KPS METHOD: A SUSTAINABLE, DEVELOPMENT AND HUMAN CAPACITY BUILDING TOOL IN TEACHING, LEARNING AND EVALUATION IN THE THIRD WORLD NATIONS

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Abstract
This paper presents a 5-step problem-solving method tagged Kolawole’s Problem-Solving (KPS) Method and investigated into the usefulness of KPS the method as a sustainable, development and human capacity building tool in teaching, learning, evaluation and problem-solving in the third-world nations. Steps in KPS include: (1) Identification of Keywords, Terms and Terminologies (KTT) (2) Mathematical-Concept (3) Mathematical-Language (4) Mathematical-Computation and Manipulation (5) Mathematical-Appraisal. The behavioural objectives to elicit each of these steps are coined with distinct passwords. These passwords include ‘KTT’ to elicit identification of the Keywords, term and terminologies; ‘DIRECT’ to elicit Mathematical concept; ‘DEVECQUIT’ to elicit Mathematical Language; ‘SCRIPT’ to elicit Mathematical Computation & Manipulation and ‘APPRAISE’ to elicit Mathematical APPRAISAL’. KPS method is based on the following assumptions: 1) effective teaching would necessitate good knowledge of the subject matter, mastery of appropriate teaching method and evaluating skills. 2) effective teaching would necessitate the identification of relevant Keywords, Terms and Terminologies (KTT) to the topic given consideration to students’ educational level. 3) most Mathematics teachers usually start their lessons with examples and calculations without explaining the meaning of relevant KTT 4) most Mathematics teachers often ignore the translation and interpretation of relevant terminologies before carrying out relevant calculations. 5) application of the topics taught by most Mathematics teachers to everyday life is often totally ignored by these teachers. 6) simultaneously combining teaching, learning and evaluation in teaching – learning process is often difficult for most Mathematics teachers. KPS is an effective and motivational tool for application in teaching learning and evaluation (as empirically proven by the outcome of extensive researches on the comparability of KPS method with other existing problem-Solving Methods). It is also applicable for solving practical life’s problems, items- writings, book-writings and Test-construction etc. KPS method was experimentally found to be valid, reliable, not gender-biased and not location-biased. The method is consequently recommended for usage in the third world nations.

Keywords: KPS, sustainable, development, human capacity building, teaching, learning, evaluation, third world

INTRODUCTION
No nation’s technological, scientific, political and economic breakthroughs could be sustained without adequate investment in human capacity building of her citizenry. In fact it seems as if the nations’ investment in human capacity development is the bedrock of increased productivity-cum-economic development of respective nations. This might possibly be the reason why most developed nations often greatly invest in the intellectual capacity of their citizenry so that their future production levels may be increased astronomically thereby accelerating the rate of their economic growth. As a result of advanced nations’ awareness of the indispensable role of education in fostering national-cum-global development, a tangible portion of most of such nations’ financial resources is often devoted to the improvement of their educational sector. Even though it is assumed in many quarters that the quality of the tertiary education is the major determinant of the educational health status of nations, yet the reverse seems to be the case. Experience have shown that the pre-tertiary educational levels (i.e. the foundational primary and secondary levels), are the actual determinants of the effectiveness of each nation’s educational system. This is in line with Federal Republic of Nigeria, FRN (2004), which states that the broad goal of secondary education in the National Policy of Education is to prepare the individual for useful living within the society.

