TRAINING OF UNDERGRADUATE TEACHERS IN NIGERIAN UNIVERSITIES: FOCUS ON PROBLEMS OF EFFECTIVE INTEGRATION AND ATTITUDE OF STUDENTS TO COMPUTERS IN MATHEMATICS INSTRUCTION

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ABSTRACT

It has been argued that the ways teachers were taught and the behaviour patterns they developed for coping with feelings exert a long pull on their teaching. It follows, therefore, that if teachers are to comprehend and appreciate the nature of mathematics and mathematical thinking, they must experience as learners, the kinds of mathematical knowledge and thinking that they are expected to teach. Similarly, if teachers are to appreciate the use of instructional materials and tools, especially the new technology (computer), in mathematics instruction, they must experience as learners, and be exposed to the use of such technology in mathematics teaching, as a model of what they themselves might do. The study was designed to investigate the attitude of undergraduate mathematics education students to computer usage and the problems facing the effective integration of computers into mathematics instruction in Nigerian Universities. Three hundred undergraduate mathematics education students and thirty mathematics educators were selected for the study through stratified random sampling technique. Two sets of questionnaires- one for the students and the other for the mathematics educators were used, for data collection. Percentage, means and t-test statistic were used for data analysis. The results revealed non-availability of manpower and computers in the universities for the training of mathematics education students due to inadequate funding of higher education in Nigeria. Therefore, the student teachers are not exposed to computer usage in mathematics instruction. Some of the recommendations made include: more money should be made available for the universities to enable them acquire both human and material resources for effective integration of computers into mathematics instruction at undergraduate level.

Introduction

The issue of poor performance of students in mathematics has become a perennial problem, both elsewhere and in Nigeria. In Nigeria, the performances of students in external examinations in mathematics have continued to slide on a downward trend. Learners continue to manifest weak understanding of mathematics concepts, skills, generalizations, etc, not only in external examinations, but also in internal examinations and classroom exercises (Bot, 2000).

One contributing factor to this problem is the teacher factor. For instance, Agwagah (1993), Harbor-Peters and Ogomaka (1991), highlighted the issue of teaching methods adopted by teachers. This could arise from the fact that many teachers are not competent to teach mathematics, and are not able to provide and use necessary instructional materials for teaching, especially the new technology (computer), which is beginning to have a significant impact on almost every aspect of our lives, especially the education sector (Perl, 1990). As is well known, the basis for acquisition of knowledge in subject matter and ability to provide and use appropriate instructional materials is provided in the methodology courses teachers go through in their training. Thus, one objective of teacher education, as stated in the National Policy on Education, is to provide teachers with the intellectual and professional background adequate for their assignment and make them adaptable to changing situations (Federal Republic of Nigeria, 1998).

However, it has been recognised, in Nigeria and elsewhere that the undergraduate program is not adequately preparing teachers to function as professionals (Reid, 1997). This supports previous reports (e.g. Bigum, 1990), which have indicated that many of the inappropriate uses of IT in schools are the result of lack of preparation and training for teachers.

In Nigeria, the computer is slowly finding its way into the public school (Fafunwa, 1991), and it has been found very useful. However, not much seems to have changed since 1991, especially with respect to the training of teachers on the use of computers. If computers are known to have positive influence on education and especially the pedagogical aspect of education, teachers ought to be familiar with how to effectively utilize them for instructional purposes, and this they ought to acquire during training. It has been argued that the ways teachers were taught and the behaviour patterns they developed for coping with feelings exert a long pull on their teaching (Hyde, 1989). It follows therefore that teachers must experience good mathematics teaching as a model of what they themselves might do. They must experience as learners, and be exposed to the use of instructional materials, such as the new technology (computer) in mathematics teaching, as a model of what they themselves might do.

Given this stand, how are undergraduate mathematics education students in Nigerian Universities prepared to cope with the teaching of mathematics after their training, especially as it relates to the use of computer in mathematics instruction? Are computers available in education departments of Nigerian Universities for mathematics education program? To what extent are students exposed to the use of computer in mathematics instruction in the mathematics method course?

Also, it has been pointed out that teachers' beliefs, attitudes and feelings about mathematics are equally important in developing in them the confidence and competence they need to be able to teach mathematics. Thus, a survey of teachers' attitudes toward the use of computer in mathematics education is necessary. Harbor-Peters (1997), found that majority of mathematics

teachers in Nigerian secondary schools are not ready and not in support of the use of computers for fear of being displaced from job. Would undergraduate mathematics education students have the same feeling? Would the feelings of students be influenced by gender of student or the type of University (Federal or State), in which the student is studying? What are the problems militating against the effective integration of computers in mathematics instruction? These questions constitute the problem of this study.

