



Research Article

Kolawole's Problem-Solving Method (KPS) A panacea to mathematical and life's problems

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Abstract

This paper presents a 5-step Problem Solving method tagged: 'Kolawole's Problem-Solving (KPS) method'. These steps include the followings : (1) Identification of the keywords, terms and terminologies; (2) Mathematical Concepts; (3) Mathematical Language; (4) Mathematical Computation and Manipulation and (5) Mathematical Appraisal. The behavioural objectives to elicit each of these steps are coined with distinct passwords. These passwords include 'DIRECT' to elicit Mathematical Concepts, 'DEVECQUIT' to elicit Mathematical Language, 'SC³RIP^T' to elicit Mathematical Computation and Manipulation and 'APPRAISE' to elicit Mathematical Appraisal. KPS method is based on the following assumptions i.e. (i) effective teaching would necessitate good knowledge of the subject matter, mastery of appropriate teaching method and evaluating skills. (ii) Effective teaching would necessitate the identification of relevant keywords, terms and terminologies to the topic giving consideration to students' educational level. (iii) Most Mathematics teachers usually start their lessons with calculations without explaining the meaning of relevant keywords terms and terminologies. (iv) Most Mathematics teachers often ignore the translation and interpretation of relevant terminologies before carrying out relevant calculations. (v) Application of the topics taught by most Mathematics teachers to everyday life is often totally ignored by these teachers. (vi) Simultaneously combining teaching, learning and evaluation in teaching – learning process is often difficult for most Mathematics teachers. KPS method could be used in teaching, book – writing, item – writing, test – construction, solving and evaluating mathematical problems. The method can also be adopted for onward usage in all the formal school's teaching subjects in order to improve learners' performance, as well as in solving practical life's problems. Extensive researches on KPS indicate that the method is an effective method of teaching, as well as reliable, valid and dependable. The method is not biased towards gender as well as location of the students. It is therefore recommended that Mathematics teachers (and teachers of other subjects) should adopt the method and its adaptations in the teaching, learning and evaluation processes and additionally in solving life's problems.

Keywords: Problem-Solving, science-based knowledge, Mathematics teachers

Abbreviations

KPS; Kolawole's Problem Solving Method.

'DIRECT': Define, Identify, Recognise, Enlist, Classify and Treat.

'DEVECQUIT': Demonstrate, Expatriate, Verify, Explain, Compose/Convert, Query, Understand, Interpret and Translate

'SC³RIP^T': Solve/Simplify, Calculate, Compute, Construct, Read, Interpret, Plot, and Tabulate

'APPRAISE': Apply, Prove, Predict, Relate/Review, Appraise/Asses, Induce, Solve and Estimate.

INTRODUCTION

Mathematics, according to Kolawole and Udeh (2012) is a tool in the development of science-based knowledge such as technology, industry and even for sound analytical reasoning in daily living in this communication age. Nwadiae (2010) reported that 75% of the total candidates who sat for West African Senior Secondary School Certificate Examination (WASSCE) May/June 2012 failed mathematics and English language. He further gave a breakdown for those who scored credit in mathematics as 41.50%, while those who had credit in the previous years are 25.00% in 2009 and 13.76% in 2008. Nigeria is currently being bedeviled with poor performance of students in Mathematics and poor performances of learners in virtually all the nation's educational strata in Mathematics (i.e. from primary to tertiary levels) have reached an unimaginable proportion. Inasmuch as poor performance in public examinations is a course in the wheel of progress of all categories of students, it is reasonable to find lasting solutions to the problem. It is unfortunate that most of the teachers who have the mastery of the subject matter while teaching could not link it but properly linking it with appropriate evaluation process. It is an undeniable fact that Nigerian schools are blessed with highly qualified teachers. These teachers know the contents of the subject, as well as the appropriate method of teaching these contents but they often find it extremely difficult to construct appropriate or standardized tests.

Experiences have shown that students might have acquired relevant knowledge, yet perform poorly in examinations because they were often not exposed to the right kind of testing procedures due to invalid and unreliable tests constructed by their teachers, hence the dire need to address this shortcoming by the development of a proactive problem-solving method. It is also observed that for practical purpose of classroom testing, existing taxonomies of educational objectives are too complex for usage by the current crop of teachers/lecturers in the nation's different institutions of learning. Consequently, since most of the currently serving teachers did not fully understand the meaning of the terminologies used in either Bloom's or any of the nation's public examinations body's taxonomies in classifying their items, it becomes almost impossible for them to construct appropriate test items according to these categories.

