



ABSTRACT

This research focused on the impact of teaching mathematics concept using mother tongue and local instructional materials and adopted quasi-experimental pre-test post-test design where experimental and control groups were formed and descriptive survey design using questionnaires. The population of the study comprised of all Junior secondary two (JS II) students in Katsina state. Six schools were randomly selected from the three senatorial zones in Katsina state (two from each strata) using stratified sampling and one

THE IMPACT OF TEACHING MATHEMATICS CONCEPTS USING MOTHER TONGUE AND LOCAL INSTRUCTIONAL MATERIALS ON STUDENTS' PERFORMANCE AT JSS IN KATSINA STATE

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INTRODUCTION

Nigeria is a country of multilingual nature filled with abundant natural resources to be tapped for national development. Chisunum and Ejie (2014) stated that the Nigeria government recognizes the multilingual nature of Nigeria and thus, provision is made for their use in the two most important documents that spell out national life; namely; the constitution of the Federal Republic of Nigeria and National Policy on Education. Laying the importance of mother tongue practice in early Mathematics education can be a foundation of language preservation and knowledge achievement in Mathematics (Begi, 2014). Mathematics serves a vital role in everyday life. It is an area of knowledge which can never be easily acquired and quickly learned; instead it requires full attention, hard work and proper attitude.

Mathematical skills are often hard to acquire and master in a language unfamiliar to the learners. Oftentimes, students fail to master mathematical concepts and skills when they can hardly comprehend the medium of Instruction as stated by Siyang (2018). While learning in mother tongue-based bilingual, pupils are given an opportunity to develop proficiency in the second language and at the same time gain deeper understandings in the learning outcomes (Ball, 2013). Hence, by using mother tongue-based education practice in a classroom, it could provide an opportunity to bring a proper and culturally integrated education that is digestible by the locals.

Miciano (2005) showed that the use of instructional materials has significant effect on the performance of students in Mathematics. While studies by Ikwuka and Ezigbo (2015), and Adamu (2009) proved



male and one female from each strata. 60 students were selected from each school to form four groups (three experimental and one control groups) and used for the study 60 mathematics teachers were selected (20 from each strata) for the study. Geometry Achievement Test (GAT) was used to collect pre-test and post-test scores of students before and after treatment and a self-designed questionnaire to determine interest of teachers whose reliability coefficient are 0.91 and 0.722 respectively obtained from Cronbach alpha after pilot test was conducted. Descriptive statistics, t-test and ANOVA were tools used for data analysis. The results revealed that the use of mother tongue and local instructional materials have positive impact on the students' performance compared with the traditional method and that the usage of both mother tongue and local instructional materials is gender friendly. Teachers have positive interest on desires to use mother tongue and local instructional materials, however, they are faced with the challenges of lack of vocabulary and difficulties in translation of some concepts to mother tongue and non-availability of instructional materials in school for teaching mathematics. It was recommended that mother tongue must be used properly at all level of educational ladder and teachers should always use available local instructional materials for teaching mathematics concepts to yield improved performance

Keywords: Teaching Mathematics, Mother Tongue, Local Instructional Materials, Student Performance, JSS Level.

that the use of instructional materials and instructional tape recorder enhanced the performance of students in Basic education and English language respectively. It is a common practice among Mathematics teachers in secondary schools to adopt conventional and theoretical method as a way of teaching Mathematics. The influence of students' gender in their achievements had been a concern to researchers, yet no consistent result had emerged. Gender differences in the mathematics performance have been an issue in education arena for so many years. In most of the researches on gender differences in mathematics performance, a variable phenomenon emerges, boys out-perform girls in the area of mathematics as stated in the works of Paret and Fenner (2006), Joseph and Lubienski (2011), (Dung, 2019).

Statement of the problem

The importance of mathematics in the life of an individual and technological development of a nation cannot be over emphasized. Some problems that are related to the students poor performance in mathematics are; inadequate instructional resources for the teaching of mathematics in so many schools, lack of translating mathematics language to the mother tongue of the children, environmental factors and socio-economic status of some families, poor motivation etc. according to Kurumeh and Achor (2008) some of the attributed causes of poor performance of students in mathematics include abstractness of its concepts, the way these concepts are presented to the students and poor foundations, among other things.



Thus, this study is aimed at improving students' performance by improving the mode of instruction in considering mother tongue and local instructional materials as key part of mathematics instructions for improvement of students' academic performance in JSS in Katsina state. The study will benefit mathematics teachers, mathematics educators, students and curriculum reviewers to plan and implement the policy of using mother tongue and local instructional materials in their instruction.

