

SCHOOL FACTORS AND PUPILS ACADEMIC ACHIEVEMENT IN MATHEMATICS: A CASE FOR INTERNATIONALIZATION OF EDUCATION

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Abstract

This study investigated the relationship between school factors and pupils' achievement in Mathematics in Owerri Education Zone of Imo- State. Based on the objectives of the study three hypotheses were formulated and tested at 0.05 level of significant. Descriptive survey research design was adopted in carrying out the study. The population of the study involved all 7,014 primary school mathematics teachers in all public schools in the study area. A sample of 1,014 Mathematics teachers selected through a multi-stage sampling procedure. The instruments used for data collection were School-based Quality Inventory and Mathematics Achievement Test (MAT). The validity of the instruments was determined by two experts in mathematics education and one expert in measurement and Evaluation. The reliability of the instruments was determined using test retest method which yielded reliability coefficients of 0.93 and 0.87. Data collected were analyzed using means, standard deviation and multiple regressions. The results revealed that out of the nine variables, the two

variables that contribute significantly to pupil's achievement in Mathematics are conveniences and instructional materials ($\beta = 0.130$, $t = 2.381$, $P < 0.05$), ($\beta = 0.134$, $t = 2.470$; $P < 0.05$) respectively. Instructional materials and conveniences (toilets) have been adjudged to have contributed significantly to students' achievement in Mathematics. Therefore, Government and other stakeholders should ensure that schools are provided with effective and adequate toilet facilities. It is also recommended that instructional resources should be provided in schools.

Keywords; Schools Factors Academic Achievement And Mathematics

Mathematics is one of the subjects that is globally recognized as important because of its relevance and it acts as pivot on which rests national development of man and society (Ezeilo, 2005; Jegede ,2010). It is the only core science subject that act as pivot on which national development and wealth of any nation is created. Competency in mathematics learning is vital and sustainable for every individual's meaningful and productive life. Mathematics learning is very important in enhancement and sustainability of human existence because mathematics is all about finding solution to human problems and physical challenges. All these are indications that mathematics is useful in domestic and business deals, scientific discoveries, technological breakthroughs, problem solving and decision-making, in different situations in life (Usman and Nwoye, 2010; Unodiaka 2011), in Odili (2006), posited that mathematics is one of the school subjects that any nation needs for industrial and technological advancement.

Sidhu (2006), in his own view opined that mathematics is a very useful subject for moral vocations and higher specialized courses of learning. One interesting thing about the various views is that they all covered on the point that mathematics is the key to industrial and national development. Setidisho (1996) affirmed that Mathematics is a fundamental science that is necessary for understanding of most other fields in education. He stressed further that, it is glaring that no other subject forms such a strong force among the various branches of science. The Science Teachers Association of Nigeria (2014) referred to Mathematics as the central intellectual discipline of the technology societies. In his submission, Odusoro (2002) affirmed that the knowledge of science remains superficial without Mathematics. It therefore means that, the position of Mathematics in primary school curriculum in Nigeria is important for scientific development. However, it is disheartening that research and data from internal and external examinations have shown a consistent poor performance in this subject.

Majority of pupils often dread and show negative attitude towards Mathematics (Awofala, 2000).

In spite of its importance; Mathematics is a subject that is considered difficult and boring by many students. For instance, weaker students feel negative anxiety toward mathematics, and this negative anxiety affects their performance in the subject (Van Wyk, 2012). However, it is disheartening that research and data from internal and external examinations have shown a consistent poor performance in this subject. Majority of pupils often dread and show negative attitude towards Mathematics (Awofala, 2000).

According to Woodard (2004), students who lack mastery in mathematics are less successful in mathematics examination. Furthermore, students' performance in mathematics was found below average in the unity exams (Chief Examiner's Report, 2015).

Scholars have observed the fact that students' academic achievement is an output of educational system which cannot be examined in isolation of the inputs and process. Therefore, World Bank (1999) asserted that good quality of education requires efficient systems that would provide supportive learning environment, motivated staff with mastery of their subject matter, adequate access to resources, and students who are healthy and ready to learn. In the same vein, Obanya Okpala (1984) submitted that, it is only a combination of quality inputs and quality processes that can produce quality outcomes. Concerted efforts have been made at investigating trends of students' achievement in Mathematics as well as factors responsible for the level of their achievement. Some of the reasons attributed to the observed poor achievement in Mathematics as submitted by scholars include; shortage of qualified Mathematics teachers (Ohuche, 1989), poor facilities, equipment and instructional materials for effective teaching (Akpan, 1987 and Odogwu, 1994), use of traditional chalk and talk methods (Oshibodu, 1988, Edwards & Knight, 1994), large pupils to teacher ratio (Alele-Williams, 1988) and mathematics phobia (Georgewill, 1990), limited background preparation in Mathematics, lack of Mathematics teaching equipment and materials, fright and anxiety, low level of interest and some government policy (Abimbade, 1995), lack of problem solving abilities (Abimbade, 1997), self-concept and achievement motivation (Akinsola, 1994).

