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Factors Influencing Academic Achievement in Quantitative Courses among Business Students of Private Higher Education Institutions

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Abstract
The objective of this research was to examine factors influencing academic achievement in quantitative courses among business students of private higher education institutions in South Africa. A sample of one hundred and nineteen students was used for the study, in which participants were selected using simple random sampling technique. Academic achievement results in business quantitative subjects were obtained from the students' statements of results. A structured questionnaire was used to collect data on students' level of agreement on the extent to which specific factors influence their academic achievements. The Keiser-Meyer-Olkin of 0.791 and the Cronbach's alpha of 0.742; with a factor analysis total declared variance of 49.3 percent were obtained from the questionnaire data used for the analysis. Five hypotheses were tested at 5 percent level of significance using descriptive statistics, ordinary least squares and stepwise regression techniques. The final results from stepwise regression indicate that lecturer competence, teaching methods and quality of learning materials have significant positive influence on undergraduate students' academic achievements in quantitative business courses, while mathematics aptitude and minimum admission criteria have no significant influence.
Keywords: business students, academic achievements, quantitative courses

1. Introduction

Suboptimal academic achievements in quantitative courses among numerous business students of private higher education institutions has remained as one of the major factors leading to student dropouts, low graduate point averages and reduced graduate throughput. From a labour market perspective, the demand for labour has become dynamically competitive such that higher academic achievements have become an effective tool for job security and poverty reduction (Okafor, 2008). Given the research evidence that poverty headcount is significantly high among uneducated, unskilled and semi-skilled segments of the population, it can be concluded that success in education is a necessary condition for poverty alleviation (Khan & Williams, 2006).

Following AL-Mutairi (2011), students' academic achievements are influenced by numerous factors applicable from one context to another. The broad dimensions of such factors include socioeconomic status; academic institutional arrangements and individual student attributes. For instance, Kang'ahi et al. (2012) found that teaching styles used by lecturers in delivering their lessons have a positive influence on learners' academic achievements.

1.1 Research Problem

Attainment of low educational achievements in quantitative courses among business students of private higher education institutions has led to student dropouts and low graduate point averages.

1.2 Research Question

What are the major factors influencing academic achievements in quantitative courses among business students of private higher education institutions?

1.3 Research Objective

The aim is to measure the influence of lecturer competence, teaching method, quality of learning materials, minimum admission criteria and mathematics aptitude on academic achievements in quantitative courses among business students of private higher education institutions.

1.4 Null Hypotheses

a) There is a significant positive correlation between lecturer competence and student academic achievement in quantitative courses
b) There is a significant positive correlation between teaching methods and student academic achievement in quantitative courses
c) There is a significant positive correlation between quality of learning materials and student academic achievement in quantitative courses
d) There is a significant positive correlation between minimum admission criteria and student academic achievement in quantitative courses

e) There is a significant negative relationship between poor mathematics aptitude and student academic achievements in quantitative courses

1.5 Significance of the Study

The empirical investigation of the major factors influencing students' academic achievements in education management remains an area of considerable interest. This research study helps to provide some relevant insights on measurable aspects of major factors influencing business students' academic achievements in quantitative courses. Furthermore, such knowledge will help academics in designing strategies that can improve learners' academic achievements.

1.6 Contribution of the Study

Various empirical studies on students' achievement have focused on different factors that influence learner's academic performance. This research study is unique in the way that it is the first research in which "quality of learning materials" is incorporated as one of the primary variables that influence business students' academic achievements in quantitative courses.

2. Literature Review

2.1 Student Academic Achievement

Diverse approaches are applied in analyzing students' academic achievements. While some studies use grade point averages in measuring academic achievement, this study follows the approach applied by Hijaz & Naqvi (2006) and Hake (1988); in which students' achievements are measured through end of semester overall course marks; computed as weighted averages of both formative and summative assessments for the respective semester.

