

Approaches to Conducting Scientific Research in Education, Arts and the Social Sciences

Dr. Nwachukwu Prince OLOLUBE¹ and Dr. Peter James KPOLOVIE²

¹Department of Educational Foundations and Management, Faculty of Education, University of Education, P.M.B. 5047, Port Harcourt, Nigeria.

²Department of Educational Psychology, Faculty of Education, University of Port Harcourt, P.M.B. 5323, Port Harcourt, Nigeria.

Downloaded 3 June, 2012

Accepted 23 June, 2012

This article examines a number of methodologies used in conducting effective scientific research. It begins with an introduction to the significance of research methodology, followed by a description of research design, population, sampling, and sample size; it also involves a concise description of types of research instruments. The validity and reliability of effective investigations, as well as data collection methods are highlighted as is the need for use of both qualitative and quantitative techniques. This present study employs a qualitative research design that used document analysis to evaluate approaches to research methods. The authors describe as holistic a representation as space could allow of the components of the themes of this study. This study suggests that combining qualitative and quantitative methods adds rigor, breadth and depth to a scientific study.

Keywords: Scientific research, research design, methodology, qualitative, quantitative.

INTRODUCTION

As we entered the 21st century, current perspectives on scientific writings shifted and researchers began to emerge in geometric progression. While methodological approaches continued to favour scientific writings, the behaviours and interactions of researchers began to change, either directly or indirectly. Researchers want their respondents to be able to share their own stories and the perceptions that reflect their day-to-day experiences. These reflections can prove to be quite useful qualitative and quantitative data for researchers [1]. Given these changes, decisions about the best kind of investigative approach to adopt have come to occupy the thoughts of many researchers [2].

Approaches to conducting scientific research refer to the range of methods used in research to gather data,

which is then used as a basis for inference, interpretation, explanation and prediction [3,4]. Traditionally, the word methodology encompassed those techniques associated with the positivistic model of eliciting responses to predetermined questions, recording measurements, describing phenomena and performing experiments [5]. However, while the term methodology is sometimes applied to the methods and techniques used by social science researchers, the methodological aspects of a study more accurately refer to the philosophy of science embedded both within these methods and within a researcher's approach to data collection and analysis [6].

Research methodology is used to describe and analyze the research processes, throwing light on their limitations and resources, clarifying their presuppositions and consequences, relating their potentialities to the twilight zone at the frontiers of knowledge. It ventures generalizations from the success of particular techniques, suggests new applications, unfolds the specific bearing of logical and metaphysical principles on concrete problems, and offers new formulations [7,8].

According to Robertson [9], research methodology is a system of rules and principles that guide scientific

*Corresponding Author's E-mail:
lololubepince@yahoo.com

investigation, provide guidelines for collecting evidence about what takes place and for explaining why it takes place, and accomplishes such in a way that enables other researchers to verify the findings. It is perceived as an organized method employed by a researcher towards the making and completion of a research goal. Generally, the method(s) used must be scientific and specific to the questions and issues at hand, which should also be straightforward and generalizable to the research, but relevant to other future researchers. The idea here is that research methodology establishes a form and relation toward the making of a research plan and contributing to the organized frame of a research goal [10,11].

Research methodology can best be perceived as the process of arriving at dependable solutions to problems through a planned and systematic collection, analysis, and interpretation of data. It is the most important tool for advancing knowledge, promoting progress, and enabling people to relate more effectively to their environment, accomplish purposes and resolve conflicts. In sum, research methods are the means of formulating research data and outcomes [10] and the aim of a research methodology could be inferred as helping us to comprehend, in the broadest terms possible, both the process of a scientific inquiry and the product itself.

Purpose of this Study

This study is based on the premise that researchers often find it difficult to choose the appropriate research method to adopt when carrying out a study. It is hoped that the researcher's own experience and reflection on topical research issues will contribute to a set of clear, flexible guidelines for new researchers preparing to write academic papers using qualitative and quantitative methods. The desire to write this paper stems from an interest in sharing experiences with other faculty and researchers so that experienced and inexperienced researchers alike will be better prepared to sort out some of the confusion and deal with the issues they confront as part of what can be a lonely, uphill scientific writing expedition.

METHODOLOGY/PROCEDURES

In this study, we employed a qualitative research design that used document analysis to evaluate approaches to research methods. This approach was used because it enabled me to obtain and interpret information, and its meaning and experiences from a broad standpoint. We used document materials to evaluate approaches to research methodologies. Documents materials are valuable sources of data about research methodologies. The categories of documents used in this study include both primary and secondary sources. Primary sources include reports and publications that have first-hand

information on the theme of this paper. Secondary sources include textbooks, journals, and reports of research carried out by other investigators, relevant to this topic. Primary and secondary documents such as these are often generated contemporaneously with the events they refer to. Hence, they are less likely to be subject to memory decay or memory distortion as compared to data obtained from an interview [2]. When seeking out the aforementioned materials, there was a need to assess their validity and value to this research. To some extent such assessments are contingent on the agenda and approach of the research [2,3,6,12,13]. All the materials used for this study were validated using Scott's [14] overlapping validity criteria of authenticity, credibility, representativeness and meaning.

Conceptualization

Research Design

One of the goals of science is description [15] and most social sciences and education research methods are descriptive [5,16]. Descriptive research according to Best [17] often analyses the conditions or relationships that exist; practices that prevail; beliefs, point of views, or attitudes that are held; processes that are going on; efforts that are felt; or trends that are developing. According to Hale [15], descriptive research methods are pretty much as they sound—they *describe* situations. They do not make accurate predictions, and they do not determine cause and effect. Sometimes, descriptive research is concerned with how what exists is related to some preceding event that has influenced or affected the present condition or event. In other words, descriptive research is primarily concerned with portraying the present. While it is not technically a research method, as it represents many approaches to data collection grouped together, each of these methods endeavours to depict the present position of a given situation [18,19].

The process of descriptive research design goes beyond the mere collection and tabulation of factual data. It is not only a structural attempt to obtain facts and opinions about the current condition of things, but involves elements of comparison and relationships of one kind or another. Its focus is on the discovery of meaning. Descriptive research may not answer all of a researcher's questions, but it provides useful data which can serve as a basis for further research using more rigorous experimental and non-experimental design [10].

