Relationship between Entry Qualification and Academic Performance in Undergraduate Science Courses at the University of Nairobi, Kenya

Dr. Lydiah Wambugu and Prof. Adenike Emeke

ABSTRACT

A number of institutions admit students based on their entry qualification with the scenario of admitting the more qualified students. This is premised on the fact that since learning is a cumulative process, a student admitted with higher entry qualification is expected to be well prepared for the course content than one admitted with lower qualification. In this paper, the researchers explored the relationship between entry qualification and academic performance by comparing the performance of students in the Bachelor of Education (Science) on-campus mode of learning relative to those enrolled in the open and distance learning (ODL) mode at the University of Nairobi. On-campus students are admitted with higher entry qualification than their distance learning counterparts yet the students are taken through the same course content and sit for equivalent examinations. Our data were based on externally moderated examination marks from a sample of 131 on-campus students and 50 distance learning students. Using Pearson Product Moment correlation and Regression, results indicate that there was a significant positive correlation between entry qualification and academic performance in Chemistry and Biology. In Physics, there was almost no linear relationship between entry qualification and academic performance. Results also indicate that the variation explained by entry qualification is below 50.0% and therefore entry qualification is not the best variable to predict academic performance though this parameter should not be ignored in admission exercises. The researchers recommend that other factors for instance working experience, age and past academic performances other than entry qualification should form part of admission criteria.

Key words*: Open and Distance learning, on-campus learning, entry qualification, academic performance*

1. Introduction

A university is as good as the quality of her graduates. It is common practice that the quality of graduates is measured using academic performance. The quality of students a university attracts is one variable that contributes to quality graduates. One indicator of a quality student is the entry qualification. However, entry qualification may be said to be one among many other factors that influences academic performance. A number of studies have been carried out to identify and analyze the numerous factors that affect academic performance. Ali (1983) identified student factors (attitude, individual differences, physical health and readiness and expectations); home, cultural and parental factors; and institutional factors which include school

type , population, discipline, personnel interactions, admission and examination or evaluation policies. Flowers (1966) identified teacher/instructional/curriculum factors (teacher attitude to students, types of classroom control, curriculum content, teacher adequacy in professional qualification and preparation, instructional contents and presentation, use of relevant teaching aids etc).

In Kenya, admission into a university undergraduate programme is based on the performance at the Kenya Certificate of Secondary Education (KCSE) examination. Normally, a mean grade of C+ and above qualifies a student to join the university. In the recent past, the number of people seeking university education has been on the rise globally. This has forced some universities to become dual modes offering both on-campus and open and distance modes of learning. University of Nairobi is among such universities in Kenya.

At the University of Nairobi, admission into the on-campus and ODL programs require different entry grades. "Distance education students comprise of people mostly mature who might have qualified for university entry by scoring the grade C+ but were locked out by the bed capacity criteria" (University of Nairobi, 2008, p.9). Others may have scored lower than C+ in secondary school, but a pass in a professional course allows them to study for a degree by distance mode. On the other hand, the on-campus students mainly comprise of students who meet the admission criteria set by the Joint Admissions Board of Kenya and are often among the top performers in KCSE. A number of studies on the relationship between entry qualification and academic performance indicate that students with high entry qualification often perform better than those with low entry qualifications (Adedeji, 2001; Aderson, Benjamin and Fuss, 1994; Alias and Zain, 2006; Zezekwa and Mudavanhu (2011).

2. Description of the Bachelor of Education (Science) Program

The Bachelor of Education (Science) degree program is meant to equip potential teachers with the right knowledge, attitudes as well as pedagogical skills for the purposes of guiding students in the learning process within the formal school system. A candidate registering for the Bachelor of Education (Science) degree takes courses in Education (i.e. Educational Communication and

Technology, Educational Administration and Planning, Educational Foundations, Psychology, Physical Education and Sport) combined with two teaching subjects from the following disciplines: Physics, Geography, Mathematics, Biology and Chemistry. The course is taught and evaluated in terms of unit courses. This study confined itself to students registered in the subjects with practical orientation namely: Chemistry, Biology and Physics.

