Full Length Research Paper

Perceived difficulty in integrating educational objectives within the Mathematics classroom: A comparison of beginner and experienced teachers

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Differences in the perception of the difficulty level of integrating specific educational objectives into Mathematics teaching between beginner and experienced secondary school Mathematics teachers was examined. One hundred and seventeen Mathematics teachers from State Secondary Schools in Anambra, Nigeria were included in the investigation. A descriptive survey instrument was constructed for the study which incorporated 32 items in the areas of Planning Instruction (PI), Implementing Instruction (II), Use of Educational Technology (ET), and Maintenance of Discipline (MD). Analysis of the survey results showed that: a. There was a significant difference between beginner and experienced teachers in their perceptions of the difficulty of integrating PI, II, and MD educational objectives into Mathematics classes, b. There was no significant difference between experienced and beginner teachers in their perceptions of the difficulty of integrating ET into their classroom teaching, and c. The perceived level of difficulty experienced by Mathematics teachers in using those skills is independent of gender. The results of this study suggest that, student Mathematics teachers should be prepared by their various institutions as to the importance and methods of implementation of the educational objectives defined by the survey items in this study.

Key words: Mathematical skill, Nigeria, secondary school, student Mathematics teachers.

INTRODUCTION

Mathematics which has been conceived as the key in the needs of daily life, occupies a central position in the scientific and technological growth of any country. Of all sciences, Mathematics serves as the rudiment in which the child is taught the spirit of inquiring and reasoning. Ukeje (1986) described Mathematics as the minor of civilization in all the centuries of painstaking calculation and, the most basic discipline for any person who would be truly educated in any science and in many other endeavours. A credit pass in Mathematics is required for admission into most science and technology courses if not all courses at the tertiary level of education (medical, pharmaceutical, engineering, agricultural sciences etc). This was recognized by the curriculum planners because

the products of secondary schools will be expected to posses; Mathematics literacy, Mathematics knowledge, positive attitude towards Mathematics, the ability to think and work like a mathematician, mathematical skills, and the ability to use Mathematics method in solving the problem of the environment (Okigbo, 2007).

In spite of this central position of Mathematics among sciences and other related disciplines, students performance has consistently been poor and unsatisfactory (Betiku, 2002; Maduabum and Odili, 2006). Maduabum and Odili (2006) revealed a disturbing trend in the extent of poor performance of students in general Mathematics in Senior School Certificate Examination (SSCE). Their finding revealed that the proportion of students who achieved a credit level pass and above (A1 to C6) is considerably low (7.71 to 36.6%) compared with the proportion of students who achieved failing grades (F9), which is overwhelmingly large (30.7 to 66.2%). Many

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variables were blamed for the dismal performance of students in Mathematics. Such related variables include teacher, government, curriculum, students, home, text book variables, etc (Betiku, 2002). The teacher-related variables include poor method of teaching, inexperienced teachers, negative attitude of teachers, lack of knowledge of the required mathematical skills by the teachers etc. Good quality teaching enhances effective learning. No educational system can rise above the quality of its teachers (FME, 1998). As a result of this, government recognized that teacher education will be given priority attention in all educational planning.

Teaching is the art of helping somebody to learn and it is one of the oldest and most widely practiced professions in the world. For effectiveness, teachers have to posses some degree of skills. Mathematical skills are usually concerned with the repeated application of certain mathematical concepts which are found to be useful in a variety of situations. Thus, a skill is acquired by a large amount of repetitive practice. Odogo (1998) outlined the appropriate mathematical skills as: breaking down the scheme of work into smaller units, planning the appropriate teaching strategies that will cover the scheme, planning how the students will discover the basic concepts themselves, providing materials that will give a varied attention on each unit, extra practice and special teaching techniques, provision for very bright students, skills and experiences needed as the background for teaching etc.