Objectives of the study

The main aim of this study is to find out whether the academic achievement of students is affected by the use of mother tongue and local instructional materials to teach mathematics concepts at junior secondary schools in Katsina state. The study is however guided by the following research questions and hypotheses:

1. What is the difference in mean achievement scores between JSS students taught mathematics concepts using mother tongue and those taught with traditional method in Katsina state?
2. What is the difference in mean achievement scores between JSS students taught mathematics concepts using local instructional materials and those taught with traditional method in Katsina state?
3. What is the difference in mean achievement scores between JSS students taught mathematics concepts using mother tongue and those taught using local instructional materials in Katsina state?
4. What is the difference in mean achievement scores between JSS students taught mathematics concepts using mother tongue with local instructional materials and those taught using traditional method in Katsina state?
5. What is the difference in mean achievement scores of students taught mathematics concepts using mother tongue with local instructional materials at JSS in Katsina state based on gender?
6. What is the interest of mathematics teachers in using mother tongue and local instructional materials to teach mathematics concepts at JSS in Katsina state?
7. What are the challenges that mathematics teachers encounter in teaching mathematics concepts using mother tongue and local instructional materials at JSS in Katsina state?

The following research hypotheses are formulated to be tested at 0.05 level of significance for acceptance or otherwise:

- Ho1: There is no significant difference in mean achievement scores between JSS students taught mathematics concepts using mother tongue and those taught with traditional method in Katsina state.
- Ho2: There is no significant difference in mean achievement scores between JSS students taught mathematics concepts using local instructional materials and those taught with traditional method in Katsina state.
- Ho3: There is no significant difference in mean achievement scores between JSS students taught mathematics concepts using mother tongue and those taught using local instructional materials in Katsina state.



- Ho4: There is no significant difference in mean achievement scores between JSS students taught mathematics concepts using mother tongue with local instructional materials and those taught with traditional method in Katsina state.
- Ho5: There is no significant difference in mean achievement scores of students taught mathematics concepts using mother tongue with local instructional materials at JSS in Katsina state based on gender?

Literature Review

Several studies about the impact of teaching mathematics concept using mother tongue and local instructional materials in instructions existed separately and would be presented as research overview of topics of the study as follows

Review of Related Empirical Studies on Mother Tongue

Alimi et al, (2020) conducted a study to determine the effectiveness of mother tongue instruction on the achievement of primary five (V) pupils in literacy and numerical skills in Osun state, and found that there was a significant difference in the achievement of pupils taught with mother tongue and conventional strategies in literacy and numeracy skills. Englis & Boholano (2021) studied the use of mother tongue in teaching elementary mathematics in Philippines, and found that contextualized teaching connects the learning of basic skills that focuses teaching and learning on the concrete applications in a specific context that is of interest to the student. Thus, contextualized and innovative model in teaching Mathematics using mother-tongued based instruction is essential in the delivery of instruction. Englis & Boholano study is similar to our study as its take-out on the same teaching subjects and relate to one variable of this study which is mother tongue Obiageli (2013). This study sought to find out the effects of using Igbo language as a medium of instruction on academic achievement of Junior Secondary School Students in Enugu State. The result showed that the students who were taught with Igbo language performed better than the control group taught with English language. Based on this result, the researcher recommended the use of Igbo in teaching Basic Science, which helps to relate the subject to the immediate environment on the learners.

Review of Related Empirical Studies on Local Instructional materials

Otor, Ogbeba, and Ityo (2015) studied the Influence of Improvised Teaching Instructional Materials on Chemistry Students' Performance in Senior Secondary Schools in Vandeikya Local Government Area of Benue State, Nigeria. The study found that Students taught using improvised instructional materials outperformed their counterparts taught with conventional lecture method. The study recommended among others that teaching of chemistry using improvised instructional materials should be encouraged. Olayinka (2016) conducted a study on Effects of Instructional Materials on Secondary Schools Students Academic Achievement in Social Studies in Ekiti State, Nigeria” The aim of his study is to highlight the contribution of instructional materials to the academic achievement of secondary school students in Social Studies in Ekiti State. The study concluded that students who were taught with instructional materials performed better than those taught without.



Methodology

Research Design

Pre-test Post-test experimental design was be used for this study and descriptive survey design. A pre-test will be given to all the sampled schools in order to ascertain their prior knowledge of the subjects before the treatment is administered. Thereafter, six weeks treatment will be given to the experimental groups taught using Mother Tongue alone, using Instructional Materials alone and using both Mother tongue and Instructional materials while the control group will be taught using the conventional teaching method. At the end of the treatment, post-test will be given to all the groups to ascertain their level of achievement. A questionnaire was drafted for the teachers using the descriptive design to gather information on the interest and challenges teachers face in using teaching mathematics concept using mother tongue and local instructional materials.

