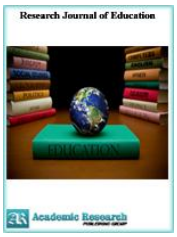

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Statistical Analysis of the Effects of Kolawole's Problem Solving (KPS) and Conventional Teaching Methods on the Academic Performance and Retention of Senior Secondary School Students in Mathematics in Ekiti State, Nigeria

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Abstract: The study investigated statistical analysis of the main, Joint and individual effects of Kolawole's Problem Solving (KPS) and conventional teaching methods (CM) on the academic performance and retention of senior secondary school students in Mathematics in Ekiti State, Nigeria. The study also sought to find out whether teaching Mathematics with KPS method is gender and location biased. The study adopted quasi-experimental pretest and post-test research design. The population of the study consisted of all senior secondary schools students in Ekiti State Nigeria. A sample of 400 students were randomly selected from 8 local Government Areas of Ekiti State. Intact classes in each school were randomly selected from each of the 8 Local Government Areas putting into consideration gender and locations of the schools. The results of study showed that all this sample students were homogeneous at the commencement of the study. There were main, joint and individual significant teaching effects of the Kolawole's Problem Solving (KPS) and conventional methods on academic performance, and retention of senior secondary school students in Mathematics. Also, there was no significant difference in the academic performance and retention of students in rural and Urban Areas and also between male and female students. Based on the findings it could be concluded that KPS is an effective method while conventional method improves and contributed positively towards the academic performance and retention of the students but ineffective method of teaching Mathematics' KPS method is more effective and students retained more knowledge than convectional method (CM). Finally, KPS method of instruction is neither location nor gender biased. Based on the above findings, KPS method should be adopted as an effective method of teaching Mathematics) in Senior Secondary Schools in order to improve teaching, learning, solving and evaluation skills of the Mathematics teachers as well as those of Mathematics students. Furthermore, seminars and workshops should be organized on KPS for the teachers for effective teaching,-learning,-solving, and evaluation of Mathematics.

Keywords: Statistical analysis; Teaching effects; Academic performance; Retention; Problem solving method; Senior Secondary School Students.

1. Introduction

Mathematics is a creation of human mind concerned primarily with ideas, theory, logic, theorems, primary, processes and reasoning. Thus, mathematics is much more than Arithmetic, the Science of manipulating numbers and computation, more than Algebra, the language of symbols, expression and General relationships; more than geometry, the study of the properties and relationships between points, lines angles, shapes and solids. It is much greater than Trigonometry, the science of the relationship between angles and sizes of any triangle. It is much more than statistics, Science of collecting, arranging, analyzing, synthesing and interpretation of data and graph. It is more than calculus, the study of change, limits, infinite and limits. So, mathematics is one of the core and compulsory subjects in both primary and secondary schools in Nigeria. Above all, mathematics is the foundation of all science subjects and technology. Thus, there is a need to provide a very solid and impeachable foundation for it at both primary and secondary levels.

Nigerian Secondary Schools are blessed with professionally qualified teachers in the areas of their specialization; however, they seem not to be adequately skilled in the appropriate method of teaching the contents, as

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well as acquisition of appropriate evaluation skills in constructing valid and reliable tests for the learners. Experiences have shown that students might have acquired relevant and adequate knowledge, yet perform poorly in both internal and public examinations because they are often not exposed to the right kind of testing procedures due to inability of their teachers to teach content, learning and evaluation procedures simultaneously. Therefore, for any effective teaching – learning – solving and evaluation procedures, the teacher must have good knowledge of the subject matter, (content knowledge) well equipped with appropriate teaching method (pedagogical knowledge) and good evaluating skills (evaluation skills) and his ability to carry out this trio-processes simultaneously. A good and effective teacher must be well equipped with content – pedagogical and evaluation skills/knowledge and show how the trio must be performed simultaneously. Kolawole's Problem Solving method (KPS) is a-5step problem solving method that caters for teaching-learning-solving and evaluating simultaneously. (Kolawole, 2013). Conventional method manipulated and controlled method adapted to be used by the teacher for teaching the control group in the study.

