The Effectiveness of Teachers and Schools Cluster Model of Primary School Mathematics Teachers Professional Development in Cross River State, Nigeria

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Abstract – *It is believed that no nation can have the quality of her education rise above the quality of her teachers. The import of this statement is that teachers in Nigeria need to be adequately trained and positioned to ensure quality teaching which will invariably provide effective learning and qualitative functional education. Mathematics teachers' production requires a deserved attention in the Nigerian educational system in that the demand for them outstrips the supply. A situation that has led to not so well qualified and motivated candidates to be re-directed to major in mathematics in tertiary institutions as professional teachers. These mathematics teachers in training struggle to graduate and are employed to teach mathematics in the schools. In this circumstance, re-training of such caliber of teachers becomes imperative. Workshops, seminars and in-service training of good quality become crucial for their professional development. However, the commonest method of re-training of these teachers had been the cascade approach in which five days of a week in one year are used for interaction between the teachers and commissioned facilitators who lecture them without proper coordination and consideration of the objectives of the re-training.*

However, late in 2013 the Cross River State Ministry of Education introduced the cluster model of re-training of teachers. Against this background, this study assessed the effectiveness of the teachers and schools cluster model of primary school mathematics teachers' professional development to ascertain the impact on pupils' achievement in mathematics. It was recommended that the cluster model of re-training professional teachers should be adopted. It was also suggested that all teachers in the primary school be given a chance of participating in the programme from time to time.

Keywords – Cluster model, professional development, mathematics teachers, functional education

I. INTRODUCTION

The common saying that no nation can have the quality of her education rise above the quality of her teachers underscores the significance of teacher education programme. Nigeria as a nation needs to adequately plan, prepare and provide for the future. To this end, teachers need to be adequately trained and positioned to ensure quality teaching. Quality teaching will provide for effective learning which in turn will make way for qualitative, functional education.

Teacher production programmes face a series of challenges, teachers in training may have poor knowledge of the subjects they are expected to teach, especially where the status of teaching is low and the educational standards of entrants to teacher preparation courses are poor. Therefore the re-training of teachers of mathematics is one area of teacher production that needs a deserved attention in the Nigerian educational system (Nwagbara & Edet 2013).

In Nigeria the demand for mathematics teachers substantially, outstrips the supply as a result of mathematics teacher preparation system and the inherent unattractive conditions of service of teachers. By the provisions of the new policy on education (NPE) holders of the Nigeria certificate in education (NCE) are to teach in primary schools where teachers largely teach all subjects in the school curriculum, including mathematics. The implication of this is clear: the need exists to correct the obvious inadequacy of the average Nigerian primary school teacher in the area of mathematics, re-training of these mathematics teachers to raise their performance levels and prepare them for changes and challenges in the teaching job becomes imperative. The national policy on education in realization of this scenario, emphasized that in-service training shall be developed as an integral part of continuing teacher education and shall also take care of all inadequacies.

According to Swanepoel and Erasmus (2000), teacher re-training should result in the following: improve the standard and performance of teachers, once their training needs have been identified; prepare the teachers for future positions; increase their literacy levels; competencies and skills; and help them to make better decisions and increase job satisfaction.

In tandem, the universal basic education commission programme (UBEC, 2003) emphasized that the goal of teacher in-service professional development of UBEC is to improve the overall quality of teaching and learning at the classroom level with the specific objectives to: update teachers' subject scope; sharpen their skills and methodology; improve their instructional skills and practices; empower them to have a more positive impact in their classrooms; encourage them to try new methods and materials within their schools; and train them on lesson plan development, pupil-centred techniques, critical thinking, classroom organization and continuous assessment of pupils' learning.

To achieve, the mentioned objective, any strategy for in-service training should take cognizance of the following: the recognition of the value and potential capability of every teacher; the importance of a multi-level strategy to support learning of the classroom level; trainings must be carried out in such a way that they will have impact on teacher effectiveness and performance at the school level.

Different models of teacher professional development have been in use in Nigeria. The commonest model is the cascade approach which is a one-time workshop of 5 days per year. According to Musset (2010), the approach is ineffective and inefficient. The reach is small because only a small percentage of teachers benefit from it. There is much reliance on those teachers who attended the workshop to pass newly acquired information on to their colleagues through the same cascade mechanism which most frequently does not happen because of ineffective dissemination mechanism. Workshops or courses are often based on series of presentations or lecturers which provide negative models of passive learning. The workshops are "expert driven" in that a desk-board specialist typically transmits abstract information to teachers. Most often, they tend to be ad hoc in content and rarely provide a comprehensive learning programme for teachers and they lead to little change in teachers' classroom approaches because the trainings are conducted in very artificial circumstances outside the teachers' environment with no realistic linkages to his/her current practices.