Good physical and mental health of school students is essential if they are to fully participate in education services being offered and if they are to concentrate and learn while in school. There is growing evidence that regular physical activity enhances learning and school achievement. Physical activity fuels the brain with oxygen, enhances connections between nerves and assists in memory. Children who participate

in daily activity have shown superior academic performance and better attitudes towards school (Dwyer, Blizzard and Dean, 1996). This means that, schools with effective health services have better chances of achieving high academic excellence in their students. Not only that, availability of sports facilities which facilitate regular physical activity is also germane to effective learning.

School counselling services serve a vital role in maximizing students' achievement. Effective counselling services are important to the school climate and a crucial element in improving student achievement (American School Counselor Association, ASCA, 2008). A lot of studies have revealed a close link between school counselling and students' academic achievement. For instance, House and Martin (1998) and, Lee and Watz (1998) discovered that, school-counselling service through the counsellors has great effect on academic achievement of students.

School leadership is one of the school-based quality factors that have to be reckoned with in students' achievement. Leadership is the process of influencing the activities of an organized group towards goal setting and goal achievement. It is the ability to get things done with the assistance of other people in the institution (Adesina, 1980). It is a mechanism for directive coordination, which leads to goal achievement in an organization (Atanda and Lameed, 2006). A cursory examination of the literature on school effectiveness reveals that while there are some differences of approach, the active leadership of the principal is regarded as essential to school improvement in general and the most essential ingredient of educational reform (Purkey and Smith, 1998). To be regarded as effective, the principal being the educational leader must ensure that other effective factors are put in place. Obadara (2005) discovered that transformational and transactional leadership styles contributed significantly to academic performance of secondary school students ($R = 0.712, P < 0.05$) and ($R = 0.799, P < 0.05$), respectively.

Supervision is a quality assurance mechanism in education. This could be carried out within the school by the head of department, vice principal or the principal. The Ministry of Education also supervises the schools in their domain so as to achieve the school goal. Kose (2007) stressed that instructional supervision is critical for the effective teaching and learning processes. It is one of the factors that influence students' performance in schools (Pansiri and Dambe, 2005). It means that instructional supervision is meant to improve instruction and learning outcome. Atanda (2002) also found positive relationship between supervision of instruction and school quality ($r = 0.766$). He also confirmed that supervision in both private and secondary schools does not differ.

Instructional materials in facilitating teaching and learning has been a major concern of researchers in recent time. Apparently because of this concern, different

researches have been carried out on the effective use of different media in facilitating teaching and learning. Consequently, researchers like Abimbade (1997) and Lasisi (2004) agreed that no matter the method or strategies chosen to be effective, there is need to make use of appropriate instructional materials in facilitating learning.

Studies have established significant relationship between library and students' academic performance. For instance, Keith (2004) in his study found that the size of a library media programme as indicated by the size of its staff and collection is the best school predictor of academic achievement of students. In addition, the instructional role of the library media specialist shapes the collection and in turn academic achievement. Finally, the degree of collaboration between library media specialist and classroom teacher is affected by the ratio of teachers to pupils. In a related study, Waldman (2003) discovered that students visit library for different purpose. This purpose therefore will have strong influence on their performance. In one of his research questions on what do they do in the library? 80% reported studying, 38% to do research, 33% to sleep, 30% to socialize, 24% to use the library's electronic resources, 22% to check the books out and 21% to e-mail or chat. He concluded that, even though some of these areas overlap (research and use of electronic resources, for example) and students could pick more than an option, it is clear that these students are mostly using the library as a place, not to make use of the library resources or services. From the fore going, the empirical studies have established that there are a number of factors found within the school which could influence students' achievement in Mathematics in secondary schools. It is against this background that the study investigated the school-based factors (school leadership, quality of instruction, school library, supervision of instruction, counselling services, health services, convenience, and instructional materials and sports facilities) on pupil's academic achievement in Mathematics

Purpose of the Study

The main purpose of the study is to investigate the relationship between school based factors and pupils academic achievement in mathematics. Specifically it seeks to examine;

- i. Relationship between school – based factors and pupils' academic achievement in mathematics
- ii. School based factors joint contribution to pupils academic achievement in mathematics
- iii. School- based factors relative contribution to pupils' academic achievement in mathematics.