1.1. Purpose of the study

The purpose of this study was to investigate the into the main, joint and individual teaching effects, contributions, size effect of Kolawole's Problem Solving (KPS) Method and Conventional Method (CM) on the academic performance and retention of the senior secondary school students in Mathematics, Ekiti State Nigeria. The study also sought to find out whether those who were taught Mathematics using KPS performed better than those who were taught with conventional method. They sought to find out which of KPS and CM is the more effective method.

2. Methodology

This study employed quasi-experimental research design. The population of this study comprised all Senior Secondary School one (SSI) students in Ekiti State public Secondary Schools. The sample consisted of 400 students randomly selected from local Government Areas of Ekiti State using multistage techniques. Intact class of each of the schools was randomly selected from 8 local Government Areas of the state putting into consideration gender and locations of the students. The instruments used in this study were two equivalent locally standardized Achievement Tests. Viz Mathematics Achievement Test (MAT) and Mathematics Retention Test (MRT) covering the course outline of Senior Secondary School I for second term of the year 2015 calendar session. The selected experimental schools were taught and trained personally by the researchers and control school teachers were only given the scheme of work of their normally course outline for second term of year 2015. The four hundred students were given pre-test (MAT) at the beginning of the term to check for the homogeneity and entry points. The data collected from the pretest were subjected to 2 way ANOVA and the result of the analysis showed there was no significant difference between academic performances of the students. This implies that, the groups (experimental KPS) and conventional (CM) control were homogenous at the entry point of the research work.

The research plan/timetable is as follows:

Period	**Activities**
1st Week	Orientation for Mathematics teachers/Conduct of pre-test.
2nd - 11th	Teaching of the Science students
12th – 13th	Conduct of Post-Test
19th – 20th	Conduct of Retention Test

2.1. Reliability of the Instrument

Test-retest technique was used to determine the reliability of both MAT and MRT on the same 50 testees randomly selected from schools outside the sampled schools and Local Government Areas. The instruments were administered to the same testees twice at the interval of 2 weeks. The results of the two tests were subjected to Pearson product moment formular yielding 0.86 and 0.89 respectively. These coefficients are high enough to indicate the reliability of the two instruments.

2.2. Validity of the Instruments

The two instruments were validated by criterion related validity method that confirmed validity procedures correlating each of MAT and MRT with Ministry of Education Examination in Mathematics. The correlation coefficients yielding 0.83 and 0.81 respectively indicating the validity of the two instruments.

3. Research Questions

In view of the purpose of the study, the following research questions were raised.

(1) What are the main, joint and individual and joint contribution, effect size and main teaching effects of KPS and conventional methods on the academic performance of senior secondary school students in Mathematics?

(2) What is the teaching effect of KPS methods on the academic performance of students in Mathematics?

(3) Which of KPS and conventional methods will enhance better performance of student in Mathematics?
(4) Which of KPS and conventional method is more effective for teaching mathematics
(5) Will KPS and conventional methods enhance retention of academic performance in Mathematics?
(6) Will location of the students have any influence of KPS and conventional on their academic performance in Mathematics?
(7) Will gender of the students have any influence on their academic performance in Mathematics?

4. Research Hypotheses

Based on the research questions the following hypotheses were postulated.

$H01_a$ There is no significant main teaching effect of KPS and conventional methods on the academic performance of the students in Mathematics.

$H01_b$ There is no significant joint teaching effect of KPS method and conventional method combined on the academic performance of students in Mathematics.

H01c There is no significant teaching effect between KPS and CM methods on academic performance of Senior Secondary School Students in Mathematics.

H02a There is no significant main effect of KPS and conventional methods on the retention of the students in Mathematics.

$H0_{2b}$ There is no significant retention effect in the post-test mean scores and retention mean scores of students who were taught Mathematics with KPS methods.

$H0_{2c}$ There is no significant difference in the retention scores of students taught with KPS method and those taught with convectional method.

$H0_3$ There is no significant difference between academic performance of female students and male students taught with KPS method in Mathematics.

$H0_{3b}$ There is no significant influence of gender on academic performance of Senior Secondary School Students who were taught Mathematics with KPS method.