Research into the operations of the secondary school’s education in Nigeria shows that the level seems not efficient in terms of inputs and the outputs. Coherent studies such as, Azuka (2013), Olubor (2004), Ajayi (1997), etc. have revealed that not all the students admitted to the first year in Nigerian Junior Secondary Schools often complete their education as expected. Moreover, even many of those who complete theirs are found to spend more years than necessary. The implication of the aforementioned is that the outputs of the nation’s secondary schools take in more than necessary inputs. The increase in the number of non-coping learners at pre-tertiary levels constitute serious wastage of capital and human resources of the educational system of the nation. Many reasons have been advocated from synthesis of relevant literature for this strange development among which poor learning environment, undesirable teachers’ motivation, high student-teacher ratio, lack of needed facilities, ignorance of problem-solving strategies, etc. stand out. The third world nations refer to those segment of the globe (especially most parts of Africa and Asia) where ignorance is rampant, poverty level is high and
underdevelopment of almost all the sectors obvious, as well as unimaginable untapped and unactivated latent potential, lack of sophisticated equipments, tools (or facilities) for solving both the existing and possible emerging problems, etc. Several strategies have been advocated both for teaching, learning and evaluation in this problematic segment of the globe, yet persistent poor performance of public schools’ students have necessitated the development of a proactive and effective indigenously-coded problem-solving method, capable of being adopted for complete overhauling of the system. In response to the aforementioned challenge Kolawole’s Problem Solving (KPS) method was postulated.

It is an undeniable fact that among all the subjects being studied in formal schools, Mathematics has contributed more to the objectives of general education of man (with his problem-solving feat) than other subjects. This accounts for why Mathematics globally had been made compulsory at the primary and secondary schools’ level unfortunately is spite of the global recognition of the paramount importance of Mathematics to national development the teaching, learning and evaluation of the subject have been in a dismal state in many third world countries. It is no longer news that many of the learners greatly dread the subject and consequently perform poorly therein. The aforementioned is depicted by Nwadie (2010), which reported that 75% of the entire candidates who registered and also sat for the West African Senior Secondary School Certificate Examination (WASSCE) May/June 2012 actually failed the subject. The unimaginable dwindling performance of learners in Mathematics in virtually all the nation’s education stratum have become an issue of great concern to stakeholders in the education sector in recent times. Inasmuch as continuous poor performance of learner in public examinations is an indicator of the diseased status of the education of learners, it is reasonable to seek lasting solution to the problem. It is unfortunate that most teachers have great mastery of the Mathematics’ subject matter couldn’t properly link such with appropriate evaluation process. As such, it is obvious that even though the nation’s schools are blessed with qualified (and appropriately certificated) teachers, who are familiar with the subject’s contents, yet many of these teachers often find it extremely difficult to construct appropriate standardized tests.

Amazingly, many learners who have acquired relevant knowledge of the subject matter prior to their examinations have been found to perform poorly in examinations because they were often not exposed to the right kind of testing procedures due to invalid and unreliable testing instruments constructed by their teachers; hence the dire need of addressing this shortcoming by the development of a highly effective problem-solving method, such as KPS. Experiences have shown that appropriate use of well constructed test blueprint enhances high content validity of the test. However, it is unfortunate that most teachers in the third world nations always construct their testing instruments without previously constructing such Test’s Blueprint; and inasmuch as Test’s Blueprint is the two-way grid that maps behavioural objectives with the contents, any test constructed without such is in reality invalid. KPS method, by its peculiar design as shown in Table 1 takes care of Teaching, Learning and Evaluation by deliberately encapsulating the trio in one integral whole (Kolawole, Oladosu & Ajetunmobi, 2013). The most unique feature of KPS method is that while the teacher can use it for teaching and evaluating the students, the learner can also simultaneously use it for learning and self-evaluation.

STATEMENT OF THE PROBLEM
The problem of this paper is poor performance of learners in Mathematics (and other subjects) and other problem-solving endeavours, which had been traced to the inability of teachers to start their lessons by identifying the keywords, meanings and interpretations of these keywords; and additionally, their inability to link teaching, learning, evaluation and problem-solving in order to facilitate the simplication of their everyday’s problem-solving tasks.

