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A Case for Using Excel in Scoring Multiple Choice Test Items and Conducting Item and Test Analysis

Abstract

Scoring of multiple choice objective test items and conducting item analysis has been a problem for teachers at all levels of Nigerian educational system. In view of the longer procedural steps it will take for item and test analysis coupled with complex mathematical / statistical computations involved, teachers nowadays jump the protocol of the normal procedure to be followed in constructing items for a credible, reliable and valid tests. The effect of this is that teacher-made tests are no longer yielding the true performance of examinees' ability. This problem persists because of the inability of making teachers to fully integrate ICT into the school assessment practices. This paper makes a case for the use of spreadsheet package (Microsoft Excel) in scoring multiple choice objective test items and conducting item / test analysis. Excel was used in this article to score hypothetical 15 students' responses to 20 items multiple choice questions. This same excel was later used to compute the difficulty index, discrimination index of the items and also validity and reliability of the test. The scoring and the analysis of both test and item statistics were performed at faster rate and with utmost great accuracy. It is hereby recommended that:

- 1. Government, University Management and Teaching Service Commission (TESCOM) should as a matter of urgency organize seminars and workshops for lecturers | teachers periodically so as to update their knowledge in ways of using spreadsheet package (Microsoft Excel) to score multiple choice objective test items and conducting item | test analysis.
- 2. Curriculum of Teachers Training programme needed to be re-designed to enable prospective teachers have firsthand experience during their training programme on how to use computers to score their students' tests, analyze the psychometric properties of such tests and even familiar with the ways of using statistical packages like Excel, Lotus 1-2-2, SPSS and E-views in analyzing data emanated from their research project.

Keywords: Excel; Scoring; Multiple Choice Objective Test Items; Item and Test Analysis



1-Introduction

Education in Nigeria has been adopted as an instrument for national development. It is an indicator for a community social well-being, standard of living and social justice. In the opinion of Akindutire (2010), education is regarded by many as the key that unlocks the development of personal and national potentials of individuals including their rights and powers. In view of the realization of these laudable goals of education to national development, educational institutions were established for the training of the individuals. Since the value and functionality of any educational system lies in its ability to actualize the goals of education, the machinery through which the extent of knowledge and skills acquisition is determined at each stage of education has been set up. This is in form of assessment.

Assessment is an important aspect of teaching and learning. Assessment provides information for decision-making about the students, schools, programmes and policies with which the sole purpose of ensuring that good results are obtained (Afemikhe, 2005). Assessment should be the true reflection of the knowledge gained in any educational institution (Atabong, Okpala, Abondem and Essombe, 2010); hence, any action that undermines assessment poses a great threat to the validity and reliability of assessment results and certification (Hassan and Ogunmakin, 2010). This assertion was earlier noticed by Charles Spearman in 1904 when he propounded Classical Test Theory (CTT). To Spearman, the observed score (X) of any student in any test is a composite function of his true score (T) and error score (E); expressed symbolically as $X = T \pm E$. The more the error score tends towards zero, the more the true score becomes the observed score.

Poor assessment culminating from faulty items of a test remains one of the most serious threats to the validity and reliability of teacher-made tests in Nigeria. Teachers' made tests have come under strong criticisms in recent time in Nigeria (Adeyemo, 2003; Osakuade, 2006). The basis for the criticisms was borne out of the fact that teachers' made tests lack sound psychometric properties.

There are five major basic procedures to follow while constructing good test items (Okpala, Onocha and Oyedeji, 1993). The steps are:

- identification of the purpose of the test;
- stating the general objectives;
- writing the table of specifications (test blue print);
- · construction of the items; and
- item analysis.

Out of these five major steps, item analysis was the major problem teachers are facing because of complex mathematical steps involved. As a result of this, teachers end up selecting items from textbooks and past question papers to form their tests without mindful of the psychometric properties of such items. According to Kolawole (2006), item analysis attempts to find out the following about test items:

- discriminating power its ability to discriminate between the brilliant students and poor students.
- Its difficulty level, that is, the proportion of the testees who answer an item correctly.



