bennett et al., 2008; Clariana & Wallace, 2002) no significant difference was found in achievements, whereas in some other studies (Gallagher, Bridgeman, & Cahalan, 2000) little significant difference was observed. In their recent study Terzis and Economides (2011) describe the trends of male and female students towards CBAs.

2.3 Test Administration

The computerized administration of tests has also been considered as an attractive alternative to the conventional paper-and-pencil mode of administration. In a computerized test administration, the test-taker is presented with items on a display device such as a cathode-ray tube (CRT) and then indicates his or her responses device such as standard keyboard. The presentation of test items and the recording of the test-taker's responses are controlled by a computer. Most of the attention to computerized test administration however, has been directed

towards psycho-diagnostic assessment instruments such as psychological tests and personality inventories. Even in the case of education related ability and achievement tests, testing (as part of computer-assisted instruction or computer-manage instruction) has mostly been used as the basis for prescribing remedial instructional procedures to determine if the student has achieved mastery, and also to provide the student with some feedback of how he or she performed.

Four main computer-administered testing procedures used in educational assessment settings include computer-based testing, computer adaptive testing, diagnostic testing and the administration of simulations of complex problem situations. Computer-based testing (CBT) generally refers to “using the computer to administer a conventional (i.e. paper-and-pencil) test” (Wise and Plake, 1999). That is, all examinees receive the same set of test items.

Unlike conventional testing where all test-takers receive a common set of items, computer adaptive testing (CAT), or “tailored testing”, is designed so that each test-taker receives a different set of items with psychometric characteristics appropriate to his or her estimated level of ability. The primary selling point of adaptive testing is that measurements are more precise when examinees respond to questions that are neither too hard nor too easy for them (Millman, 1994). This test involves making an initial ability estimate and selecting an item from a pool of test item for presentation to the test-taker. According to Green et al (1994), each person’s first item on an adaptive test generally has about medium difficulty for the total population. Those who answer correctly get a harder item; those who answer incorrectly get an easier item. After each response the examinee’s ability is re-estimated on the basis of the previous performance and a new item is selected at the new estimated ability level. The change in item difficulty form step to step is usually large early in the sequence, but becomes smaller as more is learned about the candidate’s ability. The testing process continues until a specified level of reliability or

precision is reached and the testing process terminated. This testing is based on Item Response Theory (Lord, 2010) “which provides the mathematical basis for selecting the appropriate question to give at each point and for producing scores that are comparable between individuals” (Ward, 1994). Adapting testing allows the tailoring of the choice of questions to match the examinee’s ability, bypassing most questions that are inappropriate in difficulty level and that contribute little to the accurate estimation of the test-taker’s ability. Individual with low ability never encounter the difficult questions on which they would resort to blind guessing; others do not waste time with easy questions that they would almost certainly answer correctly. Computer adaptive tests have been shown to take less than half of the time as traditional achievement tests and to provide more precise ability estimates from high to low ability, Weiss, et al (1994), cited in Olsen et al (1999).

There are numerous variables that impact on student’s performance when questions are presented on a computer, such as the quality of the monitor (Schenkman, Fukuda, & Persson, 1999) and others. Attitude is one of the most prominent variables that have not been so much considered in various related studies particularly from the African context and Nigeria particularly. Attitude by definition is an inner psychic state influencing behaviour. We can understand an inner state from actions and words. For instance, we may presume that a person actively avoiding a computer has a negative attitude towards it. Attitude is not an inborn, instinct phenomenon; it mainly depends upon person’s experience and its impact in a new situation (Saparniene, Merkys, & Saparnis, 2002). Consequently, attitudes are formed in the process of experience and their change is possible due to the internal and external factors. In other words, attitude towards computer based test in this study is defined as ways of thinking and feelings of the students towards taking computer-based testing.

Stricker et al (2004) assess test takers' acceptance of the computer-based version of the Test of English as a Foreign Language (TOEFL), and the links between this acceptance, general attitudes about tests. A questionnaire concerning attitudes about the test, familiarity with computers, and other relevant variables was administered to TOEFL test takers at large testing centers in Buenos Aires, Cairo, and Frankfurt. Attitudes about the TOEFL were moderately positive and had similar patterns of relationships in the three countries: slight or moderate with test performance, moderate with general attitudes about tests, slight with computer anxiety and test anxiety, and minimal with other variables.

Butler (2003) conducted a study on the Impact of Computer-Based Testing on student attitudes and behaviour. He reported that overall, a moderate number of tests were associated with better student attitudes. Student attitudes were generally more positive toward the proctored, computer-based testing facility than toward in-class, pencil and paper testing. Because this study did not involve careful manipulation of the independent variables, some of these attitude effects may have been due to the practices of faculty members or other unmeasured variables.

2.4.1 Review of Empirical Studies on Attitude

In general, attitudes can be defined as a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object (Fishbein and Ajzen, 1975). They are relatively less stable than personality traits and can be changed both across time and across situations in virtue of individual's interaction with the environment (Robinson, Simpson, Huefner, and Hunt, 1991). Since attitudes are learnt, they are moldable i.e. they change with experience of the stimulus objects and with social rules or institutions (Binder and Niederle, 2007). According to Whitrow (1999) computer-related attitudes influence students' desire to use computers, their desire to enroll in computer-related subjects and courses, and their choice of

career path. Students' computer-related attitudes are also directly related to their prior experiences and use of computers (Levine & Donitsa-Schmidt, 1997). Different researches have been conducted on how users' attitudes toward computers influence the future use of and behaviour toward computers Fann, Lynch & Murranka, 1989; Woodrow, 1991. Consequently, Nash and Moroz [1997] supported the view that evaluation of computer attitudes is an important technique in response to the trend of computers becoming more centralized in education through integration. This study is focused on factors which may be responsible for certain attitudes the student demonstrates towards the use of computer and which may affect their future interest and possible choice of computer and related vocations.

Adebowale, et al (2009) conducted research to study students' attitude towards the computer (computer attitudes), their computer self-efficacy and computer anxiety separately. The study was specifically targeted at determining if socio-demographic variables like gender, age and field of study had any effect on these computer parameters among secondary school students. It also explored the possibility of been able to predict students' computer characteristics from computer efficacy, computer anxiety and demographic variables. 600 students were selected by proportionate sampling from the Senior Secondary class III (SS III) of six secondary schools equipped with 40 micro-computer-fitted laboratories by the Nigerian (Lagos state) government. The instrument for the study consisted of two types of questionnaires, one titled "Questionnaire on the computer attitude" was used to obtain a measure of students' computer attitude while another titled "Questionnaire on student's computer self-efficacy and computer anxiety" was used to measure their computer self-efficacy and computer anxiety. The questionnaires were administered by their ICT teachers under the supervision of the researchers. Data analyses were by using t-test, ANOVA, Post- hoc tests and multiple regression. The results showed that gender

had no significant influence on any of the three parameters but age seems to affect computer attitude and computer anxiety. Students in the vocational and commercial fields of study had better attitude towards the computer than those in the sciences and arts. In terms of predicting students' computer attitudes, fields of study, computer self-efficacy, gender and very low levels of computer anxiety were found to be the significant predictors of computer attitude.

In the study of Irfan and Cicek, (2012) investigated the attitudes of primary school students towards computer based testing and assessment in terms of different variables. The sample for this research is primary school students attending a computer based testing and assessment application via CITO-ÖİS. The "Scale on Attitudes towards Computer Based Testing and Assessment" to collect data and the results obtained were compared in terms of school type, gender, and grade level. The results of the study revealed that significant differences exist between attitudes of students from different schools. Such a difference does not exist between attitudes of students when their genders, grade levels, and participation periods to computer based assessment are taken into account.

Jinsong, (2014) in his study investigated test candidates' attitudes to the Fudan English Test (FET), a university-based English proficiency test, and explored the relationships between test candidates' attitudes, test taker characteristics, and test performance. The participants in this study were 157 students who had just attempted the FET. A questionnaire and an interview guide were designed to collect the data. Exploratory factor analysis extracted five attitudinal factors. Descriptive statistics at the factor level indicated that test candidates had the most positive attitudes to test administration and least positive attitudes to the mode of the computer-based speaking test. Factorial MANOVA showed that test candidates' gender and academic backgrounds had no significant effect on their reported attitudes. Stepwise regression analyses

showed that two attitudinal factors, attitude to test wash back and attitude to test information explained 9.4% of the test score variance. As well as presenting the FET provider with additional evidence about the quality of the test, this study also lends empirical support to the argument that attitudinal factors need to be taken into serious consideration in test development and validation.