2.2 Lecturer Competence

Akiri & Ugborugbo (2009) indicated that lecturer competence in teaching is a multidimensional construct in the sense that it measures a variety of interrelated aspects in teaching; which include subject matter expertise, lesson preparation, lesson presentation and effective communication. The influence of lecturer's teaching competence on students' learning outcomes is measured through students' academic achievements (Starr, 2002; Adediwura & Tayo, 2007; Adu & Olatundun, 2007; and Schacter & Thum, 2004). As such, competent teachers are expected to produce students with higher academic achievements, given that teachers effectively apply their teaching knowledge and skills (Akiri & Ugborugbo, 2009).

2.3 Teaching Methods

Teaching is an interactive process which encompasses participation by both students and the teacher. Adunola (2011) indicated that teaching methods used by the teacher should be best for the subject matter because if the method is not aligned with the specific outcome, then the result will be either poor or a failure. In certain cases, poor students' achievements are attributed to poor teaching styles (Kang'ahi et al., 2012). Since every individual student interprets and responds to questions in a unique way (Chang, 2010), alignment of lecturer's teaching methods with students' preferred learning styles helps to improve students' achievements (Zeeb, 2004). Ayeni (2011) maintained that teaching is a continuous process that involves bringing about desirable changes in learners. Bharadwaj & Pal (2011 indicate that teaching methods work effective if they suit learners' needs. Adunola (2011) further maintained that bias in selection of teaching methods by teachers in areas in which they possess exclusive monopoly knowledge should be avoided to improve students' results.

2.4 Quality of Learning Materials

Karemera (2003) found that students' achievements are significantly correlated with the quality of learning materials in respect of the manner in which curriculum is designed, linkage of topics, and content of concepts to be covered. Quality of curriculum structure can best be evaluated in terms of readability of texts, simplification of concepts to ensure understanding, content to be covered and chronological sequence of topics (Pozo & Stull, 2006). Silva et al. (2010) found that clear structuring and optimal integration of curriculum content is an essential element that helps students perform better.

2.5 Minimum Admission Criteria

Information on student admission has historically been used as a predictor of academic success at tertiary learning level (Silva et al., 2010). This view was also underscored by Choudhury & Das (2012) who found prerequisites as important elements in predicting students' academic achievements. Through designing and effective implementation of comprehensive minimum admission criteria, provision of proper guidance to prospective learners prior to enrolment can help students to achieve higher academic results (Mushtaq & Khan, 2012). Silva et al., (2010) reinforced that admission criteria are related with students' achievements during the formative assessment phase. McManus et al. (1998) elaborated that this may largely be attributed to internal self-motivation by the students. Successful achievements in the admission tests were found to be a good indicator of competence of the students, which would predict future achievements by the respective students (McManus et al., 1998).

2.6 Student Mathematical Aptitude

Individual mathematical backgrounds were cited in some studies to have significant differential effects on learners' academic achievements in quantitative courses (Choudhury & Das, 2012). Anecdotal evidence indicates that statistical and mathematical reasoning are integral curriculum components of most tertiary learning academic programmes. Choudhury & Das (2012) found that students with good mathematical aptitude achieve higher grades in quantitative courses and; have proficiency in performing numerical operations with speed and accuracy. The examination anxiety in quantitative subjects by most learners emanates primarily from lack of acquaintance in mathematical reasoning and logical thinking. Hence, acquisition of background knowledge (Bagamery, Lasik & Nixon, 2005) and understanding of the concepts was found to be the key driver of students 'success in quantitative subjects (Choudhury, Hubata & St. Louis, 1999). Thus, proper prerequisite subjects that build confidence in mathematical apprehension help to improve academic results (Choudhury & Das, 2012).

3. Methodology and Procedure

3.1ntroduction

This section describes the research design used, sample and sampling procedure, data collection, validity and reliability of the instrument; overview of data and the analytical techniques applied.

3.2 Research Design

The research was conducted based on descriptive survey and correlational study designs. A survey design was chosen to ensure collection of information which accurately describes the nature of existing conditions at a specific point in time (Kang'ahi et al., 2012).

