JOSTMED 9 (1), DECEMBER, 2012 ISSN: 0748 – 4710

JOURNAL OF SCIENCE, TECHNOLOGY, MATHEMATICS AND EDUCATION (JOSTMED)

website: www.jostmed.com
www.futminna.edu.ng
Blogsite: www.jostmedng.com
E-mail: jostmedscience@yahoo.com
jostmed@futminna.edu.ng
Phone: +234-816-680-7534

PUBLISHED BY:
DEPARTMENT OF SCIENCE EDUCATION
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA,
NIGERIA, AFRICA

JOURNAL OF SCIENCE, TECHNOLOGY, MATHEMATICS AND EDUCATION (JOSTMED)

ISSN: 0748 – 4710

VOLUME 9(1), DECEMBER, 2012

WELCOME TO JOSTMED

Welcome to the Journal of Science, Technology, Mathematics and Education (JOSTMED). The JOSTMED is a scholarly based journal published thrice in a year by the Department of Science Education, School of Science and Science Education, Federal University of Technology, Minna, Nigeria, since September 1998. The scope of the Journal includes the research, development, and practice in all areas of Science, Technology, Mathematics and Education.

INSTRUCTIONS TO CONTRIBUTORS

1. General Guidelines

(i) **Types of Manuscripts:** The Editorial Board of the Journal of Science, Technology, Mathematics and Education accepts only scholarly and original articles that meet its aim and scope. Contributions must be original, therefore, authors is/are to guarantee that their article is original and not currently being considered for publication elsewhere.

(ii) **Language:** The JOSTMED is published in English Language.

(iii) **Length:** Usually full-length article, survey or report should be between 3,000 - 5,000 words (12 – 15 pages).

(iv) **Abstract and Keywords:** Each article should be summarized in about 150 - 200 words, serving as a brief description of the content of the article. In addition, following the abstract, supply 4 - 5 keywords/phrases that characterize the content of the paper and which can be used for indexing purposes.

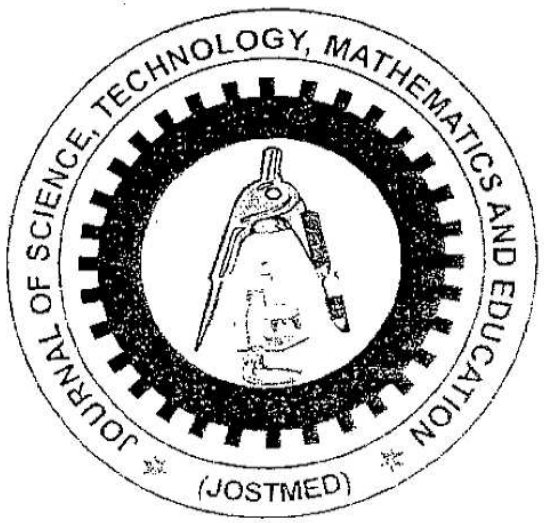
(v) **Manuscript:** Manuscripts, including the abstract and references, should be typed double-spaced on **A4** paper set-up using Times New Roman, 12 font size.

(vi) **Review:** Each submission will be subjected to blind peer-review by at least two experts in the fields of the articles. Before the publication of accepted article, corresponding authors will receive a PDF version of their manuscript for final proofing. It should, however, be emphasized that changes in content (new or additional results, corrected values, changes in article title, etc) are not permitted without the approval of the Managing Editor.

2. Copyright

Only original papers will be accepted and processed. Paper accepted will be subjected to viper anti-plagiarize detector software. In addition, no compensation will be given in respect of published papers. However, authors reserve the right to

JOSTMED, VOLUME 9(1), DECEMBER, 2012



ARTICLES AND RESEARCH REPORTS ON SCIENCE

INVESTIGATION INTO THE USE OF VEGETABLE (PEANUT) OIL AS A

CORRELATION ANALYSIS OF TEACHERS' CHARACTERISTICS AND INSTRUCTIONAL PRACTICES FOR QUALITY TEACHING AND LEARNING OF PHYSICS IN LAGOS STATE SECONDARY SCHOOLS

Akintoye, O. Hakeem[1] & Aregbede, O. Solomon[2]
Department of Science and Technology Education,
Lagos State University, Ojo
E-mail: akintoyeakm@yahoo.com[1] & areoye63@yahoo.co.uk [2]
Phone No: +234-802-909-6746 & +234-802-381-8955