$H0_{4a}$ There is no significant difference between the academic performance of students taught KPS in Mathematics in Urban and rural areas.

$H0_{4b}$ There is no significant influence of location on the academic performance of students taught with KPS method**.**

$H0_{5a}$ There is no significant influence of gender on the retention of the students taught Mathematics with KPS.

$H0_{5b}$ There is no significant difference between the retention scores of male and female students taught Mathematics with KPS method.

$H0_{6a}$ There is no significant difference between retention scores and post test scores of the students taught with KPS method.

$H0_{6b}$ There is no significant /influence on location on the mention of students who were taught Mathematics via KPS method.

5. Descriptive Analysis

5.1. Research Questions

5.1.1. Research Question 1a

(a) What are the main teaching effect, contribution, size effect and accountability of KPS and conventional methods on the academic performance of Senior Secondary School students in Mathematics?.

Table-1. Main Teaching Effect, Contribution, size effects and Accountability of KPS and Conventional Methods on the Academic Performance of Senior Secondary School Students in Mathematics.

Teaching Methods	N	Pretest SD	Pretest Mean	Post test Mean	Post test SD	Adjusted deviation Coveriate	Zc	Area above mean	Accoun-tability R^2	Coefficient Variation
KPS	200	4.809	7.01	73.60	11.857	+28.62	0.9466	0.3289	0.905	6.207
Conventional	200	4.731	7.58	16.18	5.973	-28.61	-0.9466	0.3289		2.709
Mean Total	400	4.772	7.295	44.89	30.224		0			1.485
		Effect Size eta^2	0.8989							

Table1 shows that the two methods jointly accounted for 90.5% (R^2 = 0.905) the variability on the academic performance of the students in Mathematics. The table 1 also shows that the two methods jointly had effect size – eta^2 = 89.89% of the variability of the teaching effect on the academic performance in Mathematics. The table 1 also shows that students exposed to Mathematics via KPS method (post test Mean = 73.6%) tends to perform better than those in conventional group (post test mean score = 16.18%).

Table 1 shows that students in KPS method has a gain of 67.54% which is tantamount to 963% of knowledge gained over pre-test score as against 8.6 ≈ 113% over pre-test in conventional method. KPS method has the highest coefficient variation of 6.207, conventional method with 2.709 and combined method 1.485. By implication, KPS method mean is more spread and more effective than either conventional method or the two methods combined.

5.1.2. KPS Method Group

The KPS method group had the mean = 73.60% with a gain of 939% while CM 16.18% and had gain 939%. KPS Adjusted deviation + covariate = 28.61 while CM = -28.61 by implication 32.81% of KPS Group scored between Grand mean44.89% and 73.61% 65.62% of the KPS method group scored between 16.81and 73.6% on one hand, while 32.81% of CM method group scored between 16.18% - 44.89% and 17.11% scored below 16.18%.

By implication, KPS method produces better performance in Mathematics than conventional method.

Table 1 also shows that the two methods combined produces better results than the performance at the entry point (pretest) of the study. Gain percentage of 515.35%

- In the final analysis, KPS method group performed better in Mathematics than the conventional method group or methods combined with high efficiency.
- KPS method is an effective method and conventional method is an ineffective method and a very poor efficiency.
- KPS method is more effective method of teaching Mathematics than convectional method and combined group of KPS and conventional method.
- In stanine (standard nine) grading – In KPS method group:
  (a) 32.89% of the group had the grades $C_5 – B_3$,
  (b)32.89% had $D_7 – C_5$,
  (c) 65.78% had $D_7 – B_3$ and
  (d)17.11% had B_3 or A_2 or A_1
  In conventional method group : (a) 17.19% had F_9, or P_8 or P_7 and (b) 32.89% had P_7 or C_6 or C_5
- Coefficient variation: KPS method 6.209, CM method = 2.709 and combined 1.485 KPS method has the degree variation than CD and combined method
- In scoring system: KPS method group (a) 32.89% of the students in this group scored between 44.89% and 73.60%, (b) 17.60% of the students in this group scored 73.6% and above.
- In CM group (a) 65.68% of the students in this group scored between 16.18% and 73.6%, and above, (b) 65.68% of the students in this group scored between 16.18% - 73.6%

Table-2. Will KPS and Conventional methods enhance the retention of Senior Secondary School students in Mathematics?