The fundamental purpose of research is to develop new knowledge about the phenomenon under study [12,20]. More precisely, the purpose of a research is to develop confidence that a particular knowledge claim about a phenomenon is true or false. This is because researchers attempt to design a study that will yield strongest possible evidence to support or refute a knowledge claim. The research design of a study is the

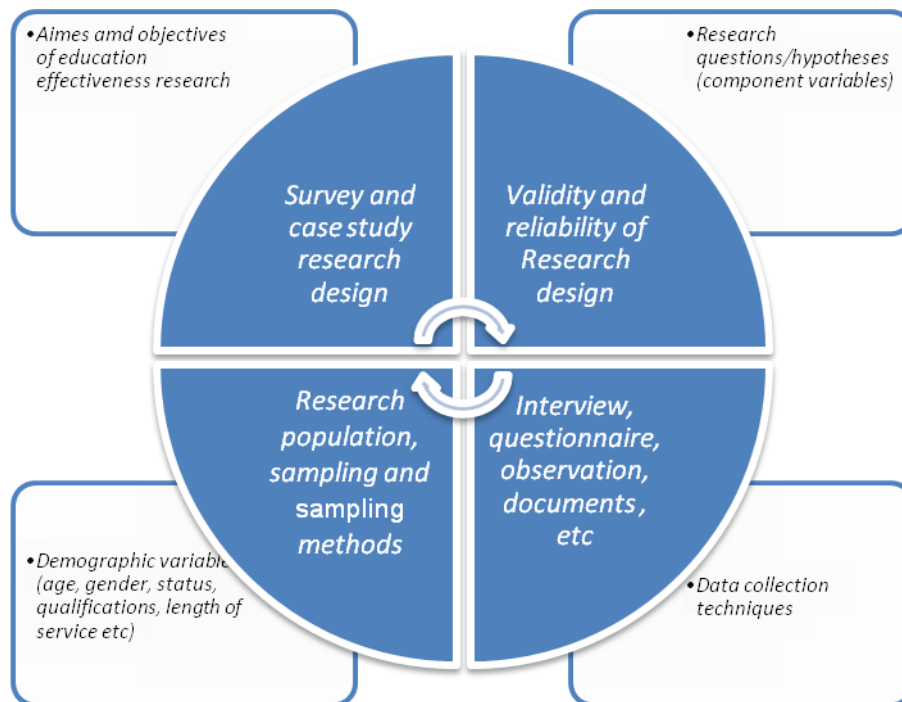


Figure 1: Research design summarized. Adapted from Ololube [23].

logical sequence that connects to a study's initial research questions and hypotheses to its data and ultimately to its conclusions [21]. It involves the structuring of investigation aimed at identifying variables and their relationships to one another [22,67-70] (figure 1). It is thus logical to include specific research design features from the broad empirical and theoretical perspectives so as to assess the quality and verify the intended study.

Researchers sometimes mistakenly come to believe that research planning or design is unnecessary [24]. Conversely, Kerlinger [25] points out that research design sets up the framework for "adequate" tests of the relations among variables. The choosing of a research design that is relevant to a study is critical because the plan, structure and strategy conceived to obtain answers to a study's research questions and hypotheses affect the resulting significance of the research or findings. Design tells us, in a sense, what observations to make, how to make them, and how to analyze the quantitative representations of the observations. Strictly speaking, design does not "tell" us precisely what to do, but rather "suggests" the directions of observation making and analysis. An adequate design "suggests" for example, how many observations should be made, and which variables are active and which are attribute variables. We can then act to manipulate the active variables and to categorize the attribute variables. A design also suggests what type of statistical analysis to use and outlines possible conclusions to be drawn from the research

analysis [25].

Survey Research

Survey research is designed to collect systematic descriptions of existing phenomena in order to describe or explain what is going on. According to Palmquist [26], surveys represent one of the most common types of quantitative social science research. In survey research, the researcher selects a sample of respondents from a population and administers a standardized questionnaire to them. The questionnaire, or survey, can be a written document that is completed by the person being surveyed, an online questionnaire, a face-to-face interview, or a telephone interview. Using surveys, it is possible to collect data from large or small populations (sometimes referred to as the universe of a study).

Survey research is a systematic method of data collection [27]. The purpose of survey research is to describe specific characteristics of a large group of persons, objects, or institutions [28]. Surveys are one of the most commonly used methods of descriptive research in education and other behavioural sciences. This method is frequently employed to indicate prevailing conditions or particular trends. It is not concerned with characteristics of individuals as individuals, but it is concerned with providing information about population variables [18]. Nworgu [29] notes that in survey research a group of people or items are studied by collecting and analyzing data from only a few people or items considered

representative of the entire group. Survey researchers use a “flow plan” or “chart” to outline the design and subsequent implementation of a survey. The flow plan starts with the objectives of the survey, lists each step to be taken and ends with the final report [29]. For Kerlinger [25], a survey or study design, or the flow plan or chart of survey research, is a check of the reliability and validity of the sample and data gathering methods.

Most education effectiveness research involves descriptive surveys. These studies are often aimed at collecting and describing data in a systematic manner, including the characteristics or features of a given population. These types of studies look to describe certain variables in relation to the population [7]. As correlational descriptive surveys, they seek to establish what relationship exists between two or more variables specific to the research questions and hypotheses and as articulated in the perception of respondents [8]. For example, the descriptive survey method may be used to seek and elicit the opinion of teachers and heads of departments on whether professional training has a positive effect on teachers’ job effectiveness.

Survey research has contributed much to the methodology of the social sciences and education. The most important contribution has perhaps been the rigorous sampling procedures, the overall design and implementation of the design, the unambiguous definition and specification of research problems, and the analysis of data. It allows for standardization and uniformity both in the questions asked and in the method of approaching subjects, making it far easier to compare and contrast answers by respondent groups. It also ensures higher reliability than some other techniques [30].

Case Study Research

The case study approach has been noted as suitable for theory creation or cases in which the theory is at an early formative stage and for sticky practice-based problems where the experiences of the actors are important and the context of action is critical [31-34]. Benbasat *et al.* [31], in a comprehensive characterization that draws from a variety of sources, described the case study as a research approach that examines a phenomenon in its natural settings, employing multiple methods of data collection to gather information from one or few entities (people, groups, or organisations) on a phenomenon that is not clearly evident at the outset.

In support of the case study, Yin [21], in his popular book on case study research, considered case studies appropriate to a contemporary phenomenon or event in its real-life context, especially when the boundaries between the phenomenon and the context are not evident. In a case study, the researcher does not or cannot control or manipulate the situation. Case study methodology also does not necessarily require step-by-step data analysis and this allows for various interpretations of research data. Admittedly, this interpretation could

introduce bias and affect the outcome of the research. However, the case study method allows for the use of multiple methods of data collection such as interviews, questionnaires, documentary reviews, archival records and direct participant observations [21,35] for triangulation. The triangulation of data sources can reduce the problem of bias and greatly increase validity [5].