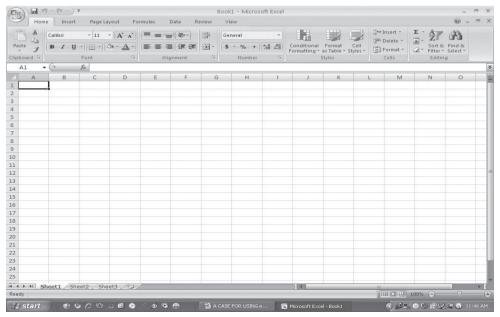
- number of testees who answer the item correctly
- number of the testees who choose the distractors, that is, distractors analysis.
- number of the testees who do not attempt an item.

The place of computer in item analysis cannot be over-emphasized. The spreading applications of sophisticated mathematical / statistical procedures in item analysis is an aspect of the computer revolution. Teachers in Nigeria today have not been able to realize that item analysis can be done with computer using a spreadsheet package (Microsoft Excel). This research paper is put in place to sensitize teachers on how to use Ms-Excel to score multiple choice objective test items and finding the psychometric properties of such items (i.e. difficulty index, discrimination index, validity index and reliability index).

2-Spreadsheet Structure

Ms-Excel like other spreadsheet packages is organized in a tabular structure with rows and columns. The intersection of a particular row and column designates a cell. The rows are usually numbered while the columns are lettered. Single letter identify the first 26 columns, double letters are used thereafter (A, B, C, ..., Z, AB,AZ, B, BA, ..., BZ, ..). Most spreadsheets permit up to 256 columns and over 8,000 rows. Three things can be entered into each cell. These are texts, numbers and formulars. Texts are usually in the form of labels used to identify rows and columns from each other. Numbers form the basis of calculations, unless otherwise specified, numeric entries are right justified on the right edge of each column, and text entries are left justified. However, one can specify what entries to be left- or right- justified or centered in the column. Formulars are used for calculations. A formular is always preceded by a plus (+) or equal to (=) sign.

Figure 1: MS-Excel Worksheet Structure





3-Materials and Methodology

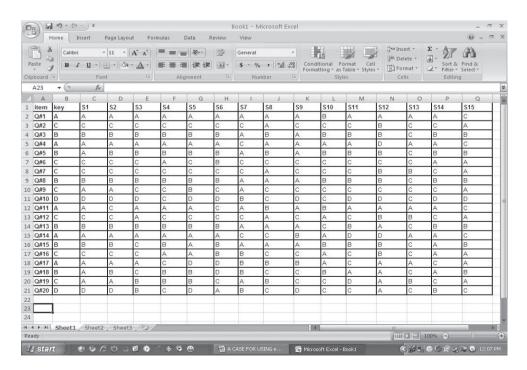
The study made use of responses of 20 students to a 15-question multiple choice objective test items fed into Ms-Excel worksheet. This section of the paper is divided into three parts. The first part deals with the scoring of the responses using Excel, the second part deals with the preliminary item statistics using Point-Biserial Correlation (item discrimination) and P-Values (item difficulty), the third part deals with test statistics (validity and reliability power). Details of the analysis are shown forthwith.

4-Experimentation and Procedure

4.1-Part A: (Using Excel To Score Multiple Choice Objective Test Items)

To score the responses of 20 hypothetical students in a 15 question multiple choice objective test items using excel, the first thing is to open blank Excel worksheet in which we will designate the rows for individual students. In row 1 starting with cell A1, we type in the following labels for columns: "item", "key", "S1", "S2", ... "S15". For column A starting with cell A2, we type in the following labels for rows: "Q#1", "Q#2", ... "Q#20". The data table is now set and ready for entering student responses. First enter the keys to all the 20 multiple choice questions. Then enter students' responses (e.g., A, B, C, D). You have now created your data table and ready to score the responses with respect to the keys. The key and the pattern of students' responses to the items are as shown below in table 1

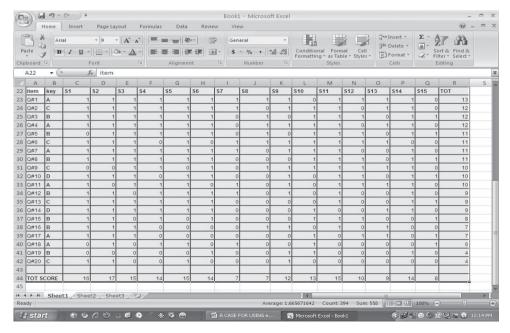
Table 1: Responses of 20 students to 15 Questions Multiple Choice Objective Items