Subject	**Teaching Method**	N	**Post test**		**Retention**		**% Retained**	**% Loss**
			Mean	**SD**	**Mean**	SD		
Mathematics	KPS	200	73.603	11.857	70.04	11.578	95.16	4.84
	Conventional	200	16.148	5.973	14.10	12.69	87.3	12.69
	Total Mean	400	44.876	8.915	42.07	8.76	8.76	8.76

$R^2 = 0.985$, Adjusted $R^2 = 0.985$ R = 0.992, $eta^2 = 0.0796$

Table 2 shows that two methods jointly accounted for 98.5% of the variability in the knowledge retained over post-test mean scores. The retention scores and post-test scores were extremely related (R=0.992) retention mean scores in Mathematics and post test mean scores and retention mean scores had effect size of 7.96% of post-test mean scores were affected in the retention of academic performance of Senior Secondary School students.

Table 2 shows that KPS group retained 95.16% of the knowledge gained in teaching effect while only lost 4.84% of the knowledge gained. On the other hand, Conventional Method group retained 87.30% of the gained in teaching effect while only 12.69% is lost within the six weeks gap.

By implication, both KPS and conventional methods jointly enhanced retention of Senior Secondary School students in Mathematics. Finally, KPS method group retained better than Conventional Method group or the two methods combined.

6. Hypothesis Testing

$H0_{1a}$ There is no significant difference in the teaching main effect of KPS and Conventional Methods on the academic performance of senior secondary schools students in Mathematics.

$H0_{1b}$ There is no significant difference in the teaching effect between the pre-test mean scores and post-test mean score of senior secondary school students in KPS method group and conventional method group.

$H0_{1c}$ There is no significant teaching effect between the academic performance of senior secondary school students in KPS group method and conventional method group.

Table-3. ANCOVA of Students in KPS Conventional group methods on Academic performance

Source	SS	df	MSS	Fcal	Sig	Result
Corrected Model	329651.586	2	164825.793	1865.632*	0.000	Significant
Intercept	238997.436	1	238997.436	2705.167*	0.000	Significant
Pre-test	3.364	1	3.364	0.038	0.845	Not Significant
Groups	328633.885	1	328633.885	3719.745*	0.000	Significant
Error	35074.351	397	88.346			
Total	1170681.00	400				
Corrected total	364725.937	399				

R^2= 0.904, Adjusted R^2 = 0.903, R= 0.9508 eta^2 = 0.901 *P<0.05

$H0_{1a}$: Table 3 Corrected model shows that Fcal = 1865.632 and P = 0.000 <0.01<0.05 for the main teaching effect of KPS and Conventional Method, pretest mean and post-test scores of the academic performance of senior secondary school students in Mathematics. This means that there was an extremely strong evidence (p<0.01 to reject the null hypothesis $H01_{(a)}$. Thus, there was a significant teaching main effect of KPS method and Conventional

Method on the academic performance of senior secondary school students in Mathematics with effect size of (eta^2 = 0.901). This implies the academic performance of senior secondary school students was affected by 90.1% of the academic performance. This further implies that the KPS method and Conventional Mwethods are effective methods of teaching Mathematics. In order to find out whether the two teaching methods are effective. We need to find out whether there is a significant difference between the pre-test mean score and post-test mean score hence we have H01b.

$H0_{1b}$: There is no significant difference between the pre-test mean score and post-test mean score in Mathematics.

Table 3 Intercept: Fcal = 2705.167 and P=0.000<0.01 < 0.05 means there is an extremely strong evidence to reject $H01_b$ that is there is a significant difference between the pretest mean score and post test mean score. By implication, the two methods are effective methods of teaching Mathematics. Since the two methods were effective methods of teaching Mathematics. There is need to find out which one is more effective methods of teaching Mathematics. Hence we test $H0_{1c}$

$H0_{1c}$ There is no significant difference between the academic performance of students in KPS method group and Conventional Method group.