In another study conducted by Gary (2000), he tried to determine if a statistical relationship existed between academic achievement and exam delivery method for students enrolled in a Computer Applications in Agriculture course during spring semester 1999. A purposive sample of college of agriculture students ($n = 45$) had their computing application skills tested through traditional (paper and pencil) and electronic (e-mail) methods. Significant, moderately positive associations resulted between academic achievement and exam delivery method for the quiz exam scores. Agriculture students who took the quiz using paper and pencil had significantly higher scores than did students who took the quiz through an electronic version. A significant moderate relationship existed between academic achievements and learning style for the quiz; field-independent students achieved significantly higher quiz scores than did field-dependent learners. No significant associations were found between academic achievement and students' attitudes towards computers, computing anxiety levels, attitudes towards electronic exams, or gender. The variable of time may have a significant impact upon academic achievement for students involved in computerized testing situations. Early identification of field-dependent learners affords the instructor time to provide additional assistance for those who find learning computing skills an academic challenge.

In the research of TOJET (2004) examined students' attitudes toward computerized testing. The paper, reports the attitudes of 202 students in a first year cell biology and histology course toward computerized testing and its influence on their study habits over a three year period. The

result indicate that students readily accept computer exams and that their study habits were influenced in a positive manner by the computer administered extra-credit examinations. It also provide further evidence that medical students like the use of computer administered examinations and that the examinations may actually accentuate the learning experience.

In the study of Adeyinka, Bashorun (2017), examined the attitude of the students towards computer-based test (CBT) at the University of Ilorin, Nigeria. A case study research design was adopted to carry out the study. The sample consists of 2209 undergraduate students selected from seven out of the ten Faculties that made up the university. Data were collected through a computer based test attitudinal survey (CBTAS) and a focus group discussion. The results demonstrated that; generally, respondents have positive attitude towards CBT. More than average of the respondents prefer CBT to paper and pencil test. Respondents also demonstrate strong perception of increase in their learning performance as a result of taking CBT/examination. On the other hand, problems such as shortage of computers, lack of skills, loss of data in the process of writing CBT, slow network and hazard of reading on the screen were identified.

There are numerous variables that impact on student's performance when questions are presented on a computer, such as the quality of the monitor (Schenkman, Fukuda, &Persson, 1999) and others. Attitude is one of the most prominent variables that have not been so much considered in various related studies particularly from the African context and Nigeria particularly. Attitude by definition is an inner psychic state influencing behaviour. We can understand an inner state from actions and words. For instance, we may presume that a person actively avoiding a computer has a negative attitude towards it. Attitude is not an inborn, instinct phenomenon; it mainly depends upon person's experience and its impact in a new situation (Saparniene, Merkys, &Saparnis,

2002). Consequently, attitudes are formed in the process of experience and their change is possible due to the internal and external factors. In other words, attitude towards computer based test in this study is defined as ways of thinking and feelings of the students towards taking computer-based test.

In this study, the study seeks to examine the attitude of the students towards computer-based test (CBT) at the KAU-Saudi Arabia

Jeddah. Quantitative approach using survey questionnaire was adopted to carry out the current study using convenience-

sampling technique. The sample consists of (60) undergraduate students who had taken the exam on CBT were selected from college of science-

chemistry department to examine their perception towards CBT. To achieve this aim, the researcher examines the possibility of using student feedback in the effectiveness of this method in assessment. The findings show that: the

majority of respondents have positive attitude towards CBT, (83.7%) of students said they were competent with the use of computer due to their prior experience. Regarding test administration, they reported that there are some errors in the chemical equations, formulas, construction in the exam sections, and inadequate time. Nevertheless, they achieved the exam

successfully and reached satisfaction through CBT features such as direct scoring, validity, and transparency in grading. The bottom line, CBT experience will become favorable for students and then will earn its effectiveness in the context of assessments methods.

(Powers & O'Neill, 2006), assessed the degree of contribution of CBT to performance among a number of students of mathematics by using a questionnaire survey. It was found that no serious effect.

Karadeniz (2009) studied the impact of CBT and PPT and mobile-based test on students'

performance. A group of 38 students was experimented for 3 weeks. Significant differences were found between the scores achieved by the students in second week, but not in first week. It was perceived by the authors that students had positive attitude towards CBT and assessment due to ease of use, comprehensive and instant feedback. Moreover, most favored the CBT and the least favored were the PPTs.

The National University of Singapore introduced computer-based testing (CBT) in 2004. Lim, et al (2006) examined medical students' attitude about CBT VS PBT testing. Through an online survey 213 (53.5%) final-year students were tested out of which 91 (79.8%) preferred CBT, 11 (9.6%) preferred PPT format and 12 (10.5%) were un-sure. Authors further explained that 42 indicated that 42 liked CBT because of good quality of images and independent of assigned seating positions; 22 liked because they could proceed at their own pace; one stated that CBT examination was fun; 4 enjoyed the convenience of CBT and 6 cited "equality" as the reason they preferred CBT over PPT.

Study of (Williams, 2007) he examined attitudes of pre – hospital undergraduate students undertaking a web based examination as an adjunct to the traditional paper based examination mode using questionnaire survey among (94) students, the study found students' satisfaction and performance is high.

2.3.1.1 Review of Empirical Studies on Performance

Based on a study of Joseph, Cari, George (2017), more than 30,000 elementary, middle, and high school students conducted in winter 2015-16, researchers found that elementary and middle school students scored lower on a computer-based test that did not allow them to return to previous items than on two comparable tests -- paper- or computer-based -- that allowed them to skip, review, and change previous responses. Elementary school students scored marginally

higher on the computer-based exam that allowed them to go back to previous answers than on the paper-based exam, while there was no significant difference for middle school students on those two types of tests.

In contrast, high school students showed no difference in their performance on the three types of tests. Likewise, previous research has found that the option to skip, review, and change previous responses also had no effect on the test results of college students. For the study, tests were given to students in grades 4-12 that assessed their understanding of energy through three testing systems. Instructors elected to administer either the paper-and-pencil test (PPT) or one of two computer-based tests (CBT) based on the availability of computers in their classrooms.

One CBT (using TAO, an open source online testing system) allowed students to skip items and freely move through the test, while the other CBT (using the AAAS assessment website) did not allow students to return to previous test items. In addition, on the TAO test, answers were selected by directly clicking on the text corresponding to an answer. On the AAAS exam, answers were chosen more indirectly, by clicking on a letter (A, B, C, or D) at the bottom of the screen corresponding with an answer. Gender was found to have little influence on a student's performance on PPT or CBT; however, students whose primary language was not English had lower performances on both CBTs compared to the PPT. The cause for the difference depending on primary language was unclear, but could have been linguistic challenges that the online environment presented or limits on opportunities to use computers in non-English-speaking environments. Overall, the study results, along with previous research, indicate that being able to skip, review, and change previous responses could be beneficial for younger children in elementary and middle school but have no influence on older students in high school and college. Furthermore, results indicated that marking an answer in a different location on a multiple-choice

test could be challenging for younger students, students with poor organizational skills, students who have difficulties with concentration, or students who are physically impaired. In addition, having to match an answer to a corresponding letter at the bottom of the screen likely adds an additional level of complexity and cognitive processing. The researchers note that additional study of CBT answer-choice selection and test navigation features and how they influence elementary and middle school students' test performance is warranted. The study was supported by a grant from the Institute of Education Sciences.

In the Gavin, and Mathew (2005) investigation of children's performance and attitude towards a paper-based and computer based test. Twenty children, aged between 7 and 8 of mixed gender, participated in this study using a commercial software application. The children's attitude towards the software was captured through the use of a smarty-o-meter to indicate their level of preference and the performance was based on their tests scores. The conclusions highlight the children's preference for using computer in their assessment and shows that there was no difference in performance between the two test modes.

Christine, Stuart, and Robbert (1991), they investigated the effects of a computer-based test on the achievement and test anxiety of students, explored the relationship between computer anxiety and computer experience, and assessed the affective impact of computerized testing on students. Fifty-four male and fifty-one female Grade 10 students were randomly assigned to take the computer-based or paper-and-pencil version of the test. They then completed a questionnaire which determined their computer experience, test anxiety and computer anxiety, and their reactions toward computer-based testing. The mean achievement score was significantly higher for the computer-based group. There was no significant difference in text anxiety between the groups. No significant relationship existed between the students' computer experience and the

computer anxiety evoked as a result of taking the computer-based test. Reactions toward computer-based testing were generally positive. It is concluded that if computerized test-taking tasks are kept simple, even test-takers with minimal computer experience may not be disadvantaged.

In some of the studies investigating the difference between assessment methods in terms of gender, race and age, no significant difference was found in achievements, whereas in some other studies little significant difference was observed. In their recent study, Terzis and Economides (2011) describe the trends of male and female students towards CBT. Yurdabakan (2011) reported that as a result, they highlighted both genders having positive views on CBTs, if they are based on games; they are open and course-related. Additionally, they state that the attitudes of males and females towards CBTs are under the influence of social environment; the boys focus on the usefulness while the girls stress the ease of use.