Most of the teachers in Nigeria always construct tests without previously constructing Test's Blueprint (or Test's Plan). Such teachers could be likened to a bricklayer building a house without a house-plan or a fashion-designer sewing a dress without any pattern (or design). Test plan or Blueprint is a two-way grid that maps behavioural objectives with the content, without which a test becomes invalid and not useful for the purpose for which such a test is intended. Appropriate use of well constructed test blueprint enhances high content validity of the test.

Kolawole (2013) in response to the aforementioned problem postulated a comprehensive easy-to-use problem-solving method called; *Kolawole's Problem-Solving (KPS) method* which by design deliberately takes care of: (i) **Teaching** (i.e. Content versus Behavioural Objective for the teacher) (ii) **Learning** (i.e. Content versus Behavioural Objectives for students) and (iii) **Evaluation Processor** blueprint (i.e. Taxonomy of Educational Objectives, which incorporates content versus illustrative verbs). The unique feature of KPS method is that the teacher can use it for teaching and evaluating the students. In this regard, the KPS method involves a combination of content, teacher's activities, student's activities and evaluation that could be operated concurrently (or simultaneously) as shown in table 1

Table 1. KPS Method's Ability Levels and Taxonomy of Educational Objectives

KPS Method's Ability Levels	Taxonomy of Educational Objectives		
	Teacher's Activities in KPS (Behavioural Objectives)	Students' Activities in KPS	Illustrative Verbs for Evaluating Students in KPS
Identification of all relevant keywords, Terms and Terminologies of the topic	Teacher identifies all relevant Keywords (K), Terms (T) and Terminologies(T) of the problem (KTT)	Should be able to identify all relevant Keywords, Terms and Terminologies of the topic	Identify, list, mention, list-out, itemized all relevant Keywords, Terms and Terminologies of the topic
Mathematical Concept (<i>with the password DIRECT</i>)	'DIRECT' all relevant keywords, terms and terminologies of the topic.	should be able to Define, Identify, Recognize, Enlist, Classify & Treat concepts, terms and terminologies correctly	Define/give meaning, identify, recognize, enlist, classify, treat (or test), mention, recall, recite, etc.
Mathematical Language (<i>with the password DEVECQUIT</i>)	'DEVECQUIT' all relevant keywords, terms and terminologies of the topic.	Should be able to Demonstrate, Explain, Verify, Expatriate, Convert/Compose, Question, Understand, Interpret (or Illustrate) and Translate concepts, terms and terminologies correctly.	Demonstrate, explain, verify, expatriate, convert, query, understand (or uncover/unravel), interpret, translate, differentiate, simplify illustrate, identify, Compose etc.
Mathematical Computation and Manipulation (<i>with the password SC³RIPT</i>)	'SC ³ RIPT' out all calculation and manipulation involved in the topic	Should be able to Solve problems, Simplify, Calculate, Compute & Construct using the data given, Read, Interpret, Plot & Tabulate figures, graphs, chart & tables correctly.	Solve (or simplify) calculate, compute, construct, read, interpret, plot, tabulate, find, determine, factorize, expand, estimate, draw, measure, show, etc.
Mathematical Appraisal (with the password 'APPRAISE')	'APPRAISE' the topic	Should be able to Apply the knowledge acquired from the topic to everyday activities, Prove & disprove theorems, Predict, relevant concepts, Relate/Review concepts to other concepts, Appraise/Asses, concepts, Induce (or deduce), Solve & Estimate to solve problems correctly.	Apply, prove, (or disprove), predict, relate, Review, appraise, asses, induce (or deduce), solve, estimate, interpolate, compute, interpret, predict, compare and contract, calculate, establish, justify, etc.

THE BASICS OF KOLAWOLE'S PROBLEM-SOLVING METHOD

Step 1: Identification of all relevant keywords, terms, and terminologies. Identify all relevant Keywords, Terms, Terminologies (KTT) of the Mathematical problem/Topic

Step 2: "DIRECT" the Problem/Topic Mathematical Concept Ability Level: this ability level is the level at which the teacher 'DIRECT' the topic i.e. **Define, Identify, Recognize, Enlist, Classify and Treat** all relevant keywords, terminologies of the topic correctly. The student at this level should also be able to; **define, identify, recognize, enlist, classify and treat** all relevant keywords, Problem, Terms and Terminologies etc. correctly. In evaluating students at this ability level, the following illustrative verbs for evaluating the students are: **define, identify, recognize, enlist, classify, treat, as well as, recall (or mention), and any equivalent words or verbs for eliciting Mathematical concept.**