Research Population

The population for this study will consider all Junior Secondary Schools year two (JS II) students in Katsina state. There are 3 senatorial zones – Katsina, Daura and Funtua with 14 educational zones. There are a total of 251 Junior Secondary Schools with 166,270 male, 133,855 female and a total population of 300,125 in Katsina State (MOE Katsina, 2020)

Sample Size: Slovene's formula will be used to select the sample for the study. However, since an intact class was used and split to form 4 groups, six schools made up of 4 classes each was selected randomly with 60 students (15 each for the 24 classes) of both experimental and control groups. That is, a total of 60 JS II students was randomly selected from each of the six schools giving a total of 360 students. The six schools that were randomly selected for the study are as follows:

1. Government College Junior Secondary School, Katsina (GCJSS Pilot)
2. Government Girls College, Katsina (GGCK Junior)
3. Government Girls Junior Secondary School, Daura (GGJSS)
4. Government Junior Secondary School, Ganga (GJSS)
5. Government Girls Junior Secondary School, Funtua (GGJSS)
6. Government College Junior Secondary School, Funtua (GCJSS Day wing)

A total of 60 mathematics teachers will be randomly selected, 20 from each zone to serve as sample size for the teachers for the study.

Sampling Technique

A stratified random sampling technique was used to share Katsina State into 3 senatorial zones. From the strata, two schools each were randomly selected from each of the senatorial zones. This is to ensure that the students in each of the stratum were well represented such that the conclusion of the study will be valid on the entire population.

Research Instrument

Two instruments were developed and use for the study. First, Geometry Achievement Test (GAT) was used to collect the appropriate data from students across all groups. The topics under study will cover the theme Mensuration and Geometry and the sub-theme Shapes and Angles as contained in the syllabus of Junior Secondary School (Federal Ministry of Education, 2012). The pre-



test scores will give information on the present level of the students before the treatment while the post-test scores will give information on the performance levels of the students after treatment. Second, a questionnaire on interest and challenges teachers faced in teaching mathematics concepts using mother tongue and instructional materials will be used. The questionnaire will consist of items on interest and challenges to be rated using 4 point Lickert scale.

Validity and Reliability of the instrument

To ensure validity, the instruments will be given to two experienced teachers from Junior Secondary Schools and two Mathematics educators for the content validation and face validity. After this, appropriate adjustments will be made to ensure conformity with their suggestions. Purposively, 12 and 30 questionnaires and GAT was administered to Family Support Secondary School, Katsina which was not among the randomly selected schools for the pilot study because the randomly selected schools cannot access what happened in the purposively selected school. A reliability test was performed on the outcome to test internal consistency of the questions using Cronbach alpha and 0.722 was obtained for the interest questionnaire and 0.91 for the GAT. Simple percentage was adopted to report the results from the questionnaires. The mean and standard deviation of the data will be obtained. Since the data are independent, t – test and ANOVA were used to test the difference between the means at 0.05 significant levels and SPSS (23.0 version) statistical package will be used for the data analyses.

Results, Data Analyses and Discussions

The bio-data of the respondents for the study was collected and presented in table 2.

Table 1: Bio-data of the respondents

SN	Items	Category	Number	Percentage (%)
1	Gender of Teachers	Male	41	68.3
		Female	19	31.7
		Total	60	100.0
2	Age of Teachers	21-30 years	15	25.0
		31-40 years	34	56.7
		41 years and above	11	18.3
		Total	60	100.0
3	Marital status of Teachers	Single	11	18.3
		Married	49	81.7
		Total	60	100.0
4	Qualification of Teachers	NCE	18	30.0
		Degree	35	58.3
		Master	5	8.4
		Others	2	3.3
		Total	60	100.0
5	Experience of teachers	Below 5 years	10	16.7
		6-10 years	25	41.7
		11-20 years	20	33.3



		Above 20 years	5	8.3
		Total	60	100.0
6	Gender of Students	Male	169	48.6
		Female	179	51.4
		Total	348	100.0

The results in table 1 showed that the gender of the teachers selected are 68.3% male and 31.7%. Also, 56.7% of the teachers are within the age range of 31-40 years old, 25.0% are within 21-30 years old and 18.3% are 41 years and above. 81.7% of the teachers are married while 18.3% are still single. 58.3% of the teachers have a Degree qualification, 30.0% possesses NCE qualification, 8.4% have Master degree and 3.3% have other qualifications for teaching. 41.7% of the teachers have experience in teaching ranging from 6-10 years, 33.3% possesses experience ranging from 11-20 years, 16.7% have experience of below 5 years and 8.3% have over 20 years of experience in teaching. On the other hand, the gender of the students showed that 51.4% are female and 48.4% are male.