Bachelor of Education (Science) – on campus students are mainly admitted through the Joint Admissions Board. A few are admitted through the parallel mode where they are integrated together with the JAB students. They are on-campus throughout every semester during their course of study interacting with the lecturers and other students. A semester comprises 45 contact hours covered in a period of 15 weeks and an additional 2 weeks for examinations. The course is structured in two (2) semesters per academic year and extends over a period not exceeding eight semesters. The mode of learning is face to face lectures, tutorials and laboratory work. A student is allowed to register for a minimum of 55 units.

Bachelor of Education (Science) degree by distance learning mode is also referred to as External Degree Program (EDP). The following are admissible into this program: A holder of Kenya Certificate of Secondary Education (KCSE) C+ with a minimum performance grade of C+ in Physics, Chemistry, Biology, Mathematics, Geography or Computer Science; a holder of Kenya Advance Certificate of Education (KACE) with two principal passes or equivalent; a holder of professional qualifications such as Diploma in Education or Teachers Certificate (S1) with C plain in the KCSE; a trained primary school teacher of P1 grade with C plain in the KCSE; and a Holder of other degrees from a recognized university.

The ODE program is divided into 6 semesters of 24 weeks each. The students take their course by the distance learning mode. The main medium of instruction is print and electronic correspondence materials. The course content for each subject is provided in self-instructional study modules. The module covers content equivalent to forty five one hour lectures. In addition, there are supplementary modes of delivery in the form of face-to-face teaching and practical sessions during the school holidays in April, August and December. This session covers fifteen

hours per semester. In every science subject (Chemistry, Biology and Physics), the subject specialists have identified skills and concepts that the students should develop during the course of study and have categorized practical work into three: Those that can be carried out at home or home environment of the student assisted by a science kit (Audio/Video tapes or CD are used for guidance); Experiments that could be carried out in well equipped laboratories in adjunct local institutions; and Experiments that can only be carried out at the university under the supervision of the tutor or lecturer during residential or face-to-face sessions. A student is allowed to register for a minimum of 54 units.

At the inferential level, there are a number of assumptions that can be made from these observations. It might be argued that since EDP students most likely had a score lower than C+ at high school, then they would score at a lower level at the university than their on-campus counterparts who had a higher score at high school. The second assumption would be that those with lower grades study on their own using self-instructional materials while those with higher grades have access to learning resources and learn under renowned Professors. Newman-Ford, Lloyd and Thomas (2009) noted that mature students tend to be admitted into their programs with distinctively lower educational attainment than the younger students. They therefore lack basic skills required for effective study and are also impaired by age-related deficits.

On the other hand, it might be argued that distance study students are more mature and more motivated, focused and goal oriented than the youthful on-campus students. In support of this Richardson (1994) pointed that when compared to the younger students, the academic performance of mature students is as good, if not better than that of young students. This is because '...mature students were rather more likely than younger students to adopt a deep approach or a meaning orientation towards their academic work, and ... were conversely less likely than younger students to adopt a surface approach or a reproducing orientation' (Richardson, 1994, p.5). In this study, there were two groups of students: mature ones with low entry grades versus youthful ones with higher entry qualification. The aim is to establish whether entry qualification can predict academic performance of the on-campus and distance learning mode science students at the university level using the University of Nairobi as a case study. .

3. Empirical Studies

Mutonga (2011) conducted a comparative study in Kenya of academic performance of students in the Registered Community Health Nurse Upgrading Program under face-to-face and Distance learning modes of instructional delivery. The study found out that there was a statistically significant difference ($p=0.000$; $p< 0.05$) between the performance of distance education and face-to-face students. Face-to-face students had significantly higher scores than distance study students. The study also found that there was a relationship between student's performance and their entry qualification. The better the O-level grades attained, the higher the licensing examination mean score.