Monira, Mohammad, Mostafa (2014), in their study examined the score comparability of institutional multiple-choice reading comprehension tests in two testing methods, i.e. paper-based and computer-based tests taken by Iranian first-year English students in Azad University of Tehran, Iran. In order to find the results, the researcher required examining the impact of computer-based testing (henceforth CBT) on the test score results, and exploring the relationship between particular test takers' characteristics such as prior computer familiarity and computer attitudes as well as test performance with their test scores. Two equivalent tests were administered to participants on two different occasions. Utilizing matched t-test to compare the means of two test modes, the results of the study show the priority of PPT over CBT with .01 degree of difference at $p < .05$. Using ANOVA, the findings revealed that computer familiarity and attitude towards computer had no significant influence on the students' performance in

computerized test. Additionally, participants showed more preference on test features presented on the computer test.

Bridget (2010), investigated the impact of assessment methods on student performance on accounting tests. Specifically, the author used analysis of variance to determine whether the use of computer-based tests instead of paper-based tests affects students' traditional test scores in accounting examinations. The author included 2 independent variables, student gender and student class, as covariates. The findings indicate that there was no significant difference in the values of the students' performance according to the 2 methods of assessment. The findings also revealed that neither student gender nor class was correlated to the test scores in either form of testing.

2.4.2 Summary and Uniqueness of the Study

Scores of studies had been carried out on the developing trend and application of the computer based test as a modern assessment technique, what now gradually taking over the manual paper and pencil tests.

The following works had shown some of the investigation made on the computer based tests. A study by Lee et al (1996) which observed the performance of (585) military recruits with ($P > 0.05$) level of significance. The results show a higher mean score. In the works of Eaves & Smith (1986), tests some (96) graduate educational media class at ($P > 0.05$) in comparison with the paper and pencil test and a significant mean difference was found in the test scores. Similarly the work of Wise & Wise (1987) had compared the performance of (68) 3rd and 4th grade students on paper and pencil alongside the computer-based test on a (32) items multiple choice test of basic arithmetic. The result shows no significance differences on the test.

Other related studies on this computer testing mode include; Bunderson, et al (1989), Miller, (1987), Wise & Plake (1989), Servela & Nooman (1988), English & Patience (1977), Wood (1984), and etc.

The bulk of the studies that the researcher has identified were carried out mostly on assessing the correlation between the paper and pencil test and the computer-based testing mode. And moreover the studies were carried out elsewhere i.e no such studies on the computer-based testing within Bauchi State since the inception of the computer-based test in the country in 2013.

Therefore, the researcher had observed the relevance of carrying such study to evaluate the attitude and performance of the science and art students on the computer-based test, in Bauchi State University, Gadau for the 2016/17 academic year.

As such this study is unique with other studies as it reviewed the students' attitude and performance to the computer-based test alone, with a focus on only Bauchi State University Gadau students. Furthermore, the study differs with other studies on the research design, methodology, and population of the study and sample size as well as the data collection procedures and data analysis techniques.

The study of Irfan and Cicek (2012) investigated the attitudes of primary school students towards computer based testing their subject of the study were primary students while for this study was University students. The results of this study revealed that significant differences exist between attitudes of students from different schools while in this study there was no significant difference between the science and art students. The population of their research were all the schools and students participating in the CITO-ÖİS applications. While in the present research the population was the level 100 science and art Students University. Layered group sampling (Layers are types

of schools i.e. private or state school) was administered in their research while in this research multi-stage sampling technique was used. The data collection instrument is a 35-item scale developed by the authors. While in the present study a 20-item scaled was developed to collect the data.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The chapter contains the aspects of research design, population of the study, the sample size, sampling techniques, validation of data collection instrument, data collection procedures and data analysis. It also deals with the data collection instrument and procedures.

3.2 Research Design

The researcher employed an ex-post factor research design. This pattern of research measures the existed cause and effect of a given problem under study without any manipulating influence on the variables Ary, Donald, et al (2002).

This design differs with experiment research as it rules out control of any observable group under study. Moreover, the researcher used an existed fact or information for which this research subject had already developed or processed.

3.3 Population and Sample

3.3.1 Population of the Study

Population of the study are the entire admitted students into the level 100 of the Bauchi State University Gadau through the JAMB computer-based test (CBT) criteria for the academic session 2016/2017. The total number of the students for the session is 2679 (Bauchi State University Gadau Admission Office 2017), which gained admission across the four faculties of the university.

The following table shows the population of the study across the four faculties of the university.

Table 3.1 the total number of level 100 students admitted for 2016/2017 session (Population of the study)

FACULTY	NO. OF STUDENTS
Arts	387
Sciences	1311
Social sciences	842
Education	139
TOTAL	2679

The following table shows the population of the study according to gender group

Table 3.2 gender distribution of the population of the study

S/NO	FACULTY	GENDER GROUP		SUB – TOTAL
		MALE	FEMALE	
1.	Arts	288	99	387
2.	Sciences	952	359	1311
3.	Social sciences	668	174	842
4.	Education	105	34	139
TOTAL		2013	666	2679

3.3.2 Sample Size

A sample of 313 students was drawn from the population of the two delimited faculties that the study covered. i.e faculty of Arts and Sciences. The total population for the two faculties is One thousand six hundred and ninety eight (1698). This table below shows the sample size across the two faculties.

Table 3.3 Sample of the Study from the two Faculties of the University

S/NO.	FACULTY	SAMPLE
1.	Arts	71
2.	Sciences	242
TOTAL		313

Sample size according to gender group of the two faculties

Table 3.4 sample size according to gender distribution

Faculty	Population	Male	Female	Sub-Total
Arts	387	35	36	71
Science	1311	128	114	242
Total	1698	163	150	313

3.3.3 Sampling Technique

The multi-stage sampling techniques was applied in determine its population sample of the study. Multi-stage refers to a sampling technique in which sample of a given population is being derived via stages. Such that population of the study is categorized into some strata or units. Then one or more unit or clusters are chosen at random and every subjects within the chosen cluster is sampled. Hence, using all subjects or elements in all the selected units or cluster may be expensive or unnecessary. The population of the study is Two thousand six

hundred and seventy nine(2679). Which is the total number of 100 level students admitted for the 2016/2017 academic session via CBT. The University had (4) faculties i.e. (arts, science, social science and education).

To apply the multi-stage sampling the researcher randomly selected two faculties which are arts and science. Departments are randomly selected from the two selected faculties from where nine departments were selected as follows;

Faculty of Arts

1. Education
2. English
3. Arabic
4. Law
5. Hausa

Faculty of Science

1. Microbiology
2. Pharmacology
3. Physics
4. Mathematics

Finally, a random selection of six departments was taken which are;

Faculty of Arts

1. Education
2. English
3. Law
4. Hausa

Faculty of Science

1. Microbiology
2. Mathematics

Table 3.5 Sample size according to Department of the two (2) faculties of Art and Science

DEPARTMENT	FACULTY	SAMPLE
English	Arts	16
Hausa	Arts	24
Islamic Studies	Arts	19
Adults Education	Arts	12
Micro-Biology	Science	92
Mathematics	Science	150
TOTAL		313

Table 3.6 Sample Size of the Population across the Six (6) Selected Departments with Gender Group.

Department	Faculty	Male	Female	Sub-Total
English	Arts	5	11	16
Hausa	Arts	15	9	24
Islamic Studies	Arts	11	8	19
Adults Education	Arts	4	8	12
Micro-biology	Science	40	52	92
Mathematics	Science	88	62	150
	Total	163	150	313

3.4 Data Collection Instrument

A researcher developed a Questionnaire which was named a CBT attitude Questionnaire and was used to measure the attitude of the sampled students towards the UTME/JAMB CBT in Bauchi State University Gadau. The Questionnaire has two sections, section A contains respondents' bio-data (i.e. gender, faculty, and the JAMB registration number) while section B contains the 20 items of the questionnaire. The options of the response were scored 4, 3, 2, and 1 respectively and used to find out their attitude towards JAMB CBT using SPSS. The CBT attitude questionnaire was given to the experts for scrutiny. Based on the suggestions, comments and observations of the experts, some of the items were removed and substituted while others were modified. The fact that some items in the questionnaire were taken from the questionnaire used in previous related studies in turn contributed to validity of the instrument. To ensure the reliability of instruments it was administered to 35 students of College of Education whom got admission into NCE one via JAMB CBT Examination. Test re-test

reliability of three weeks interval was later conducted. The scores obtained was subjected to a Cronbach alpha and the overall reliability of the questionnaire was $r=0.84$.

3.5 Data collection Procedures

The researcher obtained an introductory permit letter from the Department of Education Bayero University Kano, which is addressed to the study area that is Bauchi State University Gadau from which official permit was given. The questionnaire was administered to the 100 level students of science and arts of the university 2016/2017 academic year. Sample random sampling was used to select the 242 students of science and 71 students of arts at their respective faculties and a total of 313 CBT attitude questionnaire was administered to the students. No single questionnaire was missing because the questionnaire was collected instantly after responding at the spot and their JAMB registration number was used to get their JAMB scores from the data collected from the university. However, the researcher developed a pro-forma for which the students' Computer-Based Test scores were collected. The students were required to provide their JAMB registration number so that the UTME scores could be retrieved from the JAMB result of the level 100 students of Bauchi State University Gadau 2016/2017 academic session. The attitude questionnaire scores and the JAMB scores were made possible for analysis.