According to the research methods glossary, in a research context, triangulation describes the use of a variety of data sources or methods to examine a specific phenomenon either simultaneously or sequentially in order to produce a more accurate account of the phenomenon under investigation. Triangulation means the collecting of information from a diverse range of individuals and settings using a variety of methods. This strategy reduces the risk of chance associations and of systematic biases due to a specific method and allows a better assessment of the generality of the explanations that one develops [36]).

In another instance, Palmquist [26] examined case study research and considered this method as drawing on the interplay of all variables in order to provide as complete an understanding of an event or situation as possible. This type of understanding is arrived at through a process known as ‘thick description’, which involves an in-depth description of the entity being evaluated, the circumstances under which it is used, the characteristics of the people involved in it, and the nature of the community in which it is located. Unlike quantitative methods, surveys (which often focus on the questions of who, what, where, how much, and how many), and archival analysis, which situates the participant in some form of historical context, case studies are the preferred strategy when how or why questions are asked. Likewise, they are the preferred method when the researcher has little control over the events and when there is a contemporary focus within a real life context. In addition, and unlike more specifically directed experiments, case studies are best suited to a problem in need of a holistic understanding of the event or situation in question using inductive logic—reasoning from specific to more general terms.

Research Population

In a general sense, a research population includes all members or elements, be they human beings, animals, trees, objects, or events of a well-defined group. It defines the limits within which the research findings are applicable. In other words, it should be defined in such a way that the result of the investigation is generalizable unto itself. A research population is categorized into target and accessible populations. A target population is all the members of a given group to whom the investigation is related, whereas the accessible population represents those elements in the target population that are within the reach of the researcher [6].

Sampling

A sample is the smaller group of elements drawn through a definite procedure from a specified population; the elements that make up the sample are those that are actually studied. Kerlinger [25] has offered a comprehensive definition of random sampling as the method of drawing a portion (sample) of a population or universe so that all possible samples of fixed size 'n' have the same probability of being selected. This definition is general and thus satisfactory.

Simple random sampling is by far the easiest and simplest probability sampling technique in terms of conceptualization and application [37]. It does not necessarily require knowledge of the exact composition of the population, only that we can reach all the members of the population. However, when a sample is used as a way of estimating the characteristics of a population, the sample is unlikely to be exactly representative of the population. Even when random sampling is used, a certain amount of sampling error will usually occur. For example, a random sample of women will usually be slightly taller or slightly shorter than the average height of women in the population. However, when a sampling process is not random, an additional source of potential error, bias, exists [6]. Other probability sampling techniques include:

- Stratified simple random sampling;
- Cluster sampling; and
- Equal probability sampling

Validity of a Study

Research questions or entire measurement instruments can be judged in terms of their content (e.g., item wording). Content or face validity is commonly assessed by judges or raters [38]. A valid research finding is one in which there is similarity between the reality that exists in the world and the description of that reality. Validity is concerned with the degree to which a test appears to measure what it purports to measure [27]. The most common definition of validity according to Kerlinger [25] is epitomized by question: what are we measuring? The emphasis in this question is on what is being measured.

In a research endeavour, terms should be fairly straightforward. Research should use a common sense way of referring to the correctness or credibility of a description, explanation, interpretation, conclusion, or other sort of account. The common sense uses of terms should be consistent with the way they are generally used by researchers, so that it does not pose any serious philosophical problem. For example, the use of the term "validity" does not imply the existence of any objective truth to which an account can be compared. However, the idea of objective truth is not essential to a theory of validity that does what most researchers want it to do,

which is to give them some grounds for distinguishing accounts that are credible from those that are not. Nor are we required to attain some ultimate truth in order for our study to be useful and believable [36]. Maxwell [36], citing Campbell, Putnam and others, argued that we do not need an observer-independent "gold standard" to which we can compare our account to see if it is valid. All we require is the possibility of testing these accounts against the world, giving the phenomena that we are trying to understand the chance to prove us wrong. The key concept for validity is the validity threat: a way you might be wrong. These threats are often conceptualized as alternative explanations, or what Huck and Sandler [39] called rival hypotheses. Validity is a component of one's research design that consists of the strategies used to rule out threats [36].

In ensuring that the instruments used for research are valid, a researcher must take the time to comply with the formalities and procedures adopted in framing a research questionnaire [29]. To validate a research instrument (questionnaire/interview guide), the instrument(s) should be given to experts and faculty colleagues who will read through and make necessary corrections. In a second process to validate a research instrument, the questionnaire or interview guide might be pre-tested and the responses from the respondents used to improve the questionnaire/interview guide items.

Reliability of a Study

Another fundamental requirement of an instrument is reliability [38]. The quality of research is necessarily dependent on the consistency with which the observations are made. Consistency in turn is dependent on the precision with which an observable is specified [40]. Reliability refers to the level of internal consistency or stability of the measuring devices over time. It is concerned with the consistency with which an instrument measures whatever it measures. In addition, reliability refers to the relative absence of errors of measurement in a measuring instrument.

According to Kerlinger [25], reliability can be defined in three different ways. One approach is epitomized by the question: If we measure the same set of objects repeatedly with the same or comparable measuring instrument, will we get the same or similar results? This question implies a definition of reliability based on stability, dependability, and predictability. This is the definition most often given in elementary discussions of the subject. A second approach is epitomized by the question: Are the measures obtained from a measuring instrument the "true" measures of the property measured. This is a more accurate definition when compared with the first. This definition is removed from common sense intuition, but it is also more fundamental. These two approaches or definitions can be summarized, respectively by the words stability and accuracy. The

third approach to the definition of reliability is an approach that not only helps us to better define and solve both theoretical and practical problems, but also implies that other approaches and definitions are like “errors of measurement”.

The strength of an instrument used in a study may be reliable if it is able to elicit the required information concerning the phenomenon under study (for example, job satisfaction and effectiveness). However, a true measure of reliability should be based on testing. A number of techniques can be used to ensure the reliability of a standardised measuring instrument such as an attitude questionnaire, personality test or pressure sore risk calculator. These include test-retest, split-half and alternate forms. There are also statistical tests that can be used to assess reliability such as Cronbach Alpha and the Spearman rho correlation coefficient test. Statistically testing the reliability of the measurement instrument is vital and provides non-random results [8]. Measurements to assess reliability should be seen as suitable to avoid the influence on results of respondents who answer questions randomly because they are directly affected by the study (it may, for example, focus on their professional competencies).