Richardson and Placier (2001), Clarke & Hollingsworth (2002) have provided evidence of the failure of such earlier models. Their findings and increased criticism have provided an impetus for re-conceptualization of teachers' re-training and professional development by taking a change to teachers and schools cluster model. Nwagbara (2013) is of the view that to ensure that courses and topics of re-training are relevant and of practical use, there should be involvement of experienced mathematics teachers in the design and delivery of courses at the school (or cluster of schools) level. In recognition of this, cluster schools model as advocated is an attempt to bring teachers together in clusters and facilitate a process where they become creative in problem-solving, effective utilization of available resources, through lesson study, preparation of lesson plans, production of teaching materials, classroom management and other pedagogical skills.

In this model, neighbouring schools are grouped around a larger nucleus school to form a cluster. Such school clusters serve two main purposes; firstly to improve teaching by sharing experience and expertise among staff, and secondly, to facilitate administration and to harness resources, especially skills, from several small schools through effective networks and collaboration among the teachers.

The cluster program provides a bottom-up approach whereby the on-the-job needs of teachers are identified, the teachers are trained on-the-job, work cooperatively and collaboratively to share ideas, build a local resource network and take the lead in all teaching and learning activities. Arop, Eju and Ekpeni(2013) have noted that the basic concern of teachers training workshops and seminars is to bring change in the attitude of teachers. They emphasized that teachers training contribute towards not only to shape and modify teachers' attitude but also to develop certain teaching skills which are necessary to improve performance in the teaching profession.

Leithwood (1992) remarked in his study that professional development trainings are very crucial in teacher's career as professional development courses and programme develop the survival skills of teachers. Arop, Eju and Ekpeni (2013) intoned that also teacher development training aids to develop competency in basic skills of teaching, expanding instructional flexibility and increasing instructional expertise. It also contributes towards professional growth and increase participation in decision making. These views agree with objectives of cluster schools models of teacher professional development which include inter alia; to establish reasonable groups of schools into clusters in order to achieve quality education through sharing of experience, expert mentoring and teacher support, provide guidance and support in the management and structure of school cluster groups, provide intensive school-based professional support; expose teachers and education managers to current trends in education

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policies, management systems and teaching methodologies, judiciously utilize available resources for teacher development and get value for money, assist teachers and other personnel to develop the spirit of team work, share ideas and innovations in teaching as well as develop creative skills to produce relevant instructional materials from local resources; mentor, especially the less experienced teachers, reduce the stress, costs, time and risks involved in travelling long distances to attend workshops and seek support and invariably focus on specific challenges unique to the local environment.

Ajibade (1993), Adeniyi (1995) and Arikewuyo (1999) have drawn the attention of all and sundry to the inestimable value of training and development which they see as an avenue to acquire more and new knowledge and develop further the skills and techniques to function effectively and improve performance. In this perspective, the cluster schools model is line with current trends in education which emphasizes on new ways of teaching and learning such as; active learning and learner-centred curriculum; critical thinking and problem solving; central role of teacher quality as determinant of education quality; school-based model of in-service training; more decentralized/localized decision-making; more participatory/democratic school environment/classrooms; increased school autonomy, accountability, community involvement; "communities of learning" among teachers and school leaders, continuing professional development to develop teachers who are reflective and can make informed professional choices.

In view of the background information and in line with the perspectives of the schools and teachers cluster model of professional teachers' development, the focus and objective of this study is to assess how effective this re-training of primary school teachers of mathematics impacted on the achievement of the pupils of the teachers that participated in the exercise.

II. OBJECTIVES OF THE STUDY

The study aims to test if there is any significant improvement in the achievement and problem solving competencies of primary school pupils who received instruction from school cluster model of re-trained teachers; and to determine if those teachers re-trained through the school cluster model of teachers development programme are more efficient than those not re-trained.

1. **H_0:** At pre-test, there is no significant difference between the mean scores of experimental and control groups.
2. **H_0:** There is no significant difference in the mean achievement scores of pupils taught mathematics by school cluster model re-trained teachers and those taught by non re-trained teachers.