3.2 Sample and Sampling Procedure

The population for the research survey was business students from private higher education institutions in Gauteng province, South Africa. Simple random sampling technique was applied to select one hundred and nineteen (n = 119) business students. The sample comprised of 77.3% female and 22.7% male students. Following the sampling procedure applied by Kang'ahi et al. (2012), the formula specified below was used for sampling the research participants:

$$n = \frac{\chi^2 N \hat{p}\left(1-\hat{p}\right)}{d^2\left(N-1\right)+\chi^2 \hat{p}\left(1-\hat{p}\right)} \qquad (1)$$

where :

n = required sample size

N = the given population

$\hat{p}$ = population proportion ; assumed to be 0.5

d = the degree of ccuracy set at 0.05

χ^2 = table value of chi - square (= 3.841 for 0.95 confidence interval)

3.3 Data Collection

The source of data for the study was primary data collected through use of two instruments; a structured questionnaire and students' statements of results which provided students' academic results of the quantitative courses they completed. The quantitative courses used are Business Statistics, Quantitative Techniques, Business Calculations and Quantitative Methods for Business. The questionnaire gathered data on students' level of agreement regarding the extent to which lecturer competence, teaching methods, quality of learning materials; minimum admission criteria and mathematical aptitude influence their academic achievements. Based on a five point Likert scale questionnaire, students indicated their level of agreement in the range: Strongly Disagree (SD=1), Disagree (D=2), Neutral (N=3), Agree (A=4) and Strongly Agree (SA=5).

3.4 Validity of Instruments

The structural validity of the measurement tools was examined using factor analysis; in which total correlation analysis of items was evaluated. Prior to conducting factor analysis, the Keiser-Meyer-Olkin (KMO = 0.79) analysis was undertaken to determine suitability of the size of sampling for factor analysis.

Table 1: KMO and Bartlett's Test

Keiser-Olkin-Meyer Measure of Sampling Adequacy		0.791
Bartlett's Test of Sphericity	Approx. Chi-Square	114.142
	df	10
	Sig.	0.000

The Bartlett's test of sphericity of the research items was found to be 114.142 ($p < 0.001$); which confirmed that factor analysis could be performed on the data. Additionally, the scale was observed to be one dimensional; as confirmed by the determinant of 0.372., indicating that the items were not an identity matrix. The total declared variance computed was 49.43% for the single factor scale (Table 2).

Table 2: Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	Percentage of Variance	Cumulative Percentage	Total	Percentage of Variance	Cumulative Percentage
1	2.471	49.427	49.427	2.471	49.427	49.427
2	.803	16.062	65.488			
3	.648	12.962	78.450			
4	.568	11.360	89.810			
5	.509	10.190	100.000			

Extraction Method: Principal Component Analysis.

3.5 Scale Reliability

To determine the degree to which the chosen set of items measured a single unidimensional latent construct, internal consistency of the questionnaire items was examined using the Cronbach's alpha (found to be 0.742), following the computation:

$$\alpha = \frac{K}{K-1}\left(1-\frac{\sum_{i=1}^{K}\sigma^2_{Y_i}}{\sigma^2_X}\right) \quad (2)$$

where:

K = number of items

σ^2_X = variance of observed total scores

$\sigma^2_{Y_i}$ = variance of item i for the current sample

Table 3: Reliability Statistics

Cronbach's Alpha	**No. of Items**
0.742	5

3.6 Data Analysis

The outcome variable was academic achievements in quantitative achievements computed as the final grades obtained from the overall assessment comprising of semester formative (coursework) and summative (final examination) assessments for the subjects in question. Data were analyzed using descriptive statistics to examine the profile of the sample. With a 95.2% response rate, hundred and nineteen (n = 119) questionnaires from the surveyed students were used; of which 77.3% were female and 22.7% were male. Students' performances measured by the academic results achieved in quantitative subjects were recorded in the following scale: from 119 students; 27.7% (n=33) - excellent; 39.5% (n=47) - high; 20.2% (n=24) – average; 10.9% (n=13) – low; and 1.7% (n = 2) – at risk. Assessment academic achievements by students were scaled and further categorized as follows: [75 – 100%] = excellent; [60 – 74%] = high; [50 – 59%] = average; [30 – 49%] = low; and [< 30%] = at-risk (Figure 1).