4.2-Scoring Students Responses

To begin scoring the responses of the students, first, we will copy column and row headings together with key in table 1 above and paste in another area of the worksheet. To achieve this, we will highlight cells A1 to Q21, select Copy from the pull-down menu of Edit, click cell A22, then select Paste from the pull-down menu of Edit. Click at cell C23, type in the formula dialogue box "=IF(C2=\$B2,1,0)" and then press Enter, cell C2 is now scored and displayed in cell C23. Click at cell C23, place your cursor at the lower right-hand corner of cell C23 until your cursor changes to a cross, press down your mouse and while keeping it pressed, drag the mouse forward to cell Q23, release your mouse. Without clicking, place your cursor at the lower right hand corner of cell Q23 until it changes to a cross, press down your mouse and while keeping it pressed, drag the mouse downward to cell Q42 (the response to the last multiple-choice question by the last student in Q21). release your mouse. Now all students' responses to multiple-choice question have been scored. The above mouse dragging and releasing process is called AutoFill. The final analysis of scoring is to calculate each student's total score on the test. Click at cell C44, click at the summation sign E on the tool bar, use your mouse to select cells C23 to C42 then press Enter. The total score for the first student (S1) is now calculated. Use Autofill to calculate the total scores for other students. We can equally calculate the total number of students that answer each item correctly. To achieve this, click at cell R24, click at the summation sign E on the tool bar, use your mouse to select cells C23 to Q23 then press Enter. The total score on item 1 (Q#1) is now calculated. Use Autofill to calculate the total scores on the remaining items. We have now completed scoring all students' responses and it is been shown in table 2 below.

Table 2: Sample scoring worksheet of the 15 students in 20 Questions Multiple Choice Objective Items



4.3-Part B: Conducting Item Analysis - Item Difficulty and Item Discrimination

We will now calculate item difficulty and discrimination for each of the items on the test. First, use mouse to select cells A1 to A21 from table 1 above and paste in cell A47. in cell B47 type "Points", in cell C47 type "Difficulty", and D47 type "Discrimination". Type in maximum point for each of the items (in this case "1") in column "Points". Click at cell C48 to begin calculating item difficulty. Type "=SUM(C23:Q23)/(15*B48)" in the formula dialog box and press Enter (15 is the total number of students), the difficulty index for item 1 is calculated. Use AutoFill to calculate the item difficulties for other items. Now click at cell D48 to begin calculating item discrimination. Type in the formular "=CORREL(C23:Q23,C\$44:Q\$44)" and press Enter. The item discrimination for item 1 is now calculated. Use AutoFill to calculate item discrimination for the rest of items. The results of item difficulty and item discrimination is as shown below:

9 9·0-) = Book1 - Microsoft Excel Home Insert Page Layout Formulas Data Review View @ -See Insert × X × X A A Political Section Section 5 Calibri 11 · A A A General Calibri · II · A A | = = | ※ | Gr | General | ES | Conditional Format Cell | Formatting - os lable - Styles - Formatting - Os | Format Sort & Find & Format * Font □ Alignment □ Number Clipboard 5 J50 → () f_X 47 item MAX PTS DIFFICULTY DISCRIMINATION 48 Q#1 49 0#2 0.8 50 Q#3 0.6 51 Q#4 52 Q#5 0.7 53 Q#6 0.5 54 Q#7 55 Q#8 0.8 0.8 57 Q#10 0.6 58 0#11 0.2 59 Q#12 60 Q#13 0.7 61 O#14 0.6 63 Q#16 0.5 64 Q#17 0.7 66 O#19 67 Q#20 69 H + H Sheet1 Sheet2 Sheet3 / Sheet3 # start ♥ ♥ Ø Ø ♥ Ø Ø ♥ ■ ■ A CASE FOR USING e...

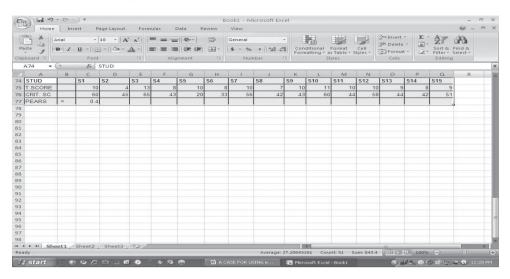
Table 3: Item Difficulty and Item Discrimination