The data analyses was conducted starting with answers to research questions and concluding with tests of hypotheses.

Research Question 1: What is the difference in mean achievement scores between JSS students taught mathematics concepts using mother tongue and those taught with traditional method in Katsina state?

Table 2: Difference in mean of those taught mathematics concept using mother tongue and those taught with traditional method

Methods	N	Mean Pretest	Std Dev	Mean Posttest	Std Dev	Mean Difference
Mother tongue	193	30.49	18.951	43.91	22.346	13.42
Traditional	189	24.87	11.560	35.95	16.066	11.08
		5.62		7.96		2.34

From table 2, the mean difference in the pretest between those taught using mother tongue and traditional method is 5.62. The posttest mean of those taught using mother tongue is 43.91 and that of traditional method is 35.95 with mean difference of 7.96. This showed that those taught using mother tongue performed better than those taught using traditional method.

Research Question 2: What is the difference in mean achievement scores between JSS students taught mathematics concepts using local instructional materials and those taught with traditional method in Katsina state?

Table 3: Difference in mean between those taught mathematics concepts using local instructional materials and those taught using traditional method

Methods	N	Mean Pretest	Std Dev	Mean Posttest	Std Dev	Mean Difference
Instructional materials	193	26.54	11.821	43.81	17.762	17.27
Traditional	189	24.87	11.560	35.95	16.066	11.08
		1.67		7.86		6.19



The results in table 3 showed that the mean pretest score is similar with the difference of 1.67. The posttest mean score of those taught using local instructional materials is 43.81 and those taught using traditional method is 35.95 with mean difference of 7.86. This showed that those taught using local instructional materials performed better than those taught using traditional methods. Research Question 3: What is the difference in mean achievement scores between JSS students taught mathematics concepts using mother tongue and those taught using local instructional materials in Katsina state?

Table 4: Difference in mean between those taught mathematics concepts using mother tongue and those taught with local instructional materials

Methods	N	Mean Pretest	Std Dev	Mean Posttest	Std Dev	Mean Difference
Mother tongue	193	30.49	18.951	43.91	22.346	13.42
Instructional materials	193	26.54	11.821	43.81	17.762	17.27
		3.95		0.10		3.85

Table 4 showed that the difference in pretest mean score between the two groups is 3.95. The posttest mean score of those taught using mother tongue is 43.91 and those taught using local instructional materials is 43.81 with the mean difference of 0.10. The two groups performance is similar with mother tongue having slight increase compared with local instructional materials. Research Question 4: What is the difference in mean achievement scores between JSS students taught mathematics concepts using mother tongue with local instructional materials and those taught using traditional method in Katsina state?

Table 5: Difference in mean between those taught mathematics concepts using mother tongue with local instructional materials and those taught using traditional method

Methods	N	Mean Pretest	Std Dev	Mean Posttest	Std Dev	Mean Difference
MT & IM	189	27.17	12.503	50.40	24.494	23.23
Traditional	189	24.87	11.560	35.95	16.066	11.08
		2.3		14.45		12.15

The results in table 5 showed that the difference in the mean pretest score between the groups is 2.3. The posttest mean score of those taught using mother tongue with local instructional materials is 50.40 and those taught using traditional method is 35.95 with the mean difference of 14.45. This showed that those taught using mother tongue with local instructional materials performed better than those taught using traditional method.

Research Question 5: What is the difference in mean achievement scores of students taught mathematics concepts using mother tongue with local instructional materials at JSS in Katsina state based on gender?



Table 6: Difference in mean between those taught mathematics concepts using mother tongue with local instructional materials based on gender

Gender	N	Mean Pretest	Std Dev	Mean Posttest	Std Dev	Mean Difference
Male	100	23.02	6.834	53.00	27.789	29.98
Female	89	31.84	15.484	47.47	19.916	15.63
		8.82		5.53		14.35

The difference in mean score of those taught using mother tongue and local instructional materials based on gender is presented in table 6 with the difference in pretest score as 8.82. The posttest mean score of male students is 53.00 and for female is 47.47 with mean difference of 5.53. This showed that the male students taught using mother tongue with local instructional materials is better than that of the female.

