

MATHEMATICS SKILLS AS A PREDICTOR OF STUDENTS PERFORMANCE IN FIRST YEAR ACCOUNTING COURSES

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Abstract

This study examines the extent to which proficiency in mathematics can predict the performance of university students in introductory accounting courses. This study adopted the correlational type of descriptive survey research design. The population of the study consists of students in the management and social sciences from three universities in Delta State, Nigeria. The sample of the study consists of 342 students, representing the total student population taking introductory accounting courses in the first year. Data for the study was obtained from math pre-test and students' scores from semester examinations. Data was analyzed through the analysis of covariance (ANCOVA). The study finds that math skills have a positive relationship with students' accounting grade. The study further discovers that students' performance in accounting can be used to predict their overall GPA. The study also reveals no significant difference in accounting grade in terms of gender and majoring in accounting and therefore concludes that mathematics skills facilitate students' understanding and professional success in accounting.

Keywords: Math Skills, Accounting grade, Students' performance, GPA, Pre-university accounting knowledge, Accounting majors.

Introduction

Accounting as a discipline involves accurate numerical measurement of precisely defined operational concepts. There has been a plethora of debates by scholars and professional bodies on the necessity of accounting students to possess the relevant mathematical skills which will aid them in understanding accounting as a discipline and thus enhance accountancy practice. In view of this, it has been argued that students of accounting are expected to be generally comfortable with numbers and mathematics. Accounting and finance teachers are of the opinion that arithmetic skills are essential for students to understand accounting systems and financial statement analysis. There is almost a general belief that academic and professional success in accounting will be facilitated by a high level of mathematical skill. Consequently, students who are not so good in math tend to view accounting as a difficult subject. However, it is not always the case that only students who are grounded in mathematics perform better in accounting courses. On the contrary, some have argued that accounting principles of debit and credit, double entry or financial statement analysis only require basic arithmetic. (Guney, 2009; Aidoo-Buameh & Ayagre, 2013).

Accounting is a discipline which records, classifies, summarises and interprets financial information about the activities of a concern so that intelligent decisions can be made about the concern. It is pertinent to note that though most

accounting definitions do not specifically mention the term mathematics, accounting requires numerical and analytical skills which are also integral elements in mathematics (Jackling & Calero, 2006).

Over the years, there have been some concerns about accounting as a discipline in terms of the dwindling number of students majoring in accounting as compared to other management disciplines such as business administration and economics. Studies attribute this to a number of issues. Cohen and Hanno (1993) suggested that students who chose not to major in accounting did so based on recommendations and advice from people important to them, but more significantly, they perceived it to be too number-oriented. Jackling and Calero (2006) cited that accountants have been typically referred to as number crunchers' given that book-keeping and auditing work has emphasized or been associated with an emphasis upon numerical accuracy, routine recording and calculation methods, together with attention to detail.

Financial accounting is usually one of the first business courses taken by university students in the management and social sciences in Nigeria. As such, financial accounting not only exposes students to a system of recording and summarizing business transactions, but more importantly, it helps students interpret and analyze financial information which are crucial inputs in most business decisions. It is also worthy of note that the Joint Admissions and Matriculations Board (JAMB), a body that conducts the Unified Tertiary Matriculation Examination (UTME) in Nigeria does not make Financial Accounting at the O'Level a prerequisite for admission into university accounting programme. JAMB defines the pre-university qualifications required for admission to accounting degree programme to include English Language, Mathematics and Economics with any other two relevant subjects at WASSCE/SSSCE/NECO/NABTEB. In essence, it implies that having a prior basic knowledge of accounting in the secondary school is not considered necessary for studying accounting in the university.

Furthermore, the curriculum of a management oriented programme such as Accounting, Finance, Economics and Statistics contains significant quantitative content highlighting the importance of math aptitude. In addition, professional accounting bodies such as the Institute of Chartered Accountants of Nigeria (ICAN) and Association of National Accountants of Nigeria (ANAN) place value on numeric and communication skills that incorporate and assume math aptitude. As a matter of fact, ICAN examination programmes from the foundation to the professional level explicitly require mathematical skills. This study therefore seeks to examine how mathematics proficiency can be used as a predictor of students' performance in first year university accounting courses by using some control variables such as gender, pre-university accounting knowledge and accounting majors to ascertain the extent of impact.