Lizzio, Wilson and Simons (2002) conducted a study to determine the influence of Tertiary Entrance (TE) score in the students' years 11 and 12 of their secondary education on academic outcomes at the University of Griffith, Australia. A sample of 64 students was drawn from the Faculty of Business Studies. Findings showed that TE score was positively but weakly ($\rho = .39$) associated with a high Grade Point Average (GPA) score measured on a scale of 1 (low) to 7 (high). The weak relationship could be an indication that past performance is not a determinant of present performance; probably due to cognitive development which is associated with maturity. In contrast, Adedeji (2001) found a strong positive correlation ($\rho = .85$) between students' admission scores and their undergraduate performance at the Faculty of Technology, University of Ibadan. A study by Aderson, Benjamin and Fuss (1994) also found out that student's who received better scores (between 777-999) in high school tended to have a Grade Point Average score of above 3.0/4.0 at the university.

Other studies by Alias and Zain (2006); Mudavanhu and Zezekwa (2011) show that there is a positive relationship between entry qualification and academic performance. However, Olle-Momoh (u.d) who investigated the relationship between students' entry grade and academic achievement at the Kwara State College of Education, Ilorin found that there was no statistically significant relationship between the students' entry grade and their cumulative academic achievement in science and mathematics courses (r - 0.08, $p > 0.01$). The researcher therefore concluded that the achievement of the students at the university depends on their experiences

under the influence of the college instructional environment which should motivate learners for effective learning.

Going by some of the quoted researches (e.g Adedeji (2001, Zezekwa (2011) it can be argued that the B.Ed (Science) on-campus students who join the University of Nairobi with high mean grades (C+ and above) at KCSE level are likely to perform higher than the distance study students whose entry qualification is in most cases lower than C+. However, with studies such as those of Lizzio, Wilson and Simons (2002) and Bowen & Hobson, (1975), the tendency is to conclude that higher entry qualification score is not necessarily an indication of better performance in a course of study. It is such contradictory results that motivated the researchers to carry out this study.

4. Research Methodology

The design of this article was correlational survey where a simple random sampling was used to select 50 ODE and 131 on-campus students from a population of 58 ODE and 195 on-campus third year B.Ed (Science) students respectively. Document analysis guide was used to collect entry grade and externally moderated marks for the sampled students.

5. Data Analyses and Results

The results of the data analyses are divided into three parts, demography, entry qualification and finally relationships between entry qualification and academic performance.

5.1 Demography

Under demography; gender and teaching subjects are discussed.

Both males and females have equal chance of being selected to join the Bachelor of Education (Science) program as long as they have met the minimum qualification set by the university. However, Table 1 shows that while the Distance learning mode had more females than males, the on-campus mode had more males than females. A probable explanation to these would be the flexibility in the ODE mode that allows women to double up as students and mothers. The statistics also can be a pointer that males performed well in sciences in KCSE examination than

females. In fact, Office of Technology Assessment (OTA) (1985) suggested that at every level after high school, fewer women than men advanced to the next stage of training in sciences

Table 1: Gender distribution of the B.Ed (Science) students

Distance Study students			**On-campus students**	
Gender	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Male	22	44.0	93	71.0
Female	28	56.0	38	29.0
TOTAL	**50**	**100.0**	**131**	**100.0**

A cross tabulation of gender and teaching subjects, Table 2, shows that in the ODE mode, Biology was more popular while Physics was more popular among the on-campus mode. Benbow and Stanley (1982) suggested that women and girls often were weak in mathematics, guaranteeing that they either would be frightened of a mathematical science or would fail early on.

Table 2: Cross tabulation of gender and the students' teaching subjects

	Distance study students			**On-campus students**		
Teaching subject	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Chemistry	4 (40.0%)	6 (60.0%)	10	22 (61.1%)	14 (38.9%)	36
Biology	13 (46.4%)	15 (53.6%)	28	19 (55.9%)	15 (44.1%)	34
Physics	5 (41.7%)	7 (58.3%)	12	52 (85.2%)	9 (14.8%)	61
TOTAL	**22**	**28**	**50**	**93**	**38**	**131**

5.2 Entry Qualification of the B. Ed (Science) Students

Table 3 shows that the entry qualification for the on-campus students is by far higher than for the ODE students. The bulk of the on-campus students (96.9%) had a mean grade of B and above at KCSE while 74.0% of the ODE had a mean grade of C+ and below.