Abstract
Physics teachers' characteristics and practices have been found to impact on students' achievement. This study employed descriptive survey design to see how teachers' characteristics and practices serve as correlates to the effective teaching and learning of physics. One hundred physics teachers were randomly selected from fifty Lagos state senior secondary schools. A teacher questionnaire was used to collect data which were analyzed using non-parametric statistics. Findings revealed that most teachers' characteristics and practices variables considered had positive relationship and impact on the teaching and learning of physics. Recommendations which include (i) motivating teachers to acquire higher education degree were suggested for improvement (ii) organizing teacher training programmes for teachers to improve their teaching skills, were suggested for improvement

Keywords: pedagogy, instruction, achievement, teacher characteristics, instructional practice, best practice

Introduction

Excellence in teaching and learning of physics depend on many factors among which are: the teacher, course content, availability of laboratory equipment, a clear philosophy and workable plan for meeting students' needs, serious dedication to learning goals, and adequate motivation (Nelson, 2006). The role of the teacher, however, is the most important. Without a well-educated, strongly motivated, skilled, well-supported teacher, the arch of excellence in high school physics will collapse. The teacher is the keystone of quality (Fred, Young & Batman, 2010).

Education research has continued to show that an effective teacher is the single most important factor of student learning (Darling-Hammond, 2000; Marzano, 2007). The physics teacher's knowledge base consists of three components which

are content knowledge, pedagogical knowledge, and pedagogical content knowledge (Etkina, 2005). Content Knowledge is knowledge of the discipline itself, and includes such things as procedural methods. Pedagogical knowledge represents a "generic why and how to" of teaching. Pedagogical content knowledge (PCK) represents a situation-specific overlap of content knowledge and pedagogical knowledge. It can be described as "knowledge in context" and, Shulman (1986) pointed out that PCK includes knowledge of students' difficulties and prior conceptions in the domain, knowledge of domain representations and instructional strategies, and domain-specific assessment methods.

A number of studies (Car, 2006; Betts, Zau & Rice, 2003; Darling-Hammond, Holtzman, Gatin & Vasquez, 2005) have examined the effects of teacher characteristics, such as teachers' experience, preparation, and degrees earned on students' achievement. These studies concluded that teacher education, certification and experience are not strong predictors of teacher's effectiveness, as measured by student achievement gains. (Aaronson, Barrow & Sander, 2007) found that 90 percent of the variance in teacher's influence on student learning was not explained by teacher characteristics such as highest level of education, experience, credentials, and selectivity of the school that the teacher attended. The preponderance of evidence suggests that teachers who have completed degrees are not significantly more effective at increasing student learning than those with no more than a bachelor's degree. Rice (2003) examined students' achievement in a wide variety of grades and subjects areas; found that teachers having completed an advanced degree had no significant effect on students' performance. Ehrenberg & Brewer (1994) found a significant relationship between teacher completion of a master's degree and student achievement

The relevance of experienced physics teachers in the teaching and learning processes cannot be over emphasized. Tahir (2003) noted poor teaching process exhibited by inexperienced teachers as among the many problems of educational development in Nigeria. Best practices are an inherent part of a curriculum that exemplifies the connection and relevance identified in educational research. They interject rigour into the curriculum by developing thinking and problem-solving skills through integration and active learning. Relationships are built through opportunities for communication and teamwork. Four best practices for teachers include teaching a balanced curriculum, teaching an integrated curriculum, differentiating instruction to meet individual student needs and providing active learning opportunities for students to internalize learning (Public Schools of North Carolina, 2003).

Teacher clarity and organization which is part of science best practices has been found to correlate with student motivation, achievement, self-reported gains in knowledge, and problem solving. Goodman and Thomas (2010) suggested that the teaching professional and the field of physics are in a constant state of change. Teaching strategies are emergent and not absolute therefore quality professional development is critical to the retention and improvement of any teacher in the classroom.

Purpose of the Study

This study was designed to investigate the teacher characteristics and instructional practices. In addition it was to find if there is correlation between physics teachers' characteristics and instructional practices variables in science teaching.