Table 3: Group: Fcal = 3719.45, P=0.000<01<0.05 means that there is an extremely strong evidence to reject the null hypothesis. That is, there was a significant difference between the academic performance of the students in KPS and conventional groups in favour

of KPS method group. In other words, students in KPS method group performed better than those in convectional group and also KPS method was more effective in teaching of Mathematics than convectional method. Conclusively, KPS method enhanced better performance in Mathematics than conventional method. KPS method is an effective method of teaching Mathematics. The outcome of this study was at variance with that of Samuelson (2013) who claimed that there was a significant difference in problem solving approach and conventional method of teaching Mathematics with respect to conceptual understanding.

$H02_a$: There is no significant difference in the main effect of KPS and conventional methods on the retention performance of students in Mathematics.

$H0_{2b}$: There is no significant difference in the retention mean scores and retention post-test means scores of students taught Mathematics via KPS and conventional methods.

$H0_{2c}$: There is no significant retention of students in KPS method group and convectional method group in Mathematics.

Table-4. ANCOVA of KPS method group and convectional method group.

Source	SS	df	MSS	Fcal	Sig	Result
Corrected model	340389.472	2	170194.736	13285.73	0.00	Significant
Intercept	89.082	1	89.082	6.954	0.009	Significant
Maths Post-test	27577.050	1	27517.050	2148.034	0.000	Significant
Group	244.458	1	248.458	19.395	0.000	Significant
Error	5085.705	397	12.810			
Total	1053345.000	400				
Corrected total	345475.177	341				

Rsquared = 0.985 (Adjusted Rsquared = 0.985 Eta^2 = 0.072%

Table 4 corrected model: Fcal 13285.73, P=0.000<0.01<0.05

This implies that there was an extremely strong evidence (p<0.01) to reject the null hypothesis, which means, there is a significant main effect on retention of senior secondary school students in Mathematics. Since there was a joint main effect of KPS and conventional method on the retention of the senior secondary school students, we need to find whether there is a significant difference between the retention post-test mean scores and retention mean scores of senior secondary school students in Mathematics, hence, we test $H0_{2b}$.

$H0_{2b}$: There is no significant effect between post-test mean score and retention mean score in Mathematics.

Table 4: Intercept: Fcal = 6.954, p< 0.009 < 0.01 <0.05 This means, there is an extremely strong evidence to reject the null hypothesis, that is, there was significant effect between retention post-test mean score and retention mean score at $\alpha = 0.05$ level of significance. In order to find the more effective method of teaching senior secondary school students in Mathematics. We need to find whether there is a significant effect on retention between mean scores of senior secondary school students in KPS method group and conventional method. Hence $H0_{2c}$

$H0_{2c}$: there is no significant effect on retention between means scores of senior secondary school student taught Mathematics with KPS method and those taught with convectional method.

Table 4: Group Fcal = 19.395, P = 0.00 < 0.01 <0.05. $Eta^2 = 0.00072 = 0.07.2\%$

This means that there was an extremely strong evidence to reject the null hypothesis 2c. In other words, there was a significant effect on retention of senior secondary school students in Mathematics of those taught with KPS method and those taught with convectional method, in favour of KPS method group. With $eta^2 = 0.072\%$ effect size the post mean score is only affected by 0.072%. By implication, those students in KPS group retained knowledge of Mathematics better than those in Conventional group. See table 2, KPS method mean = 70.14% while conventional method mean score = 14.10%

$H03_a$: There is no significant influence of gender on the academic performance of senior secondary school students in KPS method group in both Rural and Urban areas.

$H03_b$: There is no significant difference in the academic performance between Female and Male students taught Mathematics through KPS method.