III. METHODS

Research Design

The study was a quasi-experimental type leading to a pre-test and post-test of the respondents. The 600 respondents were given the test before the beginning of the treatment on the specified topics on fractions under normal test conditions. After the teaching to both the experimental and control group for 10 days, the same test items were administered on the respondents as post-test. The answer scripts were collected at the various schools by the research assistants for marking and collation of data.

Population and Sample

The broad Spectrum of Primary Schools Pupils in Cross River State form the population. The sample size of 600 pupils was used for the study. The sample was randomly drawn from thirty(30) primary schools also randomly selected from five(5) local government areas of the state.

Sampling Procedure

Five local government areas in the state that are easily accessible were chosen for the study. These are Calabar South Local Government Area, Calabar municipality, Odukpani local government area, Akpabuyo local government area, and Akamkpa local government area. Six(6) primary schools were randomly selected from each local government area for the study making thirty (30) primary schools in all. From each school, twenty(20) primary five(5) school pupils were randomly chosen for the experiment, giving a total of 600 pupils. In each school, the pupils were randomly split into two groups, ten(10) pupils in the experimental group and the other ten(10) in the control group. In each school a teacher that underwent the school cluster re-training session was assigned to teach addition and subtraction of fractions, equivalent fractions and simplification of fractions to the experimental group while another teacher that did not participate in the re-training was asked to teach the same topics to the control group. In all, 300 primary school pupils were in the experimental group while the other 300 pupils were in the control group. They were all pre-tested on items from the mathematical concept of fractions before they undertook the experiment. The teaching session lasted for ten(10) days at 40 minutes a day in each school. At the end of the ten(10) days

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teaching sessions, in each school, the two groups were post-tested with the same test instruments.

Instrument

Mathematics achievement test (MAT) instrument made by the researcher was used for the study. It consisted of thirty(30) item multiple choice questions with five(5) options lettered A-E . Out of the five options, only one answer was correct, the rest were distractors. The test items covered the areas of addition and subtraction of fractions, equivalent fractions and simplification of fractions. The test was given to the 600 primary school pupils as pre-test and at the end of the experiment as post-test. The respondents were instructed to attempt all the questions within a test period of forty-five (45) minutes. The instructions were in simple language and easy to follow. The question items were framed in simple, clear and not too hard to understand language and also not impeded by ambiguity.

Table specification was used to assure of content validity. Item analysis was done to establish the difficulty and discriminating indices. The analysis assisted the researcher to either replace, drop or sustain items in the test instrument. The instrument received face validation by the verdict of three mathematics educators, one expert in measurement and evaluation. They screened the instrument in terms of scope, clarity, and ambiguity. Due to their comments, and item analysis, some test items were restructured while some were changed to make for clearer understanding by the respondents. Reliability of the test instrument was achieved by administering the same test instrument to twenty-six (26) primary five pupils of another school not involved in the experiment. With the split half method, the two halves test scores were correlated by use of the Karl Pearson Product moment coefficient approach to obtain a yield of correlation coefficient of r=0.86 value which attested to the high reliability and internal consistency rate.

Data Collection

To achieve as planned in the cluster schools model, ten(10) schools minimum formed a cluster out which one school was selected to serve as the cluster centre. The entire state had many cluster centers which was not less than fifty. Each centre had fifty(50) teachers, five(5) facilitators, two(2) local government education area supervisors and one(1) State Universal Basic Education Board staff. The cluster centre provided local example of good practice, in being a central meeting venue at which most cluster activities take place and in providing appropriate services to schools that are members of the cluster. Staff from participating schools gather at the cluster centre to attend meetings, conduct interactive needs-based training sessions and share information. To facilitate and encourage cluster centres in performing their functions, the State Universal Basic Education Board(SUBEB) will give priority to their development and to equipping them with appropriate personnel, facilities, resources, running cost and other services. This is in anticipation that cluster centres will be the venues for facilitation of in-service training in the state.

There was a pre-cluster meeting to collect baseline information for preparations in the implementation of the cluster sessions. There were also needs-based interactive sessions (facilitator and trainers). The cluster stage was where the actual intervention took place and involved the cluster teaching activities. At the cluster teacher meetings, the major professional support was provided to participants. Teachers were brought together from the various participating schools to develop and generate ideas on the best was they could facilitate learning.