Figure 1: Quantitative Subjects Academic Achievements of Surveyed Students

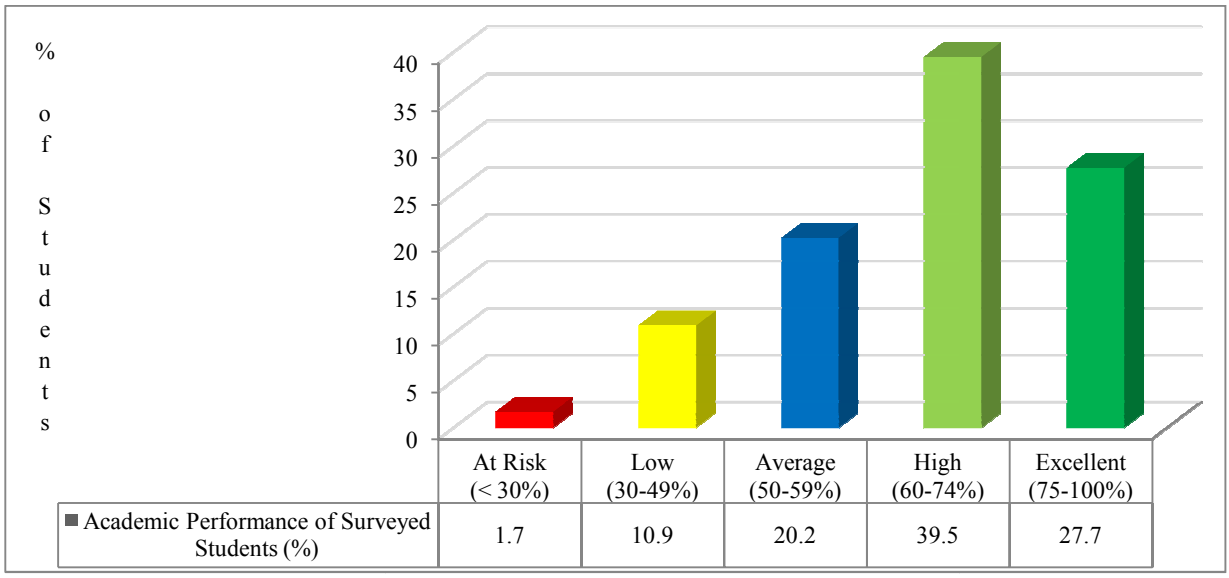

Table 4: Descriptive Statistics

Description of Item	Mean	SD	Skewness	Kurtosis
Gender-Based Academic Performances:				
▪ Female	3.74	1.004	-0.517	-0.474
▪ Male	4.04	1.055	-1.138	1.210
Overall Assessment Result	3.81	1.019	-0.628	-0.269
Factors Influencing Students Academic Achievements In Quantitative Subjects:				
▪ Teaching Methods	3.76	1.055	-0.834	0.280
▪ Lecturer Competence	3.67	1.026	-0.788	0.480
▪ Quality of Learning Materials	3.66	0.943	-0.491	-0.088
▪ Minimum Admission Criteria	3.97	1.016	-0.967	0.311
▪ Mathematics Aptitude	3.57	1.147	-0.470	-0.575

In respect of gender-based academic results, female students' achievements (mean = 3.74) was marginally lower compared to male students' achievements (mean = 4.04). This finding is consistent with previous studies by Lumsden & Scott (1987) who found that female students tend to perform well in essay related assessments while males perform better in quantitative subjects. Anderson & Rodway-Macri (2009) also found that male students often perform better in calculus and algebra, whereas female students do better in English. Overall, the mean score (= 3.81) of the surveyed students indicate that their achievements was high (60 – 74%). The mean values greater than 3.55 (mean > 3.55) of all the variables influencing students' achievements indicate that students, on average, agree that the factors employed in the study influence their academic achievements in quantitative courses. The skewness and kurtosis values of the set of constructs under study lie in the range -1 and +1; thus satisfying the normality condition.