Statement of Problem

There is a broad range of cognitive and non-cognitive factors that affect students' performance in accounting. Cognitive factors such as academic aptitude, Math, English proficiency, age, gender, study effort, work experience, and high school accounting are all known to have some level of effect on accounting grades (Gist, Goedde & Ward, 1996; Guney, 2009). Other studies (Darwin, 2011; Doran, Marvin & Smith, 1991) focus on non-cognitive factors such as study hours, study habits, motivation, teachers and students' perception of accounting as well as school environmental factors on the performance of students in introductory accounting courses.

A review of previous studies on the effect of math ability on accounting performance shows that the results are varied and diverse. Grover, Heck and Heck (2010) report substantial explanatory power for pre-test math, accounting and economics scores. Darwin (2011) reported that math proficiency was a good predictor of academic performance and furthermore, that the degree performance cannot be linked to validity of grades obtained in the entry qualification. Dewan and Kaplan (2005) explain why a group of students with average grades in first-year statistics and average GPA perform more poorly in their 2nd year finance course than the group of students with even lower grades in first-year statistics and GPA. They think that since the accounting course requires more application, these students lack the drive for hard work to go beyond memorization despite their innate ability in the foundational subjects.

In the pre-university accounting background, the results are also unconvincing. On one hand, some studies (Yunker, Yunker & Krull, 2009; Parker, 2000, Negash, 1997) find that performance is not significantly associated with prior exposure to high school accounting education. On the other hand, (Jones & Fields, 2001; Aidoo-Buameh & Ayagre, 2013; Ibrahim & Usman, 2015) find that prior accounting knowledge, obtained through high school education, is a significant

determinant of performance in college-level accounting courses. There is also some ambiguity with regard to the influence of majoring in accounting on performance in accounting courses in comparison with performance of students in other management disciplines. For example, Masky and Zheng (2008) suggest that students majoring in accounting outperform students taking accounting but pursuing other management programmes. Guney (2009) suggests that grades in mathematics are a very strong determinant of performance in accounting but only for non- accounting majors.

Gender is also a factor that should be given some attention. Gracia and Jenkins (2003) find that there is a significant difference in the performance in favor of female students over male students. Van Ness, Van Ness and Adkins (2000) find no significant relationship between grade in an introductory finance course and gender of students. Gammie, Paver, Gammie and Duncan (2003) find very little indication of performance differential between males and females throughout the degree program.

This study builds on the results of previous studies by examining the level of effect cognitive factors like pre-accounting knowledge, basic math skill, gender and core accounting have on accounting grade focusing on first year university students in Delta State, Nigeria. The study is the first of its kind involving students from universities in Delta State among the few (Jubril, 2011; Musa & Adamu, 2012; Aidoo-Buameh & Ayagre, 2013; Ibrahim & Usman, 2015) conducted in developing countries. Furthermore, the study makes a clear departure from previous study by examining the relationship between accounting grades and students' overall GPA. Do we expect students' performance in accounting to have a significant effect on the overall GPA and to what extent?

Objectives of the Study

The aim of this study is to empirically examine the extent to which proficiency in mathematics can enhance the performance of students in introductory accounting courses. Specifically, the study seeks to:

- examine the effect of math proficiency on accounting grade;
- examine the influence of accounting grade on students GPA;
- determine the effect of pre-university accounting knowledge on accounting grade;
- assess the influence of gender on accounting grade; and
- find out the difference in mean performance of accounting majors and non-accounting majors.

Research Hypotheses

The following hypotheses stated in the null form were subjected to empirical test:

- Ho: There is no significant statistical effect of students' Math proficiency on Accounting grade.
- Ho: There is no significant statistical effect of students' Accounting grade on overall GPA.
- Ho: Pre-university Accounting knowledge does not have a significant statistical effect on students' Accounting grade.
- Ho: There is no significant statistical effect of students' gender on Accounting grade.
- Ho: There is no significant statistical difference between mean performance of Accounting majors and non-Accounting majors.

Methodology

This study adopted the correlational type of descriptive survey research design. This design is appropriate so as to find the relationships between the variables in the study. The population of the study consists of students in the management and social sciences from three universities in Delta State, Nigeria. The number of students in the sample of this study is 342 students, representing the total student population taking introductory accounting course in the first year.