A quantitative analysis of an inquiry should be performed with a statistical package. The Statistical Package of the Social Sciences (SPSS) can statistically test the reliability of the research instrument. The reliability of the variables in a study might be deemed to be high enough given that statistical tests show them to be between 0 and 1. The nearer the result is to 1, and preferably at or over 0.8, the more internally reliable is the scale [41].

Data Collection Techniques

There are two main sources of data collection in social science research; primary and secondary sources. The data collected for most social science research comes from both sources. A primary source is an original document or account that is not about another document but stands on its own. Interviews, which rely directly on participants' responses are primary sources. Primary sources enable a researcher to get as close as possible to what actually happened or what something means to participating individuals. Secondary sources are those that do not have a direct physical relationship with the event being studied and are made up of information that cannot be described as being an original source data. A secondary source would thus be one in which the person describing the event was not actually present but who obtained description from another person or source such as a textbook or an interview or a survey. Best [17] points out that secondary source of data are usually of limited worth because of the errors that result when information is passed on from one person to another. Nevertheless, secondary sources of data are still relevant in social

sciences research. As such, Cohen and Manion [5] opined that the value of secondary sources should not be minimized. There are numerous occasions where a secondary source can contribute significantly to more valid and reliable research than would otherwise be the case.

Interviews, questionnaires, documents and observation are the major ways through which data is gathered. The data from documents and interviews is intended and expected to give information for qualitative analysis, while data from questionnaires is intended and expected to provide information for quantitative analysis or inferential statistics. Inferential statistics are concerned with drawing inferences or generalizations about a population's characteristics based on information collected from a random sample of a population. With inferential statistics, we can thus draw conclusions that apply beyond the actual subjects studied and extend these conclusions to other subjects that belong to the same population.

The conclusions of research that does not rely on inferential statistics can only validly apply to those elements or subjects, which have actually been studied. It should be obvious that any research whose aim is to draw conclusions that apply only to the actual elements or subjects studied will be of limited applicability and this can hardly be the aim of any meaningful research. Rather, meaningful research should be interested in conclusions that are generalizable to a limited number of subjects or elements.

Interview

The interview is an interpersonal role situation in which one person, the interviewer, asks a person being interviewed (the respondent) questions designed to obtain answers pertinent to a research problem. The interview is used for gathering data, as in surveys or experimental situations; or for sampling respondents' opinions. As a research technique interviews are considered one of a range of survey methods, although the purposes of the interview in the wider context of life are many and varied. It may thus be used, for example, as a means of evaluating or assessing a person in some respect: for selecting or promoting an employee; for effecting therapeutic change as in the psychiatric interview; for testing or developing hypotheses; for gathering data, as in surveys or experimental situations; or for sampling respondents' opinions, as in doorstep interviews [5].

In social science research, the interview session is normally scheduled to last for at least thirty to forty minutes in a convenient and peaceful atmosphere. At the inception of the interview, the interviewer should take some time to discuss with the interviewee(s) the purpose of carrying out the research. In the case of a face-to-face interview, a leaflet may be handed to the participants stating the reasons and the basis for the research and

guidelines for conducting the interview.

When the interview has been completed, the researcher's next steps should be to first listen to the tape(s) and then to transcribe them. After the transcription, the researcher should read the interview transcripts repeatedly and write observational notes: memos, categorizing strategies (such as coding and thematic analysis) and note contextualization strategies [42]. The researcher should continue to keep observational memos throughout the analysis process as they not only capture analytic thinking about the data, facilitate one's thinking and stimulate one's analytical insight.

The categorization strategy and the coding method in particular, will help researchers to generate useful themes from their data. Its main objective is to open and then reorganize the data into categories that will facilitate the comparison of data within and between the categories. This can be followed by the contextualization strategy. Rather than fracturing the data, contextualization refers to linking the data or looking for methods to identify the relationships among the different elements of data. This, in turn, will enable the researcher to assemble relationships that connect statements and events within a context into a coherent whole.

It is also possible to use graphs to draw themes and meaning from interview data. This occurs on the path to data analysis and researchers should try to graph as much of the data as possible on the same day it is collected. From day to day, the points on the graph will tell a lot about the progress of the research. It is like a fox pursuing a hare. The graph is the hare's track, and you must stay close to that hare. You must try to react and change course frequently. However since nature is complex, let it lead you, try not to get too far ahead, so that you will not backtrack [5,42].

Finally, a researcher should identify ways to display the obtained interview data in a way that will have meaning for the audience. Thus, tables should be employed to make the ideas and analysis visible and permanent and to facilitate thinking about the relationships among different elements. Tables reduce and present data in a form that allows it to be grasped as a whole and give the data the most detailed presentation.

Questionnaire

The most natural tool with which to conduct surveys and interviews is the questionnaire. Questionnaire is a term used for almost any kind of instrument that has questions or items to which individuals respond. Although the term is used interchangeably with "schedule", it seems to be associated more with self-administered instruments that have items of the closed or fixed-alternative type [25]. The questionnaire is in no small measure the most frequently used instrument in social science research. Its popularity is demonstrated by the number of published

studies and student projects that rely on this instrument for data collection. There are two types of questionnaires:

- (1) Structured or fixed response questionnaires
- (2) Unstructured or open-ended questionnaires.

There has been a great deal of well-designed research on how questionnaires should be structured to minimise extraneous influences on the self-rating process [38]. In designing questionnaires for a study, for example, Nworgu's [29] characteristics of a good questionnaire may be applied. These characteristics are: relevance, consistency, usability, clarity, quantifiability and legibility. If you are choosing respondents from a number of different categories of people (for example, educated and uneducated), it is important that the questionnaire be as simple as possible.

In terms of specific design, a questionnaire based on a likert-type scale (summated) is often appropriate [23]. A summated rating scale is a set of attitude items, all of which are considered of approximately equal "attitude value". It is also important that a section of the questionnaire be dedicated to gathering demographic data about respondents. Most questionnaires follow some form of the following:

Section 'A' of a Questionnaire

Section "A" of a questionnaire focuses on demographic items such as gender, age, length of service, status, qualifications etc.

Section 'B' of a Questionnaire

Section "B" of a questionnaire focuses on the research questions/hypotheses and possible variables being tested.

Observation

Observation is another research instrument used in data collection and can be divided into participant and non-participant observation. The type of observation used should reflect the research setting, with the objective of sharing in people's lives while attempting to learn their symbolic world. Descriptive observation involves concentrating on observing the physical setting, the key participants and their activities, particular events and their sequence and the attendant processes and emotions involved [43]. Observation is perhaps the most demanding of all research methods, necessitating a great deal of thought and practice. The problem here, of course, is that practice can only effectively occur in real research situations [6].