3.7 Empirical Model and Estimation

The estimation of the impact of lecturer competence, teaching methods, quality of learning materials, minimum admission criteria and mathematics aptitude on students' academic achievements was conducted first by using ordinary least squares. Furthermore, to address the practical problem of model specification bias using the ordinary least squares technique, stepwise regression procedure was applied to capture the set of predictor variables that possess statistical significance in determining students' academic performance. The goal was to specify and estimate an appropriate education production function that best explains students' academic achievements in respect of lecturer competence, teaching methods, quality of learning materials, minimum admission criteria and mathematics aptitude; holding other factors constant. Based on this approach, the basic academic achievements function was specified in the form:

$$EP = \alpha + \beta_1 TM + \beta_2 LC + \beta_3 QLM + \beta_4 MAC + \beta_5 MA + u_t$$

$$\text{expectations}: \beta_1 > 0;\ \beta_2 > 0;\ \beta_3 > 0;\ \beta_4 > 0; \beta_5 < 0 \quad (3)$$

where EP is the student's education production (achievement) measured by overall assessment course result for a given semester, LC is the lecturer competence - subject matter expertise, TM represents teaching methods used by the lecturer, QLM represents quality of learning materials, MAC is the minimum admission criteria, MA is the student's mathematics aptitude; and u_t is the error term capturing the effect of other factors influencing students' academic achievements.

4. Results and Interpretation

4.1 Ordinary Least Squares Results

Model Summary

Overall, the estimated model indicated that about 32.7% (Adj. R^2 = 0.327) variation in students' academic achievements was influenced by teaching methods, lecturer competence; quality of learning materials, minimum admission criteria and mathematics aptitude. The model's F-test value (= 12.455; significant at 0.000 level) also indicated that the model was highly significant.

Table 6: Coefficients[a]

Model	Unstd-zed. Coeff.		Std-zed. Coeff.	T - Statistic	Sig.	90% Conf. Interval for B	
Adjusted R^2 = 0.327 Durbin-Watson = 1.794	B	Std. Error	Beta			L.B	U.B
(Constant)	0.735	0.414	-------	1.777	0.078	-0.084	1.554
Teaching Methods	0.249	0.081	0.257	3.066	0.003	0.088	0.409
Quality of Learning Materials	0.230	0.095	0.213	2.424	0.017	0.042	0.419
Lecturer Competence	0.280	0.088	0.282	3.165	0.002	0.105	0.455
Minimum Admission Criteria	0.194	0.090	0.193	2.151	0.034	0.015	0.372
Mathematics Aptitude	-0.141	0.083	-0.158	-1.697	0.093	-0.305	0.024

a. Dependent Variable: Assessment Result

Based on the unstandardized results, approximately 25% variation in student achievements was accounted for by teaching methods at 5% level of significance. Therefore, we cannot reject the null hypothesis that teaching methods positively affect student's achievement. Lecturer competence accounted for approximately 28% variation in student's achievement in quantitative subjects. Accordingly, we cannot reject the null hypothesis that lecturer competence has a statistically significant positive influence on students' attainments. Quality of learning materials has about 23% positive influence on students' academic performance; hence improvement in quality of learning materials leads to about 0.23 percent improvement in students' achievements.

Minimum admission criteria have nearly 19% positive influence on students' performance, but the t-value is insignificant. Therefore, the null hypothesis that minimum admission criteria have a significant effect on students' achievements can be rejected. Poor mathematics aptitude had approximately 14% negative effect on students' achievements in quantitative subjects; but the t-value is also insignificant. Therefore, the null hypothesis that poor mathematics aptitude has a significant negative effect on students' achievements in quantitative courses can be rejected.

