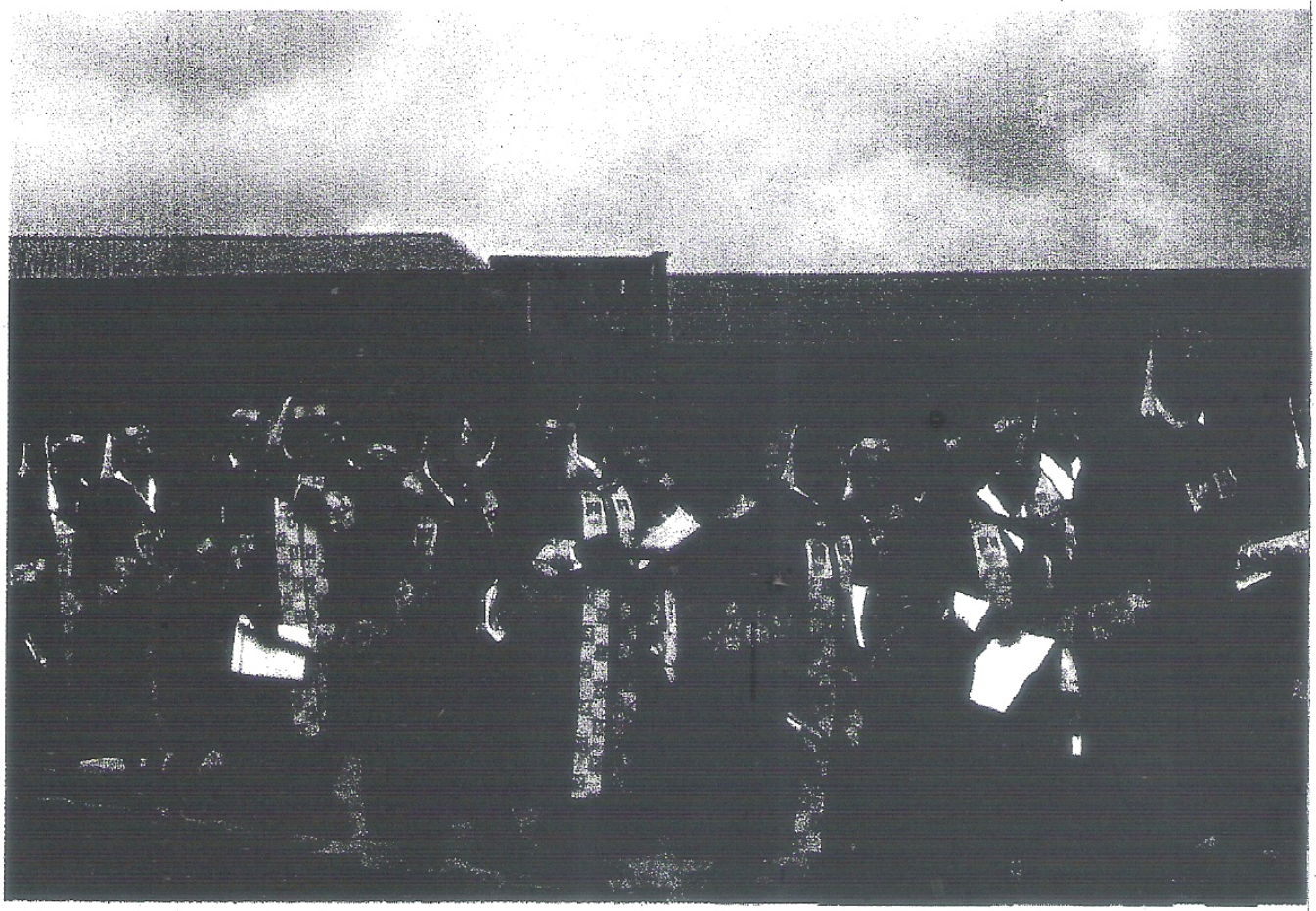
DYNAMICS OF EDUCATION IN LAGOS STATE IN THE 21ST CENTURY



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CHAPTER TWENTY-SEVEN

TEACHERS 'KNOWLEDGE OF IMPROVISATION OF MATERIALS IN MATHEMATICS: AN ENTREPRENEURSHIP IN THE DYNAMICS OF EDUCATION

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Abstract

The study was carried-out to examine the teachers' knowledge of improvisation of materials in mathematics at the Secondary School levels. As a descriptive research design, it made use of ninety mathematics teachers through simple random technique in fifteen public secondary schools in Lagos State. Four research questions and hypotheses were raised in the study. Questionnaire for teachers' knowledge of improvisation of materials in mathematics was developed, validated and used for the study. While reliability coefficient was found to be 0.66 data was analyzed through descriptive and inferential statistics tools. Finding reveals that teachers had the knowledge of improvisation of materials in mathematics with mean score = 54.47, and standard deviation = 17.186 but at variant due to the nature of schools and gender. Teachers' qualifications influenced their knowledge of improvisation with mean score = 56.48 and standard deviation = 8.592, though differential. Furthermore, teachers' experience affects knowledge of improvisation with mean score () = 56.4 and standard deviation () = 8.535 though varying according to teachers' experience. There was significant mean difference of teacher's knowledge of improvisation of materials in mathematics due to the nature of schools (F-cal>F-value =3.07; df= (2,87); P<0.05) which led to Scheffe's post hoc analysis of identifying the significant group. Also, there was no significant mean difference of teacher's knowledge of improvisation of materials in mathematics based on teachers' qualifications (F-cal<F-value = 2.29; df= (5,84); P>0.05). Similarly, there was significant difference of teacher's knowledge of improvisation of materials in mathematics due to their teaching experience (F-cal>F-value =3.07; df= (2,87); P<0.05). finally, there was significant genders' difference of teacher's knowledge of improvisation of materials in mathematics (t-cal<t-value = -1.980; df = 88; P<0.05). The implications of these findings were analyzed in the write up.

Introduction

Teaching and learning of mathematics are exciting whenever mutual interaction and understanding exist among the teachers, students and the materials to make learning thrive. The quality of materials to express

concepts to the students plays an important role in the learning of mathematics. The materials include textbooks, workbooks, chalkboard, charts, models, real objects etc. According to Ugwuda (2005), instructional materials allow teachers to be the manager of instruction rather than a dispenser of information. Teachers will have more time to diagnose and correct students' problem, spend few hours copying notes which made students develop theoretical knowledge of mathematics and not practical knowledge. They neither see nor interact with most mathematical facilities to enrich learning. A picture according to Nwaboku (2006) is worth a thousand words. This is because students will relate this picture to the immediate practical knowledge rather than theoretical knowledge that encourages rote learning. As a result teachers have to employ diverse instructional materials that pass message across to the learners; otherwise they resort to teachers dominated lecture method where students are passive and non-participating.

