

**FACTORS INFLUENCING STUDENTS' ACHIEVEMENT IN MATHEMATICS
WORD PROBLEMS: A CASE OF FEDERAL COLLEGE OF FORESTRY, IBADAN,
NIGERIA**

Appah Ogechukwu R.¹, Odumosu Oluwakemi M.² and **Olisama Victoria O.**³

¹Federal College of Forestry, Ibadan, Forestry Research Institute of Nigeria

^{2&3} Adeniran Ogunsanya, College of Education, Oto/Ijanikin, Lagos State. Nigeria.

ABSTRACT: *This article examined factors which contribute to the mathematics word problem achievement of National Diploma Students' of Federal College of Forestry. The study was designed specifically to consider the students' profile (gender, interest in mathematics, attitude towards mathematics and awareness of importance of mathematics to their course of study) as well as their performance in English courses. Data were collected using students' profile questionnaire, their scores in English courses (GNS 101 and GNS 102) and Mathematics (MTH 111). A correlational analysis showed that the relationship between the respective students' profile and performance in English courses with achievement in mathematics word problem were significant. Result revealed that all the variables contributed significantly to students' achievement in mathematics word problem. It is therefore recommended that all these factors should be well treated and made right in order to boast students' brilliant performance in mathematics word problems in the Colleges.*

KEYWORDS: Mathematics achievement, Attitude towards mathematics, Interest in mathematics, Performance in English, Awareness.

INTRODUCTION

The importance of mathematics in national development explains why Federal Republic of Nigeria included mathematics as a pre-requisite for admission into science and technology based courses in tertiary institutions. This inclusion could be attributed to indispensable role mathematics plays in the advancement of science and technology of the nation (Iyekepololor and Bulus, 2009). This means that the knowledge of mathematics is a major requirement for any nation aspiring for scientific and technology advancement. The role of mathematics is such that there is no science based course that mathematics is not found. Mathematics is needed and applied to the study of agriculture science (Unodiaku, 2017 and Bengtsson, 2011). This perhaps explains why mathematics is made compulsory for forestry and agricultural students in every institution of learning in Nigeria. Thus, for any student in forestry technology department and word and paper department in Federal College of Forestry to successively graduate from the college, he/she must not fail mathematics courses.

One of the objectives of mathematics curriculum is to teach students how to apply the mathematics skills learnt to new and unfamiliar situation. Every field require good mathematics skills and forestry and agricultural science are no exception. Application of mathematics to every field should also be included in primary and secondary curricula this will enable students at that level understand the importance or relevance of mathematics to every discipline. To apply this mathematics skills appropriately, students have to understand and solve word problems in mathematics. Mathematics word problems refer to mathematical exercises which present information on a problem as text, rather than mathematical notation (Timmermans, et al., 2007). This explicates that effective solving a mathematical word problem depends not only on students' ability to perform mathematical operation, but also the extent to which they understand the words used in the questions. Therefore, reading and comprehensive skills play important role when solving mathematics word problem. This is important because without the understanding of the question the students will find it difficult to solve the problem. Mathematics word problems provide questions that challenge students to apply mathematical thinking to various situations, and they may be an efficient means of relating this thinking to the real world (Eric and Lynda, 2004). Word problems in mathematics serve several important functions in the classroom such as providing questions that challenge students to apply mathematical thinking to various situations. Thus, students can learn mathematical procedures, but without real-word applications, these skills are rendered meaningless and can easily be forgotten by the student.

Word problems are integral part of all the mathematics courses offered in all Federal Colleges of Forestry in the federation. The reason for this is not far-fetched; a wealth of mathematical research and knowledge is required for a forester to be successful in his/her field. Mathematics is therefore a sound foundation that every professional in the field of agriculture and forestry need to give proper focus, time and practice to. It also plays important role considering the fact that knowledge of mathematics enables scientists to carry out their work, solve the problems and interpret findings as well as predict the future (Osugwu & Anemelu, 2004 as cited by Adeleke & Appah, 2011). For a forester to be successful in their field, mathematics figures and words are needed. For instance, the area of plot is an important factor to consider in the process of planting trees or crops. The unit related to this area of plots include hectares, acres, metre, square metres. All these units require mathematical skills and languages to convert. The understanding of these units and how to apply them in real life is necessary in the field of forestry and agriculture. Mathematics word problems therefore, enable the students of the college to think and develop reasoning skills rather than relying on formulas or memorising skills. This fact is acknowledged by Amit & Klass-Tsirulnikov (2005), that word problems are very important because without them, students have no way to relate real-life situations to the mathematics learned in the classroom. Hence, they illustrate the connection between mathematics and clear, critical thinking on any subject.