3.6 Data Analysis Procedures

Data collected from the CBT attitude questionnaire were coded and analysed using statistical package SPSS. Inferential statistical tool in the form of t-test was used to test all the formulated hypotheses. This is because, the test involves two independent groups or variables with a large number of sample 1 – 30 Gay, (1996).

CHAPTER FOUR

PRESENTATION AND DATA PRESENTATION

4.0 Introduction

This chapter deals with testing hypotheses, summary of findings and discussions on findings

4.1 Testing of Hypotheses

Four hypotheses which had been formulated to guide the study were tested one after another at 0.05 level of significance.

4.2 Hypothesis One

There is no significant difference between science and arts students' attitude towards JAMB CBT

Table 4.1: Summary of t-test analysis of science and arts students' attitude towards JAMB CBT

Faculty	N	Mean	Std. Dev.	Df	t-cal	t-crit	p-value	Remark
Arts	71	55.39	5.671					
Attitude				311	0.409	1.984	0.683	NS
Science	242	55.06	6.210					

Significant at $p \leq 0.05$

Table 4.1 shows the summary of t-test analysis of science and arts students' attitude towards JAMB CBT. The table revealed that the mean score of Arts students (55.39) is slightly greater than the mean score of Science students (55.06). T-test analysis revealed that the $df = 311$, $p\text{-value} = 0.683 > 0.05$ level of significance. Therefore, the null hypothesis is accepted. This

implies that there is no significant difference between science and arts students' attitude towards JAMB CBT.

4.3 Hypothesis Two

There is no significant difference between male and female science students in their attitude towards JAMB CBT

Table 4.2: Summary of t-test analysis of male and female science students' attitude towards JAMB CBT

	Gender	N	Mean	Std. Dev.	Df	t-cal	t-crit	p-value	Remark
Science	Male	128	55.46	6.407	240	1.652	1.984	0.100	NS
	Female	114	53.98	5.554					

Significant at $p \leq 0.05$

Table 4.2 shows the summary of t-test analysis between male and female science students' attitude towards JAMB CBT. The table revealed that the mean score of male science students (55.46) is a little greater than the mean score of female science students (53.98). T-test analysis revealed that since the p-value (0.100) > 0.05 level of confidence, therefore, the null hypothesis is accepted. This implies that there is no significant difference between male and female science students in their attitude towards JAMB CBT.

4.4 Hypothesis Three

There is no significant difference between males and females within Arts students in attitude towards JAMB CBT

Table 4.3: Summary of t-test analysis male and female Arts students' attitude towards JAMB CBT

	Faculty	N	Mean	Std. Dev.	Df	t-cal	t-crit	p-value	Remark
Arts	Male	35	55.25	5.494	69	0.378	1.990	0.707	NS
	Female	36	55.83	6.308					

Significant at $p \leq 0.05$

Table 4.3 shows the summary of t-test analysis between Arts male and female students' attitude towards JAMB CBT. The table revealed that the mean score of male Arts students (55.25) is a little greater than the mean score of female science students (53.83). However, t-test analysis revealed that the p-value (0.707) is greater than 0.05 level of confidence; therefore, the null hypothesis is accepted. This implies that there is no significant difference between Arts male and female students in their attitude towards JAMB CBT. The implication of this is that, gender has nothing to do with attitude of students towards JAMB CBT irrespective of the faculty from which students were admitted to.

4.5 Hypothesis Four

There is no significant difference between students' performance in the faculty of Arts and Sciences.

Table 4.4: Summary of t-test analysis of science and arts students' performance in UTME JAMB CBT

	Faculty	N	Mean	Std. Dev.	Df	t-cal	t-crit	p-value	Remark
Performance	Arts	71	198.82	12.892	311	1.746	1.984	0.082	NS
	Science	242	202.65	17.116					

Significant level at $p \leq 0.05$

Table 4.4 shows the summary of t-test analysis of science and arts students' performance in UTME JAMB CBT. The table revealed that the mean score of science students (202.65) is greater than that of the Arts Students (198.82). However, when subjected to t-test analysis by the aid of SPSS, it revealed that the difference is not statistically significant ($p\text{-value} = 0.082$ greater than 0.05 alpha level of confidence. In other word, the null hypothesis which states that there is no significant difference between students' performance in the faculty of Arts and Sciences, is therefore accepted.

4.6 Summary of Findings

The findings of the study were summarized as follows;

1. There was no significant difference between the science and art students in their attitude towards JAMB CBT because the $p\text{-value} = 0.683 > 0.05$ level of significance.
2. That insignificant difference was revealed between the males and females science students attitude toward JAMB CBT the $p\text{-value} (0.707)$ is greater than 0.05 level of significance.
3. No significant difference between males and females students attitude on JAMB CBT because the $p\text{-value} = 0.082$ is greater than 0.05 level of significance.
4. That performance of the science and art students in their JAMB CBT is not significant because the $p\text{-value} (0.100) > 0.05$ level of significance.

4.7 Discussion on Finding

The study investigated the attitude and performance of level 100 students of Bauchi State University Gadau towards UTME JAMB CBT for the academic session 2016/2017. The findings

of the study have shown that the students' attitude and performance towards the UTME JAMB CBT between science and arts students, gender division and corresponding performance has been insignificant.

The result of the findings have revealed that the mean scores of the art students (55.39) is little greater than the mean scores of the science students (55.06). The t-test of the $df = 311$ $p\text{-value} = 0.685 > 0.05$ level of significance and that have shown that the difference in their mean scores is not significant, which indicated that the null hypothesis should not be rejected.

The findings agreed with research work of Amnah (2016) who had investigated students' attitudes towards Computer-Based Testing on chemistry course in Science College Jeddah, Saudi Arabia. The study involved (60) undergraduate students. Quantitative approach with survey questionnaire was adopted. The findings have shown that the majority of respondents have positive attitude towards CBT. Hence (83.7%) of the students said they were competent with the use of the computer.

The hypothesis two which stated that, there is no significant difference between males and females science students in their attitude towards JAMB computer-based testing had been similar with the study conducted by Irfan and Gicek(2018) who verified primary school students' attitudes towards computer-based testing and assessment in Turkey. The sample for the study was primary school students attending a computer-based testing and assessment application. The result of this study revealed that significant difference existed between attitudes of students from different schools. However, such difference was not found between students attitudes on their gender, grade level and participation period. According to the result of description and comparison the students have generally present positive attitudes ($x = 3.09 \pm .41$) towards computer-based testing. Moreover, this had periled the results presented by (Bernard, 1997,

Terzis and Economides, 2011). Considering students gender and school they were enrolled at, no significant difference was found between the attitude of boys ($x = 3.12 \pm .42$) and girls ($x = 3.09 \pm .39$).

In another research work conducted by Strickar wilder and Rock (2004) had assessed test takers' acceptance of computer based version of the test of English as a foreign language (TOEP) as well as the gender performances in the test and general attitude. A questionnaire was administered to the test takers at large testing centers in Buenos Aires, Cairo and Frankfurt. The findings of the study have shown a moderate positive attitude on the (TOEFL) and with no significant difference on the gender attitude and performance.

Similarly, in the works of Wingenback (2000) who had determined whether a statistical relationship existed between the academic achievement of students exam delivery method and their attitude in a computer application in agriculture course during spring semester (1999). A purposive sample of college of agriculture students ($n = 45$), had their computing application skills tested through traditional (paper and pencil) and electronic (e-mail) methods. The test result had revealed significant moderately positive associations between their academic achievement and exam delivery method. And agriculture student who took their exam using paper-and-pencil had significantly higher scores than did students who took it through an electronic version. However, no significant associations were found between academic achievement and students' attitude towards computer-based testing.

In a related study conducted by Gavinand Mathew(2005), on the performance and attitude of children in computer-based versus paper-based testing of the department of computer in the University of Central Lancashire, United Kingdom. A sample of twenty (20) children, age between 7 & 8 of mixed gender were tested on the commercial software application. The

children 'attitudes towards the software was captured through the use of a smarty-o-meter to indicate the level of preferences and performance based on their test scores. The result of the study have shown a strong correlation between the children's performance on the computer-based and paper-based testing ($\rho=0.647$, $p = 0.002$). The mean scores of paper-based test was $m=7.6$ $SD = 1.35$ which is not significantly different ($t = 1,674$, $df = 19$, $p = 0.11$) from that of the computer-based test $m = 7.78$, $SD = 1.39$, which is not significantly different ($t = 0.52$, $df = 18$, $p = 0.61$) to the girls $m = 7.45$, $SD = 1.36$.

Another work that agreed with this is the investigation from the American Association for the advancement of science, son Antonio Texas. Join studies by Joseph, Cari, and George(2007) they compare students' performance on paper-and-pencil and computer-based testing. A total of 34,068 students had participated in the test. All students were enrolling in a science class at the time of the testing. Student's performance on grade, gender class and primary language, the findings have revealed that average performance of elementary, middle and high school students for each modality. Elementary and middle school students scored lower on the CBT – AAAS than on the PPT. elementary students scored 2 logits lower ($MW u=128.944$, $p < .001$) and middle school students scored 1 logits lower ($MW u=2.706,071$ $p < .001$).