Step 3: 'DEVECQUIT' the Problem/Topic Mathematical Language Ability Level: This ability level is the level at which the teacher 'DEVECQUIT' the topic i.e. **Demonstrate (or Dissect), Explain, Verify, Expatriate, Convert or Compare, Question, Understand, Interpret or Illustrate and Translate** the keywords, terms and terminologies etc. that underlie the topic correctly. The student at this level should be able to adequately **demonstrate, explain, verify, expatriate, convert or compare, question, understand, interpret or illustrate and translate** all relevant keywords, terms and terminologies etc. that underlie the topic. The illustrative verbs to be used by the teachers to evaluate students at this level are: **demonstrate (or differentiate), explain, verify, expatriate, convert, question, understand, interpret, translate, as well as simplify, differentiate, and any equivalent word or verb that is appropriate for eliciting Mathematical Language mastery.**

Step 4: 'SC³RIPT' the Problem/Topic Mathematical Computation and Manipulation Ability Level: This ability level is the level at which the teacher 'SC³RIPT' the topic i.e. **Solve (or Simplify) problems, Calculate, Compute and Construct** relevant data, **Read, Interpret, Plot and Tabulate (or Translate)** relevant data, chart, table etc. correctly. The student at this level should be able to: **solve (or simplify) problems, calculate, compute and construct** relevant data, **read, interpret, plot and tabulate** using given data, chart, table, etc. correctly. The illustrative verbs for evaluating students at this level are: **solve, calculate, compute, construct, read, interpret, plot, tabulate, as well as find, determine, solve, form a table, etc. factorize, expand, simplify, prove, disprove, read, draw, measure, show and any equivalent word or verb that is appropriate for Mathematical Computation and Manipulation.**

Step 5: 'APPRAISE' the Problem/Topic Mathematical Appraisal Ability Level: This ability level is the level at which the teacher 'APPRAISE' the topic i.e. **Apply** the topic to everyday life issues (i.e. to familiar, as well as unfamiliar situations); **Prove (or disprove theorems); Predict, Relate, Appraise, as well as Induce (or Infer/deduce), Solve and Estimate** appropriately in order to equip (or empower) students to solve more difficult problems. The students at this level should be able to use the knowledge acquired from the topic to **apply** the problem to familiar and unfamiliar problems, **prove or disprove theorem, predict** appropriate concepts, **relate** given concept to others, **appraise, induce (or deduce), solve (using the most appropriate formulas, methods, techniques, processes etc.) and estimate** concepts that underlie the topic in order to solve problems. The illustrative verbs that could be used to evaluate students' ability in problem solving include: **apply, prove (or disprove), predict, relate, appraise, induce, solve and estimate as well as generalize, calculate, establish, justify and any equivalent word or verb appropriate for appraisal.**

ASSUMPTIONS OF KPS

1. For effective teaching, teachers must have good knowledge of the subject matter, and be well equipped with appropriate teaching methods, and good evaluating skills.
2. For effectiveness, teachers must be able to adequately identify relevant keywords, terms and terminologies to the topic, putting into consideration the educational level of the students (omission of step 1 in KPS).
3. Most mathematics teachers usually start their lessons with examples, calculations and manipulations without any reference to the meanings of all relevant keywords, terms and terminologies of the subject matter (i.e. omission of step 2 in KPS)
4. Most of the mathematics teachers are not used to translating and interpreting relevant keywords, terms and terminologies before the computing and manipulation processes (omission of step 3 in KPS)
5. Most of the mathematics teachers are not used to applying the topic to everyday life i.e. both familiar and unfamiliar situations (omission of step 5 in KPS)
6. Most Mathematics teachers are not familiar with how to make teaching, learning and evaluation procedures to go simultaneously in teaching-learning processes (omission of step 5 in KPS).

USAGE OF KPS METHOD

KPS method can be used for the followings:

1. **TEACHING:** In using KPS for teaching, the teacher should first of all identify all relevant keywords, Terms, and Terminologies associated with the topic or problem or subject matter, then 'DIRECT', 'DEVECQUIT', 'SC³RIPT' and 'APPRAISE' the problem respectively.
2. **BOOK WRITING:** The writer identifies all relevant keywords, terms and terminologies associated with the topic or problems or questions or subject matter, and thereafter 'DIRECT', 'DEVECQUIT', 'SC³RIPT' and 'APPRAISE' the problem respectively.
3. **LEARNING:** The learner identifies all relevant keywords, terms and terminologies associated with the topic, problem, question, exercise or subject matter, and then 'DIRECT', 'DEVECQUIT', 'SC³RIPT' and 'APPRAISE' the problem respectively.
4. **ITEM WRITING:** The author identifies all the relevant keywords, terms and terminologies and concepts associated with the subject matter or problems. Then 'DIRECT', 'DEVECQUIT', 'SC³RIPT' and 'APPRAISE' the problem respectively.
5. **EVALUATION/TEST CONSTRUCTION:** Construct a 2-way grid that maps content with ability level column 1 in which the tester allocates the number of items or questions appropriate into each cell, then 'DIRECT', 'DEVECQUIT', 'SC³RIPT' and 'APPRAISE' the problem respectively to write appropriate items for each cell.
6. **PROBLEM SOLVING:** Identify all relevant keywords. Terms and Terminologies associated with the problem then 'DIRECT', 'DEVECQUIT', 'SC³RIPT' and 'APPRAISE' the problem respectively.