Research Question 6: What is the interest of mathematics teachers in using mother tongue and local instructional materials to teach mathematics concepts at JSS in Katsina state?

Table 7: Interest of teachers in using mother tongue and local instructional materials in teaching mathematics concepts at JSS in Katsina state

SN	Items	Agree (%)	Disagree (%)	Mean	SD
1	A policy on the use of mother tongue in the Nigeria in basic schools is good in principle and mathematics should not be left out.	59 (98.3)	01 (1.7)	3.47	0.536
2	It is possible to teach all basic school subjects in the mother tongue or language of the local community.	56 (93.3)	04 (6.7)	3.27	0.578
3	I dislike teaching mathematics contents completely in mother tongue and clearly to students understanding.	26 (43.3)	34 (56.7)	2.33	0.986
4	Teaching mathematics in mother tongue will enable students to express themselves clearly and make lessons more interesting.	55 (91.7)	05 (8.3)	3.58	0.645
5	Teaching mathematics using mother tongue will enable parents to participate in the education of their children.	47 (78.3)	13 (21.7)	2.95	0.622
6	All technical terms and expressions in mathematics concepts can be easily translated into mother tongue for better teaching of students.	43 (71.6)	17 (28.4)	2.95	0.723
7	Textbooks for teaching mathematics concepts can easily be produced in mother tongue for use by teachers in their instruction.	43 (71.6)	17 (28.4)	2.80	0.732



8	My education and training, which have been in mathematics, will not interfere with my teaching students in mother tongue.	46 (76.7)	14 (23.3)	2.90	0.706
9	Use of mother tongue in teaching mathematics concepts will degrade the teaching profession in Katsina and Nigeria at large.	18 (30.0)	42 (70.0)	2.12	0.904
10	I am willing to undergo any special training that will enable me to teach mathematics concepts in mother tongue.	59 (98.3)	01 (1.7)	3.63	0.520
11	Student's performance in mathematics is not encouraging due to lack of instructional aids usage.	49 (81.6)	11 (18.4)	3.30	0.766
12	Students find it easy to ask question for more explanation in mathematics when instructional aids are used.	59 (98.3)	01 (1.7)	3.62	0.524
13	I adopted teacher-centred methods in my teaching of mathematics because it is easy and does not require using any resources..	27 (45.0)	33 (55.0)	2.32	0.983
14	Instructional facilities and equipment are provided and when they are not provided I improvise them for my mathematics lessons.	47 (78.4)	13 (21.6)	2.97	0.736
15	Instructional aids make me teach mathematics to the understanding of students and improves their performance in the subject	60 (100.0)	-	3.58	0.497
16	Students usually performed excellently even when instructional aids are not used in mathematics lessons.	16 (26.7)	44 (73.3)	2.12	0.640
17	Instructional aids make me teach mathematics concepts more effectively than when only class lecture is used.	60 (100.0)	-	3.62	0.490
18	Interaction with instructional aids will improve students' thinking ability, manipulative skills and creative abilities in mathematics.	58 (96.6)	02 (3.4)	3.65	0.547
19	I think using instructional material in teaching mathematics concepts is waste of time and difficult to do.	02 (3.4)	58 (96.6)	1.48	0.567
20	Mathematics lesson can be delivered without instructional aids and students will grasp the content of the lesson satisfactorily.	17 (28.4)	43 (71.6)	2.18	0.701
	Cumulative aggregate	847 (70.58)	353 (29.42)	2.942	0.670



In table 7, the interest of mathematics teachers in using mother tongue and local instructional materials in teaching mathematics concepts showed that 98.3% agreed that the policy on the use of mother tongue in teaching is good in principle and they are willing to undergo any special training to enable them teach with mother tongue, 93.3% of the teachers agreed that it is possible to teach all basic school subjects in language of the local community, 91.7% agreed that mathematics instruction with mother tongue will enable students to express themselves clearly and makes it more interesting, 78.3% agreed that teaching mathematics with mother tongue will enable parents to participate in the education of their children, 76.7% agreed that their training in mathematics does not interfere with them teaching with mother tongue, 71.6% agreed that all technical terms and expressions in mathematics concepts can be easily translated into mother tongue and textbooks for teaching mathematics can be easily produced in mother tongue for use in mathematics instruction, However, 70.0% disagreed that use of mother tongue in mathematics instruction will degrade the teaching profession and 56.7% disagreed that they dislike teaching mathematics completely in mother tongue and clearly to students' understanding.