Table-5. ANOVA of Post Test Score of Male and Female of Students in Kps Method Group

Source	SS	df	MSS	Fcal	Sig	Result
Corrected model	329832.6	3	109944.200	1247.743	0.000	Significant
Intercept	805681.29	1	805681.290	9143.573	0.000	Significant
Gender	70.33	1	70.33	0.798	0.372	Not Significant
Group	329719.368	1	329719.368	3741.943	0.000	Significant
Gender * Group	114.048	1	114.048	1.294	0.256	Not Significant
Error	37893.338	396	88.114			
Total	1170681.00	400				
Corrected Total	364725.937	399				

**p<0.05*

$H03_a$: Table 5 Gender: Fcal = 1.294 P=0.256 > 0.05

This means there is an extremely strong evidence not to reject the null hypothesis 3a.Which means that there was no significant influence of gender on the academic performance of senior secondary school students in Mathematics. In other words, gender of the senior secondary school students had no significant influence on their academic performance in Mathematics when taught with KPS method. We need to find out if there is a significant difference between the performance of male and female students in KPS group. Hence H03b

$H0_{3b}$: There is no significant difference between the academic performance of male and female students of those taught Mathematics with KPS method.

Table 5: Gender: Fcal = 0.798, P= 0.372 > 0.05. This means that there was no significant difference in the academic performance of male and female students of those students taught with KPS method. This finding is in line with Fryer and Levitt- (2010) who reported that there were no mean differences between boys and girls upon entry to school, but girls lose more than two-tenths of a standard deviation relative to boys over the first six years of schools. While Ayodele (2012), Joseph (2012), Kolawole and Ogini (2009) claimed gender inequality in academic performance of our students in Mathematics: Kolawole and Ogini (2009) claimed Girls did not perform significantly better than boys in Mathematical computation tasks also Girls in Girls' performed better than their counterpart in mixed schools in Mathematics computational task and finally he claimed that the type of school a student attends enhances his performance in Mathematical computational tasks. This finding is in line with ascertion of Okeke (2003) who reported that there was no significant gender differences exist in academic achievement.

This finding is at variance with Ezeameyi (1999) who claimed the dominance of males over females in academic achievement.

Hypothesis 4(a): There is no significant difference between the academic performance of students taught Mathematics via KPS in Urban and Rural Areas.

$H0_{4b}$: There is no significant influence of location on the academic performance of students taught Mathematics with KPS method.

Table-6. ANOVA Analysis of Post Test Scores of Location of the Students in Kps Group

Source	SS	df	MSS	Fcal	Sig	Result
Corrected model	329688.201	3	109896.067	1242.056.*	0.000	Significant
Intercept	805379.589	1	805379.589	9102.481*	0.000	Significant
Location	7.749	1	7.749	0.088	0.767	Not Significant
Group	329547.049	1	329547.049	3724.574	0.000	Significant
Location * Group	32.229	1	32.229	0.364	0.546	Not Significant
Error	329547.737	396	88.479			
Total	1170681.00	400				
Corrected Total	364725.937	399				

*P < 0.05, R^2 = 0.904, Adjusted R^2 =0.903 R= 0.9508

Table 6: Location: Fcal = 0.088, P = 0.767 > 0.05, since P > 0.05. There is a strong evidence to not reject the null hypothesis, that there was no significant difference between the academic performance of students taught Mathematics with KPS method in Urban and Rural Areas.

$H0_4$(b): There is no significant influence of location on the academic performance of students taught Mathematics with KPS method.

Table 6: Location *Group: Fcal = 0.364, P=0.546 >0.05

There is a strong evidence not to reject the null hypothesis that is there is no significant interactive effect of location on the academic performance of students exposed to Mathematics with KPS method. This means that Location of the students taught Mathematics with KPS method has no significant influence on their academic performance in Mathematics through KPS method.

(1) **Table 6**: R^2 = 0.904 and R = 0.950, Degree of alienation = 0.096. Table 6 shows KPS method accounted for 90.4% of the variability the teaching effect of students in Rural and Urban areas

(2) There is almost perfect relationship (0.9508 between the academic performance of students in Urban and Rural areas.

(3) Only 9.6% of the variability in the teaching effect is strange to the KPS method

$H0_{5a}$: There is no significant influence effect of gender on the retention of students in Mathematics.

$H0_{5b}$: There is no significant difference between male in a KPS method and female students in retention.

