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An Investigation of Teachers' Attitude to the Use of Instructional Materials in Mathematics Teaching

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Abstract
This study investigated teachers' attitude to the use of instructional materials in Mathematics teaching. 150 teachers of Mathematics participated in the study. The four research questions raised to guide the study examined the variables: Qualification, subject area of specialization and sex of the teachers as they relate to the teachers' attitude to the use of instructional materials in Mathematics teaching. A questionnaire for Mathematics teachers was the instrument used for data collection. Data collected were analyzed with the statistical tools: Z-test of sample proportion, analysis of variance (ANOVA) and Tukey's Honestly Significant Difference (HSD). Analysis of data revealed that majority of the teachers had positive attitude to the use of instructional materials, the qualification and sex of the teachers are not related to the teacher's attitude, where as the teachers subject area of specialization significantly relates to the teachers' attitude to the use of instructional materials in Mathematics teaching. The study recommends with emphasis that Mathematics should be taught only by teachers trained in the teaching of Mathematics and that emphasis should be laid on the need and practice of using instructional materials in Mathematics teaching in the pre-service training of Mathematics teachers.
Keywords: Mathematics, Teaching, Teacher, Training, Attitude, Instructiona

1. Introduction

Mathematics teaching and learning have become issues of concern to all stakeholders in the education industry. Parents, Teachers, Educators, Government and even students themselves are interested in the effective teaching and learning of Mathematics. Mathematics as a school subject "has been given a pride of place in the Nigeria school curriculum" (Eraikhuemen, 2010: 90). The indispensability of Mathematics in national development, all human activities, scientific and technological advancement as well as in numerous career areas have been emphasized in the literature (Obodo, 2002; Eraikhuemen, 2003; Bola & Musa, 2006). As Harbor-Peters (2005) rightly put it, "we are therefore no longer contending the fact that Mathematics and Mathematical sciences are indispensable. The issue at hand is on how to change the attitude and attract the interest of the people (students) towards Mathematics and mathematical sciences". In as much as I agree with Harbor-Peters that students need a change of attitude to Mathematics, I am also of the opinion that teachers need a change of attitude to Mathematics teaching, especially in the use of instructional materials in Mathematics teaching.

Attitude is an expression of likes or dislike. It is the expressed tendency to act for or against something which translates into a positive or negative value for that thing. Attitude is measured by people's expressed opinions of their likes or dislike. Attitude to the use of instructional materials within the context of this study refers to the way a Mathematics teacher perceives or the opinion the teacher holds about the use of instructional materials in teaching. This influences the teacher's choice of action.

Instructional materials also known as teaching aids are facilities and materials which the teacher use in the course of teaching to demonstrate and explain procedures, concept, skills, etc. This use of instructional materials in Mathematics teaching makes Mathematics learning easier, interesting, concrete, enjoyable and challenging. From research evidence, the use of instructional materials in Mathematics teaching enhances students academic achievement in Mathematics (Agwagah, 2001; Bola and Musa, 2006).

In a study on the use of Information and Communication Technology (ICT) by Mathematics teacher in Edo State, Eraikhuemen and Eraikhuemen (2006) reported that Mathematics teachers have positive attitude to the use of ICT in Mathematics teaching. It has also been reported that some Mathematics teachers do not use instructional materials in teaching even when the materials are available and most often some teacher use instructional materials in a most ineffective way (Awoshiyan, 2006). The effective use of instructional materials, or ICT tools in Mathematics teaching is certainly an issue of attitude. Like Jonah-Eteli recommended, there should be preparation of teachers in skills and attitude to the use of the materials prior to the provision of instructional materials.

2. Statement of the Problem

The use of instructional materials makes Mathematics teaching effective. Effective teaching of Mathematics enhances Mathematical progress of pupils and students in schools. The need to enhance Mathematics teaching for all ages and ability groups, to help learners achieve their Mathematical potentials call for the use of

instructional materials in Mathematics teaching. Empirical evidence points to non use or ineffective use of instructional materials in Mathematics teaching. Investigating teacher attitude to the use of instructional materials in Mathematics teaching in an attempt to account for the observed irregularities in teachers' use of instructional materials, with an aim to proffering recommendations for good practice in the use of instructional materials in Mathematics teaching.

3. Research Questions

The following four research questions were raised to direct the study.