Data Analysis

The hypotheses of the study were tested using the independent t-statistics. The statistics involved for the computation were the means, standard deviations and difference of means of the two groups. Significance of difference between the mean scores of both the experimental and control groups on the variables of pre-test scores and post-test scores were tested at 0.05 level of significance by applying the student's t-test at 598 degrees of freedom.

IV. RESULT

Table 1. Comparison of mean scores of the experimental and control groups at pre-test

Groups	N	Mean scores	SD	$t_{cal.}$	t_{exp}	df	∝-level
Experimental group	300	46.9	13.6				
Control group	300	46.2	13.2	0.74*	1.96	598	0.05

*Not significant $t_{cal.}$ 0.74 < t_{exp} 1.96

t_{exp} = 1.96 at 0.05 level of significance and 598 df

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Table 1 shows that the mean score difference of the experimental group and the control group at pre-test was not significant at 0.05 level. As indicated, the calculated t-value was 0.74 and the table value was 1.96. The difference in their means was 0.70 (MSD). The difference in standard deviation was 0.40(SDSD). At pre-test, the two groups were homogeneous as evidenced by the mean scores and standard deviations. Based on the available data and statistics, the null hypothesis of no significance difference between the mean scores of the experimental and control group on pre-test was upheld. It signifies that both groups are to be equitably treated.

Table 2. Comparison of mean score of the experimental and control group at post-test

Groups	**N**	**Mean scores**	**SD**	$\mathbf{t_{cal.}}$	$\mathbf{t_{exp}}$	**df**	**∝-level**
Experimental group	300	58.4	18.9				
Control group	300	49.3	16.7	6.1*	1.96	598	0.05

*** Significant** $\mathbf{t_{cal.}\ 6.1 > t_{exp}\ 1.96}$

t_{exp} = 1.96 at 0.05 level of significance and 598 df

Table 2 shows the difference between the mean scores of the experimental and control group at post-test and at 0.05 level of significance is significant. Calculated t-value was 6.1 while expected or table value was 1.96 at 598 degrees of freedom. The mean score gain of 9.1(MSD) and standard deviation gain of 2.2 (SDSD) are significant. This is accounted for by the improvement of the respondents in the experimental group as a result of the impact of the re-training programme on the teachers who in turn taught mathematics impressively to the pupils.

Looking at the results, the null hypothesis of no significance difference between the mean achievement scores of pupils taught mathematics by school cluster model re-trained teachers and those taught by non re-trained teachers was rejected. This is to say that there is a significant difference in the mean achievement scores of pupils taught mathematics by school cluster model re-trained teachers and those taught by non re-trained teachers.

V. DISCUSSION

From the analysis and results, the two research questions have been attended to because there are indications that the achievement and problem solving competencies of the primary school pupils taught mathematics by teachers who received the re-training improved significantly from the pre-test level to the post-test situation with hypothesis I, the null hypothesis which was upheld is an indication that at the pre-test level, the two groups have the same back ground, attitude and mathematical exposure. Though the research was done in different schools with the same approach, the result showed no discrepancy in their achievement levels. Test of hypothesis 2 led to the rejection of the null hypothesis and the acceptance of the alternative. There was gain in the mathematics learned. It was evidenced from all the indicators in the analysis. Individual scores, mean score and the standard deviation of the experimental group showed that the group improved as a result of efficient teaching of the mathematics topics from the teachers that undertook the school cluster model re-training programme.

The results are in agreement with Muzaffar & Malik(2012), that professional development of teachers exact positive changes in attitudes of the teachers and sharpen their skills, competencies and productivity. Also Obanya (2003) affirms that development oriented academic conferences, re-training of professional teachers lead to a continuous re-skilling and systematic formal exposures to advanced and innovative teaching methods. Mulkeen, Chapman, DeJaeghere and Leu (2007) have strengthened the argument for competency skilled up grading as they have evidence that there is a positive correlation between teachers' knowledge of their subjects and their impact in the classroom.

Teachers also may acquire the appropriate understanding through subject specific pedagogical re-training course more effectively than through higher academic qualifications in their subject (Wilson, Floden and Ferrini-Mundy, 2001). Abiodun(1999) accepted training as a systematic development of the knowledge, skills and attitudes required by employees to perform adequately on a given task or job. Adeniyi (1995) observed that staff training and development as a work activity that can make a very significant contribution to the overall effectiveness and profitability of an organization. It is no gain saying that professional development has great deal of importance for the teachers as it is directly connected with student's learning. Professional development not only updates the knowledge and skills of the teachers but also increase the productivity and potential of the practicing teachers as well as the student's achievements.