Statement of the Problem

The issue of poor academic performance of students, Physics students inclusive in Nigeria has been of much concern to all and sundry. Nneji(19980 reported that the performances of students in West African Senior School Certificate Examinations(WASSCE) in sciences between 1988-1992 had been poor and that on average only 8.27% had credit while 31.2% had passes. Omiwale (2011) also reported that from 2002-2006, though the performances had improved, yet not as expected. According to him, the percentage pass at credit level were 47.66, 47.56, 51.02, 41.50 and 58.66 respectively. He went further to state that a special report of the Science Teachers Association of Nigeria (STAN) physics workshop held in Osogbo in 2004 fingered among other factors responsible for poor performances teachers' characteristics and instructional practices. Since over the years, students' academic performance in both internal and external examinations had been used to determine excellence in teachers and teaching (Ajao, 2001). This problem necessitated this research which is meant to find out the relationship between physics teacher's characteristics variables and best practices variables and its impact on the teaching and learning of physics.

Research Questions

Six research questions were used in the conduct of the research. These are:

(i) Is there any relationship between teachers' qualification and instructional practices in the teaching of physics?

(ii) Is there any relationship between teachers' experience and instructional practices in the teaching of physics?

(iii) Is there any relationship between school type and instructional practices in the teaching of physics?

(iv) Is there any relationship between teachers' workshop attendance and instructional practices in the teaching of physics?

(v) Is there any relationship between instructional period and instructional practices in the teaching of physics?

(vi) Is there any difference between female and male teachers' use of teaching methods and instructional practices in the teaching of physics?

Methodology

This research adopts a descriptive survey method in the conduct of this research. One hundred teachers were randomly selected from fifty senior secondary schools in Lagos state. Teacher characteristics and instructional practices questionnaire was the main instrument for the conduct of the research. The questionnaire consists of two sections (A & B). Section A deals with teachers' background information and issues related to the type of teachers qualification, attendance of workshops, in-service training and so on. Section B is also subdivided to cater for issues such as teachers' understanding basic physics concepts, required teaching method, skills children are expected to acquire after learning physics and improvisation of instructional materials. Section B consists of thirty-two (32) items which teachers were expected to respond to on a four scale-Likert type of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD).

The questionnaire was subjected to peer-review with two other postgraduate students with specialization in science education. Their comments were included in the final draft. The final draft was then trial tested using ten physics teachers who were not part of the main study. The data collected from the trial test was subjected to reliability test using Statistical Packages for Social Scientists (SPSS) version 14 and an alpha coefficient of 0.85 was obtained. The researchers personally visited the schools and administered the questionnaires and collected same that day. The data collected was coded as: Strongly Agree (4), Agree (3), Disagree (2) and Strongly Disagree (1) and was analyzed using means, standard deviation, bar-chart and correlation coefficient.

Results

The results are presented in the tables below:

Table 1: Mean, standard deviation of teachers' characteristics variables

	GENDER	QUALIFICATION	EXPERIENCE	TYPE OF SCHOOL	WORKSHOP	INSTRUCTIONAL PERIODS PER WEEK
NO OF TEACHER	100	100	100	100	100	100
MEAN	1.63	4.45	1.98	1.26	3.00	2.45
S.D	.486	1.436	.992	.443	1.262	.771

Table 1 above shows the mean, standard deviation of teachers' characteristics variables such as gender, qualification, experience, number of workshops/ seminars attended and number of instructional periods per week

The result shows that the mean value of qualified female physics teachers is higher than that of male physics teachers. This means that there more female teaching physics at the secondary schools visited. The experience possessed by both male and female teachers is equal.

Also, there is no discrimination in the area of the number of male and female physics teachers in both public and private secondary schools.

Male physics teachers attended workshops and had more teaching periods than the female physics teachers.