It is obvious that lack of adequate mathematical skills needed for the teaching of Mathematics could be a possible cause of the high failure rate of the subject. Mathematics teachers have a big role to play in using the appropriate teaching skills. If the required skills are not properly demonstrated in the teaching of the subject, then the teachers have failed the students and the nation. For a teacher to meet the demands of his job, he should possess the qualification, experience and competence necessary for effective implementation of the curriculum (Iheagwam, 1987).

Adeyegbe (1993) supporting him concluded that, the effective implementation of the curricula and the attainment of their lofty objectives rest on the caliber of teachers handling them. He further stressed that teachers must be knowledgeable and experienced in the discipline they profess to teach. Experience and familiarity with the subject help the teachers considerably in all the classroom situations which may arise. Ofoegbu (1984) reported that primary school pupils taught by experienced teachers performed significantly higher than those taught by non-experienced teachers in science process skills acquisition. Odogo (1998) supporting Ofoegbu pointed that, many other changes which have taken place in the Mathematics classroom have required the teacher to study more carefully the different specific ways of presenting certain topics in the syllabus. Thus, she found that experience of the Mathematics teachers was related to their students' performance in Mathematics.

Studies (Kemp and Hall, 1992; Holden, 1993; Uchedili, 2009) had shown that the interaction patterns of male and female students were often influenced by the teachers' gender. Kemp and Hall (1992) revealed that, male teachers tend to have more classroom management and control skills than their female counterparts. According to the study, male teachers tend to be more authoritative whereas female teachers tend to be supportive and expressive. Uchedili (2009) also found male teachers to be more effective than the female teachers in teaching Mathematics in boys' secondary school but the difference was not significant. Any fight to improve Mathematics instruction in Nigeria must be fought with all imaginable weapons and the war will not be fought in a bush, air, sea, but in the classrooms (Ale, 1989).

In view of this, the study is designed to ascertain Mathematics teachers' perception of the problems they have in implementing mathematical skills identified as appropriate for teaching Mathematics in the classroom.

Statement of the problem

The persistent poor performance in Mathematics at the SSCE results in many students not being enrolled into science and its allied courses in tertiary institutions. One wonders what could be responsible for such dismal performance as manifested for many years. Could it be that secondary school teachers have problems in using skills which are deemed essential for effective teaching and learning of Mathematics in the secondary school? This study was designed to find possible answers to this question.

Purpose of the study

The purpose of this study include to:

1. Identify the skills appropriate for Mathematics teaching in secondary schools.
2. Determine Mathematics teachers' perception of the problems they have in implementing the identified skills in their classroom.
3. Determine the extent of gender influence in using the identified skills in their daily classroom practices.

Research hypotheses

Ho$_1$: There is no significant difference between beginner and experienced Mathematics teachers' perception of their problems in using appropriate skills for Mathematics teaching.

Ho$_2$: There is no significant difference between male and female Mathematics teachers' perception of their problems in using the identified Mathematics teaching skills.

METHODOLOGY

Research design

The design is a descriptive survey. The research involved identifying mathematical skills appropriate for Mathematics teaching. Also, the Mathematics teachers' opinion to ascertain their perceptions of the problems they have in using the identified Mathematics teaching skills was obtained.

Population and sample

The population comprised all the 406 Mathematics teachers in all (263) public secondary schools in Anambra State, Nigeria. One hundred and seventeen (117) out of 406 Mathematics teachers were sampled for the study. Thirty-three out of 263 secondary schools were chosen by proportionate sampling and all the Mathematics teachers found there were used, 117 (27 males and 90 females) teachers. Also, twelve (12) Mathematics teachers were identified as beginning teachers while 105 were experienced teachers. Beginning teachers are those with less than five years experience in teaching Mathematics while those who have taught Mathematics for five years or more are classified as experienced teachers.