ASSUMPTIONS UNDERLYING THE DEVELOPMENT OF KPS
(I) Effective teaching would necessitate good knowledge of the subject matter, mastery of appropriate teaching method and evaluating skills. (2) Effective teaching would necessitate the identification of relevant Keywords, Terms and Terminologies (KTT) to the topic given consideration to students’ educational level. (3) Most Mathematics teachers usually start their lessons with calculations without explaining the meaning of relevant KTT (4) Most Mathematics teachers often ignore the translation and interpretation of relevant terminologies before carrying out relevant calculations. (5) Application of the topics taught by most Mathematics teachers to everyday life is often totally ignored by these teachers. (6) Simultaneously combining teaching, learning and evaluation in teaching – learning process is often difficult for most Mathematics teachers.

THE BASICS OF KPS METHOD
Step 1: ‘Identification’ of all relevant Keywords, terms and terminologies (i.e. KTT) of the topic
Step 2: ‘DIRECT’ the topic (i.e. Mathematical Concept Ability Level): This level is the stage at which the teacher ‘DIRECT’ all the relevant Keywords, terms and terminologies correctly (where ‘DIRECT’ is the acronyms or password for Define, Identify, Recognize, Enlist, Classify and Treat). Learners are also expected to ‘DIRECT’ the topic at this level. Moreover, ‘Moreover, ‘DIRECT’ and other equivalent evaluative verbs are used for evaluating the students.
Step 3: ‘DEVECQUIT’ the topic (i.e. Mathematical Language Ability Level): This level is the stage at which the teacher ‘DEVECQUIT’ the topic} where
‘DEVECQUIT’ is the password for Demonstrate (or Dissect), Explain, Verify, Explicate, Convert (or Compare), Question, Understand, Interpret (or Illustrate) and Translate. Learners also ‘DEVECQUIT’ the topic at this level. Furthermore, ‘DEVECQUIT’ and other equivalent evaluative verbs are used for evaluating the students.

**Step 4:** ‘SCRIPT’ the topic (i.e. Mathematical Computation and Manipulation Ability Level): This level is the stage at which the teacher ‘SCRIPT’ the topic (where ‘SCRIPT’ is the password for Solve (or Simplify), Calculate, Compute and Construct relevant data, Read, Interpret, Plot and Table (or Translate) relevant data, chart, table at this level. Moreover, ‘SCRIPT’ and other parallel illustrative verbs are used for evaluating the students.

**Step 5:** ‘APPRAISE’ the topic (i.e. Mathematical Appraisal Ability Level): This level is the stage at which the teacher ‘APPRAISE’ the topic (where ‘APPRAISE’ is the password for Apply (or familiar and unfamiliar situation), Prove, Predict, Relate, Appraise, Induce (or Infer/deduce), Solve and Estimate appropriately in order to equip students to be able to solve more difficult problems.

### MOTIVATION, SIGNIFICANCE AND APPLICATIONS OF KPS METHOD AS A HUMAN CAPACITY BUILDING TOOL

KPS method can be used for the following education-related endeavours:

**[1] TEACHING:** Teaching/Classroom instructions under the guidance of teachers have been reputed to be the major formal tool for shaping the minds of learners worldwide appropriately. However, inasmuch as seasoned experts have agreed that excellent performance of learners mainly depends on the correct use of appropriate teaching methods in the classroom settings there is dire need to find a suitable replacement for the hitherto adopted in the schools empirically proven ineffective traditional/conventional instructional method. KPS is found suitable for teaching all kinds of formal school subjects. This is as a result of the fact that teachers (in the various nations’ schools) often teach their subjects’ components without adequately identifying and explaining relevant keywords, terms and terminologies to the topic (i.e. Omission of step 1 and 2 in KPS); as well as failed in translating and interpreting these keywords, etc. (i.e. Omission of step 3 in KPS) and also in the application of the topic to solve problems and synchronizing teaching, learning and evaluation procedures (i.e. Omission of step 5 in KPS). KPS method compensates for the aforementioned anomalies by ensuring that no teacher (applying KPS method as his/her instructional method) would teach any topic without adequately identifying and explaining the meaning of relevant keywords, terms and terminologies to the topic; as well as applying the topic appropriately (i.e. for solving both the familiar and unfamiliar problems) and additionally make teaching, learning and evaluation go simultaneously in formal schools.