In a study conducted by Olaniyonu (2002) over the state of instructional facilities in the schools it was reported that the situation could only be described as not yet improved in terms of adequate facilities to enrich learning, over the last 20 years in Nigeria. Nwaboku (2003) however reported shortage of funds towards the inadequacy of facilities for training a large population of students especially at the Colleges of Education. This constitutes a threat to the quality of teachers produced and the quality of our school systems.

Oderinde, et al (2004) opined in their study of secondary schools in Lagos State that laboratory facilities, are scanty and the situations are not too different in the school libraries. Most students, especially during their participation in the focus group discussion, claimed to have theoretical knowledge of science subjects, Mathematics inclusive, but no practical knowledge because they had neither seen nor interacted with most science materials. Aregbede (2005) found that 50% of private schools had no apparatus in science when 10% of public schools had the instruments. This is in line with the study of Agusiobo (2000) in integrated science that teachers' non-use of resources might be due to their non-availability in the schools or that teachers were not conversant with their use. Infact, Odubunmi (2006) observed that infrastructural facilities and equipment needed to teach integrated science are not adequate. He opined that if curricular are well designed and science and technical teachers are well trained, the in-adequacy of facilities and equipments can adversely affect the classroom implementation of the curriculum. This buttressed the findings of Nwokocha & Tanko (1998). Owolabi, (2000) and Ajeyalemi

(2002) that have reported the inadequacy of science facilities in the senior secondary schools for more than two decades.

With these inadequacies of facilities, one is confused if teachers are equipped to face the challenge of their profession by engaging in the improvisation of materials whenever the shortage is experienced. Improvisation, according to Nigeria Educational Research Council (NERC, 1987) is the making or substitutes from available ones especially via the use of local material. Improvisation could be role substitution and role simulation depending on the nature of materials being used in the classrooms. When improvised materials are used as a result of non-availability of the original material then it is role substitution. On the other hand improvised materials are role simulation when such materials are fabricated in the form of the original, in order to make teaching and learning possible. Improvised materials in science, mathematics inclusive, are very crucial due to circumstance of learning and the threat which their non availability and the traditional methods of teaching posed to learning. In a situation where students of Biology are expected to learn different types of bones in human body the teacher is not under force to provide real skeleton, otherwise he might be charged for murder and without prototype materials learning might not take place effectively.