Instrumentation

Construction of the instrument

The researchers obtained data on the appropriate skills for Mathematics teaching from three sources namely:

i. Analysis of core curriculum materials,
ii. Observation of Mathematics teachers during their classroom practices using two Mathematics education graduate teachers as assistants,
iii. Structured interviews were conducted with 20 Mathematics teachers from 10 schools not participating in the study to elicit from them the appropriate skills for Mathematics teaching.

The skills got from the three sources were compared with that got from literature (Moore, 1977; Adeniyi, 1986; Odogo, 1998) before the final selection was made. The identified skills were categorized under four major areas which include:

1. Planning Instruction (PI),
2. Implementing Instruction (II),
3. Use of Educational Technology (ET), and
4. Maintenance of discipline (MD).

Instrument and validation

The instrument for collecting data was the Questionnaire for Mathematics Teachers (QMT) structured by the researchers. The QMT was made of up of two sections A and B. Section A sought information regarding the personal data of the teachers and section B, a thirty-two item questionnaire, was designed to determine from the teachers' perception, the level of problem they have in using the identified Mathematics teaching skills. Section B required the Mathematics teachers to indicate if they have no problem (5), minor problem (4) moderate problem (3) difficult problem (2) or serious problem (1) in carrying out the classroom practices contained in the questionnaire. Section B was organized in 4 sub-sections;

1. B$_1$ (7 items) had the information regarding planning of instruction covered in items 1 to 7.
2. B$_2$ (17 items) covered skills of implementing instruction in items 8 to 24.
3. B$_3$ (4 items) spans from items 25 to 28 covering skills of educational technology.
4. B$_4$ (4 items) covered skills of maintenance of discipline in items 29 to 32 (Appendix A).

The validation of the instrument was done by two experienced Mathematics teachers, two Mathematics educators and two Mathematics experts. The instrument was trial tested and the reliability of each section established with Cronbach alpha (α) using 20 subjects from the schools not participating in the study. These were found to be 0.78, 0.81, 0.85 and 0.81 respectively for B$_1$, B$_2$, B$_3$ and B$_4$.

Administration of the instrument

The researchers administered the questionnaire on their own to 117 Mathematics teachers. The administration of the questionnaire took one week. All the Mathematics teachers responded to the items of the questionnaire and the researchers collected them on the spot. This resulted to 100% return of the filled copies of the questionnaire. At the end the researchers compiled the responses of the teachers in form of data which were analyzed. The decision point is 3.00, any score from the items above it is regarded as not being difficult and any score below it is regarded as difficult.

Method of data analysis

The data collected were analyzed using mean, standard deviation and t-test. The two hypotheses were tested at 95% confidence level.

RESULTS

The lists of the identified teaching skills were presented in Table 1.

DISCUSSION

The findings revealed that from the four sub-scales of the identified skills, the experienced Mathematics teachers exhibited higher mean rating (3.76) than the beginning teachers (2.87). The experienced Mathematics teachers also exhibited the mean rating above the decision region (3.00) in Planning Instruction (PI), Implementing Instruction (II) and Maintenance of Discipline (MD) while the beginning teachers exhibited mean rating above the decision level only in Planning Instruction (PI). Both experienced and beginning Mathematics teachers exhibited mean rating below the decision region in skill of

Table 1. Identified teaching skills needed by Mathematics teachers.