Scores on the CBT –TAO were not significantly difference from scores on the PPT for middle school students ($MW u= 2,812,702$, $p > .05$) and were marginally difference for elementary school students ($MW = 133,853$) high school students performed similarly on all format test ($KW u = 1.51$, $p > .05$).

The students' performance on gender have shown that both elementary and middle school males and females student performed lower on CBT-AAAS compare to the PPT on CBT-TAO while middle school males have performed slightly higher on the CBT-AAAS compare to their females

counterpart (difference in average performance = 0.05 logits, MW $u = 799,923$, $p < .05$). But in high school, the performance of both males and females of high school students did not vary with testing modality (KWH = 0.06, $p > .05$ and KWH= 1.54, $p > .05$ respectively).

The hypothesis four of the study which state that there is no significant differences between student performance in faculty of art and science. The result of finding revealed the mean score of science student is (202.65) which is greater than that of the art student of (198.82). And the t -calculated (1.984) which shows the novel hypothesis should not be rejected, as no significant difference was identified.

A corresponding work of odunton,Ojuawo and Oduntun(2015) they examined students' performance in paper and pencil (PPT) and computer based test (CBT) exam system or the department of computer science in federal polytechnic AroOgun state, Nigeria, where a sample of 50 students have been tasted. The result have shown the correlation coefficient of 0.087993 which is approximately 0.1 is obtained,which indicated a low positive correlation between the student performance in the CBT and PPT. Further analysis revealed the number of students who scored 200 and above, those who score 150-199 and who score less than 150. Where (4) students who wrote the PPT scored 200 and above, while that of the CBT is (5) students, 34 students who sat for PPT had scored between 150 -199, while those of CBT were 33 students. And (12) students scored 150 in both PPT and the CBT. In a similar work of Chua (2012) of the institute of education leadership, university MalaysiaKuala Lumpur, Malaysia, the study involved (140) Malaysia undergraduate students' teachers from a teacher training institute. There was (61) males (43.57) % and 79 females (56.43)% with an average of 21 years. The students perhaps were randomly selected from a student's teacher population ($w=219$) based on sample size determine table of Kreyicie and Morgan of (P2.05) confidence level. The test takers were enrolled

in a teacher education program (mathematics and science). They have the same level of computer application skills and received formal computer instruction in their academic curriculum. Based on their performance in biology monthly test and recommendation of their teachers, the student teachers with similar abilities into 3T equivalent groups each with four equivalent participants. The four participants in each group were assigned into four groups through a simple random sampling the four groups were then randomly assign two to control group and two to treatment groups of experiments study.

The result of split-plot ANOVA analysis (multivariate analysis of variance) using pillai's trace test. Indicate that no significant treatment effect were found in test performance for biology scores.

Institutions across the globe are migrating toward the use of Computer Based Test (CBT) to test students' knowledge. The advantages of using computer technology for educational assessment in a global sense have been recognized and these include lower administrative cost, time saving and less demand upon teachers among others.

Johnson and Green (2004) reviewed the assessment mode, the behavior as well as perception of the students being assessed because the assumption of comparability between CBT and PPT without proper investigation within that particular testing context is inappropriate. Some test takers reported that, it is more difficult to navigate back to about grades, attitudes about convenience, control and validity. Some examinees have a general anxiety about the computer itself, while others are more concerned about their level of computer experience (John et al., 2002). Some other technical issues in CBT that affect students' response to the designed questions are: Use of associated with the test mode (Leeson, 2006; Gallagher et al., 2000), with male examinees benefiting from the CBT format more than female examinees who showed

slightly poorer performance on CBTs. Though age was found to be associated with the test mode effect (Parshall and Kromrey, 1993). The study by Alexander et al. (2001) suggests no difference in the administration mode for age and class level. Consistent results were found in examinees' race associated with the test mode (Gallagher et al., 2000; Parshall and Kromrey, 1993). It was found that although the differences were quite small, some patterns were consistently found for some racial/ethnic groups, with African American examinees and Hispanic examinees benefiting from the CBT format (Gallagher et al., 2000). To explore whether family income was related to test mode effect, Pomplun and Custer (2005) examined the differences between format score means at grade level from K-3 for students eligible for free/reduced lunch and students not eligible for free/reduced lunch. Results showed that at every grade, the free/reduced lunch eligible students had larger score differences in favor of the PPT than for students not eligible for free/reduced lunch. In addition, these differences generally decreased as grade level increased, suggesting that family income and possibly computer familiarity may be related to PPT/CBT score differences and that the longer students are in school and exposed to computers, the smaller the score differences become.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

The chapter consists of summary, conclusions and recommendations from the study for further studies.

5.2 Summary

Chapter one examines the background to the study, study of objective, research hypotheses, significance of the study and scope and delimitation. The chapter being an integral part of the study gives elaborative explanation on the above mentioned aspects which serves as insight on the important matters which the study had worked on.

Chapter two deals with the conceptual background as well as the related literature review which the researcher had reviewed in the cause of the work. Those literatures expounded on the Computer-Based Testing, Test Administration, Test and its Types, Attitude of students towards computer-based testing and students' performance. Therefore, the chapter revealed the relevant literature on some similar research work by test expert, educators and researchers particularly on computer-based testing techniques and skills.

Chapter three entailed and highlighted on the Research Methodology, Research design as well as the population and sample size of the study. It also stated the data collection Instrument used by the researcher and data collection procedures employed and the statistical tool used to analyzed the data collected.

Chapter four comprised of data Analysis and Presentation; which elaborated the four hypotheses of the study tested graphically. The hypotheses have measured if there is no significant

difference on science and art students' attitude towards JAMB/CBT. Or if there is significant difference among the male and female of both science and art students. The summary of findings revealed no significant difference between the science and art students in their attitude between the males and females' attitude towards JAMB/CBT and the performance of science and arts students on JAMB/CBT is not significant.

Chapter five had summarized the research work and proffered some recommendation for the study and also recommended for further study work in some areas and aspect that the study did not cover. Chapter stated that the study examined the attitude of 100 level students of the Bauchi State University Gadau who sat for JAMB/CBT and admitted for 2016/2017 Academic Session. A sample of three hundred and thirteen (313) students from the faculty of science and arts were used for the study. The sampling technique used was multi-stage sampling and four hypotheses were formulated and tested using descriptive statistics and t-test device. The findings of the study have shown no significant difference on the science and art students as well as males and females attitudes towards the JAMB/CBT they have taken.

Meanwhile, some recommendation have been offered which include;

The government through its quality assurance offices should ensure an adequate computer training is maintained from the early primary to the senior secondary school level

The government should ensure establishment of adequate and accessible CBT centers nationwide as a panacea to perianal overcrowding being noticed during every CBT exercise

JAMB examination body should address the problems of the logistics and time management during CBT

The JAMB should create coordinates offices and desk officers of the CBT at every school for effective coordination of the CBT exercise

Finally, the researcher had recommended for further research work in many aspect of the CBT and its administration in the Nigerian educational system.

5.3 Conclusion

From the investigation analysis and finding of the study on the attitude of 100 level student of the Bauchi state university, Gadau toward the UTME/CBT. The researcher had found no significant difference on the student attitudes and performance toward the CBT both between the two faculties (science and art) and between the males and females.

5.4 Recommendations

5.4.1 Recommendations from the Study

The findings of the study form the basis for the following recommendations;

1. The government should maintain the CBT as a good examination device for entry into Nigeria higher institutional level
2. The government through its quality assurance offices should ensure an adequate computer training is maintained from the early primary to the senior secondary school level
3. The government should ensure establishment of adequate and accessible CBT centers nationwide as a panacea to perianal overcrowding being noticed during every CBT exercise
4. JAMB examination body should address the problems of the logistics and time management during CBT
5. The JAMB should create coordinates offices and desk officers of the CBT at every school for effective coordination of the CBT exercise

5.5 Recommendations for Further Study

- i. A similar study is recommended to cover levels 200, 300, and 400 in Bauchi state University Gadau
- ii. A similar study is recommended to cover faculties of social sciences in Bauchi state University Gadau
- iii. A similar study is recommended to cover faculties of Education in Bauchi state University Gadau
- iv. A similar study is recommended to cover College of Education, Azare
- vi. A similar study is recommended to cover Federal Poly Technic Bauchi
- vii. A similar study is recommended to cover AbubakarTafawaBalewa University Bauchi

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APPENDIX A

CBT ATTITUDE SCALE QUESTIONNAIRE

Dear respondents I am HabibuAlhaji student of Bayero University Kano conducting a research as part of the criteria for Master’s Degree in Education (Test and Measurement). The information given will be treated confidentially.