As a result the study was designed to elicit teachers' knowledge of improvisation of material in mathematics at the senior secondary school level.

Statement of the problem

The study was carried out to elicit teachers' knowledge of improvisation of materials in mathematics at the secondary school level. Specifically, the study examined teachers 'knowledge of improvisation of materials based on the nature of school, educational qualifications, teaching experience and gender. As a result, the following research questions were advanced for the study:

RQ 1: What influence has the nature of schools got on the teachers' knowledge of improvisation of materials in mathematics?

RQ 2: What influence has teachers' qualifications got on the knowledge of improvisation of materials in mathematics?

RQ 3: What influence has teaching experience got on the knowledge of improvisation of materials in mathematics?

RQ 4: What influence has gender got on the teachers' knowledge of improvisation of materials in mathematics?

Meanwhile, the following four hypotheses were raised for the study:

H_1: There is no significant difference between the type of school and teachers' knowledge of improvisation of materials in mathematics.

H_2: there is no significant difference between the teachers' qualifications and knowledge of improvisation of materials in mathematics.

H_3: There is no significant difference between the teachers' experience and knowledge of improvisation of materials in mathematics.

H_4: There is no significant difference between teachers' gender and knowledge of improvisation of materials in mathematics.

Method

Design

The study is a descriptive research design, which sought information from the teachers of Mathematics in the public secondary schools. The population of the study consisted of secondary schools' mathematics teachers in Lagos State. As a result of a large area to cover, the study focused on the mathematics teachers in Badagry and Ojo Local Government areas of Lagos State, respectively.

Subjects

Ninety mathematics teachers (i.e. six teachers of mathematics in each school were selected from fifteen public secondary schools. From eight schools in Ojo and seven schools in Badagry Local government areas, six mathematics teachers of JS I-SS III were chosen via simple random techniques.

Instrumentation

The questionnaire for Mathematics teachers' knowledge of improvisation of materials in Mathematics" which consisted of a 20-item based on a Likert format, was developed, validated and used by the researcher, taking cognizance of the ambiguous statement reframed. The internal consistency of the instrument was computed via its administration to some selected Mathematics teachers outside the main study, numbering eight. It was done within an interval of one week before the correlation coefficient value of 0.66 was obtained. The value which the researcher felt was within

the scope of measuring and suitable for the study. The statistical tool used to analyze the data comprised of the simple descriptive statistics like mean and standard deviation, t-test, one way ANOVA and Scheffe's post hoc analysis at a level of 0.05.

Findings and Discussions

RQ 1: What influence has nature of schools got on the teacher's knowledge of improvisation of materials in mathematics?

Table 1:
Nature of schools' mean and standard deviation

Sources/schools	Boys only		Girls only		Mixed one	
Genders of teachers	Male	Female	Male	Female	Male	Female
Count (n)	14	16	13	17	14	16
Percentages	15.6	17.8	14.3	18.9	15.6	17.8
Mean scores (χ)	68.30	67.25	49.46	5050.06	52.07	51.69
Std Deviation (σ)	1.28	1.25	4.20	3.59	4.46	2.31

Keys: (m) = means scores for male teachers, (f) = means scores for female teachers, (m) = standard deviation for male teachers and (f) = standard deviation for female teachers.

Table 1 shows mathematics teachers with knowledge of improvisation of materials in Mathematics though at varying mean score knowledge. In Boys only school where 14 male and 16 female teachers had mean score (m) = 68.30 and standard deviation of knowledge (m) = 1.28 and mean score (f) = 67.25 and standard deviation of knowledge (f) = 1.25 respectively, girls only school had 13 male and 17 female teachers with mean score (m) = 49.46 and standard deviation of knowledge (m) = 4.20 and mean score (f) = 50.06 and standard deviation of knowledge (f) = 3.59 respectively; and in the mixed school where 14 male and 16 female teachers had mean score (m) = 52.07 and standard deviation of knowledge (m) = 4.46 and mean score (f) = 51.69 and standard deviation of knowledge (f) = 2.31 respectively. Meanwhile, the male teachers in the girls' only school and the other male teachers had the least and highest knowledge of improvisation of materials with means score (m) = 49.46 and mean score (f) = 68.30 respectively. The findings reveal that the mean scores' knowledge of improvisation of materials in influenced by the gender of the teachers cum type of the schools. In general, all the teachers had the knowledge of improvisation though at varying degree.