For example: suppose you wish to teach a topic "Selling and Buying" then the following steps should be taken:

Step 1: Identification of all relevant keywords, terms, terminologies of selling and buying. These include: **cost price, selling price, loss, profit/gain, loss percentage, profit percentage.** The students at this level should be able to identify and list out all relevant keywords **cost price, selling price, loss, profit/gain, loss percentage, profit percentage.** In evaluating the students, evaluative words includes identify, mention all the relevant keywords term and terminologies on buying and selling.

Step 2: 'DIRECT' the Problem/Topic Mathematical Concept Ability Level: this ability level is the level at which the teacher 'DIRECT' the topic i.e. **Define, Identify, Recognize, Enlist, Classify and Treat** each of **cost price, selling price, loss, profit/gain, loss percentage, profit percentage.** The students at this level should also be able to; **define, identify, recognize, enlist, classify and treat cost price, selling price, loss, profit/gain, loss percentage, profit percentage.** In evaluating students at this ability level, the following illustrative verbs for evaluating the students are: **define, identify, recognize, enlist, classify, treat, as well as, recall (or mention), cost price, selling price, loss, profit/gain, loss percentage, profit percentage, seller, buyer eliciting Mathematical concept on buying and selling.**

Step 3: 'DEVECQUIT' the Problem/Topic Mathematical Language Ability Level: This ability level is the level at which the teacher 'DEVECQUIT' the topic i.e. **Demonstrate (or Dissect), Explain, Verify, Expatiate, Convert or Compare, Question, Understand, Interpret or Illustrate and Translate** each of **cost price, selling price, loss, profit/gain, loss percentage, profit percentage.** The students at this level should be able to adequately **demonstrate, explain, verify, expatiate, convert or compare, question, understand, interpret or illustrate and translate** each of **cost price, selling price, loss, profit/gain, loss percentage, profit percentage,** all relevant keywords, terms and terminologies etc. that underlie the topic. The illustrative verbs to be used by the teachers to evaluate students at this level are: **demonstrate (or differentiate), explain, verify, expatiate, convert, question, understand, interpret, translate, as well as simplify, differentiate** each of **cost price, selling price, loss, profit/gain, loss percentage, profit percentage** for eliciting Mathematical Language mastery.

Step 4: 'SC³RIPT' the Problem/Topic Mathematical Computation and Manipulation Ability Level: This ability level is the level at which the teacher 'SC³RIPT' the topic i.e. **Solve (or Simplify) problems, Calculate, Compute and Construct** relevant data, **Read, Interpret, Plot and Tabulate (or Translate)** each of **cost price, selling price, loss, profit/gain, loss percentage, profit percentage.** The student at this level should be able to: **solve (or simplify) problems, calculate, compute and construct relevant data, read, interpret, plot and tabulate cost price, selling price, loss, profit/gain, loss percentage, profit percentage.** The illustrative verbs for evaluating students at this level are: **solve, calculate, compute, construct, read, interpret, plot, tabulate, as well as find, determine, solve, form a table, etc. factorize, expand, simplify, prove, disprove, read, draw, measure, each of cost price, selling price, loss, profit/gain, loss percentage, profit**

percentage for Mathematical Computation and Manipulation.

Step 5: 'APPRAISE' the Problem/Topic Mathematical Appraisal Ability Level: This ability level is the level at which the teacher 'APPRAISE' the topic i.e. Apply the topic to everyday life issues (i.e. to familiar, as well as unfamiliar situations); **Prove** (or disprove theorems); **Predict, Relate, Appraise**, as well as **Induce** (or Infer/deduce), **Solve** and **Estimate** each of the **cost price, selling price, loss, profit/gain, loss percentage, profit percentage**. The students at this level should be able to use the knowledge acquired from the topic to **apply** the problem to familiar and unfamiliar problems, **prove** or disprove theorem, **predict** appropriate concepts, **relate** given concept to others, **appraise**, **induce** (or deduce), **solve** (using the most appropriate formulas, methods, techniques, processes etc.) and **estimate** each of **cost price, selling price, loss, profit/gain, loss percentage, profit percentage** in order to solve problems. The illustrative verbs that could be used to evaluate students' ability in problem solving include: apply, prove (or disprove), predict, relate, appraise, induce, solve and estimate as well as generalize, calculate, establish, justify each of **cost price, selling price, loss, profit/gain, loss percentage, profit percentage** for mathematical appraisal.