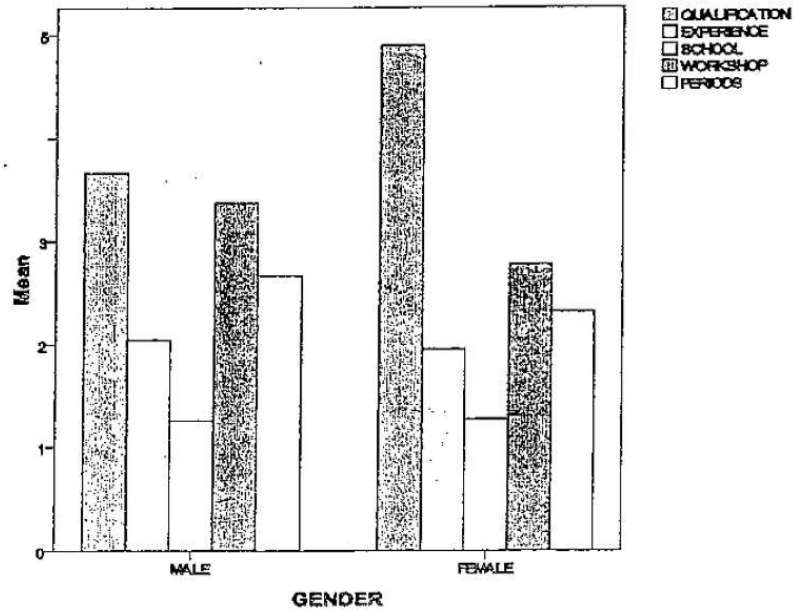


Fig. 1: A bar graph of the mean against gender of qualification, experience, workshop attendance, school- type and number of instructional periods per week.

Table 2: Correlation coefficients and p-values of teachers' characteristics and instructional practices variables as they relate to the teaching of physics

	Knowledge of basic physics Concepts	Teaching methods	Instructional Materials usage	Improvisation in physics teaching
Gender	-.218	.282*	-.143	.169
	(.080)	(.023)	(.254)	(.178)
Qualification	.216	.313*	.192	.264*
	(.083)	(.011)	(.125)	(.033)
Experience	-.313*	-.262	.282*	.120
	(.011)	(.035)	(.023)	(.341)
School type	-.182	.165	-.147	.181
	(.147)	(.190)	(.244)	(.150)
Workshop attendance	.046	.203	-.163	-.234
	(.716)	(.105)	(.195)	(.061)
Instructional Period	.234	-.283	.118	.312*
	(.060)	(.022)	(.351)	(.011)

*Significant at p <.05.

Table 2: shows the Pearson moment correlation coefficient of teachers' characteristics variables as they relate to the teaching of physics. From the table, there is significant correlation between teachers' gender and teaching method (.282); teachers' qualification, teaching method (.213), and improvisation skills (.264); teachers' experience, knowledge of basic physics concepts (.313), instructional materials usage (.282), Teaching periods and improvisation in physics teaching (.312).

Summary of findings

The study found that:

(i) There is significant relationship between teachers' qualification and instructional best practices in the teaching of physics.
(ii) There is significant relationship between teachers' experience and instructional best practices in the teaching of physics.
(iii) There is no significant relationship between school type and instructional best practices in the teaching of physics.
(iv) There is no significant relationship between teachers' workshop attendance and instructional best practices in the teaching of physics.

(v) There is significant relationship between instructional period and instructional best practices in the teaching of physics.
(vi) There is significant relationship between female and male teachers' use of teaching methods and instructional best practices in the teaching of physics.

Discussion

The results obtained indicated that of all the instructional practices considered, male and female science teachers differ on the teaching methods they use. Okoruwa (1999) found that teacher's gender had significant effect on achievement mean scores of students in science; male teachers were more effective than their female counterparts. This submission could be due to the adoption of active teaching methods by male science teachers.

Qualification of physics teachers has a role to play on the teaching methods adopted by the science teachers. Science teachers with higher qualification are likely to adopt effective and friendlier teaching methods during instruction. Qualification of physics teachers is also relevant on the ability to use instructional materials during instruction. This agreed with the findings of Darling Hammond (2000) which found that teachers quality characteristics such as, certification status and degree in the subject to be taught are very significant and positively correlated with subject outcomes in science and mathematics.

The results further indicated that experienced physics teachers are more knowledgeable on basic physics concepts and also use instructional materials effectively when delivering instruction. Okoruwa (1999) further found out that teachers' teaching experience had significant impact on students' especially in science. This was corroborated by Fettler (1999) who found out that teaching experience as measured by years of service correlated positively with students' test results.

Types of school (public or private) and workshop attendance do not have correlation on science teachers' instructional practices. Though workshop attendance does not have any significance on instructional practices, teacher training through conferences and seminars should be encouraged.

The number of times science subjects are allocated in the school time table has also been found to relate to the ability of teachers on improvisation of science materials (David, 2005). This study also found out that instructional periods have positive correlation on the ability of science teachers' ability on improvisation of science materials.

Conclusion

There are no doubts that for Nigeria to participate in a technologically driven economy which all nation of the world are turning to be, teaching and learning of science must be taken serious. Teacher thought processes, both within and out of classroom are very important because they determine classroom activities. Thus attention must be given to improve their thought processes by improving their basic skills (pedagogy, experience), emotions (in-service training, availability of science equipment and encouragement on improvisation skills) otherwise teaching and learning will be hampered, and the goals of becoming among the technologically developed nations may be a mirage.