On the other hand, 100.0% agreed that instructional aids make them teach mathematics to the students' understanding and improves their performance and instructional aids make them teach mathematics more effectively than when only lecture method is used, 98.3% agreed that students had it easy to ask question for more explanation when instructional aids are used, 96.6% agreed that interaction with instructional aids will improve students' thinking ability, manipulative skills and creative abilities in mathematics, 81.6% agreed that students' performance in mathematics is not encouraging due to lack of instructional aids usage and 78.4% agreed that instructional facilities and equipment are provided and when they are not provided they improvise for mathematics lessons. However, 96.6% disagreed that using instructional materials in teaching mathematics is waste of time and difficult to do, 73.3% disagreed that students usually performed excellently even when instructional aids are not used in mathematics lesson, 71.6% disagreed that mathematics lessons can be delivered without instructional aids and students will grasp the content of the lesson and 55.0% disagreed that they adopt teacher-centered methods in their teaching because it is easy and do not require using any resources. The cumulative aggregate showed that 70.58% of the teachers have interest in using m mother tongue and local instructional materials in their teaching of mathematics concepts with the average mean of 2.942.

Research Question 7: What are the challenges that mathematics teachers encounter in teaching mathematics concepts using mother tongue and local instructional materials at JSS in Katsina state?

Table 8: Challenges mathematics teachers face in teaching mathematics concepts using mother tongue and local instructional materials in JSS in Katsina state

SN	Challenges	Agree (%)	Disagree (%)	Mean	SD
1	Some pupils do not speak the mother-tongue of the locality because they come from difference ethnic groups	52 (86.7)	08 (13.3)	3.05	0.811
2	Some pupils are not ready to learn and understand mother-tongue language	17 (28.3)	43 (71.7)	2.22	0.846



3	Some teachers are not ready to learn and teach mathematics with mother-tongue.	38 (63.3)	22 (36.7)	2.67	0.752
4	Inadequate teacher training in the use of the mother-tongue based education.	52 (86.7)	08 (13.3)	3.22	0.885
5	There is a lack of vocabulary and difficulties in translation of some concepts in mathematics to mother tongue	58 (96.6)	02 (3.4)	3.40	0.558
6	There are not enough mother-tongue based teaching guidelines and references provided for the teachers	58 (96.6)	02 (3.4)	3.42	0.619
7	Lack parental support and inadequate support from government and School administration	53 (88.3)	07 (11.7)	3.25	0.704
8	Non-availability of materials in school to teach mathematics concepts and financial constraint.	52 (86.7)	08 (13.3)	3.13	0.724
9	Laziness amongst the teachers to prepare and use instructional aid in their mathematics lessons.	41 (68.3)	19 (31.7)	2.73	0.841
10	Lack of skills and strategies by teachers to incorporate instructional aids into their mathematics lesson.	41 (68.3)	19 (31.7)	2.63	0.780
11	Lack of support from administration/ authority of the school to make available items and resources needed for learning.	46 (76.7)	14 (23.3)	3.22	0.846
12	Lack of appropriate materials in textbook to cover the contents to be taught by the teacher.	31 (51.7)	29 (48.3)	2.65	1.176
13	Overcrowding of the mathematics classes which makes it difficult to provide enough materials.	49 (81.6)	11 (18.4)	3.37	0.823
14	Lack of improvisation on the part of the teachers when the needed materials are absent.	51 (85.0)	09 (15.0)	3.13	0.700
	Cumulative Aggregate	639 (76.1)	201 (23.9)	3.01	0.790

Table 8 presents the challenges mathematics teachers face in using mother tongue and local instructional materials in teaching mathematics. 96.6% agreed that there is lack of vocabulary and difficulties in translation of some concepts to mother tongue and there is not enough mother tongue based teaching guidelines and references provided for the teachers, 86.7% agreed that some pupils do not speak the mother tongue of the locality because they come from difference ethnic groups, that inadequate teacher training in the use of the mother tongue based education and non-availability of materials in school for teaching mathematics and financial constraints, 88.3% agreed that lack of support from parents and inadequate support from government and school management, 85.0% agreed that lack of improvisation on the part of the teachers when the needed materials are absent, 81.6% agreed that overcrowding of mathematics classes which makes it difficult to provide enough materials, 76.7% agreed that lack of support from school authority to



make available items and resources needed for learning, 68.3% agreed that laziness amongst teachers to prepare and use instructional aids in mathematics instruction and lack of skills and strategies by teachers to incorporate instructional aids into their lessons, 63.3% agreed that some teachers are not ready to learn and teach with mother tongue and 51.7% agreed that lack of appropriate materials in textbooks to cover the contents to be taught by the teacher. However, 71.7% disagreed that some pupils are not ready to learn and understand mother tongue language. The cumulative aggregate showed that 76.1% of the teachers agreed that the above listed are challenges facing teachers' use of mother tongue and local instructional materials in teaching mathematics concepts.