BASIC COMPONENTS OF KPS

The KPS is a method based on theories of Test Blueprints-cum-Taxonomy of Educational Objectives which incorporates:

A – Content

B – Cognitive Domain Level

C – Behavioural Objectives

D – Evaluation

A. **Content:** This actual problem includes all relevant keywords terms and terminologies (KTT) of all the topics in the course outline, scheme of work or syllabus in case of book writing or summative examination.

B. **Cognitive Levels:** These include:

1. Mathematical concept ability level
2. Mathematical language ability level
3. Mathematical computation and manipulations ability level
4. Mathematical Appraisal ability level

Password for Cognitive Levels – CLCA

C. **Behavioural Objectives:**

“DIRECT” to elicit Mathematical Concepts

“DEVECQUIT” to elicit Mathematical language

“SC³RIPT” out, to elicit Mathematical computation and manipulation

“APPRAISE” to elicit Mathematical appraisal

The password for behavioural objectives is “DDSA”

D. **EVALUATION:** These are the evaluative verbs for each of ability levels i.e.

Mathematical concepts

Mathematical language

Mathematical computations and manipulations

Mathematical appraisal

For each of these is 'DIRECT', 'DEVECQUIT', 'SC³RIPT' and 'APPRAISE' respectively. The password for cognitive levels in 'CLCA'

The followings are the full meanings of the passwords used in KPS i.e.

(A) **DIRECT**

D: Define/meaning

I: Identify

R: Recognize/recall

E: Enlist/list out

C: Classify

T: Treat all relevant keywords, terms and terminologies of the problem

(B) **DEVECQUIT**

D: Demonstrate
 E: Expatriate
 V: Verify
 E: Explain
 C: Compare/Compose or convert
 Q: Query
 U: Understand
 I: Interpret
 T: Translate all relevant keywords, terms and terminologies of the problem

(C) **SC³RIPT**

S: Solve or Simplify
 C: Calculate
 C: Compute
 C: Construct lines, angles, triangles, equilaterals, parallelogram, polygons etc.
 R: Read tables, charts, graphs etc.
 I: Interpret tables, laws, graphs, charts etc.
 P: Plot/plan
 T: Tabulate all relevant data keywords, terms and terminologies of the problem
 The letters in each of the acronyms are illustrative verbs for evaluating the students on the respective ability levels.

(D) **APPRAISE**

A: Apply the problem to everyday life
 P: Predict or plan/preview/paraphrase
 P: Prove or disprove laws, principles and theorems
 R: Relate/review/reappraise
 A: Appraise or Assess
 I: Induce or deduce
 S: Solve
 E: Estimate or establish all relevant keywords, terms and terminologies of the problem

THEORETICAL FRAMEWORK OF KPS METHOD

KPS is a 5-step problem solving method that can be used in teaching book writing, learning, item writing, test construction, solving and evaluating mathematical problems.

The five steps include:

Step 1 – Identify all relevant Keywords, Terms, Terminologies (KTT) to the problems topic.

Step 2 – “DIRECT” the problem (K, T, T) to teach or learn or solve or evaluate mathematical concept

Step 3 – “DEVECQUIT” the problem to teach or learn or solve or evaluate mathematical language

Step 4 – “SC³RIPT” out the problem to teach or learn or solve or evaluate mathematical computation and manipulative problems

Step 5 – “APPRAISE” the problem (KTT) to teach or learn or solve or evaluate mathematical problems.