4.4- Conducting Test Analysis – Test Validity

Calculating correlational coefficient is very paramount in validation. The analysis requires two sets of scores – one is from the test under validation, and another is from a different test that is considered to be credible thus the criterion. To achieve this, create another four rows labeled as "Student", "Test score", "Criterion Score", and "Pearson Correlation Coefficient". Type in the four headings at cells A71, A72, A73, and A74 accordingly. Enter the students identification numbers, their total scores and their criterion scores. The criterion scores used for this article were the students' performances in their previous examinations / tests believed to be valid. To calculate the correlation coefficient, at cell C74 type "=CORREL(C72:Q72,C73:Q73)" and press Enter. The validity index is now calculated and shown in the table below

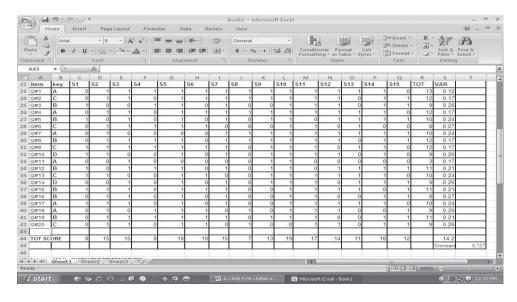
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Table 4: Test Validity



4.5-Conducting Test Analysis - Test Reliability

To calculate reliability coefficient, just revisit table 2 above and create additional column in "S". at cell S22 type "Var". at cell S23, type "=VAR(C23:Q23)" at the formular dialog box and then press Enter. The variance for item 1 is now calculated. Use AutoFill to calculate the variances of other items and of total test scores. The variance for total test score is displayed in cell S44. Now type in any blank cell e.g cell S45 "Cronbach Alpha=", click at a cell on its right (cell U44) and type in the formular dialogue box "=(20/19)*(1-SUM(S23:S42)/S44)" and press Enter. The Cronbach's alpha is now calculated and the result is as shown in table 5 below: Table 5: Test Reliability





5-Summary and Conclusion

This paper examines ways of reducing the problems associated with the teachers' analyzing the psychometric properties of a test during test construction. It introduces the practical application of a computer spreadsheet package – Microsoft Excel in the scoring of multiple choice objective test items and the computation of item analysis of the test at a faster rate with maximum accuracy irrespective of the number of items in the test and the number of students that took part in the test. Teachers, Lecturers, test experts and post graduate students in tests and measurement who are constantly familiar with the use of manual method of computation of item analysis will find this paper more useful to generate valid and reliable tests so as to produce the results that will be true reflection of the examinees.

5.1-Recommendations

Based on the roles of Spreadsheet package – Ms-Excel in reducing the problems associated with the scoring of multiple choice objective test items and the analysis of the psychometric properties, it is hereby recommended that:

- 1. Government, University Management and Teaching Service Commission (TESCOM) should as a matter of urgency organize seminars and workshops for lecturers / teachers periodically so as to update their knowledge in ways of using spreadsheet package (Microsoft Excel) to score multiple choice objective test items and conducting item / test analysis.
- 2. Application of computers in teachers training programs cannot be brushed aside. Teachers Training program needed to be re-designed to enable prospective teachers have fist hand experience during their training program on how to use computers to score their students' tests, analyze the psychometric properties of such tests and even familiar with the ways of using statistical packages like Excel, Lotus 1-2-3, SPSS and E-views in analyzing data emanated from their research project.
- 3. This paper was only limited to the scoring of multiple choice objective test items and the analysis of the psychometric properties like the difficulty index, discrimination index, validity index and reliability index using excel, it is hereby recommended to future researchers to replicate this work by calculating item response patterns, student performance by group of items

With these practices, true score of an examinee can be reliably estimated.

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Reading Ayi Kwei Armah's Two Thousand Seasons as an Intertext

Abstract:

Ayi Kwei Armah (1939-) is a Ghanaian novelist who has written so far seven novels, famous among which are his first The Beautyful Ones Are Not Yet Born (1968). Two Thousand Seasons (1973) comes fourth in order of appearance, but it is the first where Armah plunges into Africa's millennial past. The Healers (1979), Osiris Rising (1995) and KMT in the House of Life (2002) all span a given period related to African history, the last two even go as far as Ancient Egypt with its heliographic scripts, but Two Thousand Season in a number of respects remains an unparalleled book in Armah's oeuvre. This article answers what it means to write a historical novel while the initial intention is to evoke the frustrations of an unhappy present. Armah has started his novelistic career with a book - The Beautyful Ones - that carefully examines the postcolonial reality in his home country. In order to bypass the unhappy state of affair of the present, Armah sought to undo the damaging effects of master-narratives through a mythical construction of Africa's millennial existence. For him, what caused pitfalls from political independences - as evocatively dramatized in The Beautyful Ones; Fragments; Why Are So Blest? - is Africans' trust and sometimes belief in the stories made and circulated by essentially non-Africans. In other words, the reductive clichés, and generalized stereotypes have furnished the imperial powers with the necessary verbal tools in terms of a 'discourse' whereby these powers have been able to carry on and perpetuate its control and manipulation. In this connection, Armah's Two Thousand Seasons can be read as a text wrestling against other texts in the battle of representing Africa. The present study, thus, details on which texts Two Thousand Seasons draws upon, in what way and towards which end?

Keywords: Intertextuality; African History; Colonial Occupation; Cultural Representation; Millennial Past

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1- Introduction:

With Two Thousand Seasons (1973) readers observe that another phase in Armah's writing career has began: his immersion in the history of his Akan people can be read as a willingness to depart from the ex nihilo-nihili state of the man. Bako and Modin in the three early novels. Right from the prologue of Two Thousand Seasons readers find what can be considered a review on Modin and Solo's careers: "The noise the hypnotized make, multiplied by every echoing cave of our labyrinthine, is heavier, a million times louder than the sound we carry" (p. xi) Modin, readers recall from Why Are We So Blest? (1972), is left bleeding to death not far from a French military base in the Algerian desert. His physical castration can be approached as a metaphor for his emptiness from life juices, a fact that typifies his masculine unproductivity and foreshadows his uselessness for the task of regeneration. The picture, however, is not all bleak as the narrative emphasizes that there are some returning casualties' whose coming back to origins make them learn how to undo the chaotic present. Armah's reading of Africa's continental history differs and defies the monopoly established by western narratives. Two Thousand Seasons can be regarded as a spiritual biography of the continent. In showing that Africans had have a long history of struggle, and of survival and sometimes material triumphs despite the wrongs inflicted as a result from that struggle, the novelist has already made an unusual step towards a mental awakening. In the prologue, readers note the stress laid on the telling of one's story:

The ears of hearers should listen far towards origins. The utterer's voice should make knowledge of the way, of heard sounds visions seen, the voice of the utterers should make this knowledge inevitable, impossible to lose. (Armah, 1973. xiv)

2- Scope and Objective:

In the space of the present article, I attempt to review the tools by means of which Armah projected his people's history, and how his projection has been central to what can be considered his fully-fledged program for a prosperous Africa. How does his system work?—and what determines the scores and shortcomings in following such a program?

As indicated below, Armah's discourse in Two Thousand Seasons is predominantly mythical. The framing of the narrative evolves around the deployment of myths, legend, tales, dream-visions, parables and allegories. The novel never tires of drawing from this fantasia-mythical stock in order to impress its reader by showing to what extent the African present can possibly be of instructive consequences. In short, Two Thousand Seasons works ceaselessly at debunking western misrepresentations by providing one's own history. For Armah, African history in reality is neither a representation of Africa as a caricature of humanity, nor a world of naïve savages existing outside history, but a rather complex and civilizational entity. In Two thousand Seasons, readers find how the narrator becomes the unelected voice of the voiceless by merely evoking history. The community turns effectively from its paralyzing slumber once it learns about its position in space and time. Its reality of a community caught in a life or death tussle, worthy of being waged to defend its life style from the intrusion of alien lifestyles, is determined only when it is set in a historical situation. For apart from learning about one's identity and



individuality, history instructs how to confront life actively and responsibly. Edward Said pertinently observes:

Neither imperialism nor colonialism is a simple act of accumulation and acquisition. Both are supported and even impelled by impressive ideological formations that include notions that certain territories and people require and beseech domination (Said, 1994, 9)

In this regard, power itself is subject to history and thus it can be subject to contestation, competition and seizure. Since it is not God-given, power like anything worldly is initially a mental construction. He who wins materially has to win imaginatively first. This is why:

...appeals to the past are among the commonest of strategies in the interpretation of the present. What animates such appeals is not only disagreement about what happened in the past and what the past was, but uncertainly whether the past really is past, over and concluded, or whether it continues, albeit in different forms, perhaps. (Said, 1994, 3)

The writing of the past, in this context, is always motivated with some needs of the present. Differently put, the invocation of the past by a considerable novelists, of whom Armah is one, can be interpreted as an anxiety to settle some old 'scores' and 'answer back' some reductive clichés and misrepresentations as these latter have been inflicted by western domineering powers in the battle over the geography of Africa. The reductive clichés and generalized stereotypes have provided the imperial powers with the necessary verbal tools in terms of a 'discourse' whereby these powers could have carried out its control and subjectification.