At the beginning of the first semester for the 2015/2016 session, the students were given Mathematics pre-test. The test items cover certain areas especially relevant to accounting. The Math pre-test instrument was administered unannounced by Mathematics lecturers on all the students. The instrument consists of 20 questions involving arithmetic,

percentages and proportions, algebra and statistics. After the end of the semester, each student’s grade on Introduction to Accounting and the overall grade point average was obtained with the help of the Accounting lecturers. Data from the survey was analyzed using Analysis of covariance (ANCOVA) to determine the effect of independent variables on the dependent variable at 5% level of significance.

Data Analysis and Interpretation

The results of the study are presented as follows:

Hypothesis One: There is no significant statistical effect of students’ math proficiency on accounting grade.

Table 01: ANCOVA on Pre-Math on Accounting Grade.

Dependent Variable: ACCTGRADE

Source	Type Sum of Squares	df	Mean Square	F	Sig
Corrected Model	53652.638 ^a	1	53652.638	213.995	.000
Intercept	20652.911	1	20652.911	82.375	.000
School Envmt	53652.638	1	53652.638	213.995	.000
Error	85244.415	340	250.719		
Total	1053708.000	342			
Corrected Total	138897.053	341			

R. Squared = .385 (Adjusted R. Squared = .384)

From the ANCOVA table, the co-efficient of determination or R² is .386. This shows that the pre-math test is able to explain that about 39 percent of the variations of the in accounting grades of students. Significant (F (1.340) = 213.995; p=0.000<05). Thus, the R- value is not due to chance. With these results, there is evidence to support the alternative hypothesis and state that mathematics is a predictor of students’ performance in first year accounting courses in the university.

Hypothesis Two: There is no significant statistical effect of students’ accounting grade on overall GPA.

Table 02: ANCOVA of Accounting Grade on GPA

Dependent Variable: GPA

Source	Type Sum of Squares	df	Mean Square	F	Sig
Corrected Model	505.853 ^a	1	505.853	963.810	.000
Intercept	21.438	1	21.438	40.847	.000
School Envmt	505.853	1	505.853	963.810	.000
Error	178.448	340	.525		
Total	2708.402	342			
Corrected Total	684.301	341			

R. Squared = .739 (Adjusted R. Squared = .739)

In testing hypothesis two, we subject the variables accounting grade and students GPA to test using the ANCOVA. From the table, students accounting grade has a positive and significant relationship with grade point average. The F-stat is 963.810 with a p-value of 0.000. We therefore have enough evidence to reject the null hypothesis and accept the alternative. This means that accounting grade influences students’ GPA by 73.9 percent as depicted by the co-efficient of determination.

Hypothesis Three: Pre-university accounting knowledge does not have a significant statistical effect on students’ accounting grade

Table 03: ANCOVA of Pre-University Accounting Knowledge on Accounting Grade
Dependent Variable: ACCTGRADE

Source	Type III Sum of Squares	df	Mean Square	F	Sig
Corrected Model	1629.904 ^a	1	1629.904	4.037	.045
Intercept	30565.559	1	30565.559	75.709	.000
School Envmt	1629.904	1	1629.904	4.037	.045
Error	137267.149	340	403.727		
Total	153708.000	342			
Corrected Total	138897.053	341			

R. Squared = .012 (Adjusted R. Squared = .009)

The data presented in Table 3 shows that a calculated F-value of 4.037 resulted in the difference in performances between the students with pre-university accounting knowledge and students who did not study accounting in the secondary school. This F-stat of 4.037 is statistically significant since the significant level of .045 is less than .05 of alpha significance level.

Hypothesis Four: There is no significant statistical effect of students' gender on accounting grade.

Table 04: ANCOVA of Gender on Accounting Grade.
Dependent Variable: ACCTGRADE

Source	Type III Sum of Squares	df	Mean Square	F	Sig
Corrected Model	2.808 ^a	1	2.808	.007	.934
Intercept	93230.756	1	93230.756	228.220	.000
School Envmt	2.808	1	2.808	.007	.934
Error	138894.244	340	408.512		
Total	1053708.000	342			
Corrected Total	138897.053	341			

R. Squared = .000 (Adjusted R. Squared = .003)

The data presented in Table 4 summarizes the outcome of the ANCOVA analysis on the differences in accounting grade between male and female students. The data shows that a calculated F-value of .007 resulted in statistically no significant difference in performance between the male and female students taking introductory accounting courses. This calculated F-value of .007 is statistically not significant since, the significant level of .934 is greater than the alpha significant level of .05, given 1 and 340 degrees of freedom.