THEORETICAL FRAMEWORK OF KPS

Teaching – Learning – Solving – Evaluation Model

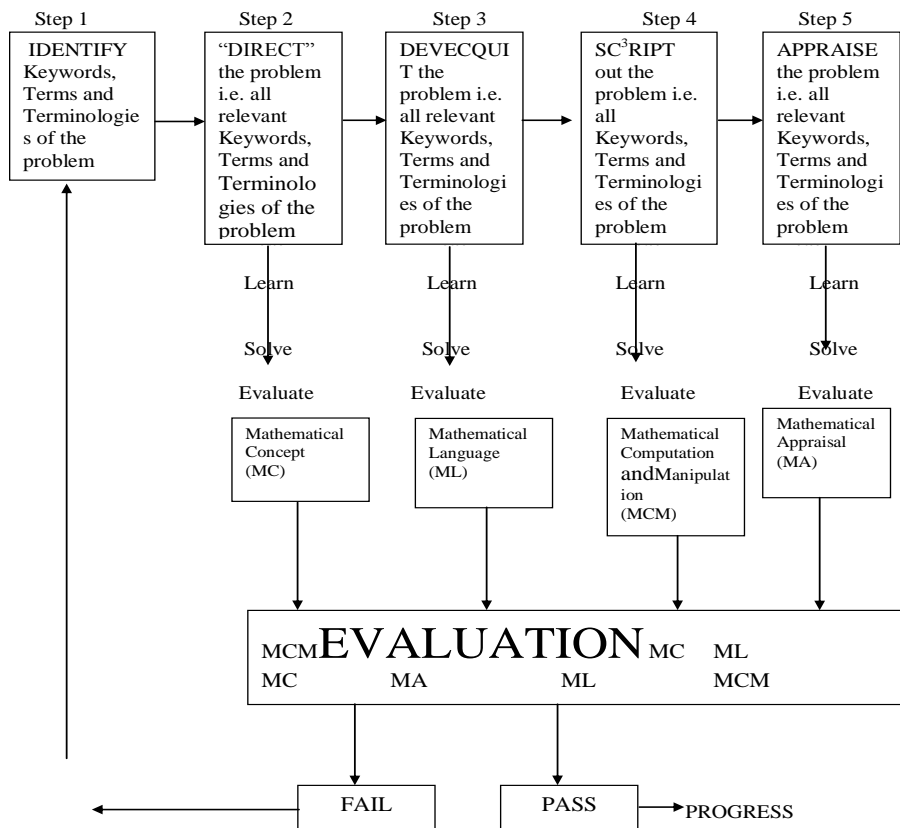


Table. Theoretical framework of kps₂ test blue-print model

CONTENT	COGNITIVE LEVELS				Total
	Mathematical Concept	Mathematical Language	Mathematical Computation and Manipulation	Mathematical Appraisal	
Topic 1					
Topic 2					
Topic 3					
Topic 4					
Topic 5					
.
.
.
Total	DIRECT all relevant Keywords, terms and terminologies of the topic	DEVEQUIT all relevant Keywords, terms and terminologies of the topic	SC³RIPT all relevant Keywords, terms and terminologies of the topic	APPRAISE all relevant Keywords, terms and terminologies of the topic	Total
BEHAVIOURAL OBJECTIVES					

APPLICATION OF KPS

A. **Kolawole’s General Problem Solving (KGPS) Method:** could be adapted from the KPS method elucidated in this study with minor modifications for onward usage in all the formal school’s subjects e.g. English Language,

Chemistry, Physics, Biology, Economics, Government, Commerce, etc. in order to improve learners' performance in all these subjects inasmuch as it has been proved from this study that the fastest (and in fact the shortest) route to commendable performance in the seemingly difficult subject called '**Mathematics**' is the '**knowledge of**', '**familiar with**' and '**deeper understanding of its language of communication**' before proceeding to all kinds of '**manipulation, computation and problem-solving**'. The same idea could be transferred to the teaching and learning of other school subjects. It is opined that since Conventional instructional method has not succeeded in improving learners' performance as expected in the nation's school, KPS method could be generally adopted (via appropriate government legislation, formal school's practice and wide acceptance by all and sundry) as the method of instruction to be used for impartation of relevant knowledge in all the formally taught subjects.

B. Kolawole's Life Problem Solving (KLPS) Method: In real life situations, people usually send congratulatory messages for promotion, appointment, marriages, and other good landmarks. What people often consider is the financial implications and benefits derivable from such landmarks without putting into consideration the concepts, language, financial implication and appraisal of the job.

The application of the KLPS techniques can be illustrated as follows:

Step 1: Identification of the keywords, terms and terminologies of the landmark/problem. Identify the keywords and of the terminologies of the landmark/problem. Suppose you are appointed as is the Dean of a Faculty, your first step should be to first identify the key officers and the rules, regulations, laws and policies associated with the office of the Dean. In other words, you should identify your bosses, associates and subordinates. Thereafter you must be familiar with the rules and regulations guiding your interaction with the aforementioned officials.

Step 2: 'DIRECT' the landmark/problem. 'DIRECT' the landmark/problem by **D**efining, **I**dentifying, **R**ecognizing, **E**nlisting, **C**lassifying and **T**reating all your Bosses, Associates, subordinates, Rules and Regulation guiding the landmark/problem appropriately. If you are the Dean, you are to 'Direct' your job i.e. who and what are you? You are to identify your bosses such as the Vice Chancellor, Associates (Fellow Deans), subordinates such as Faculty Officers, H.O.Ds, H.E.Os, EOs, Clerical Officers, Messengers, Students and Union leaders etc., as well as their roles and functions. You should also Recognize and Enlist those that are responsible to you and to whom you are responsible. Lastly, treat all these key officers as appropriate.