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Pruitt (1990) has asserted that teacher education must be a continuous process for each and every teacher whether supplemented by the government or shouldered by the individual teacher. This requires the mountain of in-service training programmes periodically by the Ministry in collaboration with Institutes and Faculties of Education. He further stressed that these programmes enable teachers to rethink what they are involved in doing and to critically analyze some of their methods and approaches. This is to say that at the core of teacher education programme irrespective of the level of the education system the trainee is being prepared for either at the pre-service or in-service training, should be a core of general education, some specialization in the teaching subject(s), some professional education as a teacher. In the process of professional preparation either pre-service or in-service, the teacher would have to acquire the right types of understanding, concepts, knowledge and values, internalize them and operationalize them as situations demand.

Pruitt (1990) emphasized that if teacher education aims at preparation for teaching towards the 21st century the process should be seen as a life-long and continuing education system for the individual teacher from the point of entry into the profession into retirement. In this vein teacher professional development requires periodical in-service(re-training) programme of short duration for the young and beginning teacher and also for the old and experienced teacher for a reappraisal and self-evaluation, for update of knowledge and skills, acquire additional and new competencies and prepare for new challenges and demands.

VI. IMPLICATIONS

Griffin in Guskey(2002) noted that high qualify professional development is a central component in nearly every modern proposal for improving education. This study, therefore, has much implication for teachers of mathematics, teachers generally, educators, educational administrators, all and sundry school cluster model of teachers' professional development programme. The cluster teacher meeting is the forum where the major professional support is provided to the teachers. Teachers meeting afford them of the opportunity to develop and generate ideas on the best ways they could facilitate learning; concepts in subject areas are introduced, issues such as curriculum, lesson plans, school examination results and evaluation are discussed, teaching and learning materials are also designed and developed. It is an avenue for sharing of ideas on workable formats for writing lesson notes, sharing ideas of teaching-learning techniques and experiences that were proved to have worked for pupils in the classroom, sharing of classroom management techniques and reinforcement strategies that helped to enhance pupils learn, learning new alternative teaching techniques taught through model teaching by the mentors and some of the good and experienced teachers.

The study on school cluster model will impact on the teachers the value of building teachers competences in pedagogy, the benefit of lesson study which focuses on the children in classroom, what the children need and how best to impart to them. In lesson study, a group of teachers develop a lesson together, one of them teach while the mentor and others observe the pupils learning.

This study has implication for the teacher of mathematics in that at interaction what he learns will help him build confidence, encourages collaborative culture among the teachers, gives the value of working together with peers and focuses on actual or needs-based practices.

Teachers learn the value of "teacher mentoring" in which a more experienced, informed, skilled and competent teacher provide guidance, supervision and coaching on-the-job in various aspects of pedagogy and classroom management.

Observed good ideas and pitfalls noticed at interaction are discussed with the facilitator. Challenges are addressed, models are emulated. These efforts collaborative enriched tasks and activities during the meetings.

VII. CONCLUSION

Teachers who received re-training based on the school cluster meetings and interactions have improved competences in the teaching of mathematics topic. Hence, the pupils' performance showed a great level of achievement as compared with the initial conditions of the two groups. The pupils instructed by cluster oriented re-training teachers had the benefit of active and participatory learning of mathematics as envisaged in the strategy imbibed, which is pupil-centred driven lesson delivery. It could be inferred that there was assurance of impact assessment and feedback that stimulated the pupils to a better level of achievement.

The cluster schools model tutored had high scores than those taught by teachers who did not receive re-training because the development programme enhanced their competences in pedagogy which accounted for the success of their lesson.

VIII. RECOMMENDATION

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The school cluster model of teacher development programme has been evaluated and found successful, hence it is recommended that the programme should be adopted as the mode of re-training teachers at all levels of the Nigerian educational system. However, if the cost involved is enormous, the primary and secondary schools should be given due consideration. The exercise should be intensified to about three times in a year . This is to enable enough teachers to benefit from the development programme each year. The observers, facilitators and the Ministry officials should take time to evaluate the programme and write a meaningful report that will stimulate the government to consider the method as the best option for teacher development programme. Let the content of the programme be broken into units i.e into modules for ease of understanding and application to practice. Mentoring and monitoring of the teachers as well as needs-based approach should be emphasized as the programme improves.