1. What is the attitude of teachers to the use of instructional materials in Mathematics teaching?
2. Is there any difference among teaching of various qualifications in their attitude to the use of instructional materials in Mathematics teaching?
3. Is there any difference among teachers of various subject areas of specialization in their attitude to the use of instructional materials in Mathematics teaching?
4. Is there any difference between male and female teachers in their attitude to the use of instructional materials in Mathematics teaching?

4. Hypotheses

The following four hypotheses corresponding to the four research questions were formulated to direct the study.

1. The proportion of teachers with positive attitude to the use of instructional materials in Mathematics teaching is not significantly different from 50%.
2. There is no significant difference among teachers of various qualifications in their attitude to the use of instructional materials in Mathematics teaching.
3. There is no significant difference among teachers of various subject areas of specification in their attitude to the use of instructional materials in Mathematics teaching.
4. There is no significant difference between male and female teachers in their attitude to the use of the instructional materials in Mathematics teaching.

5. Procedure

This study adopted the survey research design. 150 Mathematics teachers from 49 public secondary schools in three local government areas of Edo State, Nigeria participated in the study. The instrument for data collection was a questionnaire titled "Mathematics Teachers' Questionnaire". It is a like type scale with four response options. Respondents were asked to tick one option that best represent their opinion. The instrument has two sections, A and B. Section A elicited information on respondents' personal details while section B consisted of 14 items on attitude to the use of instructional materials in Mathematics teaching. The instrument was validated by the researchers and its reliability was established to be 0.70 using Cronback Alpha reliability test. Data collected were analyzed using Z-test of proportion and analysis of variance (ANOVA) and Tukey's HSD. .

6. Results

The hypotheses were tested one after the other and the results are as presented below.

Hypothesis 1: The proportion of teachers with positive attitude to the use of instructional materials in Mathematics teaching is not different from 50%.

Table 1: Teachers' Attitude to the Use of Instructional Materials

No. of Respondents	No. of Respondents with Positive Attitude	Hypothesized Proportion	Sample Proportion	Z-value	Confidence Interval
150	143	0.50	0.95	11.02	0.91, 0.98

From the table above, the calculated value of Z (11.02) is greater than the table value of Z (1.96) at 5% level of significance. The null hypothesis is rejected while the alternate hypothesis is accepted. It is therefore concluded that the proportion of teachers with positive attitude to the use of instructional materials in Mathematics teaching is significantly different from 50%. To find the exact range of teachers with positive attitude, the confidence interval was computed and found to be 0.91, 0.98. From this, one can say in response to research question 1, that majority, precisely between 91 and 98% of the teachers have positive attitude to the use of instructional materials in Mathematics teaching.

Hypothesis 2: There is no significant difference among teachers of various qualifications in their attitude to the use of instructional materials in Mathematics teaching.

This hypothesis was tested at 5% level of significance using ANOVA. The result is as shown in tables 2 and 3 below.

Table 2: Descriptive Statistic of Qualification of Teachers and their Attitude to the Use of Instructional Materials.

Teacher Qualification	Descriptive		
	N	Mean	Standard Deviation
NCE	4	48.50	9.00
B.Ed., B.Sc. B.Sc.(Ed)	141	45.12	6.89
M.Ed., M.Sc., M.Sc.(Ed)	5	52.00	2.65
Total	150	45.44	6.94

Table 3: Qualification of Teachers and their Attitude to the Use of Instructional Materials in Mathematics Teaching

Source of Variation	Sum of Squares	df	Mean Square	F-value	P-value	Decision	Significance
Between group	267.01	2	133.51	2.84	0.06	Accepted	Not significant
Within groups	6911.95	147	47.02				
Total	7178.96	149					

From table 3 above, the P-value is 0.06 > 0.05 which is the level of significance. By implication, the F-value is not significant. The null hypothesis is therefore accepted and it is concluded that there is no significant difference among teachers of various qualifications in their attitude to the use of instructional materials in Mathematics teaching.

Hypothesis 3: There is no significant difference among teachers of various subject areas of specialization in their attitude to the use of instructional materials in Mathematics teaching. This hypothesis was also tested at 50% level of significance using ANOVA. The results are as shown in table 4 and 5 below.

Table 4: Descriptive Statistics of Subject Area of Specialization of Teachers and their Attitude to the Use of Instructional Materials.