RQ 2: what influence has teachers' qualifications got on the knowledge of improvisation of materials in mathematics?

Table 2:
Teachers' qualification mean and standard deviation

Sources/Education Qualification	B.SC	B.SC/ED	B.ED	PGDE	M.SC	M.ED	Total
Percentages	18	12	11	20	13	16	90
Mean scores (χ)	20.00	43.30	12.22	22.22	14.4	17.8	100
Std Deviation (σ)	54.11	56.25	61.82	53.80	56.54	58.94	56.48
	6.76	9.51	9.44	6.57	8.16	9.34	8.60

Table 2 describes the classification of mathematics teachers according to their teaching qualification with 18 B.Sc Holders represent 20% but with the mean score () = 54.11 of knowledge and standard deviation () = 6.757, 12 B.SC/ED. Holders represent 12.22% with the mean score () = 61.82 of knowledge and standard deviation () = 9.437, 20 PGDE. Holders represent 22.22% with the mean score () = 53.80 of knowledge and standard deviation () = 6.57, 13 M.SC Holders represent 14.4% with the mean score () = 56.54 of knowledge and standard deviation () = 9.34. This shows that B.SC holders and B.ED holders had the least mean score () = 54.11 and highest mean score () = 61.82 of knowledge of improvisation of materials respectively; and by implication the knowledge of improvisation is influenced by the qualification of the teacher concerned, although all the teachers had the knowledge of improvisation with grand mean score () = 56.48 of knowledge and standard deviation () = 8.60.

RQ 3: What influence has teaching experience got on the knowledge of improvisation of materials in mathematics?

Table 3:
Teaching experience' mean and standard deviation

Sources/teaching experience	(0-6)	(7-12)	(13and Above	Total
Count (n)	31	29	30	90
Percentages	34.3	32.2	33.4	1033.40
Mean scores (χ)	57.58	59.34	52.17	56.34
Standard Deviation (σ)	9.41	9.32	3.72	8.54

Table 3 shows the mathematics teachers' experience with group (0-6) years numbering 31 (34.3%) having the mean score () = 57.58 of knowledge and standard deviation () = 9.41, group (7-12) years numbering 29 (32.2%) having the mean score () = 59.34 of knowledge and standard deviation () = 9.32 and group (13 and above years numbering 30

(33.4%) having the mean score () = 52.17 of knowledge and standard deviation () = 3.72. It is however interesting to observe that group (13and above) years had the least mean score of knowledge while the group (7-12) years had the highest mean score of knowledge of improvisation of materials. Generally, all the teachers had the mean score () = 56.34 of knowledge and standard deviation () = 8.54, which shows that they have the knowledge of improvisation though to varying degrees

RQ 4: What influence has gender got on the teachers' knowledge of improvisation of materials in mathematics?

Table 4:
Genders' mean and standard deviation

Variables/ Gender	Male	Female	Total
Count (n)	41	49	90
Mean scores	45.6	54.4	100
Percentage			
Mean scores (χ)	39.00	56.21	54.47
Standard Deviation (σ)	3.31	2.38	17.19

Table 4 describes the selection of respondents based on gender with 41 male teachers representing 45.6% having the mean score () =39.00 of knowledge ands standard deviation () = 3.31 and 49 female teachers representing 54.4% having the mean score () = 56.21of knowledge and standard deviation () = 17.19. Finding confirmed that female teachers had greater knowledge of improvisation of materials than their male teachers.

H_1: There is no significant difference between the type of school and the teacher knowledge of improvisation of materials in mathematics.

Table 5:

Source of Variation	Sum of Square	df	Mean Square	F-value	F-cal	Significant
Between Groups	5788.0048	2	2894.0024	3.07	292.63088	P<0.05*
Within Groups	860.3952	87	9.8896			
Total	6648.4	89				

* Significant
Table % shows the ANOVA scores of respondents based on the type of school and it was discovered that there was significant difference of

mathematics teachers' knowledge of improvisation of materials based on the type of schools (F-cal>F-table value; df=(2,87); P<0.05). Meanwhile, Scheffe's post hoc analysis as shown in table 6 is necessary to find out which of the group is significant.