Hypotheses

The following hypotheses were formulated to guide the study:

- Ho₁. There is no significant relationship between school-based factors and pupils' academic achievement in mathematics.
- Ho₂. School-based factors have no significant joint effect on pupil' academic achievement in mathematics.
- Ho₃. School-based factors have no significant relative contribution to pupils.

Methodology

The study adopted a descriptive survey research design. The population of the study comprised of all 7014 primary school mathematics teachers in all the public primary schools in Owerri Education zone of Imo State. The sample size of 1014 mathematics teachers was selected through simple random sampling technique. Two research instruments were used for data collection: School Factors Questionnaire (SFQ) completed by the Mathematics teachers and Pupils Performance Scores (PPS).The face and content validity of the instruments were done by two experts in mathematics education and one expert in measurement evaluation. The reliability of the instrument was determined through test method which yielded reliability coefficient of 0.92. The data collected were analyzed with multiple regression and hypotheses were considered at 0.05 level of significance.

Results

Ho1; There is no significant relationship between school-based factors and pupils' academic achievement in mathematics.

| Independent Variables | Performance in Mathematics | | Remark |
|-----------------------------------|-----------------------------------|------------|-----------------|
| | R | Sig | |
| Supervision of Instruction | 0.024 | 0.308 | Not Significant |
| School Leadership | 0.067 | 0.81 | Not Significant |
| Quality of Instruction | 0.005 | 0.462 | Not Significant |
| Guidance and Conselling | 0.060 | 0.105 | Not Significant |
| Health Service | 0.06 | 0.120 | Not Significant |
| School Library | 0.06 | 0.305 | Not Significant |
| Conveniences | 0.107 | 0.013 | Not Significant |
| Instructional Materials | 0.116 | 0.008 | Not Significant |
| Sports Facilities | 0.032 | 0.225 | Not Significant |

Results in table 1 shows pattern of relationship between schools based factors and student academic achievement in Mathematics. Out of the nine independent variables only two have significant positive relationship with students' academic achievement in Mathematics. These are conveniences (toilet) ($r = .107$; $P < 0.05$) and instructional materials ($r = .116$; $P < 0.05$).

H02; School-based factors have no significant joint effect on pupil' academic achievement in mathematics.

Table2: Composite Effect of Independent Variables on Students’ Achievement in Mathematics

| | | | | | |
|----------------------|---------------------|------------------------|------------|-------|-------|
| Multiple R = | Adjusted R Square = | .191 | R Square = | .037 | .016 |
| | | Standard Error = 50.52 | | | |
| Analysis of variance | | | | | |
| Source of Variation | SS | Df | MS | F | P |
| Regression | 40743.461 | 9 | 4527.051 | | |
| Residual | 1072012 | 42 | 2552.409 | 1.774 | 0.071 |
| Total | 1112755 | 42 | | | |

From table 3 coefficient of determination (Adjusted R^2) = 0.016 and this gives proportion of variance (Adjusted $R^2 \times 100$) = 1.6%. This implies that the independent variables accounted for 1.6% of the variance in the dependent variable. The joint effect of school based quality improvement factors is not significant on the students’ achievement in Mathematics in Nigeria (F=1.774; df (9,420); P>0.05)

HO3: School factors have no significant relative contribution to pupils ‘academic achievement in mathematics.

Table 3: Relative Contribution of School Factors on Pupils’ Achievement in Mathematics

| MODEL | UNSTANDARDIZED COEFFICIENT | | STANDARD COEFFICIENT | T | SIG |
|-----------------------------------|----------------------------|-----------|----------------------|--------|------|
| | B | STD ERROR | BETA B | | |
| Constant | -26.444 | 21.502 | | -1.230 | .219 |
| Supervision of instruction | -.757 | .692 | -.065 | -1.094 | .275 |
| School leadership | 1.226 | .680 | .103 | 1.804 | .072 |
| Quality of instruction | -9.76E | .598 | .010 | -.163 | .870 |
| Guidance and Counseling | 2.425 | 2.693 | .062 | .900 | .368 |
| Health services | 0.831 | 1.591 | .033 | .522 | .602 |
| Conveniences | 6.630 | 2.869 | .130 | 2.381 | .018 |

| | | | | | |
|--------------------------------|--------|-------|-------|--------|------|
| Instructional materials | 5.696 | 2.306 | .134 | 2.470 | .014 |
| School library | -2.729 | 2.662 | -.079 | -1.025 | .306 |
| Sport facilities | -1.213 | 1.740 | -.045 | -.697 | .486 |

Table 3 shows the relative contribution of independent variables on dependent variable. Out of the nine variables, the two variables that contributed significantly to student's achievement in Mathematics are conveniences and instructional materials ($\beta = 0.130$, $t = 2.381$, $P < 0.05$), ($\beta = 0.134$, $t = 2.470$; $P < 0.05$) respectively.