Recommendations

Based on the findings, the following recommendations are made:

(i) Physics teachers should be motivated to acquire higher qualification
(ii) Government should employed enough physics teachers to reduce their workload on the ones available
(iii) Only qualified physics teachers should be employed because of the experience required for effective teaching the subject
(iv) Teacher training programmes should be organized regularly for physics teachers in other to catch up with modern trends in teaching the subject effectively
(v) Teachers should be encouraged to engage in research activities which will also enhance their teaching methodology
(vi) School principals should endeavour to make necessary instructional materials available to teachers when needed

References

Aaronson, D., Barrow, L., and Sanders, W. (2007) Teachers and Students Achievement in the Chicago public high schools. *Journal of Labour Economics, 25(1), 5-136*

Ajao, J (2001) Cadbury is determined to move Education Forward. *Vanguard Newspaper, December 27 2001, P, 16)*

Betts, J.R, Zau, A.C, & Rice, L.A (2003) *Determinants of students Achievement: New evidence from San Diego.* San Francisco: Public Policy Institute of California, http://www.ppic.org/content/pubs/reportR_803JBR

Brophy, J. (1985). The interactions of male and female students with male and female teachers. In L.C Wilkinson & C.B Marrett (Eds.). Gender Influences in classroom interaction (pp.115-142). Orlando, FL: Academic Press.

Car, M. (2006). The Determinants of students Achievement in Ohio's public schools (Policy) Report. http:// www.buckeye institute.org/docs/Policy Report

David , S. (2005). Relationship between Instructional time students' Achievement in High Schools. *Journal of Economics 4(5)' 231-242*

Darling Hammond, L (2000). Teacher quality and student achievement: A review of state policy evidence. *Education Policy Analysis Archives.* Available http://epaa.asu.edu/epaa/v8n1/, referenced 7 June 2009.

Darling Hammond, L. Holtzman, D. J,. Gatin, S.J, & Vasquez Heilig, J. (2005) Does teacher preparation matter? Education Policy Analysis Archives, 13(42)

Ehrenberg, R.W and Brewer, D.J (1994). Do Schools and Teachers characteristics matter?. Evidence from High School and Beyond. *Economics of Education Review, 13(1), 1-17*

Etkina, E. (2005). "Physics teacher praperation : Dreams and Reality. *"Journal of Physics Teacher Education Online, 3(2), 3-9*

Fettler, T (1999). The Relationship Between Measures of a Teacher's Experience with Mathematics and Educational Level and Student's Achievement in Mathematics in the Critical Importance of well Prepared Teachers. *U.S Department of Education*

Fred, T, Young, E and Batman (2010) Teachers' quality and students' achievement. Journal of science teaching and Learning 1(2), 12-23
Goodman and Thomas (2010) Principles of Instructional best practices. *Journal of Teacher Evaluation 4(6) 34-49*

Marzano. Robert J. (2007). *The Art and Science of Teaching, Alexandria,* VA: association for Supervision and Supervision and Curriculum Development

Nelson, G (2006) *An Evolutionary Framework for Instructional Materials.* NSTA Reports,18(1)

Okoruwa, T.O (1999) The Effect of Some Teachers' Characteristics on Pupils' Performance in Primary Science, Unpublished M.Ed Project. University of Ibadan

Omiwale, J.B (2011). Relationship between problem-solving ability and achievement in physics among senior secondary school students in Osun state, Nigeria. *The Africa Symposium: An online journal of the African Educational Research Network, 11(1), 158-165*

Provasnik, S; Young, S (2003). The relationship of Teacher Quality to students Mathematics Achievement at the 8th Grade. Findings from the National Assessment of Education and Progress. *Presented at the American Educational Research Association Chicago, Illinois.*

Public Schools of North Carolina (2003), The Basic Curriculum: A Guiding Document for Scheduling and Implementation of the NC Standard Course of Study at the Elementary Level http://ncpublicschools.org/curriculum

Rice, Jennifer. K (2003). *Understanding the Effectiveness of Teacher Attributes.* Retrieved, 2010 http:/www.epinet.org/printer-carf?id=1000 & content_type/rice _name books_teachers.

Shulman, L. (1986). "Those who understand: Knowledge growth in Teaching." *Educational Researcher, 15(2). 4-14*

Tahir, G. (2003). Poor Supervision of schools in What and Where. *Vanguard: Thursday, January 23, p 25.*