Documents

The uses of document materials are an integral part of

gathering data. Document materials are valuable sources of data about society. The two categories of documents used in research studies include primary sources and secondary sources. Primary sources are in the form of government publications, UNESCO/World bank reports and publications, national newspapers, maps and magazines. They should have first-hand information on the topic under study. Secondary sources include textbooks, international and local journals, quoted materials, reports of research carried out by other investigators, encyclopaedias, and other literatures relevant to the study topic. One major advantage of this method is that documents are generated contemporaneously with the events they refer to. Hence, they are less likely to be subject to memory decay or memory distortion compared with data obtained from an interview [10,44,45].

Documentary material generated by laws, regulations, contracts, correspondence, memoranda and routine records on services and clients are often a useful source of information on programme activities and processes, and can generate questions that can then be pursued through observation and interviewing. Programme documents can thus provide valuable information that may not be accessible by other means. They can, for example, provide information about things that the evaluator cannot observe because they took place before the evaluation began, were part of private interchanges in which the evaluator did not participate, or reflect plans that have not been realized in actual programme performance [66].

Pole and Lampard [6] have noted that in order to be able to make full use of the documents that a researcher has located, the researcher needs to assess their validity and value to his/her research. To some extent such assessments are contingent on the researcher's agenda and approach. However, there are a number of themes which apply to most or all uses and types of document. Scott [14] has put forward the four "overlapping" validity criteria of authenticity, credibility, representativeness and meaning and noted that where earlier researchers have already assessed documentary sources, the authenticity and/or credibility of the documents might not be a problem. There are also occasions when the lack of credibility of an author may in itself be of interest.

On the whole, while a researcher will often want to generalize from a selection of documents, this does not mean that strict representativeness is necessary, since the generalizations that they wish to make may be theoretical rather than statistical, and the typicality and coverage of the document used may thus be of more relevance [6].

Data Analysis Techniques

In method literature, there is not one right or most appropriate way to analyze qualitative or quantitative

data. However, analysis implies and indeed requires a principal choice [46]. Analyzing and interpreting qualitative and quantitative data involves a process of systematically organizing the materials collected and bringing meaning to them so that they tell a coherent story, and then presenting it in such a way that enables others to share in the findings [47].

Qualitative Analysis

In qualitative analysis, data is usually gathered using less structured research instruments. The findings are more in-depth since they make greater use of open-ended questions. The research is more intensive and flexible, allowing the researcher to probe since he/she has greater latitude. The results of such inquiry usually provide many more details about behaviour, attitudes and motivation. However, the results are based on smaller sample sizes and are often not representative of the population. The research can usually not be replicated or repeated given its low reliability, and the analysis of the results is much more subjective [30].

Qualitative research for the most part uses participant observation and in-depth interviews to enter the world of the subjects, systematically recording their perceptions and behaviours, analyzing the verbal and non-verbal information they have offered, and then supplementing it with other materials, such as school memoranda, records, school journals, photographs and articles. Creswell [48-50] identifies qualitative research as an inquiry process of understanding a social or human problem that is conducted in a natural setting and that is based on building a complex, holistic picture from the words and views of informants. He emphasizes it as building a "complex, holistic picture" given the potential for a complex narrative that will take the reader into the multiple dimensions of a problem or issue and display it in all of its authenticity.

Much like Creswell [50], and Gay and Airasian [51] see qualitative research as the collection of extensive data on many variables over an extended period of time, in a naturalistic setting, in order to gain insights not possible using other types of research. Gall et al. [52], however, define qualitative research to mean making little use of numbers or statistics but instead relying heavily on verbal data and subjective analysis. While some critics of this method argue that there are a lot of replications in qualitative research, Leiviskä [53] argues the opposite, noting that such replication is impossible, given the dynamic nature of the social world and given that the researcher is not an instrument in the experimental sense. For qualitative studies, the concern in fact shifts to a consideration of how thoughtfully and dependably the researcher conducted the study rather than whether replication would yield the same results. This standard of practice assesses the extent to which an outsider would agree with the results of the study given the data collected

and displayed [54].

Replication aside, critics of qualitative methods have identified a number of what they perceive to be weaknesses of this method:

- Many claim that qualitative research is unscientific and that it is full of bias;
- Many claim that qualitative research lacks the rigors of quantitative studies; and
- That qualitative research lacks measures of validity and reliability [55].

It is argued that qualitative research is full of unquantifiable data and, therefore such data cannot be subjected to a statistical analysis. It is argued that without statistical analysis, a study loses its scientific flavour. However, it should be mentioned that figures alone do not make much sense unless they are explained qualitatively. Mere figures do not render a study scientific [56]. Further doubts about the strengths of qualitative research are linked to the idea of the generalizability of the findings. However, not all studies are concerned with generalization. It is possible (if desirable and despite the above criticisms) to employ specific methods in order to have the findings of fieldwork reproduced, falsified or verified [30,57].

Quantitative Analysis

Quantitative research is the collection of numerical data in order to explain, predict and/or control phenomena of interest [51]. A simplistic characterization is offered by Punch [58]: quantitative research is empirical research where the data are in the form of numbers. A more thorough explanation is given by Creswell [48], who sees quantitative research as inquiry into a social or human problem, based on testing a theory composed of variables, measured with numbers, and analyzed with statistical procedures, in order to determine whether the predictive generalizations of the theory hold true.

Gall et al. [52] distinguish quantitative research as relying heavily on numerical data and statistical analysis. Quantitative analysis is built upon statistical materials relating to samples and focuses on the analysis of a case-variable matrix containing data, which has either been collected by the researcher or which was collected by other researchers and has been obtained from them either directly or via a data archive which also contains the analysis of tabulated official statistics and other published tables or quantitative materials [6]. Pole and Lampard's [6] study revealed that quantitative data analysis is far from being simply a technical exercise. It involves a process of decision-making and data manipulation which is guided by a mixture of the following—theoretical ideas, the researcher's substantive insight, his/her degree of experience as a data analyst and the data itself.

In sum, quantitative research data is usually gathered using more structured research instruments. The results provide less detail on behaviour, attitudes and motivation and are based on larger sample sizes that tend to be more representative of the population. The research can usually be replicated or repeated, given its high reliability, and the analysis of the results is more objective [30]. Quantitative research is distinguished from qualitative research primarily because of the large numbers of people who are "sampled" and the type of questions they are asked. Generally, sample sizes of 100 are adequate for sampling "yes/no" questions to get results that are 95 percent reliable as being accurate for the entire market of buyers. To increase the accuracy to 97 percent to 99 percent, the sample sizes would have to increase to 400-2000 or more, depending upon the subject matter and complexity of questioning [59].