Teacher's Area of Specialization	Descriptives		
	N	Mean	Standard Deviation
Mathematics	134	46.31	5.12
Computer	2	50.00	8.49
Economics	1	56.00	
Physics	6	39.00	11.81
Chemistry	2	34.00	19.80
Electrical/Electronics	1	45.00	
Accounting	3	25.33	16.17
Biology	1	33.00	

Table 5: Subject Area of Specialization of Teachers and their Attitude to the Use of Instructional Materials

Source of Variation	Sum of Squares	df	Mean Square	F-value	P-value	Decision	Significance
Between Groups	2145.84	8	268.23	7.51	.000	Rejected	Significance
Within Groups	5033.12	141	35.70				
Total	7178.96	149					

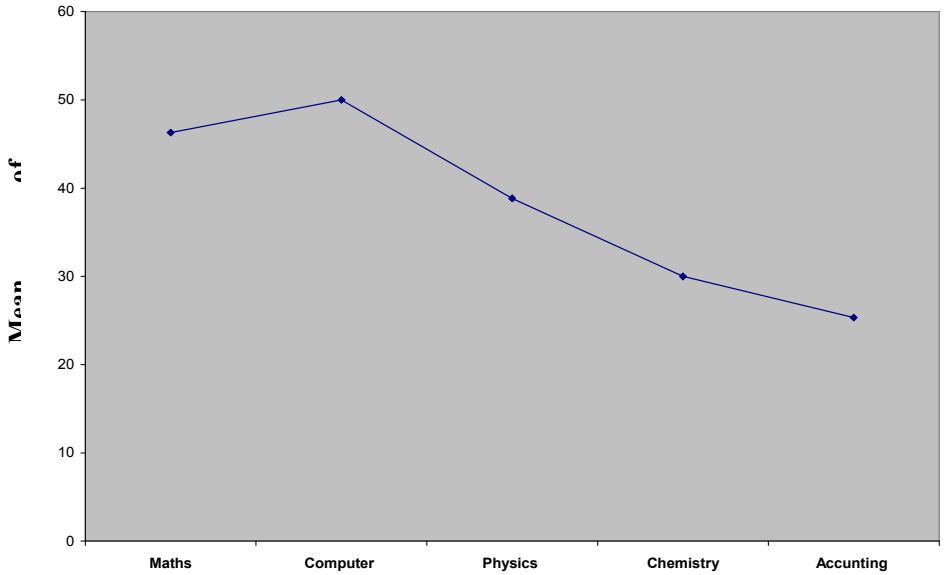
The results in Table 5 above indicates a significant relationship, since P-value of 0.00< 0.05 which is the level of significance. Hypothesis 3 is therefore rejected and it is concluded that there is a significant difference among teachers of various subject areas of specialization in their attitude to the use of instructional materials in Mathematics teaching. To ascertain the point of variation among the subject areas of specialization, a post-hoc analysis was conducted using the Tukey's Method. The result is as summarized in table 6 below.

Table 6: Summary of ANOVA Table on Multiple Comparisons.

Qualification of Teachers (i)	Qualification Teachers (j)	Means Difference (i-j)	Standard Error	Sig. P-Value	95% Confidence Interval		Decision	Significance
					Upper Bound	Upper Bound		
Maths	Computer	-3.69	4.24	.90	-15.41	8.03	Accept	Not
	Physics	7.47	2.48	.03	.61	14.34	Reject	Significant
	Chemistry	12..31	4.24	.03	.59	24.03	Reject	Significant
	Accounting	20.97	3.48	.000	11.37	30.58	Reject	Significant
								Significant
Computer	Maths	3.69	4.24	.91	-8.03	15.41	Accept	Not
	Physics	11.17	4.86	.15	-2.27	24.60	Accept	Significant
	Chemistry	16.00	5.95	.06	-.45	32.45	Accept	Not
	Accounting	24.67	5.44	.00	9.65	39.69	Reject	Significant
								Not
								Significant
								Significant
Physics	Maths	-7.47	2.48	.03	-14.33	-.61	Reject	Significant
	Computer	-11.17	4.86	.15	-24.60	2.27	Accept	Not
	Chemistry	4.83	4.86	.86	-8.60	18.27	Accept	Significant
	Accounting	13.50	4.21	0.1	1.87	25.13	Reject	Not
								Significant
								Significant
Chemistry	Maths	-12.31	4.24	.03	-24.03	-.59	Reject	Significant
	Computer	-16.00	5.95	.06	-32.45	.45	Accept	Not
	Physics	-4.83	4.86	.85	-18.27	8.60	Accept	Significant
	Accounting	8.67	5.44	.50	-6.35	23.69	Accept	Not
								Significant
								Not
								Significant

The mean difference is significant at the 0.05 level. The Post Hoc Analysis could not be conducted for Economics, Electrical/Electronics and Biology because of the small sample size (1 each).