Despite the important of mathematics in Federal College of Forestry, students' achievement in mathematics especially word problem seems deteriorating. Majority of these students dislike mathematics because of word problem. Mathematics which should be a compulsory course for

all the students of Federal Colleges of Forestry is being abandoned by some departments who probably are not aware of the importance of mathematics to their field. This is not proper, considering the relevance of mathematics to students of forestry and agriculture. Mathematics is very much relevant to day to day activities of the students of Federal College of Forestry. For instance, the planting of roots and tree crops which involves knowing the dimension and spacing needed for adequate propagation of the crops can only be mathematical calculated (Otunu-Ogbisi & Ukpbor 2009). Application of mathematics is also very important in forestry measurement inventory such as measurements of trees (diameter, volume, height) measuring the quantity of fertilizer needed for the plant. Mathematics knowledge is equally needed to generate reports about existing and future tree volume for forest sustainability and to calculate estimates of timber yields before a harvest. Disdain the importance of word problem in mathematics to forestry and agricultural field, the students' achievement in mathematics continues to decline in the Colleges. The high number of students with weak pass and carryover in this course call for urgent and thorough investigation to understand the phenomenon.

Over the years, the investigation of the factors that affect academic achievement of students in mathematics has attracted the interest of many researchers. Some of the factors include students' interest in mathematics, lack of interest has been recorded as one of the factors that affect students' achievement in mathematics Olisama & Appah, (2011), and attitude to mathematics is another factor (Adeleke & Appah, 2011; Odumosu & Adeyemi, 2015). The attitude of students can be positive or negative and can affect performance in mathematics word problem to the extent of students moving away from the learning environment. Thus, attitude is considered highly important to students' academic performance Zekele, 2001). This can be attributed to the fact that students are more likely to engage and pay more attention in activities they are interested in. Gender is one of the factors which have been reported to account for the differences in academic performance of students (Jones & Larke, 2001; Abubakar & Oguguo, 2011 and Odumosu et al., 2018).

Statement of Problem

Quite a number of activities in forestry and agriculture require competence in mathematics especially mathematics word problem which is the main integral of mathematics offered in Federal College of Forestry. However, students of this college are required to take mathematics especially word problems seriously. In this College, lecturers bitterly complain of the students' poor performance in mathematics. It is equally observed that huge efforts made by the lectures have not yielded the desired outcome. It was equally observed that researchers have not given priority to investigation of factors affecting mathematics achievement of students of Federal College of Forestry. Study of this therefore is needed to determine the extent to which student's attitude to mathematics, interest in mathematics, performance in English courses, gender, student's awareness of relevance of mathematics to Forestry and agricultural field affect performance in mathematics words problem.

Purpose of the Study

The main purpose of this study is to investigate whether a significant difference exists among students': (i) gender, (ii) interest in mathematics, (iii) attitude to mathematics, (iv) awareness of importance of mathematics to their course of study, (v) performance in English courses, and achievement in mathematics word problem.

Research Question

1. What relationships exist among students' profile (gender, students' interest in mathematics, students' attitude to mathematics, students' awareness of importance of mathematics to their course of study), students' performance in English courses and students' achievement in mathematics word problem?
2. To what extent do students' profile (gender, students' interest in mathematics, students' attitude to mathematics, students' awareness of importance of mathematics to their course of study) and performance in English courses combined predict students' achievement in mathematics word problem?
3. What are the relative contributions of performance in English courses and students profile (gender, students' interest in mathematics, students' attitude to mathematics and students' awareness of importance of mathematics to their course of study) to students' achievement in mathematics word problem?

METHODOLOGY

Research Design

The study adopted a correction survey type using multiple prediction method. There is no manipulation of variable as they have already occurred.

Population and Sample

The population for this study comprised of all year one National Diploma (ND1) (2016/2017 and 2017/2018 sessions). Purposive sampling technique was adopted to select all year one national Diploma students of Forestry Technology Department and Wood and Paper Technology Students out of four Departments that offer National Diploma programme in Federal College of Ibadan. The reason is that only the two departments offer both Mathematics and English courses as basic subjects. The departments gave a total of ninety two (92) students composed of fifty three (53) males and thirty nine (39) females used for the study.