Discussion

The relationship between students' achievement in Mathematics and quality of instruction was not significant. In the same manner, its contribution to students' achievement in Mathematics was insignificant. This explains that teachers' quality of instruction alone could not enhance students' achievement. There are other factors responsible. Further, the relationships between counselling services and students' academic achievement in Mathematics was not significant. Not only that, its contribution to Mathematics was not significant. This might be attributed to inadequacies in school counselling offices or near non-availability of these offices, counselling personnel, counselling tools, in the counselling offices for students as observed during the data collection. This study did not corroborate the previous findings that have revealed a close link between school counselling services and students' academic achievement (Capuzzi, 1998; House and Martin, 1998; Lee and Watz, 1998; and Brigman and Campbell, 2003). This could be as a result of different location of the studies, time lag, and a change in societal values.

Supervision did not have positive significant relationship between students' achievement in Mathematics. The contribution made to students' academic achievement in Mathematics was not significant. The reason for insignificant relationships and little or no contribution of supervision of instruction to students' achievement in Mathematics may be attributed to the less emphasis on instructional improvement of students by the principals in the course of their supervisory exercise.

Conveniences have relationship with students' academic achievement in Mathematics and contributed significantly. This emphasizes the importance of conveniences in school system. It is natural that teachers and students have to ease themselves. Their concentration could be affected in teaching-learning process if adequate attention is not given to this facility by concerned stakeholders.

Further, the study showed the importance and significant role played by instructional materials on students' achievement, especially in Mathematics. They have positive influence on achievement in Mathematics. This explains why a subject like Mathematics will require real objects that can convert topics that seem imaginary to

concrete for students' understanding. This establishes the conclusion made by Talmadge and Eash (1976) about four decades ago that instructional materials influence student achievement, use of process skills, and other learning outcomes. This finding consolidates previous research that revealed positive influence of instructional media on students' performance (Adedokun, 2002).

The finding of this study affirmed that all the nine school-based quality factors identified accounted for little proportion of students' achievement in Mathematics. Thus, the joint effect was not significant. This means that these factors are not good predictors of students' achievement in Mathematics. One of the reasons that could be adduced to this is inadequacy of most of these variables as observed in the field work and ineffectiveness of some of the factors (like leadership and supervision) as confirmed by some teachers. In addition, there might be other factors or variables within or outside the school premises that are stronger than those identified in the study which could have significant influence on students' achievement in Mathematics.

Conclusion

The findings of the study have demonstrated that instructional materials and conveniences are strong school-based quality factors which have the tendency of contributing significantly to pupils' achievement in Mathematics. Therefore, their availability and accessibility by students could result into better achievement in Mathematics and if otherwise, reverse will be the case. The significant contribution of conveniences shows its importance in students' performance. It implies that, if it was adequate, its contribution might be higher than what was obtained from the findings.

Recommendations

Based on the findings of the study, it recommend as follows;

1. Government should ensure that schools are provided with effective and adequate toilet facilities. As it can be seen that conveniences accounted for significant contribution to student academic achievement, school authorities should sensitize parents and old students about the need for toilet and solicit for their assistance.
2. It is also recommended that instructional resources should be provided in schools. Instructional materials make teaching real and facilitate learners understanding. Apart from provision by government, teachers should be creative in improvising instructional materials in their different disciplines.