Table 6:
Scheffe's post hoc analysis on type of schools

I th group	J th group	Scheffe's values
	B (F)	1.6989
	G (M)	49.1973*
	G (F)	52.6086 *
	M (M)	19.11110*
	M (F)	42.6448*
	G (M)	46.8144*
	G (F)	50.3240*
	M (M)	35.8087*
	M (F)	40.2505*
	G (F)	0.0345
	M (M)	0.5531
	M (F)	0.3841
	M (M)	0.3043
G (F)	M(F)	0.1653
M (M)	M (F)	0.7214

Keys: B (m) = Boys school only with Male teachers, G (m) = Girls school only with Male teachers, M (M) = Mixed school only with Male teachers, B (f) =Boys school only with Female teachers G (F) = Girls school only with Female teachers, and M (F) = Mixed school only with Female teachers.

Significant

Table 6 shows Scheffe's post hoc analysis of significant of Boys only school of male mathematics teachers B(M) and female mathematics teachers B (F) where it was found that there is no significant difference in the knowledge of improvisation of materials (Scheffe's value<F-table value; df= (5,84): P>0.05) no gender and type of school's difference. There is significant difference in the knowledge f improvisation of materials between the male teachers of boys only B (M) school and their male counterpart in the girls only G (M) school with (Scheffe's value -49.1973> table value = 2.29; df=(5.84):P<0.05). Also, there is significant difference in the mean score knowledge of improvisation of materials

between the male teachers of boys only B(M) school and their female teachers in the girls only G(F) school with (Scheffe's value =52.6086>F-table value = 2.29; df= (5,84); there is significant difference in the mean score knowledge of improvisation of materials between the male teachers of boys only B (M) school and their male counterparts in the mixed M (M) school with (Scheffe's value =19.1110>F-table value =2.29; df=(5,84); P<0.05); there is significant difference in the mean score knowledge of improvisation of materials between the male teachers of boys only B(M) school and their female counterparts in the mixed M (F) school with (Scheffe's value =42.6448> F-table value 2.22: df = (5.84); P<0.05). Similarly, there is significant difference in the mean score knowledge of improvisation of materials between the female teachers of boys only B (f) school and their male counterpart in the girls only G (M) school with (Scheffe's value =46.8144> F-table value =2.29; df= (5,84): P<0.05); there is significant difference in the mean score knowledge of improvisation of materials between the female teachers of boys only B (F) school and their female counterpart in the girls only G (F) school with (Scheffe's value = 50.3240> F-table value =2.29; df= (5,84); P<0.05; there is significant difference in the mean score knowledge of improvisation of materials between the female teachers of boys only B(F) school and the male teachers in the mixed M(M) school with (Scheffe's value=32.8087> F-table value =2.29; df= (5,84); P<0.05); there is significant in the mean score knowledge of improvisation of materials between the female teachers of boys only B(F) school and their. Female teachers in the mixed M(F) school with (Scheffe's value =40.2505> F-able value =2.29; df= (5,84); P<0.05); this means that type of schools and teachers' genders influenced their knowledge of improvisation of materials. In contrast, there is no significant difference in the mean score knowledge of improvisation of materials between the male teachers of girls only G(M) school and the female teachers in the girls only G(F) school with (Scheffe's value =0.0345< F-table value= 2.29; df= (5,84); P>0.05). Also, there is no significant difference in the mean score of knowledge improvisation of materials between the male teachers of girls only G(M) school and the male teachers in the mixed M(M)school with (Scheffe's value- 0.05531<f-table value =2.29; df= (5,84) P>0.05); there is no significant difference in the mean score knowledge of improvisation of materials between the male teachers of girls only G(M) school and the female teachers in the mixed M(F) school with (Scheffe's value =0.3043<F-table value = 2.29; df+ (5,84); P>0.05); P>0.05); there is no significant difference in the mean score knowledge of improvisation of materials between the female teachers of girls only G(F) school and the female teachers in the mixed M(F) school with (Scheffe's value=0.1653<

F-table value = 2.29; df= (5.84); P>0.05); and finally, there is no significant difference in the mean score knowledge of improvisation of materials between the male teachers of mixed M(M) school and the female teachers in the mixed M(F) school with (Scheffe's value =0.7214< F-table value =2.29; df= (5,84); P>0.05).

It is quite interesting to observe the changing roles of the teachers' gender and type of schools in the knowledge of improvisation of materials as and entrepreneurship to the dynamics in education.

Ho_2: There is no significant difference between the teachers' qualifications and knowledge of improvisation of materials in mathematics.