IX. SUGGESTIONS

Based on the success made in the use of the schools and teachers cluster as evidenced by the performance and achievement in the research, it is suggested that all the teachers in the primary school be given a chance of participating in the programme. It is also suggested that it should be adopted as a national programme for the re-training of teachers. Moreso, teachers in private schools should be allowed to send in their teachers for re-training. Where possible let the periods of the training be reflected in school calenders as a stable measure of sustaining the programme. From time to time, let the programme be evaluated and innovations and changes introduced to make it attractive and motivating.

REFERENCES

Abiodun, E. J. A. (1999) Human Resources Management, an Overview Concept Publication: Shomolu, Lagos 110-121

Adeniyi, O. I. (1995) "Staff training and Ejiogu A. Achumba I., Asika(eds) Reading in Organizational Behaviour in Nigeria Lagos, Malthouse Ltd 159-167

Ajibade, E. S (1993) "Staff Development and In-service for teachers" in Ajibade (ed) Emia Nigerian Educational Issues and Policies and Practices in the Eighties and beyond Publication 147-157.

Arikewuyo, M. O (1999) Improving Teachers' Productivity in Nigeria, in Adesemowo, P. R. (Ed). Basic of Education Lagos Triump Book Publishers 102-109.

Arop, B. A; Ekpeni, E. A; & Eju, P. E. (2013) Universal Basic Education Programme: The Need for Workshops and Seminars for Teachers. Akamkpa Journal of Education Vol. 2(2).

Clarke, D. J. & Hollingsworth, H. (2002) Elaborating a Model of Teacher Professional Growth Teaching and Teacher Education, 18, 947-967

Guskey, T. R. (2002) Professional Development and Teacher Change. Teachers and Training: Theory and Practice, Vol(8) 3 & 4.

Leithewood, K. A (1992), "The Principals Role in Teacher Development". In Fuller M., Hargreaves, A. (Eds) Teacher Development and Educational Change; Falmer Press.

Multenn, A., Chapman, W. D., DeJaeghere, J. G and Leu, E (2007) Recruiting, Retaining, and Re-training Secondary school Teachers and Principals in Sub-saharan Africa. Secondary Education in Africa (SEIA), Africa Region Human Development Department World Bank Working. Paper No 99 the World Bank Washington D. C.

Musset, P. (2010), "Initial Teacher Education and Continuing Training Policies in a Comparative Perspective: Current Practices in OECD Countries and a Literature Review of Potential Effects" OECD Education Working Papers, No 48, OECD Publishing.

Muzaffar, M. S & Malik S. Y. (2012) Language in India Strength for Today Attitude of Teachers towards Professional Development Training and Bright Hope for Tomorrow. Language in the India www.langeinindia.com

Nwagbara, A. C & Edet, E. O (2013) Re-training for Production of Quality Secondary School Mathematics Teachers in Cross River State. Paper Presented at Association of Nigerian Teachers (ASSONT) 8th Annual National Conference, Enugu, July 8th – 12th, 2013.

Nwagbara, A. C. (2013) Understanding Guidelines of Mathematics Laboratory Practicals. Jutoy Educational Services, Jutoy (Nig) Enterprises, Calabar.

Obanga P. A. I (2003) Development-Oriented Higher Education. The Nigerian Social Scientist Vol 6(1) 17-24.

Pruitt, W. N (1990), Teacher Training: The Nigerian case. In Nwachuku, D. N. (ed) Contemporary Issues in Nigerian Education and Development.

Richardson, V. and Placier P (2001) Teacher change in V. Richardson (ed) Handbook of Research on Training, 905-947, Washington D. C; American Educational Research Association.

Swanepoel, B. and Erasmus, B. (2000) South African Human Resource Management: Theory and Practice, Cape Town, Juta & Co Ltd.

UBEC(2003), Cluster Teacher Professional Support: A Training Manual for Teachers, Head teachers and Teacher Educators. Stirling-Horden Publishers (Nig) Ltd, Ibadan.

Universal Basic Education Commission

Wilson, S. M., Floden, R. E. and Ferrini-Mundy, F (2001), "Teacher Preparation Research: Current Knowledge; Gaps and Recommendations" centre for the study of Teaching and Policy Michigan State University, East Lansing, Michigan.