The implication of the aforementioned is that once the teacher adequately identifies and explains the keywords, terms and terminologies associated with any particular topic, as well as correctly translate and interpret these keywords, etc. and additionally correctly apply the topic taught to solve both familiar and unfamiliar problems—learners would henceforth be taught relevant subject’s components in a way that will empower such learners to be able to easily and confidently transfer the knowledge acquired from instructions received from their teachers (via teaching) to solve both the old and the newer atypical or ‘non-standard’ problems. This is capable of significantly improving the efficacy of teachers, which will consequently be reflected in better performance of learners in their school’s subjects (both within and outside the formal school’s settings) and to a very large extent serves as a sustainable development and human-capacity building tool for teachers in the third world nations. To apply KPS method by, the teacher should first identify all relevant keywords, terms & terminologies associated with the topic and afterwards ‘DIRECT’, ‘DEVECQUIT’, ‘SCRIPT’ and ‘APPRAISE’ the topic appropriate.

**[2] LEARNING:** The learning method adopted by learners in learning their schools’ subjects have been observed by seasoned experts to have significant effect on learners’ performance in these subjects. In fact, it have been asserted by several seasoned experts that traditional learning technique cannot satisfy the complexity of the current modern times’ sophisticated society. KPS method, when experimentally juxtaposed with other methods recorded the highest achievement mean performance (that was significantly better than other methods as found out in Kolawole, Oladosu & Ajetunmobi, 2013). This result may be ascribed to the fact that learners (in formal schools) having been fully powered by the knowledge of the keywords and their meanings, in addition to the knowledge of the nitty-gritty of the underlying relevant concepts now have deeper communication that are relevant to the topic being taught before actually moving to the realm of computation and manipulation or even actual problem-solving (i.e. practical knowledge transfer).

It is clear, therefore, that KPS method can be used to significantly improve the performance of all categories of learners (Kolawole, 2013; Kolawole, Oladosu & Ajetunmobi, 2013) because if learners at any level of the educational stratum can be fully configured to understand the underlying concepts and language of communication applicable to the computation and manipulation of the given and/or obtained data/information, their academic burden would be alleviated, which would consequently greatly aroused their interest in various school’s to an unprecedented dimension. As learners become more proficient in the mastery of different topics in their schools’ subjects and problem-solving, better results would be obtained by learners in their schools’ subjects. As such, KPS would undoubtedly henceforth serves as a sustainable, development and human-capacity building tool for learners in the third world nations. In order to properly apply KPS method to learning, the learner must identify all relevant keywords, terms & terminologies, as well as ‘DIRECT’, ‘DEVECQUIT’, ‘SCRIPT’ and ‘APPRAISE’ (the topics) appropriately.
Construction, Item-Writing & Evaluation