Data Collection

Two instruments used to collect data for this study include:

1. Students' Questionnaire (SQ).

2. Results of students Performance in Use of English (GNS101) and GNS (102) and Logic and Algebra (MTH 111) collected from the School.

Instrumentation

The instruments used to collect data for this study includes Students' Questionnaire (SQ). This instrument which was developed by the researchers was used to collect information from the students. The questionnaire had three sections A, B, C and D. Section A is made up of the student's demographic variables (gender and age). Section B which consists of fifteen (15) items which was used to solicit information on students' interest in mathematics, Section C comprised of fifteen (15) items used to elicit information from students on their attitude towards mathematics word problem. Section D consisted of fifteen (15) items was used to find out the students' awareness of importance of mathematics to their career field. The instrument was pilot tested on twenty-five (25) students who are not part of the study sample. Lawshe Content Validity (CVI) was used to establish the content validity and the value obtained was 0.84. While the internal consistency and reliability of the instrument was established using Cronbach Alpha giving the value of 0.86. The items in sections B to D are on a 4-point scale. Section B include 1= dislike very much, 2= dislike, 3= like and 4= like so much. The items in section C are on a point scale 1= strongly disagree, 2 = disagreed 3 = agree and 4 = strongly agree. The items in section D are on a point scale of 1= dislike very much, 2 = dislike, 3 = like and 4 = like very much.

Data Analysis

Data collected were analysed using Pearson Product Moment Correlation and multiple regressions.

RESULTS

Table 1: Inter-Correlation Matrix of the Predictor Variables and the Criterion Variables

	Gender	Attitude	Interest	awareness	English	maths	Achiev.
Gender (A)	1						
Attitude (B)	-.175	1					
Interest (C)	-.120	.487**	1				
Awareness (D)	-.112	.392**	.190	1			
English performance (E)	-.413**	.281*	.190	.222	1		
Maths achievement (F)	-.267	.558**	.430**	.488**	.461**	1	

Table 1 showed that there was weak relationship between each of the students' characteristic. This indicated that there was no multicollinearity between students' profile and achievement in mathematics word problem. As shown in the table, there was a non significant negative correlation between gender and students' achievement in mathematics word problem (-0.267), however, a significant positive correlation exists between students' attitude to mathematics and achievement in mathematics word problem (0.558). There was significant positive correlation between students' interest in mathematics as a course and mathematics word problem (0.420), There was also positive significant correlation between students' awareness of importance of mathematics to their field and achievement in mathematics word problem (0.488) and performance in English courses and achievement in mathematics word problem.

Table 2: The extent to which students' factors combine to predict achievement in word problem in mathematics

Model	Sum of Square	DF	Mean Square	F	Sig
Regression	9897.839	5	1979.568	20.885	.000
Residual	4454.916	47	94.785		
Total	14352.755	52			

R = .830
R² = .690
Adjusted R² = .657

From Table 2, the combination of all the five components of the predictor variable that is gender, students' interest in mathematics, students' attitude to mathematics, students' awareness of importance of mathematics to their course of study and their performance in English courses jointed predicted their achievement in mathematics word problems. With positive high correlation at R = .830, a multiple R square of .690 and Adjusted R square of .657. The multiple correlation of .830 indicated a high relationship among the five components of predictor and the predicted variable (achievement in mathematics word problems). However, the combination of the five components of the predictor variables explains 65% of the variance observed in achievement in mathematics word problems. The observed variance was equally statistically significant at $(df = 5, 47) = 20.885, p < 0.05$. This is an indication that students'

factor jointly has positive impact on mathematics word problems of students of Federal College of Forestry.

Table 3: Relative contribution of predictor variables to students' achievement in mathematics word problem.

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
Gender	-6.320	2.953	-.192	-2.140	.038
Interest	.547	.198	.265	2.769	.008
Attitude	.621	.206	.305	3.015	.004
Awareness	.523	.211	.222	2.476	.017
Performance in English	.378	.135	.262	2.811	.007

Table 3 shows the standard regression co-efficient, the accompany t-values and the significance level. The standardised regression coefficient was used to determine the relative contribution of the variables in the model to the prediction of students' achievement in mathematics word problems. It was found all the predictor variables gender, students' interest in mathematics, students' attitude to mathematics, students' awareness of importance of mathematics to their course of study and their performance in English courses with beta values -.192, .265, .305, .222, .262 relatively contributed significantly in predicting students' achievement in mathematics word problems.