Section: A

Please kindly answer every statement

JAMB Reg. Number _____

Gender: Male Female

Faculty: Science Art

Section: B

Statements of option are provided below. Each statement has four (4) options. You are required to select by ticking an option which describes your opinion about the statement.

The options are as follows;

Strongly Disagree (SD)

Disagree (D)

Agree (A)

Strongly Agree (SA)

1. Computer-based testing is frightened
2. Taking the test on computer make me anxious
3. Computer-based testing is so complicated compare to paper and pencil test
4. Computer-based testing improves students’ performance
5. I reject computer-based testing as a testing technique
6. Students feel comfortable in computer-based testing
7. Computer-based testing eliminates all possible exams malpractice
8. Computer-based testing can affect some students performance
9. Computer-based testing enhances effective evaluation of students skills
10. Students responses on computer-based testing are more accurate and reliable
11. It provides standard method of administration
12. Computer-based testing is biased to students with deformity
13. Computer-based testing time factor affects students’ performance
14. Students with little knowledge of computer are bound to fail in Computer-based testing
15. Computer-based testing would stand as best standardized test
16. Students found Computer-based testing easy to answer than paper and pencil test
17. Any technical problem of the computer may affects students’ performance
18. Generally students’ behaviour towards Computer-based testing is negative
19. Students are more conversant and confident in paper and pencil testing than Computer-based testing
20. The anxiety being faced by some students while taking CBT may affect their Performance

SD	D	A	SA
SD	D	A	SA
SD	D	A	SA
SD	D	A	SA
SD	D	A	SA
SD	D	A	SA
SD	D	A	SA
SD	D	A	SA
SD	D	A	SA
SD	D	A	SA
SD	D	A	SA
SD	D	A	SA
SD	D	A	SA
SD	D	A	SA
SD	D	A	SA
SD	D	A	SA
SD	D	A	SA
SD	D	A	SA
SD	D	A	SA
SD	D	A	SA
SD	D	A	SA

APPENDIX B

A Pro-forma on UTME JAMB computer-based-testing scores for 100 level students of Bauchi State University Gadau, for 2016/2017 academic session

S/No.	Sex	UTME Scores	Course of Study	Code
1.	M	220	ENGLISH STUDIES	1
2.	M	208	ENGLISH STUDIES	1
3.	M	199	ENGLISH STUDIES	1
4.	M	195	ENGLISH STUDIES	1
5.	M	180	ENGLISH STUDIES	1
6.	M	188	ENGLISH STUDIES	1
7.	M	196	ENGLISH STUDIES	1
8.	M	203	ENGLISH STUDIES	1
9.	M	183	ENGLISH STUDIES	1
10.	M	196	ENGLISH STUDIES	1
11.	F	196	ENGLISH STUDIES	1
12.	F	215	ENGLISH STUDIES	1
13.	F	198	ENGLISH STUDIES	1
14.	M	211	ENGLISH STUDIES	1
15.	M	202	ENGLISH STUDIES	1
16.	M	200	ENGLISH STUDIES	1
17.	M	197	HAUSA STUDIES	1
18.	M	196	HAUSA STUDIES	1
19.	M	194	HAUSA STUDIES	1
20.	M	192	HAUSA STUDIES	1
21.	M	189	HAUSA STUDIES	1
22.	M	186	HAUSA STUDIES	1
23.	M	183	HAUSA STUDIES	1
24.	F	194	HAUSA STUDIES	1
25.	F	193	HAUSA STUDIES	1
26.	F	184	HAUSA STUDIES	1
27.	M	182	HAUSA STUDIES	1
28.	M	231	HAUSA STUDIES	1
29.	M	209	HAUSA STUDIES	1
30.	M	202	HAUSA STUDIES	1
31.	M	187	HAUSA STUDIES	1
32.	M	180	HAUSA STUDIES	1
33.	M	206	HAUSA STUDIES	1
34.	M	200	HAUSA STUDIES	1

35.	M	196	HAUSA STUDIES	1
36.	M	194	HAUSA STUDIES	1
37.	F	214	HAUSA STUDIES	1
38.	F	212	HAUSA STUDIES	1
39.	F	206	HAUSA STUDIES	1
40.	F	203	HAUSA STUDIES	1
41.	F	185	ISLAMIC STUDIES	1
42.	M	236	ISLAMIC STUDIES	1
43.	M	219	ISLAMIC STUDIES	1
44.	M	205	ISLAMIC STUDIES	1
45.	M	204	ISLAMIC STUDIES	1
46.	M	200	ISLAMIC STUDIES	1
47.	M	197	ISLAMIC STUDIES	1
48.	M	194	ISLAMIC STUDIES	1
49.	M	191	ISLAMIC STUDIES	1
50.	M	190	ISLAMIC STUDIES	1
51.	M	188	ISLAMIC STUDIES	1
52.	M	181	ISLAMIC STUDIES	1
53.	F	200	ISLAMIC STUDIES	1
54.	F	194	ISLAMIC STUDIES	1
55.	F	183	ISLAMIC STUDIES	1
56.	M	241	ISLAMIC STUDIES	1
57.	M	221	ISLAMIC STUDIES	1
58.	M	216	ISLAMIC STUDIES	1
59.	M	214	ISLAMIC STUDIES	1
60.	M	208	ADULT EDUCATION	1
61.	M	202	ADULT EDUCATION	1
62.	M	201	ADULT EDUCATION	1
63.	M	200	ADULT EDUCATION	1
64.	M	197	ADULT EDUCATION	1
65.	M	194	ADULT EDUCATION	1
66.	M	192	ADULT EDUCATION	1
67.	M	188	ADULT EDUCATION	1
68.	M	186	ADULT EDUCATION	1
69.	F	198	ADULT EDUCATION	1
70.	F	189	ADULT EDUCATION	1
71.	F	182	ADULT EDUCATION	1
72.	F	180	MICRO-BIOLOGY	2
73.	M	228	MICRO-BIOLOGY	2

74.	M	213	MICRO-BIOLOGY	2
75.	M	208	MICRO-BIOLOGY	2
76.	M	201	MICRO-BIOLOGY	2
77.	M	194	MICRO-BIOLOGY	2
78.	M	184	MICRO-BIOLOGY	2
79.	M	216	MICRO-BIOLOGY	2
80.	M	205	MICRO-BIOLOGY	2
81.	M	198	MICRO-BIOLOGY	2
82.	M	188	MICRO-BIOLOGY	2
83.	M	260	MICRO-BIOLOGY	2
84.	M	234	MICRO-BIOLOGY	2
85.	M	217	MICRO-BIOLOGY	2
86.	M	214	MICRO-BIOLOGY	2
87.	M	212	MICRO-BIOLOGY	2
88.	M	209	MICRO-BIOLOGY	2
89.	M	205	MICRO-BIOLOGY	2
90.	M	204	MICRO-BIOLOGY	2
91.	M	200	MICRO-BIOLOGY	2
92.	M	196	MICRO-BIOLOGY	2
93.	M	220	MICRO-BIOLOGY	2
94.	F	241	MICRO-BIOLOGY	2
95.	F	223	MICRO-BIOLOGY	2
96.	F	250	MICRO-BIOLOGY	2
97.	F	240	MICRO-BIOLOGY	2
98.	F	233	MICRO-BIOLOGY	2
99.	M	211	MICRO-BIOLOGY	2
100.	M	203	MICRO-BIOLOGY	2
101.	F	229	MICRO-BIOLOGY	2
102.	F	220	MICRO-BIOLOGY	2
103.	F	217	MICRO-BIOLOGY	2
104.	M	187	MICRO-BIOLOGY	2
105.	M	206	MICRO-BIOLOGY	2
106.	M	181	MICRO-BIOLOGY	2
107.	M	184	MICRO-BIOLOGY	2
108.	M	185	MICRO-BIOLOGY	2
109.	M	188	MICRO-BIOLOGY	2
110.	M	189	MICRO-BIOLOGY	2
111.	M	190	MICRO-BIOLOGY	2
112.	M	192	MICRO-BIOLOGY	2