Research Hypotheses

The following research hypotheses are formulated to be tested at 0.05 level of significance for acceptance or otherwise:

Ho1: There is no significant difference in mean achievement scores between JSS students taught mathematics concepts using mother tongue and those taught with traditional method in Katsina state.

Table 9: t-test Results of difference between performances of students taught using mother tongue (MT) and traditional method (TM)

Methods	N	Mean	Std.dev	t-cal	Df	p-value	Alpha	Decision
MT	193	43.91	22.346	3.990	380	0.000	0.05	Reject Ho1
TM	189	35.95	16.066					

The results in table 9 showed that the t-calculated obtained is 3.990 at degree of freedom of 380, p-value of 0.000 at alpha value of 0.05. Since the p-value is less than alpha value, then the null hypothesis 1 is rejected. Thus, there is significant difference in mean achievement scores between JSS students taught mathematics concepts using mother tongue and those taught with traditional method in Katsina state.

Ho2: There is no significant difference in mean achievement scores between JSS students taught mathematics concepts using local instructional materials and those taught with traditional method in Katsina state.

Table 10: t-test Results of difference between performances of students taught using local instructional materials (LIM) and traditional method (TM)

Methods	N	Mean	Std.dev	t-cal	Df	p-value	Alpha	Decision
LIM	193	43.81	17.762	4.530	380	0.000	0.05	Reject Ho2
TM	189	35.95	16.066					

From table 10, the results obtained showed that the t-calculated is 4.530 at degree of freedom of 380, p-value of 0.000 at alpha value of 0.05. Since the p-value is less than the alpha value, then the null hypothesis 2 is rejected. Therefore, there is significant difference in mean achievement score



between JSS students taught mathematics concepts using local instructional materials and those taught with traditional method in Katsina state.

Ho3: There is no significant difference in mean achievement scores between JSS students taught mathematics concepts using mother tongue and those taught using local instructional materials in Katsina state.

Table 11: t-test Results of difference between performances of students taught using mother tongue (MT) and local instructional materials (LIM)

Methods	N	Mean	Std.dev	t-cal	Df	p-value	Alpha	Decision
MT	193	43.91	22.346	0.05	384	0.960	0.05	Accept Ho3
LIM	193	43.81	17.762					

Table 11 present the results of t-test conducted and showed that t-calculated was obtained as 0.05 at degree of freedom of 384, p-value is 0.960 at alpha value of 0.05. Since the p-value is greater than the alpha, the null hypothesis 3 is retained. Thus, there is no significant difference in mean achievement scores between JSS students taught mathematics concepts using mother tongue and those taught using local instructional materials in Katsina state.

Ho4: There is no significant difference in mean achievement scores between JSS students taught mathematics concepts using mother tongue with local instructional materials and those taught with traditional method in Katsina state.

Table 12: ANOVA Results of difference between performances of students taught using mother tongue with local instructional materials and traditional method

	Sum of Squares	df	Mean Square	F-cal	p-value	Decision
Between Groups	19807.446	3	6602.482	15.791	.000	Reject Ho4
Within Groups	317771.219	760	418.120			
Total	337578.665	763				

The results in table 12 is Analysis of Variance (ANOVA) where the F-calculated is obtained as 15.791 at degree of freedom [3, 760] and the p-value obtained is 0.000 at alpha value of 0.05. Since the p-value is less than the alpha, the null hypothesis 4 is rejected. Therefore, there is significant difference in mean achievement scores between JSS students taught mathematics concepts using mother tongue with local instructional materials and those taught with traditional method in Katsina state.

Ho5: There is no significant difference in mean achievement scores of students taught mathematics concepts using mother tongue with local instructional materials at JSS in Katsina state based on gender?

Table 13: t-test Results of difference between performances of students taught using mother tongue with local instructional materials based on gender

Methods	N	Mean	Std.dev	t-cal	Df	p-value	Alpha	Decision
Male	100	53.00	27.789	1.555	187	0.122	0.05	Accept Ho5
Female	89	47.47	19.916					



The results in table 13 showed that the t-calculated obtained is 1.555 at degree of freedom of 187, p-value of 0.122 at alpha value of 0.05. Since the p-value is greater than the alpha value, the null hypothesis H_0 is retained. Thus, there is no significant difference in mean achievement scores between JSS male and female students taught using mother tongue with local instructional materials in Katsina state.