Research Questions

1. What proportion of Universities has computers for mathematics education program in Nigeria?
2. To what extent are mathematics education students exposed to the use of computer in teaching mathematics in the mathematics methods course?
3. What proportion of mathematics educators in Nigerian Universities is computer literate?
4. What proportion of mathematics educators own computer machines?
5. What are the attitudes of undergraduate mathematics education students to computer usage in mathematics instruction?
6. What are the problems hindering the effective integration of computers into mathematics instruction in Nigerian Universities?

Hypotheses

The following hypotheses were tested at 0 .05 level of significance.

Ho_1 : The mean attitude rating of male undergraduate mathematics education students on the use of computer in mathematics instruction , does not differ significantly from that of female students.

Ho_2 : There is no significant difference in the mean attitude ratings of students from Federal Universities and those from State Universities, on the use of computer in mathematics instruction.

Method

Sample: The subjects were selected from thirty Nigerian Universities that run the mathematics education program. A total of three hundred and thirty subjects (300 undergraduate mathematics education students and 30 mathematics educators were selected through stratified random sampling. The unit of stratification was ownership of university (Federal-owned and State-owned universities).

Instrument: Two sets of questionnaires – one for the students and the other for the mathematics educators were used for data collection.

The questionnaire for students had 3 sections. Section A sought information on personal data – students' gender and ownership of university. Section B sought information on availability of computers in education departments, and extent of exposure of students to computer usage in mathematics instruction. Section C sought information on general attitudes of students toward computer in mathematics instruction.

The questionnaire for mathematics educators also had three sections. Section A was on ownership of university. Section B was meant to collect data on availability of computers for mathematics method course, and extent of exposing students to computer usage in mathematics instruction. The items were also meant for collecting data on computer literacy level of the educators, mode of training in computer literacy and access to computer in homes. Section C sought information on problems of integrating computer in mathematics education program.

The questionnaires were found to have an alpha reliability of 0.89 and 0.83 respectively. Two types of validity were assessed: face validity and content validity by a panel of 3 judges.

Results

Table1: *Percentage of the Universities where computers are used for mathematics education*

University ownership	Percentage
Federal (n = 23)	17.39
State (n = 7)	00.00
Total (n = 30)	13.33

Table 1 shows that 17.39 per cent Federal Universities have computers, no state university has computer and 13.33 per cent of all the universities used for the study, have computers.

Table 2: *Response of both students and educators on the extent to which the students are exposed to computer in mathematics instruction*

Extent	Frequency (n = 330)	Percentage
Very great extent	0	00.00
Great extent	0	00.00
Little extent	24	7.27
Very little extent	306	92.73

Table 2 shows the percentage of both students and mathematics educators who indicated the extent to which the students are exposed to the use of computer in mathematics instruction.

Table 3: *Percentage of mathematics educators who are computer literate (n = 30)*

Item	Yes		No	
	Frequency	Percentage	Frequency	Percentage
Are you computer literate?	14	46.67	16	53.33

In table 3, 14 (46.67 per cent) of the mathematics educators indicated that they are computer literate, while 16 (53.33 per cent) stated that they are not computer literate.

Table 4: *Mode of training of mathematics educators on computer literacy (n = 14)*

Mode	Frequency	Percentage
a. In-service training in regular institutions	1	7.14
b. Self-development through reading of computer manual	4	28.57
c. Self-development through training by computer vendors/technicians.	8	57.14
d. Workshops	1	7.14

Table 4 indicated that 1 (7.14 per cent) of the mathematics educators who are computer literate, had in-service in a regular university, 4 (28.57 per cent) were trained by self-development through reading of computer manuals, 8 (57.14 per cent) were self developed through training by computer vendors and technicians, while 1 (7.14 per cent) became computer literate by attending workshops.

Table 5: *Percentage of mathematics educators who own computer machines (n = 30)*

Item	Yes		No	
	Frequency	Percentage	Frequency	Percentage
Do you own a computer machine?	9	30.00	21	70.00

In table 5, only 9 (30.00 per cent) of the mathematics educators have access to computers in their homes, while 21 (70.00 per cent) indicated that they do not have access to computers in their homes.