113.	M	195	MICRO-BIOLOGY	2
114.	M	228	MICRO-BIOLOGY	2
115.	M	212	MICRO-BIOLOGY	2
116.	M	189	MICRO-BIOLOGY	2
117.	M	211	MICRO-BIOLOGY	2
118.	M	178	MICRO-BIOLOGY	2
119.	M	206	MICRO-BIOLOGY	2
120.	M	196	MICRO-BIOLOGY	2
121.	M	193	MICRO-BIOLOGY	2
122.	M	190	MICRO-BIOLOGY	2
123.	M	184	MICRO-BIOLOGY	2
124.	M	187	MICRO-BIOLOGY	2
125.	M	186	MICRO-BIOLOGY	2
126.	F	204	MICRO-BIOLOGY	2
127.	F	185	MICRO-BIOLOGY	2
128.	F	180	MICRO-BIOLOGY	2
129.	M	262	MICRO-BIOLOGY	2
130.	M	247	MICRO-BIOLOGY	2
131.	M	189	MICRO-BIOLOGY	2
132.	M	197	MICRO-BIOLOGY	2
133.	M	200	MICRO-BIOLOGY	2
134.	M	186	MICRO-BIOLOGY	2
135.	M	232	MICRO-BIOLOGY	2
136.	M	232	MICRO-BIOLOGY	2
137.	M	225	MICRO-BIOLOGY	2
138.	M	222	MICRO-BIOLOGY	2
139.	M	218	MICRO-BIOLOGY	2
140.	M	217	MICRO-BIOLOGY	2
141.	M	215	MICRO-BIOLOGY	2
142.	M	212	MICRO-BIOLOGY	2
143.	M	211	MICRO-BIOLOGY	2
144.	M	210	MICRO-BIOLOGY	2
145.	M	208	MICRO-BIOLOGY	2
146.	M	208	MICRO-BIOLOGY	2
147.	M	207	MICRO-BIOLOGY	2
148.	M	205	MICRO-BIOLOGY	2
149.	M	202	MICRO-BIOLOGY	2
150.	M	200	MICRO-BIOLOGY	2
151.	M	198	MICRO-BIOLOGY	2

152.	M	197	MICRO-BIOLOGY	2
153.	F	180	MICRO-BIOLOGY	2
154.	F	181	MICRO-BIOLOGY	2
155.	F	182	MICRO-BIOLOGY	2
156.	F	185	MICRO-BIOLOGY	2
157.	F	186	MICRO-BIOLOGY	2
158.	F	187	MICRO-BIOLOGY	2
159.	F	189	MICRO-BIOLOGY	2
160.	F	190	MICRO-BIOLOGY	2
161.	F	193	MICRO-BIOLOGY	2
162.	F	194	MICRO-BIOLOGY	2
163.	F	196	MICRO-BIOLOGY	2
164.	F	198	MATHEMATICS	2
165.	F	199	MATHEMATICS	2
166.	M	230	MATHEMATICS	2
167.	M	218	MATHEMATICS	2
168.	M	217	MATHEMATICS	2
169.	M	212	MATHEMATICS	2
170.	M	198	MATHEMATICS	2
171.	M	209	MATHEMATICS	2
172.	M	209	MATHEMATICS	2
173.	M	206	MATHEMATICS	2
174.	M	204	MATHEMATICS	2
175.	M	202	MATHEMATICS	2
176.	M	200	MATHEMATICS	2
177.	M	198	MATHEMATICS	2
178.	M	197	MATHEMATICS	2
179.	M	199	MATHEMATICS	2
180.	M	194	MATHEMATICS	2
181.	M	193	MATHEMATICS	2
182.	M	192	MATHEMATICS	2
183.	M	191	MATHEMATICS	2
184.	M	189	MATHEMATICS	2
185.	M	187	MATHEMATICS	2
186.	M	186	MATHEMATICS	2
187.	M	184	MATHEMATICS	2
188.	F	189	MATHEMATICS	2
189.	F	187	MATHEMATICS	2
190.	F	186	MATHEMATICS	2

191.	F	184	MATHEMATICS	2
192.	F	184	MATHEMATICS	2
193.	F	182	MATHEMATICS	2
194.	F	180	MATHEMATICS	2
195.	M	240	MATHEMATICS	2
196.	M	179	MATHEMATICS	2
197.	M	194	MATHEMATICS	2
198.	M	192	MATHEMATICS	2
199.	M	188	MATHEMATICS	2
200.	M	186	MATHEMATICS	2
201.	M	184	MATHEMATICS	2
202.	F	205	MATHEMATICS	2
203.	F	182	MATHEMATICS	2
204.	M	219	MATHEMATICS	2
205.	M	208	MATHEMATICS	2
206.	M	200	MATHEMATICS	2
207.	M	196	MATHEMATICS	2
208.	M	194	MATHEMATICS	2
209.	M	194	MATHEMATICS	2
210.	M	191	MATHEMATICS	2
211.	M	189	MATHEMATICS	2
212.	M	186	MATHEMATICS	2
213.	M	180	MATHEMATICS	2
214.	F	188	MATHEMATICS	2
215.	F	200	MATHEMATICS	2
216.	F	220	MATHEMATICS	2
217.	F	222	MATHEMATICS	2
218.	M	215	MATHEMATICS	2
219.	M	214	MATHEMATICS	2
220.	M	208	MATHEMATICS	2
221.	M	200	MATHEMATICS	2
222.	M	195	MATHEMATICS	2
223.	M	190	MATHEMATICS	2
224.	M	186	MATHEMATICS	2
225.	F	203	MATHEMATICS	2
226.	M	257	MATHEMATICS	2
227.	M	241	MATHEMATICS	2
228.	M	234	MATHEMATICS	2
229.	M	229	MATHEMATICS	2

230.	M	225	MATHEMATICS	2
231.	M	223	MATHEMATICS	2
232.	M	222	MATHEMATICS	2
233.	M	220	MATHEMATICS	2
234.	M	217	MATHEMATICS	2
235.	M	215	MATHEMATICS	2
236.	M	214	MATHEMATICS	2
237.	M	213	MATHEMATICS	2
238.	M	197	MATHEMATICS	2
239.	M	199	MATHEMATICS	2
240.	M	211	MATHEMATICS	2
241.	M	209	MATHEMATICS	2
242.	M	208	MATHEMATICS	2
243.	M	208	MATHEMATICS	2
244.	M	205	MATHEMATICS	2
245.	M	204	MATHEMATICS	2
246.	M	202	MATHEMATICS	2
247.	F	180	MATHEMATICS	2
248.	F	181	MATHEMATICS	2
249.	F	182	MATHEMATICS	2
250.	F	183	MATHEMATICS	2
251.	F	184	MATHEMATICS	2
252.	F	185	MATHEMATICS	2
253.	F	186	MATHEMATICS	2
254.	F	187	MATHEMATICS	2
255.	F	187	MATHEMATICS	2
256.	F	189	MATHEMATICS	2
257.	M	244	MATHEMATICS	2
258.	M	210	MATHEMATICS	2
259.	M	203	MATHEMATICS	2
260.	M	198	MATHEMATICS	2
261.	M	198	MATHEMATICS	2
262.	M	196	MATHEMATICS	2
263.	M	195	MATHEMATICS	2
264.	M	195	MATHEMATICS	2
265.	M	194	MATHEMATICS	2
266.	M	184	MATHEMATICS	2
267.	F	209	MATHEMATICS	2
268.	F	187	MATHEMATICS	2

269.	F	185	MATHEMATICS	2
270.	M	233	MATHEMATICS	2
271.	M	223	MATHEMATICS	2
272.	M	217	MATHEMATICS	2
273.	M	216	MATHEMATICS	2
274.	M	214	MATHEMATICS	2
275.	M	207	MATHEMATICS	2
276.	M	202	MATHEMATICS	2
277.	M	197	MATHEMATICS	2
278.	M	195	MATHEMATICS	2
279.	M	186	MATHEMATICS	2
280.	M	244	MATHEMATICS	2
281.	M	225	MATHEMATICS	2
282.	M	215	MATHEMATICS	2
283.	M	211	MATHEMATICS	2
284.	M	209	MATHEMATICS	2
285.	M	207	MATHEMATICS	2
286.	M	206	MATHEMATICS	2
287.	M	202	MATHEMATICS	2
288.	M	199	MATHEMATICS	2
289.	M	197	MATHEMATICS	2
290.	M	194	MATHEMATICS	2
291.	M	191	MATHEMATICS	2
292.	M	190	MATHEMATICS	2
293.	M	187	MATHEMATICS	2
294.	M	185	MATHEMATICS	2
295.	M	182	MATHEMATICS	2
296.	F	234	MATHEMATICS	2
297.	F	224	MATHEMATICS	2
298.	F	215	MATHEMATICS	2
299.	F	211	MATHEMATICS	2
300.	F	209	MATHEMATICS	2
301.	F	207	MATHEMATICS	2
302.	F	200	MATHEMATICS	2
303.	F	198	MATHEMATICS	2
304.	F	196	MATHEMATICS	2
305.	F	188	MATHEMATICS	2
306.	F	186	MATHEMATICS	2
307.	F	182	MATHEMATICS	2

308.	F	216	MATHEMATICS	2
309.	F	181	MATHEMATICS	2
310.	F	180	MATHEMATICS	2
311.	F	180	MATHEMATICS	2
312.	M	213	MATHEMATICS	2
313.	M	198	MATHEMATICS	2

APPENDIX C

Bayero University, Kano Department of Education, letter of introduction

Departmental Letter of Authority for Research

Department of Education
P.M.B. 3011
Kano State
Head Prof: Auwal M. Lawal
Email: auwalboss@yahoo.com
Date _____



Dear Sir,

LETTER OF INTRODUCTION

This is to certify that: HABIBU ALHAJI with Registration
Number: SRS/MED/00176/14 is our student in the Department of Education
Bayero University, Kano.

Kindly render any assistance he/she may require from you.