Indeed, it seems that what prompts Armah to write Two Thousand Seasons is the vocation to 'answer back' or 'counter-write' the colonial discourse. Towards this end, Armah's novel can be considered as a text that wrestles with other texts that when combined all together in an analytic perspective figure in the casus belli over Africa. For readers can consider Two Thousand Seasons as 'an intertext' or 'a text between texts' (Plett, 1991, 5) For some of the key events in the novel are starkly reminiscent of similar events in other narratives. There is a cluster of allusions, centos, parodies, travesties, collages and other no less important references to master western texts. Chief among these texts is Joseph Conrad's Heart of Darkness (1902), and a little referred to short story by Conrad titled: "Karain: A Memory" (1897). Similarly, Two Thousand Seasons hints at Daniel Defoe's Robinson Crusoe (1719) and Cotton Mather's Magnalia Christi Americana or: The Ecclesiastical History of New England. (1702) Certainly, not all these cases of intertextualities fall within the same effect. While the relationship between Two Thousand Seasons and the texts of both Conrad and Defoe vary between 'inversion' and 'negation', there lies some sort of 'repetition' between Armah's book and Cotton Mather's.

3-Contextualizations

Before developing on these cases of intertexuality and how they variably interact

with Armah's text, there lies the need to stress the cultural aspect of making sense of these books. Since all the works referred to are indicative of certain cultural backgrounds, the task of reviewing them should follow the same line and examine the cultural impact as it is observed from the angle of intertexuality. In this light, reading African historical novels, written by various African writers cannot be fair or objectively satisfactory without considering western narratives (novels) that touch upon the historical realities of Africa. In other words, since "each cultural work is a vision of a moment, we must juxtapose that vision with the various revisions it later provoked." (Said, 1994, 66) This is how Said arrives at his famous investigative cultural method he names 'Contrapuntal Reading'. This last means the act of reading a text "with a simultaneous awareness both of the metropolitan history that is narrated and those other histories against which (and together with which) the dominating discourse acts." (Said, 1994, 67).

4-Approach and Method Followed:

Hermeneutically, such readings are judicious since the logic which approves the right for one culture to reduce other cultures to inferiority tolerate to these 'inferiorized' cultures a right to answer back and vindicate themselves. There remains only the technical question: how can this be carried out successfully? Michel Foucault's observations prove insightful. For apart from the archaeologies which deal exclusively with the discontinuities of an episteme in one moment of time, genealogies investigate the entire fabric of changing epistemes all through time. Unlike traditional historical schools, genealogy does not seek meanings of isolated events as it scans epistemes individually, that is, as value-free events. What privileges Foucault's genealogical method is the fact that it historicizes the 'problem', not the period (Flynn, 2001, 42). The difference between the two operations lies in the idea that genealogical investigation always "should be seen as a kind attempt to emancipate historical knowledge [from the hierarchical order of power associated with science, to render them, that is capable of opposition and of struggle against the coercion of a theoretical, unitary, formal and scientific discourse." (Said, 1994, 51)

Given this theoretical context, it seems that Armah's way of projecting genealogically the history of his people has been shaped by his predominating deployment of myth. To equalize the evocation of myths with factual history may sound an undue degradation of the serious, and in Armah's case, most enduring task of self-definition and identity. For the sake of appropriate self-definition, it is often presumed that one needs more than fictive means. One has to be, in this logic, fanatically committed to factual history. Such uncritical assumptions regarding factual history, however, do not pay adequate attention that this latter can be ideologically biased and value laden. This explains the modern crisis of epistemology. With post-structuralists' readings of history, it is rather common to find factual history driven towards "egohistory". Perhaps most damaging to objectivity is the moment when the means of representation become considered of minimal value when compared to factual history.

Myths and other means of representations (what can be called: mythico-fantasmatic reserve) can be launched as active participants in the imaginary contestaion over the physical and mental space of Africa. With the clarification of the importance of myths in the task of literary representation, a deep investigation of Armah's