Table 7:
ANOVA of educational qualifications

Source of Variation	Sum of Square	df	Mean Square	F-value	F-cal	Significant
Between Groups	655.43	5	131.086	2.29	1.832	P>0.05
Within Groups	6011.03	84	71.560			
Total	6666.46	89				

Table 7 shows the ANOVA scores of respondents based on the mathematics teachers' qualification and it was discovered that there was no significant mean difference of mathematics teachers' knowledge of improvisation of materials based on their qualification (F-cal<F-table value; df=(5,84);P>0.05). Meanwhile, the null hypothesis 2 that there is no significant difference between the teacher's qualifications and knowledge of improvisation of materials in mathematics is not rejected. The rationale behind the use of ANOVA was born out of the fact that numbers of independent variables (qualifications) being observed were more than two otherwise t-test would have been applied to determine the significance.

Ho_3: There is no significant difference between the teachers' experience and knowledge of improvisation of materials in mathematics.

Table 8:
ANOVA on teaching experience

Source of Variation	Sum of Square	df	Mean Square	F-value	F-cal	Significant
Between Groups	191029.20	2	95514.6	3.07	1463.4	P<0.05*
Within Groups	5678.30	87	65.268			
Total	196707.50	89				

*significant

Table 8 shows the ANOVA scores of respondents based on the mathematics teachers experience and it was found that there was significant difference between the teachers' experience and knowledge of improvisation of materials in mathematics. (F-cal>F-table Value; df=(5,84); P<0.05). Meanwhile, the null hypothesis 3 is rejected. Meanwhile, Scheffe's post hoc analysis as shown in table 9 finds out which of the group is significant.

Table 9:
Scheffe's post hoc analysis on teaching experience

1th group	J th group	Scheffe's values
(0-6)	(7-12)	0.1535
	(13 and above)	4.0502*
(7-12)	(13 and Above	6.6173*

*Significant

Table 9 shows the Scheffe's post hoc analysis of significant of groups (0-6) years and (7-12) years not significan difference in the mean score of knowledge of improvisation of materials (Scheffe's value< F-table value, df= (5,84); P>0.05). There was significant difference in groups (0-6) years and (13 and above) years over their mean score of knowledge of improvisation of materials (Scheffe's value>F-table value; df=(5,84); P<0.05) and there was significant difference in the groups (7-12) years and (13 and above) years over their mean score of knowledge of improvisation of materials (Scheffe's value >F-table value; df=(5,84; P<0.05). This shows that experience of teachers contribute to the knowledge of improvisation of materials which serve as an entrepreneurship to the dynamics in education. The older the experience of the teacher in the course of teaching the more intimate he becomes to the relevance of teaching aids to stimulate learning unlike the young ones. This explains the rationale for the seminars for the teachers on the relevance of the

improvised materials as well as the need for the experienced teachers to monitor and guide the young ones in the course of teaching.

Ho_4: There is no significant difference between teachers' gender and knowledge of improvisation of materials in mathematics.

Table 10: t-test of gender's improvisation of materials

Genders/ Variables	Count (n)	Sum	Mean	Std Deviation	df	t-cal	t-value	Significant
Male	41	1599	39.00	3.314				
Female	49	2754	56.21	2.383	88	-48.69	-1.98	P<0.05*
Total	90	5082	54.47	17.186				

Significant

Table 10 shows the t-test scores of respondents based on the mathematics teachers' genders and it was discovered that there was significant gender difference of mathematics teachers' knowledge of improvisation of materials (t-cal<t-table value; df=88; P<0.05). Meanwhile, the null hypothesis 4 is rejected. Finding has confirmed that female teachers in this study had higher mean score knowledge of improvisation of materials than their male counterpart.

Conclusion and Recommendation

As earlier mentioned the understanding of mathematical concepts is not only dependent on the effectiveness of the teachers but also on the nature of materials to enrich learning; as these materials in most cases might not be available as corroborated by Olaniyonu (2002), Nwaboku (2003) and Aregbede (2005) due to different reason among which finance is of utmost importance. This does not mean that teachers should not teach the appropriate concept via the alternative means by improvised materials especially when considering the nature of training they have passed-through. However their knowledge of improvisation of materials has been constrained by the extent to which their qualifications and experience in the teaching allow this to be feasible. Teachers have forgotten that their function has gone beyond talking, marking and evaluating alone to an extent that other possible areas of generating much needed ideas via the improvised materials is neglected. For instance, the improvised materials could be commercialized after being made and serve as additional income for the teachers apart from the fact that such materials are used to enrich learning in the classroom. What a feasible entrepreneurship venture this is! It is essential to create room for the improvised materials in school which could facilitate learning especially in Mathematics. There is clear

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