This finding is a true reflection of the admission criteria into the two modes of learning. As had been stated earlier, the on-campus students are among the top performers at KCSE while ODE attracts students who may have met the minimum entry grade of C+ but were locked out of university admission by the bed capacity criteria. Others scored below C+ but previous training in Education either as a Primary or Secondary school teacher qualified them for entry into the university.

Table 3: Entry qualification of the B.Ed (Science) students

	Distance study students		On-campus students	
Entry qualification	**Frequency**	**Percentage**	**Frequency**	**Percentage**
A	0	0.0	5	3.8
A-	0	0.0	43	32.8
B+	0	0.0	69	52.7
B	3	6.0	10	7.6
B-	10	20.0	1	0.8
C+	20	40.0	3	2.3
C	10	20.0	0	0.0
C-	7	14.0	0	0.0
TOTAL	**50**	**100.0**	**131**	**100.0**

The researchers weighted entry qualification in terms of grade points following the KCSE grading system. This translated grade A to 12 points, A- to 11 points, B+ to 10 points, B to 9, B- became 8 points, C+ became 7 points, C became 6, and C- came to 5 points respectively. Table 4 shows that the average entry qualification for the ODE students was 6.82 (≈ 7) points which translated to Grade C+ while for the on-campus was 10.26 (≈ 10) points which translated to B+.

Table 4: Output for the Mean entry qualification

	Mode of learning	N	Mean entry qualification	Std. deviation	Std. Error Mean
Mean Entry Qualification	Distance learning	50	6.82	1.063	.150
	On-campus learning	131	10.26	.819	.072

5.3 Relationship between students' entry qualification (EQ) and academic performance

The researchers first calculated the mean academic performance in the three sciences. Table 5 shows that the mean score performance for the on-campus students was higher than for the ODE students in the three Science subjects as shown by 59.47 against 51.43 in Chemistry, 58.61 against 48.31 in Biology and 54.22 against 54.04 in Physics. This may be explained by the high mean entry qualification of the on-campus students as compared to the ODE students.

Table 5: Mean entry qualification and academic performance

Mode	EQ	Chemistry			Biology			Physics		
		N	M	SD	N	M	SD	N	M	SD
ODE	6.82	10	51.73	4.89	28	48.31	4.36	12	54.04	5.90
On-campus	10.26	36	59.47	4.90	34	58.61	5.01	61	54.22	4.71

A correlation between entry qualification and academic performance (Table 6) shows a significant positive relationship. The on-campus students who had higher grade points performed significantly higher than the ODE students in Chemistry r=.47, p<.01; in Biology r=.66, p<.01. However, in Physics this relationship is negative and not significant (r=-.05, p>.05) implying that though the ODE students had lower entry qualification marks than the on-campus students, the difference in their academic performance was not significant. This observation in Physics is also supported by the regression model, Table 9a where R^2 =.003 suggesting that in Physics, the variation in academic performance between ODE and on-campus students accounted for by entry

qualification is only .3% leaving a large amount of variance still unexplained. Other factors other than entry qualification account for the difference in academic performance.

Table 6: Relationship between entry qualification and academic performance

		Entry qualification grade points	Overall chemistry performance	Overall Biology performance	Overall Physics performance	Overall TP performance
Entry Qualification	Pearson correlation	1	.47**	.66**	-.05	.15*
	Sig. (2-tailed)	.	.001	.000	.652	.040
	N	181	46	62	73	181

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

The researchers further determined whether entry qualification can predict academic performance using regression. The model was expressed as follows: if academic performance (Y) is related to entry qualification (X_1), then:

$$Y = a + b_1 X_1 + e$$

Where: a = constant, b_1 is the regression coefficient (slope) for entry qualification.

e is the error value

The following are the output tables:

Regression Model for performance in Chemistry using students' entry qualification

Table 7a shows that there is a positive relationship, r=.47 between entry qualification and chemistry performance. The value of R^2=.225 shows that in this model, entry qualification accounts for 22.5% of the variation in chemistry performance. This variation is small leaving a large amount of variance still unexplained.