Qualitative and Quantitative Analysis at a Crossroad

The selection of an appropriate research method has always been a dilemma for researchers and evaluators. While the quantitative-qualitative research debate continues, it remains obvious that there is no one best research method for all research and evaluations. Different research purposes require the use of different research methods separately or in concert with each other. For all practical purposes, both quantitative and qualitative methods have different but complimentary roles to play in a research process and outcome. The fray between champions of these distinguishable approaches is essentially ideological and political; these two approaches differ in their ways of conducting research, and each tends to claim superiority over the other. Ironically, each tradition overtly discredits the other as if it is infallible. Fueling this charged situation is the subconscious luring of graduate students into these dichotomous camps of research methodologies and paradigms, especially from the standpoint of the research orientations of the professors—instructing or advising [60].

To carry this idea one-step further, according to Reichardt and Cook [61], researchers cannot benefit from the use of numbers if they do not know in common sense terms what the numbers mean. Punch [58] likewise warned that these differences should not obscure the similarities in logic, which makes combining the approaches possible. In spite of the distinctions that exist between qualitative and quantitative methods of research, both are increasingly compatible and have profound roles to play in social science research.

In brief, I tend to disagree with those who favour one method at the expense of the other because, as noted above, no single methodology is most appropriate for a particular research design. Thus, it is often in the best interest of a researcher to combine both methodologies (quantitative and qualitative) as doing so adds to the

rigor, breadth and depth of a study [62]. Similarly, according to Allen-Meares [63], researchers must discard the idea that the two paradigms are inherently incompatible or that one is better or more accurate than the other, and must creatively integrate them. The educational preparation of researchers must thus include knowledge about both methodologies and the importance of contextual analysis and computer-assisted models of qualitative analysis. In support of this, Olusegun [60] maintains that “research being a truth-finding construct aimed at verifying and authenticating phenomena, evidence abounds that the use of a combination of both quantitative and qualitative research methods results in a stronger validity of outcomes”. Study objectives and the kind of data being sought must thus dictate which approach should be followed. The merit of any research method depends on the relationship between theory and method, and how the researcher attends to the potential weakness of the method [57,64].

Bowen’s Seven Principal Lessons

Bowen [2] proposes seven principal lessons for effectively conducting research using scientific tools and methods. These lessons appear below and were modified to suit the purposes of this study:

Lesson 1: Read, Read, Read

The first lesson Bowen learned was to read extensively. This applies to any research undertaking as one needs to know what research exists and how others have treated a particular topic so that one can determine what additional research is needed. Prior studies provide a foundation, background, and context for new research. They establish a bridge between existing and proposed research projects and extend the knowledge base.

Lesson 2: Consult Experts

In the course of doing a study, there is a need to consult experts in the domain of your study. Certify that all phases of your research work are scrutinized and review by experts. Consider yourself fortunate that they often offer to play the role of mentor, providing counsel and guidance along the way.

Lesson 3: Adhere to Scientific Regulations

Adhere to the scientific regulations and guidelines prescribed and follow the adopted pattern. Apart from those related to content and organization and overall formatting requirements, relevant regulations include those set by the Review Board (RB), including the journal guide for authors.

Lesson 4: Pay Attention to Rigor and Trustworthiness

Early in your research process, be keenly aware of the importance of providing checks and balances to maintain acceptable standards of scientific inquiry. In effect, the need for rigorous data collection and analytic methods has to be addressed.

Lesson 5: Give Details of the Methodology

Details of research methodology are not just necessary, but vital. Researchers should spell out the methodology in detail to make the process as transparent as possible. It is important that a researcher outline the conceptual or theoretical framework of the study. It is important, as well, that the researcher provides a theoretical rationale for the selection of central concepts and that these concepts are defined in operational terms.

Lesson 6: Do not be Afraid to Include Numerical Data

Simply put, qualitative data involves words while quantitative data comes in the form of numbers. In qualitative research, findings do not result from statistical procedures, correlations, and similar mathematical calculations; instead, they come from an interpretation of non-numerical or largely text-based data. Yet, numerical data have a place in qualitative studies and should be included where available and where appropriate.

Lesson 7: Prepare to Publish

Finally, during the research process, prepare yourself to publish your work. The findings of original research, especially ground-breaking research, should be made available in the public domain. In addition to presentations at conferences and colloquia of professional organizations, journal articles and even chapters in books may be viable options.

CONCLUSION

This article provides an exceptional useful and rigorous method of qualitative/quantitative analysis. It discusses the value and applicability of research methodologies. It has placed the methods within a context of research approaches, and has explained what research methods are, how it works and why a particular approach is selected during a research endeavour.

Efforts to improve the quality and implementation of effective research practices are vital to scientific research. We all recognize the challenges we face writing academic papers for problem solving and for policy implementation and organizing qualitative or quantitative research often requires painstaking efforts. The arguments presented in this paper can serve as guidelines for experienced and inexperienced researchers alike, and would-be researchers may avoid

difficulties while writing academic papers for international audiences.

In preparing papers for publication, authors should be mindful of both the form and the substance of the manuscript. Journals provide guidelines for authors and these should be followed carefully. Browsing abstracts of articles in targeted journals is also a good idea, as it will indicate the types of articles those journals typically publish. It is helpful to contact the appropriate editor to determine the fit between your proposed article and the journal to which it is being submitted. This can save a great deal of time, expenses, and other resources and prevent frustration for would-be authors [2]. Choosing a research approach that will suite the purposes of a study is entirely the decision of the researcher. What actually matters in this case is the ability to logically represent the idea in a sequence that will tell the complete story [65,71,72].