Hypothesis Five: There is no significant statistical difference between mean performance of accounting majors and non-accounting majors.

Table 05: ANCOVA of accounting majors on Accounting Grade
Dependent Variable: ACCTGRADE

Source	Type III Sum of Squares	df	Mean Square	F	Sig
Corrected Model	941.264 ^a	1	941.284	2.320	.129
Intercept	631914.732	1	631914.732	1557.391	.000
School Envmt	941.284	1	941.284	2.320	.129
Error	137955.768	340	405.752		
Total	1053708.000	342			
Corrected Total	138897.053	341			

R. Squared = .007 (Adjusted R. Squared = .004)

The data presented in Table 5 shows that F-value of 2.320 resulted in statistically no significant difference in accounting grade of students in accounting department and students in other management sciences offering introductory accounting courses. This calculated F-value of 2.320 is statistically not significant since the significant level of .129 is greater than .05 of alpha significance level, given 1 and 340 degree of freedom. We therefore have enough evidence to retain the null hypothesis and state that there is no significant statistical difference between the mean performance of accounting majors and non-accounting majors.

Discussion of Findings

The main objective of this study was to empirically examine the extent to which proficiency in mathematics can enhance the performance of students in introductory accounting courses. To this end, the study obtained scores from the students on a mathematics test which was compared with the accounting grade and overall grade point average. The outcome of the data analysis shows the extent to which some of the chosen variables are able to predict performance of accounting students.

Math Proficiency and Accounting Grade

The findings of the study revealed a positive relationship between math proficiency and accounting grade. This implies that students' ability to understand and solve mathematical concepts enhances their accounting grade. This result meets our priori expectation. This finding agrees with Grover, Heck and Heck (2010) and Darwin (2011).

Accounting Grade and Students' GPA

The study also examined the effect of accounting performance on students' overall grade. The findings of the study show that that students' accounting grade has a significant effect on overall grade. The implication is that students who do well in introductory accounting courses have a better grade point average. The result also meets our priori expectation and conforms with findings of Guney (2009) and Dewan and Kaplan (2005).

Pre-university Accounting Knowledge and Accounting Grades.

The study also finds that there is a significant difference between the performance of students who have prior accounting knowledge and those who are taking accounting for the first time. In essence, it implies that students who have been taught financial accounting at the secondary school level are likely to perform better than those who are taking it for the first time. This finding is consistent with (Aidoo-Buameh & Ayagre, 2013 and Ibrahim & Usman, 2015). However, this finding did not conform to findings from Yunker, Yunker and Krull (2009).

Gender and Accounting Grade.

The study also examined whether there is any significant difference in the performance of male and female students taking introductory accounting courses. The study finds no significant difference in the accounting grades based on gender. This implies that female students can do as much as their male counterpart in introductory accounting courses hence gender is not a predictor of students' performance in Accounting. This position is consistent with Gracia and Jenkins (2003) but does not align with findings by Van Ness (2000).

Accounting Majors and Grade

The study also finds no significant difference in accounting grade of students in accounting department and students in other management sciences offering introductory accounting courses. This did not meet our priori expectation. The implication is that being in accounting department cannot be used as a predictor of superior performance in introductory accounting courses in the university. This finding conforms to Masky and Zheng (2008).

Conclusion and Recommendations

This study was carried out to examine how students' skills in mathematics can be used as a predictor of performance in first year introductory accounting courses. The novelty of our analysis comes from its disaggregation of exploratory variables into a number of variants based on the analysis of math pre-test and the end of semester examination of introduction to accounting in the schools surveyed. We have analyzed some simple descriptive statistics and we have used analysis of covariance (ANCOVA), to verify the relationship among these variables.

The study finds that math skills have a positive relationship with students' accounting grade. The study further discovers that students' performance in accounting can be used to predict the overall GPA. Findings of the study also reveal a significant difference between performance of students with pre-university accounting knowledge and those taking accounting for the first time. The study finds no significant difference in accounting grade in terms of gender and majoring in accounting. The study therefore concludes that mathematics skills facilitate students' understanding and professional success in accounting. The study recommends that credit pass in Principles of Accounting should be emphasized as entry requirement for admission in addition to Mathematics and English. Accounting career should also be promoted by Accounting educators and professional bodies to check the perception of accounting as a difficult subject which is partly due to negative attitude towards Mathematics and limited knowledge of Accounting as a discipline.

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