Table 7a: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.474(a)	.225	.207	5.17935

a. Predictors: (Constant), entry qualification grade points

Table 7b tests whether the regression model results in significantly better prediction of chemistry performance than if the researcher had used the mean value of the grade points. From the F value of 12.759 which is significant at $p<.05$, the regression model overall predicts chemistry performance significantly well, $F_{(1, 44)} = 12.76$, $p<.05$

Table 7b: ANOVA Table

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	342.277	1	342.277	12.76	.001(a)
	Residual	1180.329	44	26.826		
	Total	1522.605	45			

a. Predictors: (Constant), entry qualification grade points
b. Dependent Variable: overall performance in Chemistry

Table 7c: Table of Coefficients

		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
Model		B	Std. Error	Beta		
1	(Constant)	40.934	4.779		8.566	.000
	Entry qualification grade points	1.786	.500	.474	3.572	.001

a. Dependent Variable: overall performance in chemistry

Table 7c shows that even if the university disregards the entry qualification of a student during admission (X=0), the model predicts that a student would score 40.9% in chemistry. Such a student would be deemed to have passed in the Chemistry as per the university grading criteria. When the entry qualification is increased by 1 unit, then the model predicts that the score would increase by 1.79 marks. Therefore;

Performance in chemistry = 40.9+ (1.79 x entry qualification)

Finally, the t-value which is significant at $p<.05$ concludes this model by showing that entry qualification makes a significant contribution to predicting chemistry performance.

Regression Model for performance in Biology using students' entry qualification

Table 4.8a shows a positive relationship (r=.661) between entry qualification and overall performance in Biology. In addition, the Table shows that the variation in performance that is explained by entry qualification = 43.7%. This means that entry qualification is a fairly good predictor (R^2=.437) of Biology performance even though the variation explained by entry qualification is less than 50%.

Table 8a: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.661(a)	.437	.428	5.27669

a. Predictors: (Constant), entry qualification grade points

Table 8b shows that the regression model significantly predicts Biology performance; $F_{(1, 60)}$ =46.6, p<.05

Table 8b: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1297.495	1	1297.495	46.600	.000(a)
	Residual	1670.607	60	27.843		
	Total	2968.101	61			

a. Predictors: (Constant), entry qualifications grade points
b. Dependent Variable: overall performance in biology

Table 8c predicts that if the university admitted a student without considering his/her entry qualification, such a student would score 34.7% in Biology. If the entry qualification is increased by 1 unit, then the model predicts that a student score would increase by 2.23 marks.

Therefore: Performance in Biology = 34.7+ (2.23 x entry qualification).

This model concludes by showing that entry qualification makes a significant contribution to predicting Biology performance, $t_{(1, 60)}$ =12.01, p<.05.

Table 8c: Table of Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	34.746	2.893		12.01	.000
	Entry qualification grade points	2.231	.327	.661	6.83	.000

a. Dependent Variable: overall performance in Biology

Regression Model for performance in Physics using students' entry qualification

Table 9a shows that there is almost no linear relationship between entry qualification and Physics performance (r=.054). This implies that performance in Physics is independent of the entry qualification. In Physics, R^2=.003 meaning that the variation in Physics performance accounted for by entry qualification is only .3%. There are therefore other factors other than entry qualification that determine the performance in Physics.