References

- Abimbade, A. (1999). *Principles and practice of educational technology*. Ibadan: International Publishing Ltd.
- Abimbade, A., (1995). *Mathematics method 2*. Centre for External Studies, Faculty of Education, University of Ibadan (TEE 333).
- Adesina, S. (1980). *Some aspects of school management*. Lagos: Educational Industries Nigeria Limited.
- Akinsola, M.K. (1994). Comparative effects of mastery learning and enhanced mastery learning strategies on students' achievement and self concept in mathematics. (Unpublished Ph.D Thesis). University of Ibadan.
- Akpan, A.A. (1987). *Correlates of mathematical problem-solving ability among secondary school students*. Unpublished Ph.D Thesis, University of Ibadan, Ibadan. Allele-Williams, G. (1988). Keynote address delivered at the Silver Jubilee meeting of Mathematics Association of Nigeria (MAN) Sept. 1982, *Abacus* 18(1).
- American School Counsellor Association, (2008). *Effectiveness of school counselling*. <http://www.schoolcounselor.org/content.asp?retrieved 5/23/08>.
- Atanda A.I. (2002). Supervision as a correlate of effective performance of teachers in secondary schools in Ibarapa East Local Government Area of Oyo State, Nigeria. *M.ED Thesis in the Department of Educational Management, University of Ibadan*.
- Atanda, A.I & W.O. Lameed. (2006). *Fundamentals of school organisation and classroom management*. Ibadan: Awemark Industrial Printers.
- Awofala, A.O.A. (2000). *The status of mathematics teaching and learning in primary school at the year 2000*. Unpublished B.Ed Project in Teacher Education, University of Ibadan.
- Dwyer, T., L. Blizzard & K. Dean. (1996). Physical activity and performance in children. *Nutrition Review*, 54.4: 527-531.

- Edwards, R. & Knight, P. (1994). *Effective early years education: Teaching young children*. Buckingham: Open University Press. Federal Republic of Nigeria, (2004). National Policy on Education, Abuja: NERDC.
- Georgewill, J.W. (1990). Causes of poor achievement in WAEC Mathematics examination in Rivers State secondary schools, Nigeria. *International Journal of Mathematical Education in Science and Technology*, 21:3
- House, R.M. & Martin, P. J. (1998). Advocating for better features for all students: A new vision for school counsellors. *Education*, 284 - 291.
- Jegede, O.J. (1984). Non cognitive correlates of secondary school students' achievement in physics. *Journal of Science Teachers Association of Nigeria*. 22 (20), 78-87.
- Keith, C.L. (1993). *School librarians and student performance*. <http://www.library.queen.suca.inforef/library> Retrieved 19/08.07
- Kose, B.W. (2007). Instructional supervision: University of Illionis at Urbana Champaign, College of Education: Department of educational organisation and leadership. Retrieved from <http://www.ed.uiuc.edu/eo/frp/bkose>
- Lasis, S.O. (2001). Effects of three instructional media in students' teacher learning outcome: Selected teaching skills. *Unpublished M.Ed Dissertation of the University of Ibadan, Ibadan*.
- Lee, C.C. & Waltz, G. R. (1998). (Eds.). *Social action: A mandate for school counselors*. Alexandria, VA: American Counseling Association.
- Obadara, O.E. (2005). *Perceived full-range leadership, teacher factors and the academic performance of secondary schools in ogun state, Nigeria*. A Ph.D. thesis submitted to the Department of Educational Management, University of Ibadan, Ibadan, Nigeria.
- Obanya, P.A.I. (2002). Sampling plan for the I.E.A study of written composition in Nigeria. WCS/ICEE/NY 7001pp12
- Odili, G.A. (2006). *Teaching mathematics in Nigerian secondary schools: A teaching perspective*. Port Harcourt: Rex Charles & Patrick Limited.

- Odogwu, H.N. (1994). Primary school teachers and the teaching of time concept in schools. *Education Today* 7:2 Ezeilo, J.O.C. (1975). Presidential address to 11th annual conference of the Mathematical Association of Nigeria (MAN).
- Sidhu, K.S. (2006). *The teaching of mathematics*. New-Delhi: Sterling Publishers Private Limited.
- Unodiaku, S.S. (2012). Development and Validation of Mathematics Readiness Test for Senior Secondary School Students. *African Journal of Science, Technology and Mathematics Education (AJSTME)*, 2(1), 57-71.
- Usman, K.O & Nnoye, M.N (2010). Effect of Graphical Symbol Approach on the Pupils' Achievement in Ratio at Upper Primary School Level in Nsukka Central Local Government Area. *Journal of Mathematical Centre, Abuja vol 1(1)*, 123-132.
- West African Examination Council (2009). *Chief Examiners Report*. Lagos: WAEC.
- Van-Wyk, M.M. Van. (2010). The Effects of Teams-Games-Tournaments on Achievement, Retention, and Attitudes of Economics Education Students. *University of the Free State, South Africa 2010 EABR & ETLC Conference Proceedings Dublin, Ireland*.
- Woodard, T. (2004). The Effects of Math Anxiety on Post secondary development Students as related to Achievement Gender Age.