REFERENCES

- [1] Poldner E, Simons PRJ, Wijngaards G, van der Schaaf MF. Quantitative content analysis procedures to analyse students' reflective essays: A methodological review of psychometric and edumetric aspects. *Edu. Res. Rev.*, 2012; 7(1): 19-37. doi:10.1016/j.edurev.2011.11.002.
- [2] Bowen G. Preparing a qualitative research-based dissertation: lessons learned. *Qualitative Report*, 2005; 10(2): 208-222.
- [3] Miles MB, Huberman AM. *Qualitative data analysis*. Thousand Oaks: Sage Publications 1994.
- [4] Mouly GJ. *Educational research: The art and science of investigation*. Boston: Allyn and Bacon 1978.
- [5] Cohen L, Manion L. *Research methods in education*, (4th ed.). London: Routledge 1994
- [6] Pole C, Lampard R. *Practical social investigation: qualitative and quantitative methods in social research*. Harlow: Printice Hall 2000.
- [7] Kpolovie PJ. *Advanced research methods*. Owerri: Springfield Publishers 2010.
- [8] Kpolovie PJ. *Statistical techniques for advanced research*. Owerri: Springfield Publishers 2011.
- [9] Robertson IT. *An evaluation of outdoor development as a management development tool*. MBA Dissertation. University of Edinburgh 1987.
- [10] Ololube NP. *Teacher education, school effectiveness and improvement: a study of academic and professional qualification on teachers' job effectiveness in Nigerian secondary schools*. Doctoral Dissertation, December 2006. University of Helsinki, Faculty of Behavioral Sciences, Department of Applied Sciences of Education, Helsinki: University of Helsinki Press 2006.
- [11] Ololube NP. *Professionalism, School Effectiveness and Quality Improvement: Potentials and Issues Surrounding School Effectiveness*. Saarbrücken: Lambert Academic Publishers 2011a.
- [12] Ololube NP. *Computer Communication and ICT Attitude and Anxiety Among Higher Education Students*. In A. Cartelli and M. Palma (Eds). *Encyclopedia of Information and Communication Technology*, Hershey, PA: Information Science Reference 2009b; 100-105. doi: 10.4018/978-1-59904-845-1.ch014.
- [13] Curry LA, Nembhard IM, Bradley EH. *Qualitative and Mixed Methods Provide Unique Contributions to Outcomes Research*. *Circulat.*, 2009; 119: 1442-1452. doi: 10.1161/CIRCULATIONAHA.107.742775
- [14] Scott J. *A matter of record: documentary sources in social research*. Cambridge: Polity Press 1990
- [15] Hale J. *The 3 basic types of descriptive research methods*. <http://psychcentral.com/blog/archives/2011/09/27/the-3-basic-types-of-descriptive-research-methods/> (Accessed May 18, 2012)
- [16] Silverman S, Keating XD. *A descriptive analysis of research methods classes in departments of kinesiology and physical education in the United States*. *Res. Q. Exercise Sport*, 2002; 73(1): 1-9.
- [17] Best JW. *Research in education*. New Jersey: Prentice-Hall and Englewood Cliff 1970.
- [18] Verma G, Beard R. *What Is educational research*. Londres, Gower 1981.
- [19] Jackson SL. *Research methods and statistics: a critical thinking approach* (3rd edition). Belmont, CA: Wadsworth 2009.
- [20] Ololube NP. *Blended Learning in Nigeria: Determining Students' Readiness and Faculty Role in Advancing Technology in a Globalize Educational Development*. In A. Kitchenham (Ed.) *Blended Learning across Disciplines: Models for Implementation*, 2011a; pp. 190-207. Hershey, PA: Information Science Reference. doi: 10.4018/978-160960-479-0.ch011.
- [21] Yin RK. *Case study research: design and methods*, (2nd ed.). Newbury Park, CA: Sage 1994.
- [22] Asika N. *Research methodology in the behavioural sciences*. Lagos, Longman 1991.
- [23] Ololube NP. *Understanding Teachers Professional Competencies for Education Effectiveness*. Owerri: Springfield Publishers 2009a.
- [24] Strauss AL. *Qualitative analysis for social scientists*. Cambridge: Cambridge University Press 1987.
- [25] Kerlinger FN. *Foundation of behavioral research*. New York, NY: Holt Rinehart and Winston 1986.
- [26] Palmquist M (Ed.). *An Introduction to Content Analysis*. <http://writing.colostate.edu/references/research/content/contrib.cfm> 1993 (Accessed May 11, 2012).
- [27] Borg WR, Gall MD. *Educational research: An introduction*. (5th Ed.). New York: Longman 1989.
- [28] Jaeger RM (Ed.). *Complementary methods for research in education*. Washington, DC: American Educational Research Association 1988.
- [29] Nworgu BG. *Educational research: basic issues and methodology*. Ibadan: Wisdom Publishers 1991.
- [30] Dilbert A. *Quantitative research techniques*. www.ryerson.ca/~mjoppe/ResearchProcess/QuantitativeResearch.htm n.d (Accessed May 11, 2012).
- [31] Benbasat I, Goldstein D, Mead M. *The case research strategy in studies of information systems*. *MIS Quarterly*, 1987; 11(3), 369-386.
- [32] Eisenhardt KM. *Building theories from case study research*. *Acad.*

Manage. Rev., 1989; 14(4): 532-550.

[33] Järvinen P. On research methods. Tampere: Opinpajan Kirja 2001.

[34] Baker GR. The contribution of case study research to knowledge of how to improve quality of care. *BMJ Qual. Safety*, 2011; 20(1): 30-35. doi:10.1136/bmjqs.2010.046490.

[35] Okunoye AO. Knowledge management and global diversity: a framework to support organisations in developing countries. PhD Dissertation University of Turku, Department of Information Technology 2003.

[36] Maxwell JA. Qualitative research design: an interactive approach. Thousand Oaks, CA: Sage Publications 1996.

[38] Braun E, Woodley A, Richardson JTE, Leidner B. Self-rated competences questionnaires from a design perspective. *Edu. Res. Rev.*, 2012; 7(1): 1-18. doi:10.1016/j.edurev.2011.11.005

[39] Huck S, Sandler H. Rival hypotheses: Alternative interpretations of data based. New York, NY: Harper and Row/Toulmin 1979.

[40] Keeves JP (Ed.). Educational research, methodology, and measurement: an international handbook. (2nd Ed.). Oxford: Pergamon 1997.

[41] Bryman A, Cramer D. Quantitative data analysis with SPSS release 10 for windows: A guide for social scientists. Philadelphia: Routledge 2001.

[42] Maxwell JA, Miller BA. Categorizing and connecting strategies in qualitative data analysis. In P. Leavy and S. Hesse-Biber (Eds.), *Handbook of emergent methods*. 2008; 461–477. New York: Guilford Press.

[43] Anyamele SC. Institutional management in higher education: a study of leadership approaches to quality improvement in university management. Nigerian and Finnish cases. Doctoral Dissertation University of Helsinki. 2004 (Accessed May 10, 2012).

[44] Ololube NP, Ubogu AE, Egbezor DE. ICT and distance education programs in a sub-Saharan African country: a theoretical perspective. *Journal of Information Technology Impact*, 2007; 7(3), 181-194.