DEPARTMENT OF EDUCATION
BAYERO UNIVERSITY, KANO
DATE: 11/11/2014
Prof. Auwal Lawal
Head of Department

APPENDIX D

A table for determining sample size

TABLE I
Table for Determining Sample Size from a Given Population

N	S	N	S	N	S
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	100000	384

Note.—N is population size.
S is sample size.

APPENDIX E

Breakdown of Attitude scale scores for the sample students

	Art	Science																				
S/No	Gender	Gender	1	2	3	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1.	1		4	1	3	4	4	1	1	4	1	3	1	2	1	4	4	1	2	2	3	2
2.	1		3	3	4	3	2	3	3	1	3	2	3	2	2	4	3	4	3	4	3	4
3.	1		3	3	1	3	2	3	3	3	3	4	3	4	3	1	3	3	2	2	4	3
4.	1		3	2	3	4	2	3	4	2	3	3	3	2	2	2	4	4	2	2	3	2
5.	1		3	3	3	4	4	3	1	4	3	3	4	2	3	3	3	4	4	3	3	3
6.	1		2	1	1	3	3	4	4	1	4	3	4	2	2	3	3	3	3	3	3	2
7.	1		3	4	4	4	2	2	1	4	2	4	2	2	1	4	2	2	4	2	2	3
8.	1		4	1	4	4	4	1	2	4	4	4	4	4	4	4	4	1	4	4	1	4
9.	1		4	4	4	4	4	1	2	4	3	4	4	3	1	4	3	2	3	4	4	4
10.	1		3	2	2	3	3	3	2	3	3	3	2	2	3	3	3	2	2	2	3	2
11.	1		3	2	2	3	3	2	3	2	3	2	3	4	2	4	1	2	2	4	4	1
12.	1		2	4	3	3	3	1	3	4	2	3	4	3	2	4	1	3	3	4	1	3
13.	1		4	4	4	3	3	3	2	3	3	2	4	2	3	3	4	2	3	3	3	3
14.	1		2	2	4	2	2	3	4	3	4	2	3	3	2	3	2	2	2	4	4	4
15.	1		1	2	2	3	1	4	4	1	3	4	4	2	1	2	4	4	4	1	1	1
16.	1		3	1	2	3	3	1	3	3	3	1	3	2	3	2	2	3	2	2	3	3
17.	1		3	3	4	4	3	1	4	4	3	4	4	3	4	4	3	4	4	3	1	3
18.	1		4	3	2	3	2	2	3	3	2	3	3	2	3	3	3	3	3	3	3	3
19.	1		2	3	4	4	4	3	3	4	3	2	3	3	3	2	3	3	3	2	3	3
20.	1		2	3	3	3	4	3	3	3	2	2	2	2	3	3	3	4	2	2	3	3
21.	1		3	2	3	3	3	3	3	3	2	2	3	3	2	3	2	3	2	2	2	3
22.	1		1	3	4	4	3	3	3	4	4	3	2	2	3	3	3	4	3	4	4	4
23.	1		2	2	2	4	1	4	4	3	4	4	3	3	3	3	4	4	3	2	1	2
24.	1		3	2	3	3	2	3	2	3	3	2	3	2	3	3	2	3	2	2	2	3
25.	1		1	2	2	4	2	4	4	3	3	3	3	2	4	3	3	2	2	3	3	2
26.	1		3	3	4	4	2	4	3	2	4	3	3	4	2	3	4	4	4	2	2	2
27.	1		1	2	2	4	3	4	4	2	3	3	3	2	2	2	3	3	3	2	2	2
28.	1		3	2	2	3	4	1	1	1	4	1	1	4	3	1	4	3	4	1	1	1
29.	1		3	3	1	3	2	3	3	3	2	2	3	2	3	2	2	3	2	3	1	2

30.	1		1	4	1	1	3	4	2	4	4	4	2	1	4	1	2	4	2	1	4	4
31.	1		1	2	2	3	3	2	3	2	3	2	3	4	2	4	1	2	2	4	4	1
32.	1		2	3	1	4	1	2	2	4	3	2	4	2	3	3	3	2	2	2	2	4
33.	1		3	2	4	3	1	4	4	3	3	3	3	2	4	4	1	4	3	2	2	3
34.	1		1	4	2	3	3	3	4	3	2	3	2	3	2	3	3	3	3	3	4	4
35.	1		4	2	2	4	2	4	4	1	3	3	3	1	3	3	2	4	2	2	2	2
36.	1		3	3	3	3	2	3	3	2	3	3	3	3	2	2	3	3	2	3	3	3
37.	2		3	2	3	3	2	3	2	3	2	3	2	3	2	3	3	3	3	3	3	3
38.	2		2	2	4	1	3	4	3	3	2	4	3	3	4	4	4	4	4	4	3	4
39.	2		3	4	3	4	2	2	3	3	4	2	4	2	2	4	3	2	2	3	3	3
40.	2		3	3	3	2	3	2	3	3	3	3	3	2	3	3	3	2	3	3	3	3
41.	2		3	3	3	3	2	2	3	3	3	2	3	2	3	3	2	2	2	3	2	2
42.	2		3	4	2	3	1	1	2	3	3	3	3	2	3	1	3	2	1	2	1	3
43.	2		3	2	2	4	2	2	1	1	2	4	4	4	1	2	4	4	4	3	3	4
44.	2		3	2	2	3	3	3	3	2	3	3	3	2	2	3	3	3	2	3	3	3
45.	2		3	3	3	3	3	2	3	1	2	3	3	3	3	3	2	2	2	3	3	3
46.	2		1	2	2	3	3	3	3	2	3	4	4	4	3	4	4	3	2	1	3	1
47.	2		2	2	4	2	2	4	4	4	3	3	2	3	4	4	3	2	4	1	3	4
48.	2		3	2	4	4	3	2	2	3	4	3	4	3	2	3	3	3	3	4	3	2
49.	2		3	2	4	4	2	3	4	3	2	4	3	3	3	4	2	3	3	1	2	3
50.	2		3	4	3	3	2	4	3	2	3	2	3	2	3	3	2	3	2	3	3	4
51.	2		2	1	1	3	1	3	1	1	3	1	3	1	1	3	1	3	3	2	3	3
52.	2		3	2	3	3	3	3	2	4	3	2	2	3	3	3	4	2	3	3	3	2
53.	2		3	2	3	4	2	1	2	3	3	1	4	2	3	1	2	3	4	2	3	4
54.	2		1	4	3	4	2	3	3	2	2	3	4	3	4	4	3	3	3	2	2	3
55.	2		2	2	3	3	2	3	3	1	4	3	4	2	2	1	4	4	2	3	3	1
56.	2		2	3	3	2	2	2	2	3	2	3	3	4	3	3	2	3	3	2	3	3
57.	2		2	2	3	3	2	2	3	2	3	3	3	3	2	3	2	2	3	3	3	3
58.	2		1	2	1	4	1	4	4	1	4	4	4	2	3	3	4	4	3	3	3	3
59.	2		1	2	1	4	1	4	4	1	4	4	4	2	3	3	4	4	3	3	3	3
60.	2		2	2	2	1	2	1	2	3	1	2	1	2	1	3	3	3	2	1	2	2
61.	2		3	3	4	4	2	2	4	2	3	2	3	4	3	4	2	1	2	3	4	2
62.	2		3	3	4	2	2	3	3	2	2	4	2	2	4	1	3	2	4	2	3	3
63.	2		3	4	2	3	1	3	2	4	1	2	1	2	4	1	3	2	4	1	4	1
64.	2		1	4	3	4	1	4	4	1	4	4	4	4	3	3	4	4	4	2	4	3
65.	2		1	4	3	4	1	4	4	1	4	4	4	4	3	2	4	4	4	2	4	3
66.	2		3	2	1	4	2	2	4	4	3	2	3	1	1	3	4	1	3	4	4	1
67.	2		4	4	4	4	1	4	2	1	4	3	2	2	2	4	3	4	1	1	3	4
68.	2		4	4	4	4	1	3	4	1	4	3	3	2	2	3	3	1	4	4	4	4
69.	2		2	2	3	3	4	2	4	4	3	4	3	2	3	4	3	2	2	3	4	1
70.	2		3	4	4	4	2	2	3	3	4	1	2	3	4	2	1	3	2	3	4	4

71.	2		2	3	3	3	2	2	4	2	4	3	3	4	2	3	4	3	4	4	3	3
72.		1	3	2	2	3	3	3	2	2	2	3	2	2	2	2	3	3	2	3	2	3
73.		1	2	3	3	4	1	3	4	4	4	4	4	4	3	3	4	2	3	1	4	4
74.		1	1	1	3	1	2	1	3	2	3	1	1	3	3	2	1	1	2	2	1	3
75.		1	4	3	4	2	3	1	3	2	4	4	2	3	4	3	3	4	3	2	3	4
76.		1	3	3	2	3	2	2	2	3	4	2	2	2	3	4	2	3	4	2	2	4
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