The results of data analysis showed that there is significant difference between the performances of students taught mathematics concepts using mother tongue compared to those taught using traditional method. The performance of students taught using mother tongue increased significantly which showed that the mother tongue have impact on the performance of students. This finding is in line with Obiageli (2013) and Binji (2020) who found positive effectiveness on impact of mother tongue usage on students' learning as it relates to their immediate environment. The finding was further supported by Alimi et al (2020) who found out that mother tongue enhanced better literacy and numeracy of pupils and improves the effectiveness of instruction. Also, Englis and Boholano (2022) affirmed that mother tongue is essential in effective instructional delivery and could be applied to teach all subjects.

Teaching mathematics concepts using local instructional materials as shown from the findings has impact on the performance of students over the traditional method. The use of instructional materials yielded improved positive performance of students as compared to teaching using traditional method. This finding is in line with Otor, Ogbeba and Ityo (2015) who found out that using improvised materials to teach affected the performance of students positively, and Olayinka (2016) who concluded that there is increase in the performance of students when taught using instructional materials. The performance of students taught using mother tongue and those taught using instructional materials is similar with no significant difference. Thus, both the two methods yielded increase in the performance of students.

The combined effect of using mother tongue with local instructional materials gave a better performance when compared with using them individually. The results showed better performance when the two are combined which showed effective performance in the students' results. There is no significant difference in the male and female performance. This showed that the use of mother tongue and local instructional materials is gender friendly and does not require any restriction. Thus, both male and female students can benefit from the use of mother tongue and local instructional materials in teaching and learning of mathematics and any other subject. This is in line with the findings of Olayinka (2016) and Alimi et al (2020) who supported that there is no gender difference in the performance of students taught using instructional materials and mother tongue.

The teachers have interest in using mother tongue and local instructional materials in their teaching of mathematics concepts. The teachers agreed that lack of vocabulary and difficulties in translation of some concepts to mother tongue and there is not enough mother tongue based teaching guidelines and references provided for the teachers, some pupils do not speak the mother tongue of the locality because they come from different ethnic groups, that inadequate teacher training in the use of the mother tongue based education and non-availability of materials in school for teaching mathematics and financial constraints, lack of support from parents and inadequate support from government and school management, lack of improvisation on the part



of the teachers when the needed materials are absent, overcrowding of mathematics classes which makes it difficult to provide enough materials, lack of support from school authority to make available items and resources needed for learning are challenges facing teachers' use of mother tongue and local instructional materials in teaching mathematics concepts.

Conclusion

The use of mother-tongue and local instructional materials in teaching Mathematics concepts is effective in acquiring Mathematical knowledge. The teachers have interest and are well-prepared in terms of content and instructional material preparation. Students' performance have improved significantly with the use of mother tongue and local instructional materials. Utilization of mother tongue and instructional materials in learning mathematics provides excellent opportunities for planting understanding of the concept to the students based on their awareness about why and how a concept built and then can use the awareness to solve problems. The teachers and pupils code-switch and use local instructional materials around them and have their ways to cope against the challenges faced in a pluralistic classroom; and the existence of different languages in a classroom play a role in the learning process of the pupils. Moreover, the mother-tongue based education has to go more assessments and evaluation for its effective implementation. All stakeholders – teachers, pupils, parent, administrators and policy-makers should actively address the problems in the learning process of learners.

Recommendations

Based on the conclusion reached, the following recommendations are provided:

1. Mother tongue must not be only taught and use but taught properly at all level of educational ladder both by utilizing the outcome on research with these language and by ensuring adequate and suitable training for the teachers concerned.
2. The use of mother tongue and mathematical language should be prioritized so as to improve the nations' technological basis. Teaching of mathematics strictly in English should be de-emphasis to enable the mathematics teachers explain in the mother tongue whenever they are teaching.
3. Textbooks writers, Publishers and Curriculum planners should work together with experts in mathematics, so as to produce standard texts in mathematics for the pupils' mother tongues to gain its pride of place in schools for better understanding of the subject.
4. Thus teachers are expected to be well organized and use instructional aide in a way it facilitates their students learning. Instructional materials must make learning more real and meaningful to the learner so teachers should endeavor to use them in their instruction.
5. The materials should not be substitute for learning but must contribute to the learning process itself. It is suggested that the time spent on the use of instructional materials to facilitate learning should commensurate with the lesson period, allowed.
6. Instructional materials should be useable and not so ' complex that the time is spent on just learning to use them (instructional materials). And finally, the use of several kinds of instructional materials to explain one particular concept must also take cognizance of individual difference among the learners.



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