Even though the third world nations’ formal schools are blessed with countless highly qualified, appropriately certified, hardworking and proficient teachers, yet a greater percentage of these teachers have not been able to produce acceptable level of performance in various schools’ subjects for most learners (in external examinations in comparison with better performance in internal examinations) because it lacks the ability to properly connect teaching and appropriate evaluation (which ought to be the case in the normal formal education setting). While the tests items conducted by teachers (i.e. Teacher-Made Tests) often lacked validity, reliability and dependability (i.e. have poor Psychometric properties), the tests (or examinations) designed and conducted by external examining bodies called “Standardized Tests” are always valid, reliable, dependable and usable (i.e. have adequate Psychometric Properties), hence the need for an effective method applicable for Tests’-Blueprint Construction, Item-Writing and Evaluation. KPS method is a viable tool for correcting the aforementioned anomalies in as much as the same distinct passwords used for teaching learners the concerned subject’s matter i.e. ‘KTT’, ‘DIRECT’, ‘DEVECQUIT’, ‘SCRIPT’ and ‘APPRaise’ is to be equally used in the construction of the tests for assessing and evaluating learners. In this regard, the probability of excellent performance by most learners is, therefore, greatly enhanced. To correctly apply KPS method to Tests’-Blueprint Construction, a 2-way grid mapping subject’s content with ability levels, in which the test-construction allocates appropriate number of items or questions into each cell of KPS Ability Levels i.e., ‘Concept’, ‘Language’, ‘Computation & Manipulation and Appraisal levels which sequentially employs the Passwords ‘DIRECT’, ‘DEVECQUIT’, ‘SCRIPT’ and ‘APPRaise’ in formulating these. Furthermore, to apply KPS to Item-writing, the item writer identifies all relevant keywords, terms and terminologies associated with the topic (or a group of topics). Then ‘DIRECT’, ‘DEVECQUIT’, ‘SCRIPT’ and ‘APPRaise’ the aforementioned appropriately. It is the outcome of students’ assessment using these items that evaluation is based.

[4] BOOK-WRITING: It is an undeniable fact that a significant proportion of learners often find it difficult to absorb/assimilate relevant information from the print-media (especially textbooks) because the packaged information therein are often heavily coded with unexplained keywords, terms and terminologies that are often extremely difficult for decoding, hence most of the valuable useful and applicable information packaged therein are in actual fact being wasted inasmuch as their deeper meanings cannot be adequately accessed by most readers of such books. KPS method, however, by its unique design (for practical applicability) completely curtail this anomaly by its 5-steps sequential procedures including: Identification of Keywords, terms & terminologies, ‘Concepts’, ‘Language’, ‘Computation & Manipulation, and Appraisal – which are respectively powered by the following 5-distinct passwords i.e. ‘KTT’, ‘DIRECT’, ‘DEVECQUIT’, ‘SCRIPT’ and ‘APPRaise’, which have been experimentally proven to be capable of simplifying different school’s subjects topics and as such could significantly enhance book-readers levels of understanding regarding the topical issues raised in relevant textbooks associated with their subjects. To appropriately apply KPS method to book-writing, the author first identifies all relevant keywords, terms & terminologies (‘KTT’) associated with the topic (or subject matter) being dealt with, and thereafter ‘DIRECT’, ‘DEVECQUIT’, ‘SCRIPT’ and ‘APPRaise’ these appropriately.

[5] PROBLEM-SOLVING: Even though actual functionality in the real world situations require creativity and action yet the traditional/conventional instructional method often fail in this area, hence its failure to prepare learners for the real world (i.e. it often teaches abstract theories and not the practical applicability of these theories). In a realistic sense, this is the actual factor underling the astronomical unemployment rate among the educated people and its accompanying incredible poverty level in the third world. KPS method, however, by its peculiar design proffer solution to this anomaly by connecting abstract formal school’s knowledge with concrete real world experiences.
i.e. application of learned facts to solving both the familiar and unfamiliar problems. Consequently, countless richly-rewarding jobs would eventually be created and developed by experienced problem-Solvers who have been powered by KPS method.

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To appropriately apply KPS method in solving all kinds of problems, the Problem-Solver should first meticulously study the concerned problem in order to be able to successfully identify all the keywords, terms and terminologies (‘KTT’) associated with the topic (containing the problem) and thereafter ‘DIRECT’, ‘DEVECQUIT’, ‘SCRIPT’ and ‘APPRAISE’ the topic containing the problem appropriately. The implication of the aforementioned is that once the learners being properly instructionally empowered in the third world nations’ formal schools settings have been fully equipped by KPS method to solve all kinds of problems independently, the astronomical rate of unemployment in these nations (and its accompanying alarming poverty rate) would be drastically reduced to the barest minimum – and thereby creates a conducive aura/hope-filled environment for myriads of hitherto despondent learners/graduates of the various nations’ formal institutions of learning. In this regard, KPS method would, henceforth, undoubtedly serves as a sustainable, development and human-capacity building tool in teaching, learning and evaluation.