DISCUSSION

As shown in table 1 all variable correlate with each other though some are positive while others are negative. The relationship that existed between these criterion variables and the predictors could be described as moderate. Deducing from the result on table 2, students' achievement in mathematics word problems depend on students' gender, interest in mathematics, attitude to mathematics, awareness of importance of mathematics to their course of study and their performance in English courses. This is also an indication that students' factors have positive impact on students' achievement in mathematics word problem. The finding is in line with Appah et al., (2017) that students' factors have positive impact on Federal College of Forestry students' skill acquisition. From table 3, it was observed that gender makes significant contribution to students' achievement in mathematics word problems. This is in line with Nematullah et al., (2015) & Iji, (2015) who established gender effect on students' achievement in mathematics. This finding is in contrast to other studies like that of Gray, (1996), Abiam & Odok (2006), Olisama et al., (2018) gender was not an important factor that influences

students' achievement in mathematics. Also, this finding disagrees with Odagboyi, (2015) who reported that achievement in science is not gender sensitive. Interest equally contributed significantly in predicting students' achievement in mathematics word problems. This could be attributed to the fact that the students learn and perform better when they have interest in what they want to learn. The finding is inconsonance with Ancho et al., (2010); Olisama et al., (2011) that interest affects students' achievement in mathematics. Also students' attitudes to mathematics make significant contribution to achievement in mathematics word problem. This might be attributed to the fact students' attitude to a subject will add to their success. The finding of this study agrees with Mensah et al., (2013) in their studies showed that students' attitude and the students' academic performance show positive relation. This implies that quality of mathematics word problem can be better if students develop positive attitude towards mathematics. Student performance in English courses has a positive effect on achievement in mathematics. This could be attributed to the fact that students that did not understand what the problem was asking will not properly set the problem in a way that could provide a meaningful answer. The finding of this study agrees with Hassan and Khan, (2015) that positive correlation exists between English and Mathematics achievement of students.

CONCLUSION

With regards to the data collected and analysed, this study revealed that students' factors such as gender, students' interest in mathematics, students' attitude to mathematics, students' awareness of importance of mathematics to their course of study and their performance in English courses affect students' achievement in mathematics word problems positively. It is therefore recommended that these factors should be well treated and made right in order to boast students' brilliant performance in mathematics word problems in Colleges. It is imperative for policy makers in education to take these factors into consideration while formulating educational policies.

The finding of the study also confirms the existing literature on the relationship between students' performance in English language and students' achievement in mathematics word problem. This implies that apart from students' mathematics ability to solve word problem, they require a certain level of fluency and achievement in English language courses in order to handle word problems in mathematics.

Furthermore, the finding of this present study is very important to the students since it will encourage them to understand the importance of mathematics to their field of studies and then take mathematics courses very serious.

Finally, this study will serve as a reference point for future researchers working in the area of socio psychological factor as a panacea to students' achievement in mathematics word problems in tertiary institutions. Although this study had uniquely contributed to the existing literature in this area of study, more studies should be conducted to further address which

aspect of English language course enhances students' achievement in mathematics word problem in tertiary institutions.