From table 6 above, difference exist between Mathematics and Physics in favour of Mathematics, Mathematics and Chemistry in favour of Mathematics, Mathematics and Accounting in favour of Mathematics, Computer and Accounting in favour of Computer, Physic and Mathematics in favour of Mathematics, Physics and Accounting in favour of Physics, Chemistry and Mathematics in favour of Mathematics. A graph of mean of attitude against area of specialization (fig. 1 below) explains it more explicitly.



Hypothesis 4: There is no significant difference between male and female teachers in their attitude to the use of

instructional materials in Mathematics teaching.

The hypothesis is tested at 5% level of significant using ANOVA and the result is as show in tables 7 and 8 below.

Table 7: Descriptive Statistics of Teacher's Sex and Attitude to the Use of Instructional Materials.

Teacher's Sex	Descriptive		
	N	Mean	Standard Deviation
Male	98	45.06	7.07
Female	52	46.15	6.69
Total	150	45.44	6.94

Table 8: Teacher's Sex and Attitude to the Use of Instructional Materials

Source of Variation	Sum of Squares	df	Mean Square	F-value	P-value	Decision	Significance
Between Groups	40.56	1	40.56	0.84	0.36	Accepted	Not Significance
Within Groups	7138.40	148	48.23				
Total	7178.96	149					

From table 8 above, the P-value is 0.36 > 0.05 which is the level of significance. This implies that the F-value is not significant. The null hypothesis is accepted and it is therefore concluded that, there is no significant difference between male and female teachers in their attitude to the use of instructional materials in Mathematics teaching.

7. Discussion of Findings

The findings of this study can be summarized as follows:

- majority of the teachers, precisely between 91 and 98% have positive attitude to the use of instructional materials in Mathematics teaching;
- there is no significant difference among teachers of various qualifications in their attitude to the use of instructional materials in Mathematics teaching;
- there is a significant difference among teachers of various subject areas of specialization in their attitude to the use of instructional materials in Mathematics teaching;
- there is no significant difference between male and female teachers in their attitude to the use of instructional materials in Mathematics teaching.

The findings of this study corroborates Eraikhuemen & Eraikhuemen (2006) that reported, that Mathematics teachers have positive attitude to the use of ICT in Mathematics teaching while it negates Jonah-Eteli (2006). A basic question to be addressed at this point is: if teachers have positive attitude to the use of instructional materials what then, is responsible for the non use or in effective use of instructional materials in Mathematics teaching. As was discovered from this study, the subject area of specialization of the teacher is a key factor. As can be seen from figure 1, attitude to the use of instructional materials decreases from computer science to Mathematics to physics to chemistry with accounting having the least.

This is an indication of the extent to which teachers in these different subject areas were exposed to instructional materials in their preservice training. By the nature of the subjects, computer science is actually more practical based and teachers in that area are more disposed to using materials that those in the other subject areas. This is why they have better attitude to the use of instructional materials than those who specialized in Mathematics teaching. From the figure, the mean score on attitude scale of the teachers who specialized in physics, chemistry and accounting is less than 40% which is rather low. It is not surprising because these teacher are not trained to teach Mathematics.

8. Conclusion and Recommendations

Effective teaching and learning of Mathematics hinges on the effective use of instructional materials in Mathematics teaching. Teachers with high positive attitude to the use of instructional materials in Mathematics teaching are better disposed to use instructional materials. Teachers of different areas of specialization are significantly different in their attitude to the use of instructional materials, whereas the sex and qualification of the teacher does not have any significant influence on the teacher's attitude to the use of instructional materials. Teachers who are not trained in the teaching of Mathematics cannot effectively utilize instructional materials in Mathematics teaching. For specialists in the field of physics, chemistry and accounting to be teaching Mathematics is an aberration to established standards.

It is hereby recommended with great emphasis that Mathematics should be taught by only teachers

trained in the teaching of Mathematics. In the pre-service training of Mathematics teachers, emphasis should be laid on demonstrations on the need and practice of using instructional materials in Mathematics teaching. Exposing teachers of Mathematics to regular in-service training workshops on Mathematics teaching, where they can witness demonstrations of using different aids in the teaching of different Mathematical concepts, will enhance their attitude to the use of instructional materials in Mathematics teaching.

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