The standard errors for minimum admission criteria and mathematics aptitude are greater than half the beta values of the respective coefficients (S.E > β/2); indicating that minimum admission criteria and mathematics aptitude do not have statistical significance in influencing students' achievements in quantitative subjects. To address this practical consideration, stepwise regression without interaction effects was estimated to explore the constructs that yield the best fit with students' academic achievements in quantitative subjects (Table 7).

4.2 Stepwise Regression Results

Table 7: Models Results[a]

Variable	Model_1	Model_2	Model_3
Lecturer Competence	.438* [5.321] (.082)	.344* [4.170] (.082)	.285* [3.420] (.083)
Teaching Methods	---	.296* [3.697] (.080)	.234* [2.880] (.081)
Quality of Learning Materials	---	---	.247* [2.675] (.092)
	R^2 = .195 Adj. R^2 = 0.188 $F_{(.05;\ 1)}$ = 28.312	R^2 = .280 Adj. R^2 = 0.267 $F_{(.05;\ 2)}$ = 22.522	R^2 = .322 Adj. R^2 = 0.304 $F_{(.05;\ 3)}$ = 18.196 DW statistic = 1.725

a. Dependent Variable: Assessment Result

Note: * significant at 5%; [values] represent t-statistics; and (values) represent standard errors

Based on model_3 stepwise regression results, about 30.4% overall variation in students' academic achievements was accounted for by lecturer competence, teaching methods and quality of learning materials. The F-test value (=18.196) shows that the model was statistically significant at 5% level. All variables specified to have statistically significant positive impacts on students' achievements have the right signs. Lecturer competence, teaching methods and quality of learning materials accounted for approximately 28.5%, 23.4% and 24.7% variation in students' academic achievements; respectively. Thus, the null hypotheses that lecturer competence, teaching methods and quality of learning materials have significant positive effects on students' academic achievements in quantitative courses cannot be rejected. Minimum admission criteria and mathematics aptitude variables have no statistical significance; hence the variables were dropped off the model through stepwise regression.

5. Conclusion and Recommendations for Further Studies

5.1 Conclusion

This study was conducted to explore the major factors that influence business students' academic achievement in quantitative courses. The study focused on business students from private higher education institutions within Gauteng province. Five hypotheses were used in the study to examine the effects of the explored constructs on students' academic achievements in quantitative subjects. Three hypotheses were not rejected while two hypotheses were rejected. The study found that lecturer competence, teaching methods and quality of learning materials are the primary factors that significantly influence students' achievements in quantitative subjects.

Generally, competence in imparting knowledge to learners through use of effective teaching methods; coupled with high quality learning materials are significant variables of the education production function. The findings are consistent with the previous studies by Schacter & Thum (2004) and Starr (2002) which found high correlations between teacher's competence and students' academic achievements. In this respect, it can be deduced that training teachers to effectively improve their teaching competence; combined with use of quality learning materials significantly improves students' academic achievements. Additionally, making classroom interactions more interesting can also help to arouse interest of students to academic excellence; thus help them improve graduate point average of the overall qualification.

The coefficient signs of minimum admission criteria and mathematics aptitude were as expected; but they were not statistically significant. This implies that the reported level of students' academic achievements may not be a reflection of the minimum admission criteria and poor mathematics aptitude. Including such variables in the estimation of students' academic achievements function in quantitative subjects may therefore bias the impacts of lecturer competence, teaching methods and quality of learning materials.

5.2 Recommendations for Further Studies

Based on the above conclusions, the overall variation (Adj. R^2 = 0.302) in students' academic achievements accounted for by lecturer competence, teaching methods and quality of learning materials was low. This can be improved by incorporating more factors from academic institutional, individual student and socioeconomic dimensions. Moreover, the sample used was relatively small (n = 119) in comparison to other previous similar studies. Therefore, undertaking this research study further using a larger sample size that includes participants from numerous academic institutions would help improve results of the study.

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