A: Planning instruction (PI)	1. Breaking down of Mathematics into scheme of work 2. Dividing scheme of work into daily topics 3. Stating lesson in measurable terms 4. Stating lesson objectives in appropriate domains 5. Sequencing and tagging of time frame to activities 6. Considering the needs and interest of students in planning activities 7. Organizing ideas and activities so as to avoid confusion.
B: Implementing instruction (II)	1. Developing the content logically 2. Demonstrating knowledge of subject matter 3. Communicating with students by explaining concepts very clearly to them 4. Making Mathematics content meaningful to students 5. Creating interest in the topic 6. Relating Mathematics taught to real life experiences of students 7. Providing opportunity for logical thinking 8. Distributing questions, activities and inspiring them by rewarding evenly and promptly 9. Responding appropriately to students' questions and difficulties 10. Providing classroom atmosphere for variety of individual experiences 11. Using appropriate instructional materials 12. Teacher being audible and fluent. 13. Constructing valid and reliable test to evaluate students progress 14. Using test results to improve teaching 15. Developing question to low and high cognitive levels 16. Using appropriate techniques to evaluate students achievement in line with stated objectives 17. Using a variety of evaluation techniques such as tests, assignments, projects etc.
C: Use of educational technology (ET)	1. Selecting the necessary materials and equipment 2. Using instructional materials appropriate for achieving lesson objective 3. Using available educational resources of the community for instructional purposes 4. Improvising instructional materials
D: Maintenance of discipline (MD)	1. Being clearly in control of lesson by maintaining interactive (robust/friendly) and orderly atmosphere in class. 2. Identifying cause for undesirable behaviour and provide solution 3. Setting and enforcing mix expectation behaviours in the class 4. Ensuring that any corrective measure fits both offence and offender.

Educational Technology (ET), 2.98 and 2.58 respectively. From Table 4, the null hypothesis that there is no significant difference between beginning and experienced Mathematics teachers' perception of their difficulties in using appropriate skills for Mathematics teaching was rejected. Thus, there was a significant difference between the beginning and experienced teachers in the level of difficulty they perceive, in using the appropriate skills for Mathematics teaching.

The finding is in line with the findings of Ofoegbu (1984), Iheagwan (1987), Adeyegbe (1993) and Odogo (1998). Ofoegbu (1984) reported that, primary school pupils taught by experienced teachers performed significantly higher than those taught by non-experienced teachers in science process skills acquisition. Also, Adeyegbe (1993) pointed out that, for a teacher to meet the demand of his job, he should posses the qualification, experience and competence necessary for effective implementation of the stipulated curricula. Odogo (1998) reported that, experienced Mathematics teachers perceived fewer problems because they are better informed about the system than the beginning teachers who are new in the system and might not have known much about the students, school setting, usage of teaching aids etc. Thus, the experienced teachers were in a better position to know when, how and where to get teaching aids because the

Table 2. The mean rating and standard deviation of appropriate skills of beginning and experienced Mathematics teachers.

Skill (5-point rating)	Beginning teachers		Experienced teachers	
	$\overline{X}$	SD	$\overline{X}$	SD
Planning instruction (PI)	3.62	0.58	4.13	0.25
Implementing instruction (II)	2.56	0.55	3.92	0.56
Use of educational technology (ET)	2.58	0.11	2.98	0.15
Maintenance of discipline (MD)	2.70	0.52	4.02	0.82
Grand X and SD	2.87	0.44	3.76	0.45

Table 3. Mean rating of the appropriate skills in teaching by male and female Mathematics teachers.

Skill (5-point rating)	Male N=25		Female N=80	
	$\overline{X}$	SD	$\overline{X}$	SD
PI	4.05	0.32	3.91	0.33
II	3.65	0.51	3.66	0.52
ET	2.79	1.10	2.73	0.85
MD	3.58	1.18	3.67	1.04
Grand X and SD	3.52	0.78	3.49	0.69

Table 4. The t-test comparison of the problems perceived by the beginning and experienced Mathematics teachers.

Subjects (Teachers)	N	$\overline{X}$	SD	$\overline{df}$	t-cal	t-crit
Beginning	12	2.87	0.44			
				115	6.622	1.980
Experienced	105	3.76	0.45			

Table 5. Results on the gender difference in the perceived difficulties by the teachers.

Subjects	N	$\overline{X}$	SD	$\overline{df}$	t-cal	t-crit
Male	25	3.52	0.79			
				103	0.172	1.980
Female	80	3.49	0.69			

had been there for a longer period.