Table 6: *Mean ratings of students (n = 300) by gender on their attitudes to the use of computer in mathematics instruction*

Item	Total $\overline{X}$	Male $\overline{X}$	Female $\overline{X}$
i. Integration of computers in mathematics will threaten the job of teachers	4.24	4.26	4.18
ii. Computers can greatly improve learning in mathematics	4.78	4.86	4.57
iii. Some mathematics topics can not be taught with computer	2.75	2.67	2.98
iv. Computers are only useful as computational tools and therefore cannot be useful for effective teaching in mathematics	2.33	2.46	1.98
v. The use of computer in mathematics instruction can have a significant motivating effect on students	4.94	4.97	4.85

vi. Computers offer a cost-effective way of individualizing mathematics instruction	4.95	4.98	4.86
vii. With the use of computers the teacher can cover a lot of work to be done within a short time.	4.42	4.57	4.01
viii. Students might perceive mathematics more abstract in computer aided instructions	3.06	2.97	3.31
ix. The use of computers would waste more time, and it may not be possible to cover the scheme of work.	2.75	2.69	2.93
x. The learning of mathematics would become easier with the use of computers	4.02	4.15	3.69
xi. The use of computers to teach mathematics might make students to loose their sense of reasoning and thinking ability.	3.02	2.98	3.13
xii. Computers are very important and necessary in mathematics instructions	4.13	4.11	4.17
xiii. Computers will help to increase socialization among students in the mathematics classroom	3.16	3.19	3.10
Grand Mean		3.76	3.67

Table 6 shows the mean ratings of the respondents on the attitude items, and their mean ratings by gender. While items (i), (ii), (v), (vi), (vii), (viii), (x), (xi), (xii), and (xiii) had mean ratings above 3.00, others had mean ratings less than 3.00. The grand mean of the male students was 3.76 while that of females was 3.67.

Table 7: t table for difference in mean attitude ratings of male and female students

Gender	**n**	$\overline{X}$	t_{cal}	t_{crit}	**Decision**
Male	218	3.76	0.825	2.064	NS
Female	82	3.67			

Table 7 shows that the calculated t value for the difference in the mean attitude ratings of the male and female students is 0.825. This value is less than the critical value of 2.064, at the 0.05 level of significance. Hence we fail to reject the null hypothesis.

Table 8: *Mean ratings of students (n =300), by ownership of university, on their attitudes toward the use of computer in mathematics instructions*

Item	Federal $\overline{X}$	State $\overline{X}$
i. Integration of computers in mathematics will threaten the job of teachers	4.46	3.29
ii. Computers can greatly improve learning in mathematics	4.91	2.12
iii. Some mathematics topics can not be taught with computer	2.63	3.53
iv. Computers are only useful as computational tools and therefore cannot be useful for effective teaching in mathematics	2.81	2.26
v. The use of computer in mathematics instruction can have a significant motivating effect on students	4.98	1.56
vi. Computers offer a cost-effective way of individualizing mathematics instruction	4.93	3.07
vii. With the use of computers the teacher can cover a lot of work to be done within a short time.	4.99	2.87
viii. Students might perceive mathematics more abstract in computer aided instructions	2.95	4.67
ix. The use of computers would waste more time, and it may not be possible to cover the scheme of work.	2.94	3.06
x. The learning of mathematics would become easier with the use of computers	4.98	2.09
xi. The use of computers to teach mathematics might make students to loose their sense of reasoning and thinking ability.	3.87	3.07
xii. Computers are very important and necessary in mathematics instructions	4.98	3.21
xiii. Computers will help to increase socialization among students in the mathematics classroom	4.99	1.76
Grand Mean	4.19	2.81

Table 8 shows the mean attitude ratings of subjects, by ownership of university. Whereas there was an agreement on the mean attitude ratings of students from both the Federal- and State-owned Universities on items i, iv, vi, xi, and xii, they differed on items ii, iii, v, vii, viii, ix, x, and xiii.

Table 9: *t table for difference in mean attitude ratings of students from Federal- and State-owned Universities*

University Ownership	n	$\overline{X}$	t_{cal}	t_{crit}	Decision
Federal	230	4.19	3.82	2.064	S
State	70	2.81			

Table 9 shows that the calculated t value for the difference in the mean attitude ratings of students from the Federal- and State- owned Universities is 3.82. This exceeds the critical value of 2.064. at the 0.05 level of significance. Hence, we reject the null hypothesis.

Table 10: *Mean rating of mathematics educators (n = 30), on the problems facing the effective integration of computers into mathematics education program in Nigeria*.

FACTORS	MEAN
1. Inadequate funding of higher education in Nigeria	4.83
2. None-availability of computer laboratory in the Universities	4.83
3. None-availability of computer facilities in the Universities	4.83
4. Many mathematics educators are not familiar with the use of computers in teaching	4.70
5. Inability of mathematics educators to attend international conferences on the teaching and learning of mathematics	4.70
6. None-availability of computer technologist to handle problems emanating for the use of computers	4.83
7. None-availability of relevant text books on the use of computers in teaching mathematics	4.83
8. High cost of telephone and internet services	4.93
9. Irregular supply of electricity in Nigeria	4.93
10. Inadequate security of University properties	4.67

Table 10 shows the means of the response of mathematics educators to the problems facing the effective integration of computers into mathematics education program in Nigeria. The means are between 4.67 and 4.93.