Table-7. ANOVA Of Male And Female Students In Kps Group On Retention

Source	SS	df	MSS	Fcal	Sig	Result
Corrected model	312982.06	3	104327.353	1271.458	0.000	Significant
Intercept	707499.835	1	707499.835	8622.439	0.000	Significant
Gender	28.015	1	28.015	0.341	0.559	Not Significant
Group	312893.983	1	312893.983	3813.300	0.000	Significant
Gender*Group	81.623	1	81.623	0.995	0.319	Not Significant
Error	32493.117	396	82.053			
Total	1053345.000	400				
Corrected Total	345475.177	399				

R^2 = 0.906 Adjusted R2 = 0.905 R2 = 0.9518 Degree of Alienation = 0.21945

$H0_{5a}$: Table 7 Gender * Group Fcal = 0.995, P = 0.319 > 0.05. there is a strong evidence not to reject the null hypothesis, that is, there is no significant influence of gender on the retention of the students exposed to Mathematics via KPS method.

$H0_{5b}$: Table 7 Gender: Fcal: 0.341 P= 0.559 > 0.05. There is a strong evidence not to reject the null hypothesis, that is there is, no significant male and female students who were exposed by KPS in retention.

$H0_{6a}$: There is no significant retention between the KPS group students in Urban and Rural areas.

$H0_{6b}$: There is no significant influence of location on retention of the students in KPS group.

Table-8. ANOVA Of Urban And Rural Students On Retention In Kps Group

Source	SSS	df	MSS	Fcal	Sig	Result
Corrected model	312939.899	3	104313.300	1269.639056.*	0.000	Significant
Intercept	707429.150	1	707429.150	8610.406*	0.000	Significant
Location	15.150	1	15.150	0.184	0.668	Not Significant
Group	312833.547	1	312833.547	3807.623*	0.000	Significant
Location*Group	0.327	1	52.327	0.637	0.425	Not Significant
Error	3253345.000	396	82.160			
Total	1053345.000	400				
Corrected Total	345475.177	399				

R^2 = 0.906 Adjusted R^2 = 0.905, *P<0.05

$H0_{6:}$ Table 8: (a) Location: Fcal = 0.184, P = 0.668 > 0.05. This means that (a) there is strong evidence not to reject the null hypothesis. That is there was no significant difference between retention of Mathematics of these students in Rural and Urban areas.

$H0_{6b}$: Table 7: (b) Location* Group: Fcal = 0.637 P=0.425>0.05

(b) There is strong evidence not to reject the null hypothesis. That is, there is no significant influence of location on the retention of students who were exposed to Mathematics through KPS method. By implication, Location has no significant influence on the retention of students in Mathematics taught with KPS method.

This is at variance to Suzanne and Lauren (2012) who claimed that students in rural schools performed poorly in Mathematics because they do not always have access to the level of federal funding as urban and sub urban schools and this could limit the opportunity which the students have for learning Mathematics. KPS method could account for 90.6% of variability of the retention of students in rural and urban area. The finding is at variance with the submission of Obe (1994) who reported significant difference in Urban-rural achievement of Primary six pupils on the Aptitude sub-test of the National Common Entrance Examination NCEE into Secondary Schools. This finding is in line with Gana (1997) who found that there was no significant difference in the academic performance of students in urban and rural locations.

7. Findings

Based on the statistical analysis, the findings of this study are as follows:

7.1. Descriptive Analysis

- Experimental group (KPS) and control group (CM) were both homogeneous at the entry point of the research.
- KPS and conventional methods jointly accounted for R^2 = 90.5% of the variability of the academic performance in Mathematics.
- KPS method accounted for R^2 = 0.904 of the variability of students in the academic performance of the students. By implication conventional method accounted for only – 0.1 = -1% of the variability in academic performance.
- KPS and conventional methods jointly had teaching effect size = eta^2 = 89.89 of the teaching effects.
- KPS method group performed better in Mathematics than those in conventional method group and combination of the two methods.
- There was almost perfect relationship between the scores of students in KPS method group and conventional method group.
- KPS and conventional methods jointly accounted for 98.5% (R^2=0.985) of the variability in knowledge retained over posttest mean scores in Mathematics and index of forecasting efficiency was 87.8%.
- KPS method accounted for 90.6% of the (R^2 = 0.906) of the variability of in the knowledge retained over post-test mean scores in Mathematics. By implication,
- Conventional could only account for 7.9% of the variability of the knowledge retained in Mathematics and KPS has index of forecasting efficiency of 69.34%.
- There was almost perfect relationship (R^2 = 0.992) between post-test scores and retention test scores in Mathematics.
- Joint KPS and conventional methods had effect size: eta^2 = 7.96% of post-test mean score. That is, post mean score was affected by 7.96% affected.
- KPS method group retained 95.16%, loss = 4.84%, Conventional method: Retained 87.31%: loss = 12.69%. Both KPS and conventional methods retained 93.73% and loss of =6.25%
- Both KPS and conventional method or either KPS method or conventional method enhances retention of knowledge gained from teaching.
- KPS method enhances retention of knowledge gained more than conventional method or combination of KPS and conventional methods.

7.2. Inferential Analysis

Based on the data analysis, the following findings were made.

- There was a significant main effect of KPS and conventional methods on the academic performance of senior secondary school students in Mathematics.
- There was significant joint teaching effect of KPS and conventional methods with effect size = eta^2 = 0.901 in Mathematics.
- There was a significant teaching effect between the performance of students in KPS and conventional method groups.
- There was a significant main effect of KPS and conventional methods on the retention of senior secondary school students in Mathematics.
- There was significant joint effect of both KPS and conventional methods on the retention of senior secondary school students in KPS method and conventional method groups.

- There was no significant difference between female and male students in the academic performance of student taught Mathematics through KPS method.
- There was a significant influence of gender of the student on the academic performance of senior secondary school students who were taught Mathematics via KPS method.
- There was no significant difference between the academic performance of students in Rural and Urban areas using KPS teaching method.
- There was no significant influence of location on the academic performance in Mathematics using KPS method.
- There was no significant difference between the retention of male and female students taught Mathematics through KPS method.
- There was no significant interactive effect/influence of gender on the retention of students taught with KPS method.
- There was no significant difference between the retention of students in Mathematics of students in KPS method group Urban and Rural areas.
- Location has no significant influence on the retention of SSS students who were taught Mathematics in KPS.

8. Conclusions

The following conclusions were based on the findings of this study:

- KPS was the most potent in enhancing students' academic performance in Mathematics, following combination of KPS and CM and conventional method had the least potent of enhancing students' performance.
- KPS method enhanced or produced better performance in Mathematics than those in convectional method or two methods combined.
- Students in KPS method group performed better in Mathematics than those in convectional group and the two methods combined.
- KPS method was more effective than either convectional method or two method combined.
- The teaching effect of KPS method is higher than that of conventional method.
- The gender of the students taught with KPS had no significant influence on the academic performance of students in Mathematics.
- The location of the students taught with KPS method had no significant influence on the academic performance in Mathematics. That is KPS method is not location biased.
- The gender of the students taught with KPS method had no influence on the retention of the students in Mathematics irrespective of the location. That is, KPS method is not gender biased.
- The location of the students taught Mathematics with had no influence on the academic performance of students in Mathematics in respective of their gender.
- KPS method enhanced retention in Mathematics irrespective of locations and gender.
- The results of this study have shown that the use of KPS method as instructional strategy is an effective in enhancing students' academic performance in Mathematics irrespective of their location and gender. KPS method is more potent in enhancing students' performance in SSS Mathematics than conventional method.
- KPS method as an instructional strategy enhances good students' performance and retention in Mathematics.

9. Recommendations

Based on the findings and conclusion, KPS method is recommended for teaching of Mathematics, Workshops and Seminars should be organized at the local levels on KPS method. Mathematics teachers, Teachers' educators should adopt KPS method in their teaching so as to enhance academic performance and retention in Mathematics. Teachers of Mathematics at all levels of our institutions should embrace and adopt KPS as a better teaching method or alternative method to conventional method. Workshops and Seminars should be organized for teachers as well as students on KPS methods.

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