Table 9a: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.054(a)	.003	-.011	4.90843

a. Predictors: (Constant), entry qualification grade points

Table 9b shows that this model does not significantly predict Physics performance; F =.205, p>.05. This is also supported by Table 9c which shows that when the entry qualification is increased by 1 unit, Physics performance is likely to drop by .180

Table 9b: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.948	1	4.948	.205	.652(a)
	Residual	1710.583	71	24.093		
	Total	1715.532	72			

a. Predictors: (Constant), entry qualification grade points
b. Dependent Variable: overall performance in Physics

Table 9c: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	55.961	3.944		14.190	.000
	entry qualification grade points	-.180	.397	-.054	-.453	.652

a. Dependent Variable: overall performance in Physics

6. Discussion and Conclusion

In this paper, we have attempted to determine whether there is a relationship between entry qualification and academic performance. The results show that in general, there is a statistically significant correlation between entry qualification and academic performance in Chemistry and Biology whereas in Physics, there is almost no linear relationship. Nevertheless the correlations cannot be said to be very strong. We have also found that the amount of academic performance explained by entry qualification is quite low as shown by 22.5% in Chemistry, 43.7% in Biology and .3% in Physics. In conclusion, the finding from this study is similar to others which indicate that there is a correlation between entry qualification and academic performance. However, this is not the only variable that can predict performance. In other words, entry qualification alone may not be a good predictor of undergraduate performance. In cases where applicants have less than excellent mean grades, the contributions of other criteria such as age, work experience, past academic performances and participation in co-curricular activities at secondary level could be

explored before an outright acceptance or rejection of students. Future studies could explore the relationship between a combination of these factors and performance in Physics.

REFERENCES

Adedeji, O. B. (2001). *A study of the Relationship between Students UME Results and their Undergraduate Performance,* (unpublished Master's Thesis). University of Ibadan, Nigeria

Aderson, G., Benjamin, D. & Fuss, M. (1994). The Determinant of Success in University Introductory Economics Courses. *Journal of Economic Education*, *Vol. 25*, No,2, pp. 99-120

Alias, M. & Zain, A.F.M., (2006). Relationship between entry qualification and performance in graduate education. *International Education Journal, Vol. 7, No. 3*, pp. 371-378

Ali, A. (1983). Attitudes of Nigerian Secondary School Students Towards School and their Academic Achievement in Science. Journal of Nigerian Educational. *Research Association, 3(2); 11-17,*

Benbow, C. P. & Stanley, J. (1982). Intellectually talented boys and girls: Educational Profiles. Gifted Child Quarterly 26, pp. 82-88

Flowers, C.E. (1966). Effects of an Arbitary Accelerated Group Placement on the Tested Academic Achievement of Educationally Disadvantaged' Students. Teacher Education College, Columbia University

Lizzio, A., Wilson K., & Simons, R. (2002). University Students Perceptions of the Learning Environment and Academic Outcomes: Implications for Theory and Practice. *Studies in Higher Education, Vol. 27*, No. 1, pp 27-52

Mutonga, J. W. (2011). *A Comparative Study of Student Academic Performance under Face-to-face and Distance Learning Mode of Instructional Delivery: A Case of the Registered Community Health Nurse Upgrading Program, Kenya.* (Unpublished Master's Project). University of Nairobi, Kenya

Newman-Ford, L., Lloyd, S., & Thomas, S. (2009). An investigation in the effects of gender, prior academic achievement, place of residence, age and attendance on first-year undergraduate attainment. J*ournal of Applied Research in Higher Education, 1(1),* 13 – 28

OTA (Office of Technology Assessment) (1985). Demographic trends and the Scientific and Engineering workforce- a Technical Memorandum, Doc Y3.T22/2:11D39. Washington D.C. Government Printing Office

Richardson, J. T. E. (1994). Mature students in higher education: Academic performance and intellectual ability. *Higher Education, 28(3),* 373 – 386

Zezekwa, N., & Mudavanhu, Y., (2011). The effects of entry qualification on students' performance in university science courses: The case of Bindura University of Science Education. *African Journal of Education and Technology. Vol. 1, No. 3*, pp. 32-39

Momoh-Olle, J.Y., (u.d). The relationship between entry grades and academic achievement at the Kwara State College of Education Ilorin. Retrieved from www.westga.edu-distance/ojdla/winter44/olle

University of Nairobi. (2008). *Information Booklet.* Nairobi: UON