Table 3 had shown that, both male and female teachers experienced difficulty in the use of education technology but experienced minor problems in the use of other three skills of PI, II, and MD. The results from Table 3 deviates from the findings of Kemp and Hall (1992) and Holden (1993) who showed that, the interaction patterns of male and female students were often influenced by the teachers' gender. Kemp and Hall (1992) revealed that, male teachers tend to have more classroom

management and control skills than their female counterparts. According to Kemp and Hall, male teachers tend to be more authoritative whereas female teachers tend to be supportive and expressive. The results obtained from Table 5 revealed that, there is no significant difference between male and female teachers in the level of difficulty they perceive in using the appro-priate skills for Mathematics teaching. Result from 5 was in line with the finding of Uchedili (2009) who found that, male teachers were more effective than the female teachers in teaching Mathematics in boys' secondary school but the difference was not significant. Gender indifferences could be attri-buted to the fact that, Mathematics is no longer seen now as a male subject. Female Mathematics teachers are more in the schools than Mathematics teachers these days.

Conclusion

From the results of this study, the following conclusions were drawn:

1. Thirty-two skills were identified as needed by Mathematics teachers; seven in planning instruction, seventeen in implementing instruction, four in the use of educational technology and four in maintenance of discipline.
2. There is a significant difference between beginning and experienced Mathematics teachers' perception of their difficulties in using appropriate skills for Mathematics teaching in favour of the experienced teachers.
3. There is no significant difference between the male and female Mathematics teachers in the level of difficulty they perceive in using the appropriate skills in the Mathematics classroom.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made;

1. Beginning Mathematics teachers should face

orientation on the use of appropriate skills at the time of taking the teaching job.

2. The students' Mathematics teachers should be prepared using those identified skills while receiving training from their various institutions and much more attention should be given to the skill of educational technology since both experienced and beginning teachers experienced more problems in using the skill.

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APPENDIX A

Sample of Questionnaire for Mathematics Teachers (QMT)

Section A

Qualification: OND, NCE, HND, BSC/BED, MSC/MED, others specify
Years of experience: 1-3 years, below 5 years, 5 years and above
School ……………………….. Education zone …………………………
Area of specialization ………………………………. Sex ………………

Section B

S/N	Items	No. problem	Minor problem	Moderate	Difficult	Serious problems
1	Writing objectives in terms of performance					
2	Determining what to teach in Mathematics					
3	Developing daily lesson plan					
4	Considering the needs and interest of students in planning activities					
5	Stating lesson objectives in appropriate domains					
6	Planning lesson activities in sequencing order within the time frame					
7	Organizing ideas and activities so as to avoid confusion					
8	Demonstrating knowledge of Mathematics					
9	Creating interest in the topic being taught					
10	Responding appropriately to students questions and difficulties					
11	Providing for individual differences in the class					
12	Being audible and fluent in the class					
13	Using a variety of evaluation devices such as tests, assignments and projects					
14	Asking students questions that will cause them to think about the things they learnt in other topics					
15	Providing for students different learning experiences					
16	Using concrete applications and examples which make ideas clearer					
17	Encouraging my students to find out new information for themselves					
18	Asking students questions and rewarding them evenly and promptly					
19	Relating content to life outside school					
20	Providing opportunity for logical thinking					
21	Developing and pitching questions at low and high cognitive levels					
22	Constructing valid and reliable test to evaluate my students' progress					
23	Using test results to improve teaching					
24	Using appropriate instructional materials					
25	Improvising instructional materials					
26	Selecting variety of instructional materials appropriate to lesson topic					
27	Using available educational resources of the community for instructional materials					
28	Selecting the necessary materials and equipment					
29	Being clearly in control of lesson by maintaining interactive (friendly) and orderly atmosphere					
30	Identifying cause for undesirable behaviour and provide solution					
31	Setting and enforcing minimum expectation of behaviour					
32	Ensuring that any corrective measure fits both offence and offender					