Step 3: 'DEVECQUIT' the landmark/problem. 'DEVECQUIT' the landmark/problem by **D**emonstrating (leading by example), **E**xpantiating, **V**erifying, **E**xplaining, **C**omposing, **Q**uerying, **U**nderstanding, **I**nterpreting, and **T**ranslating all rules, Laws and Regulations guiding your appointments and apply correct interpretations to such rules and regulations governing your office and the key officers. These rules and regulations and their appropriate interpretations should be at your finger tips in order to check your excesses and those of your key officers.

Step 4: 'SC³RIPT' out the landmark/problem. This is done by **S**olving problems within and outside your faculty on one hand, and within your faculty and the outside world on the other hand.

Calculate or estimate your budget, **C**onstruct your developmental plan and **C**ompute the results of your students as appropriate.

Relate well with every member of your Faculty, University and the outside world, as well as avoid concentrated power.

Interpret the rules and regulations within the dictates of the law guiding your operations and those connecting you and every member of the University Community and the outside world.

Plot or form the time-table for the session within the framework of the general time-table, as well as plan effectively for the session i.e. for both human and physical resources at your disposal.

Lastly, **T**abulate or document all necessary data for both administrative and record purposes.

Step 5: 'APPRAISE' THE JOB

Apply your knowledge of administration to both familiar and unfamiliar situations in a typical day to day life.

Prove or disprove all the laws and regulations and their implications guiding your office as the Dean.

Predict the outcome of your possible actions and conflicts along the line. Note that power and positions are transient. Always think about what happens when you leave your office, because a masquerade always turns to human being after a festival.

Relate well with your bosses and subordinates. Note that you are the father of all. You are to build and not destroy.

Induce and deduce some of your actions as appropriate. You must be flexible when there is need to do so.

Appraise your actions always and try as much as possible to appraise your action to your colleagues and the implications of such actions to their careers and life.

Select the most appropriate action with God's guidance. Always think twice before you take any far reaching action.

Estimate: always make appropriate estimate of your spending profile and avoid bribery and corruption or any form of embezzlement in its totality.

Comment: it is the opinion of the author that if any individual takes these five steps seriously i.e. Identifying the keywords of the problem, Direct the job, Devecquit it, Sc³ript it out and Appraise it, he has no doubt in his mind that it will be successful and yield appropriate solution to whichever problem is encountered in the end.

The example given above is a hypothetical case that can be applied to any human endeavors, be it social, economic, marital, educational and political aspects of humanity.

VALIDITY OF KPS

The validity of a test is the degree of relevance and accuracy in which a test measures what it is meant to be measuring. Hence to validate KPS, we made use of criterion related validity method in which we took Polya's solving method (P) as a criterion that is already existing standard while KPS (K) is the variate (new instrument). The correlation coefficient between Polya's (P) and Kolawole's (K) problem solving methods was found to be $r_{pk} = 0.274^*$ (*P < 0.05 level of significance). This means there is a significant relationship between Polya's and Kolawole's problem solving methods. They are significantly related. Since Polya is a standardized method, by implication, Kolawole's Problem Solving method (KPS) is, therefore valid.

RELIABILITY OF KPS

To carry out the reliability of KPS, a test-re-test or measure of stability was applied. This process included administration of KPS based test to the testees twice within the interval of two weeks. The results of these two tests were correlated by pearson's product moment correlation formula which yielded a reliability coefficient of 0.82^* (*P < 0.05 level of significance). This reliability coefficient is high enough and significantly correlated. By implication, KPS is reliable. KPS is dependable since it is both reliable and valid.

Demographic norms of KPS

Kolawole and Ajetunmobi (2013) investigated the demographic index of KPS on sex and location of student who were taught Mathematics using KPS method. The result of the study revealed that the mean scores of the pupils taught using KPS did not differ significantly on the basis of gender. In other words boys did not perform significantly better than girls. By statistical implication, KPS method is not gender biased. Kolawole and Ajetunmobi (2013) in the same paper also investigated on the academic performance of pupils in rural and urban areas. The result equally showed that there is no significant difference between the academic performance of pupils in rural and urban areas in Mathematics taught using KPS method. By implication, KPS method is not location biased. Therefore, since in any public examination the testees are usually made up of male and female learners attending different schools sited in either rural or urban locations and KPS method had been established to be is neither sex nor location biased hence KPS is deemed appropriate for teaching Mathematics in public institutions.

Construction norms KPS

For a tester to construct a standardized test the following steps should be taken.

The first step in test construction is construction of the blueprint. As said earlier, Blueprint of a test is a two-way grid which maps the course content/topic with instructional objectives. It also usually specifies the relative emphasis to be given to each type of learning outcomes (Kolawole, 2001).