References

- Abiam, P. O. and Odok, J. K. (2006). Factors in students' achievement in different branches of secondary School mathematics, *Journal of Education and Technology*, 4(1), 161-168.
- Abubakar, R. A. and Oguguo, O. D. (2011). Age and gender as predictor of academic achievement of college mathematics and science students. *Journal of Education and Social Research*, 1(2), 89-94
- Adeleke, J. O. and Appah, O. R. (2011). Pre-admission qualification and demographic factor of year one national diploma students of agricultural institutions as predictor of achievement in mathematics. *Journal of Sociology and Education in African*. ISSN: 1116-0381, 10(2), 93-106.
- Amit, M. and Klass- Tsrulnikov, B. (2005). Paving a way to algebraic word problems using a non-algebraic route. *Mathematics Teaching in the Middle School*, 10, 271-276.
- Appah, O. R., Adeleke, J. O. and Omole, A. O. (2017). Socio psychological factor as a panacea to students' acquisition of forest plantation establishment skills in Federal Colleges of Forestry in Nigeria. *Education Research Journal*, 7(10), 255-259, October 2017. Available online at <http://resjournals.com/journals/educational-research-journal.html> ISSN: 2026-6332 ©2017 International Research Journals.
- Anchor, E. E., Imoko, B. I. and Ajia, J.T. (2010). Sex differentials in students' achievement and interest in geometry using games and simulation technique, *Nacatibey Faculty of Education Electronic Journal of Science and Mathematics Education*, 4(1) 1-10.
- Bengtsson, V. (2011). How does Mathematics Relate to Agriculture? Answers Quora. www.quora.com/How-does-maths.
- Eric, T. B. & Lynda R. W. (2004) impact of Personalization of mathematical word problems on student performance. *Journal of the Mathematics Education*, 14(2), 17-26.
- Gray, M. (1996). Gender and mathematics: Mythology and misogyny. In G. Hanna (Ed.), *Towards gender equity in mathematics education: An ICMI study*. Boston, MA: Kluwer Academic Publishers. Timmermans, pp. 27-38.
- Hassan, M. & Khan, S. (2015). Academic achievement test in English and Mathematics of secondary school students in relation to gender differences. *The international Journal of Indian Psychology* ISSN 2348-5396 (e) ISSN; 2(3), 2349-3429.

- Iji, C.O., Emiakwu, S.O. & Utubaku, R.U. (2015). Effect of problem based learning on senior secondary school students' achievement in trigonometry in Northern education zone of Cross River State Nigeria. *Journal of Mathematics*, 11(1), 16-25.
- Iyekekpolor, S. A. O. & Bulus, O. S. (2009). Teachers' perception of the problems of secondary school mathematics teaching in Southern Taraba State. *ABACUS: The Journal of the Mathematical Association of Nigeria*, 34(10), 106-111.
- Jones, W. A. & Larke, A. (2001). Factors influencing career choice of African-American and Hispanic graduates of a land-grant College of Agriculture. *Journal of Agricultural Education*, 42(1), 38-48.
- Mensah, J. K., Okyero, M. & Juranchi, A. (2013). Student attitude towards mathematics performance: Does the teacher's attitude matter? *Journal of education and practice*, 4(3).
- Nematullah, M., Yousef, Allah B. G. & Khaliq D. (2015). An analytical study of gender difference in academic achievement in mathematics at secondary level. *British Journal of Education, Society & behavioural Science*. 11(4): 1-7, 2015, article no. BJESBS 19349. ISSN:2278-0998.
- Odagboyi, I. A. (2015). The effect of gender on the achievement of students in Biology using jigsaw method. *Journal of Education and Practice* ISSN 2222-1735, 6(17), 176-179.
- Odumosu, M. O. & Adeyemi A. F. (2015). The effect of mathematics Anxiety on academic performance of pre-service teachers in Lagos. *Journal of Science Education*, 11, 54-64.
- Olisama, O. V., Odumosu, M. O. & Areelu Fisayo (2018). Effects of teachers' utilisation of tiered home assignment on students' achievements in mathematics. *International Journal of Learning, Teaching and Educational Research*. 17(4), 88-101. April, 2018 <https://doi.org/10.26803/ijlter.17.4.6>.
- Odumosu, M.O., Olisama, O.V. & Areelu, Fisayo. (2018). Teachers' content and Pedagogical knowledge on students' achievement in algebra. *International Journal of Education and Research*, 6(3), 83-94. ISSN 2411-5681.
- Olisama, O. V., Appah, R. O & Afonja, B. K. (2011). Arousing the interest of students in mathematics: Binary number code system. *A Journal of Academic Excellence*, 4(1), 224- 228.
- Osuagwu, M. N. & Anemelu, C. (2004). New school mathematics for senior secondary school. (Introductory page).

Otunu-Ogbisi, R. O. & Ukpebor, J. N. (2009). Mathematics Education: A tool for technological development in Nigeria. *Journal of the mathematical association of Nigeria*. 34(1) 46-53. Mathematics Education Series September.

Unodiaku, S. S. (2017). Assessment of mathematics' applications to agricultural science among undergraduates of the Faculty of Agriculture in a Nigerian University. *Journal of Community and Communication Research*. www.jccr.org.ng 2(1), 13-16.

Zekele, S. (2001). Gender difference in mathematics achievement: A search for explanation. *Zimbabwe Journal of Education*. 12(1), 100-118.