[45] Kpolovie PJ, Ololube NP, Ekwebelem ABI. Appraising the Performance of Secondary School Students on the WAEC and NECO SSCE from 2004 to 2006. *Int. J. Sci. Res. Edu.*, 2011; 4(2): 105-114.

[46] Coffey A, Atkinson P. Making sense of quantitative data. Complementary research strategies. Thousand Oaks, CA: Sage 1996.

[47] Ololube NP, Ubogu AE, Egbezor DE, Nwachukwu U. Evaluating Faculty Teaching of Research Methodology to Undergraduate Geography Students in a Nigerian University. *Int. J. Inform. Communicat. Technol. Edu.*, 2010; 6(1); 30-44. doi: 10.4018/jicte.2010091103.

[48] Creswell JW. Research design: Qualitative and quantitative approaches. Thousand Oaks, CA: Sage 1994.

[49] Creswell JW. Qualitative inquiry and research design: Choosing among five tradition. Thousand Oaks, CA: Sage 1998.

[50] Creswell JW. Research design: Qualitative, quantitative, and mixed methods approaches. Thousand Oaks, California, Sage Publications. 2003.

[51] Gay LR, Airasian P. Windows statistics to accompany Educational research: Competencies for analysis and application (6th Ed.). Upper Saddle River, NJ: Prentice-Hall 2000.

[52] Gall JG, Gall MD, Borg WR. Applying educational research: A

practical guide. New York: Longman 1999.

[53] Leiviskä E. Creative interdisciplinary: engineering, business, and art and design students' collaboration and learning in the international design business management. Ph.D. Dissertation, Department of Teacher Education University of Helsinki 2001.

[54] Rossman GB, Rallis SF. Learning in the field. an introduction to qualitative research. Thousand Oaks, CA: Sage 1998.

[55] Silverman D. Doing qualitative research: a practical handbook. London: Sage publications 2001.

[56] Bogdan RC, Biklen SK. Qualitative research for education. (2nd Ed.). Boston: Allyn and Bacon 1992.

[57] Kamwendo GH. Language Policy in Health Services: A Sociolinguistic Study of a Malawian Referral Hospital. Publications of the Institute for Asian and African Studies 6, University of Helsinki, Finland 2004.

[58] Punch KF. Introduction to social research: quantitative and qualitative approaches. Thousand Oaks, CA: Sage 1998.

[59] CCH Quantitative research. CCH business owner's toolkit online. http://www.toolkit.cch.com/text/P03_3150.asp 2004 (Accessed April 9, 2012).

[60] Olusegun AS. Selecting a quantitative or qualitative research methodology: An experience. *Edu. Res. Q.*, 2001; 26(1), 3-10.

[61] Reichardt CS, Cook TD. (Eds.) Qualitative and quantitative methods in evaluation. Beverly Hills, CA: Sage 1979.

[62] Maxwell JA, Loomis D. Mixed method design: An alternative approach. In A. Tashakkori and C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research*. Thousand Oaks, CA: Sage 2002; 241–271.

[63] Allen-Meaers P. Social service–research–methodology. *Social Work Research*, 1995; 19(1), 5-8.

[64] Hartley JF. Case studies in organisational research. In C. Cassell and G. Symon (Eds.) *Qualitative methods in organisational research: A practical guide*. London: Sage 1994; 208-229,

[65] Maxwell JA. Qualitative research design: An interactive approach (2nd ed.). Thousand Oaks, CA: Sage Publications 2005.

[66] Bowen G. Document Analysis as a Qualitative Research Method. *Qualitative Res. J.*, 2009; 9(2): 27-40. doi: [10.3316/QRJ0902027](https://doi.org/10.3316/QRJ0902027)

[67] Hopkins GW. Quantitative research design. *Sportscience* 4(1). <http://www.sportsci.org/2008/index.html>. 2000 (Accessed March 15, 2012)

[68] Hopkins GW. Research designs: choosing and fine-tuning a design for your study. *Sportscience*, 2008; 12, 12-21.

[70] Ololube NP, Egbezor DE. A Critical Assessment of the Role/Importance of Non-Formal Education to Human and National Development in Nigeria: Future Trends. *Int. J. Sci. Res. Edu.*, 2012; 5(2): 71-93.

[71] Ololube NP, Amaele S, Kpolovie JP, Onyekwere LA, Elechi GE. Quality higher education for improved knowledge essential for national and regional development. *Int. J. Edu. Econ. Develop.*, 2012; 3(2), 179-204.

[72] Punch KF. Developing effective research proposals. Thousand Oaks, CA: Sage 2000.

Authors Bio Statement:

Nwachukwu Prince Ololube, PhD, is a Senior Lecturer in the Department of Educational Foundations and Management, Faculty of Education, University of Education, Port Harcourt, Nigeria. He holds a PhD in Education and Teacher Education with focus in Educational Management and Planning/Curriculum Studies from the University of Helsinki, Finland. He also holds a post-graduate Diploma in Human Resources Management, a Masters of Education in Educational Management and Planning, and a Bachelors of Science in Political Science. His research focuses on institutional management and leadership, education effectiveness, instructional effectiveness and quality improvement, ICT in education, adult and non-formal education, and research methodologies. Dr. Ololube has published five books, presented at various international conferences, and contributed chapters to a number of books and encyclopedias. In all, he has authored and co-authored more than fifty publications. His professional contributions include Editor-in-Chief, International Journal of Scientific Research in Education (IJSRE), Editorial Board Member, The International Journal of Economics, Education and Development (IJEED), International Editorial Review Board Member International Journal of Information and Communications Technology Education (IJICTE), and Editorial Board Member Journal of Information Systems Education (JISE). Dr. Ololube can be reached on Phone: +2348037095659; Email: ololubepriince@yahoo.com, ololube@ololube.com. Website: www.ololube.com.

Peter James Kpolovie is a Senior Lecturer and Head of the Department of Educational Psychology, Guidance and Counselling, University of Port Harcourt, Nigeria. He earned his Bachelors of Education in 1991, his Masters of Education in 1996 and his PhD in 2002 from the University of Port Harcourt. He specialises in education testing and measurement procedures. His PhD dissertation 'Validation and standardisation of culturally fair intelligence tests for use in Nigeria' was recognised with NUC's best doctoral thesis award, the highest academic award in Nigeria. He is also the recipient of the Common Wealth Scholarship Award of Excellence. He has published extensively on intelligence testing, the application of information technology to data analysis, approaches to improved learning, and educational statistics and research methods. E-mail: drkpolovie@yahoo.com