In constructing blueprint, the following steps must be taken

(1) Outline of the course content or scheme of work incase of Primary and Secondary Schools or Syllabus in case of standardized Examination like UTME, NECO, Mock Examination or SSCE etc.

(2) The purpose of the test: Is it for formative or summative or placement or selection or diagnostic? In other words, why the test?

- (3) Length of the test/number of questions which depends on the format of the test as well as amount of available time for the test.
- (4) Selection of test format/test type. Is it objectives or Essay test?
- (5) Amount of available time- Is the test taking place during the school hours? Or at the end of term or session? This is an important point since it will help in determining the number of questions and test format.
- (6) Selection of the most appropriate Cognitive taxonomy. E.g. Bloom's Taxonomy and KPS Taxonomy (see Test's Blueprint Model).
- (7) Weigh the appropriateness of the distribution of the questions into respective cells with respect to duration spent on individual topics.
- (8) The number of questions must be distributed proportionally with respect to the point of emphasis or time spent on each topic.
- (9) Construction of the test blue print.

Example:**Test Blue print (KPS)**

Content/ Topic	Instructional Objectives		MCM	MA	Total
	MC	ML			
Topic 1					
Topic 2					
Topic 3					
DIRECT	DEVEQUIT	SC³RIP	APPRAISE		TOTAL
Total	Instructional Objectives				

The following are general steps in test construction:

A. Construction of Test Blue Print

- (1) Outline of the course content
- (2) The purpose of the test
- (3) Length of the test (Number of questions)
- (4) Selection of the type of Test (Objective/Essay)
- (5) Amount of time available
- (6) Selection of Taxonomy
- (7) Weight or number of questions allocated to each cell
- (8) Construction of test blueprint
- (9) Construction of test items.
- (10) Time yourself in taking the test and then, multiply that by 4 to 6 depending on the level of the testees, also put into consideration minimum and maximum period for a particular test.
- (11) It is best to prepare your marking scheme along the construction of the test
- (12) To avoid examination malpractice in any form, you can apply Kolawole's modulus testing and administration (KMTA) to construct your items.
- (13) Students must have access to their scores
- (14) Item Analysis of the items. This is the process of knowing whether the test is too difficult or too easy for the testees or whether too easy for the testees or whether it does discriminate between brilliant and dull students.
 - Construct all the items in each topic, one after the other with respect to blueprint of the test
 - Put all the cards with the same topic type together.
 - Put all the cards aside for one or two days. Re-read the items from the stand point of the testees and make necessary correction.
 - Arrange the selected question logically.
 - Arrange the questions from simplest to the most difficult questions.
 - Group the item types together under common instructions to save reading time.
 - If desirable, order the question logically from a content stand point.

GRADE NORMS OF KPS

MARK	GRADE	REMARK
70-100	A	Excellent performance: proceed to the next topic
60-69	B	Very Good performance: proceed to the next topic
50-59	C	Marginal performance: Require More Treatment on the topic
45-49	D	Fair performance: Require some Remedial Treatment on the topic.
40-44	E	Poor performance: Require much Remedial Treatment on the Topic
Below 40	F	Fail: To start the whole, learning process again i.e. Repetition of the whole process from Step 1 to 5.

CONCLUSION AND RECOMMENDATIONS

KPS method on application in some selected schools yielded better results than the conventional method in vogue in Nigerian schools (Kolawole, Oladosu and Ajetunmobi, 2013). As such it is obvious that **KPS** is more rewarding, more appropriate, as well as more effective to a reasonable degree than the Conventional method. In this regard, it is recommended that Mathematics teachers should henceforth adopt KPS method in order to demystify the subject in its entirety, impart relevant mathematical knowledge to pupils, evaluate pupils appropriately and consequently create an environment where learners realize that Mathematics is neither an 'abstract' nor 'esoteric subject' that cannot be understood by diligent learners as many erroneously assume.

It is clear that if students of Mathematics at any level of the educational stratum can be fully made to understand the underlying relevant concepts and language of communication applicable in their respective levels before proceeding to computation and manipulation in Mathematics, their mathematical burden would be greatly alleviated, which would consequently greatly aroused their interest in the subject to an unprecedented dimension. This in turn could yield improved performance of students in the subject. Moreover, since KPS has satisfied all the Psychometric properties and standardization of a good instrument its adoption or adaption is hereby recommend for the learning and teaching processes of Mathematics, as well as test's construction and application to all teaching subjects. It is also further recommended that seminars/workshops on the basics (or inner workings) of KPS method should be organized regularly for all the teachers, students, examiners, book writers, workers, couples, and so on in order to facilitate the adoption of the method in their respective endeavours as a potent tool (or means) solving mathematical problems, teaching and learning problems, as well as other life's problems.

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