**FURTHER APPLICATIONS OF KPS METHOD:**

**KOLAWOLE’S GENERAL PROBLEM-SOLVING METHOD (KGPS):**

A minor modification of KPS called ‘KGPS’ could be applied for teaching, learning, evaluating and problem-solving in all the formal school’s subjects – be it English Language, Economics, Biology, Physics, Chemistry, Government, Commerce, Account, etc. in order to improve learners’ performance in these subjects. As such, KPS method could serve as a viable alternative to the conventional method of impartation of relevant knowledge. However, there are few modifications for consideration by KGPS users e.g. if the subject is Economics. **Step 1**: Still bears identification of all relevant keywords, **Step 2**: becomes Economics-Concept, **Step 3**: becomes Economics-Language, **Step 4**: becomes Economics-Computation and Manipulation; while **Step 5**: (the final step) becomes Economics-Appraisal– However, all the processes and passwords involved in the operations of each step remains unchanged.

**KOLAWOLE’S LIFE PROBLEM-SOLVING (KLPS) METHOD:**

An advanced adaptation of KPS called ‘KLPS’ could be applied for solving all kinds of problems associated with everyday living – be it familiar or unfamiliar situations. KLPS also, like its KPS root is a 5-step technique in which **Step 1** involves the identification of all relevant keywords, **Step 2** involves ‘DIRECT’ the issue/problem, **Step 3** involves ‘DEVECQUIT’ the issue/problem, **Step 4** involves ‘SCRIPT’ the issue/problem and **Step 5** involves ‘APPRAISE’ the issue/problem.

The outcome of extensive studies on the degree of effectiveness of KPS in improving learners’ performance is more effective than other methods and the conventional method in vogue in Nigeria (Kolawole, 2013; Kolawole, Oladosu & Ajetunmobi, 2013, etc.) Moreover, KPS was found to be neither sex-biased nor location biased, as such KPS is applicable to teaching–learning process involving learners of both genders attending schools sited at different locations. The possible reason advocated for the high effectiveness of KPS method is simply the encapsulation of coded passwords into the ability levels involved therein, which often thoroughly assists problem-solvers in the comprehension of every Mathematical topics involved before proceeding to the actual manipulations of data involved and problem-solving. This finding is in line with Warren (2010) assertion that the complex taxonomy involved in mathematics, which is often divided into axioms, conjectures, theorems, lemmas and corollaries may prove too difficult to crack if not well understood by teachers and learners in the subject.
To transform Nigeria (and other third world nations) into some of the twenty leading economy of the world by the year 20-20 efficient machinery should be set in motion to completely overhaul their educational system. To ensure that this is possible within the shortest possible time frame, proactive steps should be taken to identify and adopt an indigenously-coded problem-solving tool in fine-tuning the nation’s teaching, learning and evaluation processes. This paper is an eye-opener capable of widening the horizon of Mathematics (and other subjects’) educators by making them to realize that KPS method is an effective tool for initiating, developing and sustaining excellent performance in education in the third world.

**RECOMMENDATIONS**

Inasmuch as KPS method had been experimentally found to be neither sex-biased, nor location-biased, but easy-to-use and highly effective for problem-solving purposes, KPS method is hereby recommended to be formally introduced and be adopted as the official Mathematics’ instruction in the third world nations’ public schools in order to greatly improve teachers’ teach-ability, students’ learn-ability, evaluation and general problem-solving in Mathematics and other school’s subjects beyond what had hitherto existed therein. Moreover, seminars and workshops, on KPS should be held regularly for public school’s teachers and their students in order to improve teaching and learning strategies (in these schools) as the concerned individuals aim at optimum academic performance.

**REFERENCES**


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