Discussion

Results of this study show that only 13.33 per cent of the universities studied have computers for the implementation of mathematics education program. A further analysis of data indicated that 17.39 per cent of the Federal- owned Universities have computers, while no State University has computers for the mathematics education program (table 1). This could be the basis for exposing the undergraduate mathematics education students, to a very little extent, on the use of computers in mathematics instruction (table 2).

The results of the study also indicated that fewer proportion (46.67 per cent), of the mathematics educators are computer literate (table 3), the few who are computer literate acquired this mainly by self-development through training by computer vendors and technicians (table 4). This finding is consistent with previous reports, such as Forcheri and Molfino (1997, p. 1), who observed, "… External stimuli led an increasing number of teachers to develop and use activities involving IT.

Moreover, very few (30 per cent) of the mathematics educators studied have access to computers in their homes (table 5). Definitely, the inability of teachers to have access to computers and the lack of opportunity to be computer literate would hamper their effectiveness in the mathematics education program. Renzulli (1998) observed that more rigorous curriculum standards, without improved curricular materials and teachers able to use them would not yield significant improved academic performance.

The results of this study indicated that generally, the mathematics education students have positive attitudes towards the use of computers in mathematics instruction. They believe that computer can greatly improve learning in mathematics; the use of computers in mathematics instruction can have a significant motivating effect on students; computers offer a cost-effective way of individualizing mathematics instruction; with the use of computers, the teacher can cover a lot of work to be done within a short time; the learning of mathematics would become easier; computers are very important and necessary in mathematics instruction; and computers would help to increase socialization among students in the mathematics classroom. However, on the negative aspect, the students in addition to believing that some mathematics topics cannot be taught with computers and computers cannot be useful for teaching for understanding in mathematics, believe that integration of computers in mathematics instruction will threaten the job of teachers. This result supports Harbor-Peters (1997) finding that Nigerian Secondary school teachers are not in support of the use of computers for fear of being displaced from job.

Analysis of the differences in the attitudes of the subjects, by gender, and ownership of university showed that no significant differences existed in the attitudes of male and female students, but a significant difference was found in their attitudes on the basis of ownership of University (table 8). Students from Federal-owned universities were found to have better and more positive attitude to the integration of computers into mathematics education program, than students from State-owned Universities. This result can be attributed to the fact that Federal-owned university students have more access to computers and already familiar with the role of computers in education, than the State-owned university students.

On the issue of effective integration of computers into mathematics education program in Nigeria, the problems identified include- inadequate funding of higher education in Nigeria;

none-availability of computer laboratory in the Universities; inability of mathematics educators to attend international conferences on the teaching and learning of mathematics; None-availability of computer experts/technologist to handle problems emanating for the use of computers; none-availability of relevant text books on the use of computers in teaching mathematics; high cost of telephone and internet services; irregular supply of electricity in Nigeria; and inadequate security of University properties.

The major cause of these problems may be traced to the inadequate funding of higher education. If enough funds are made available to the universities, most of these problems may be solved. For instance, most of the mathematics educators interviewed stated that the inability to attend international conferences was due to lack of financial support from the universities. With adequate funds, the university should be able to provide powerful generator to take care of irregular supply of electricity. Besides, the provision of adequate security for university properties will cost some money.

Conclusion and Recommendations

It has been found that computers are not widely available in the Nigerian Universities for the training of undergraduate mathematics teachers, and the student teachers are not exposed to the computer usage in mathematics instructions. Also, very few of the mathematics educators are computer literate, and have access to computers in their homes. If the Nigerian government should achieve its goal of integrating the computers into education especially mathematics education in Nigerian schools, then the teachers must be empowered through training in the use and application of the new technology. The authors therefore make the following recommendations.

1. The government should adequately fund the universities in Nigeria. Besides, industries and some "well-to-do Nigerians" should be involved in the funding of higher education in Nigeria.
2. Mathematics educators should be supported to attend at least one international conference on the teaching and learning of mathematics every year.
3. Universities should form linkages/exchange programs with Universities in the developed nations so as to help train the mathematics educators in the areas of using computers in teaching mathematics.
4. Universities should restore oversea training for their lecturers, so as to be exposed to current methods and materials for teaching and learning of mathematics.

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