Predicting Academic Performance in Undergraduate Online Degree Programs from Previous Academic Achievement in Pakistan

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Abstract

Entry qualification scores and earlier academic achievements are the quality attributes of learners. Studying those in correlation and as predictor of their academic achievement in undergraduate and postgraduate levels is valuable for students, universities and academicians. The present research was undertaken with the purpose to determine predictions from previous examination scores about students' performance at university level. Predictive correlation method was used to explore Pearson r and multiple regressions analysis to predict CGPA of students based on their previous cumulative examination scores. By program analysis of various two years undergraduate and four years BS (hons) programs was carried out on data of 2008 and 1025 graduates, respectively. Positive, significant correlations were observed in previous cumulative examination scores and entry qualification scores with CGPA of learners. Separate analyses were made for low, average and high achievers. Significant predictions for all programs of different durations were made that have certain implications for university administration, academicians, and researchers around the world. Recommendations based on findings and contextual discussion points have been made for further research.

Keywords: previous cumulative examination scores; entry qualification scores; academic achievement; CGPA; low, average and high achievers.

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Introduction

The quality of learners' outcomes becomes the repute of educational institutions which serves as one of their quality indicators. That is why the educational institutions and researchers always remain in search of variables that may contribute and augment students' learning outcomes.

Many variables have been studied as predictors of students' performances at higher education institutions such as academic self-efficacy, students' motivation, socio-economic status (Borghans, Golsteyn, Heckman, & Humphries, 2016), core-self evaluations, mastery approach achievement, goal orientation (Athar & Jamal, 2017), attendance, personality, Intelligence Quotient (IQ) (Huang, 2011; Rashid, 2011), study habits, attitude and aptitude, teachers' academic and professional qualifications, and other demographic variables of students and teachers (Roy & Chadalawada, 2014; Sahin, Cekin & Ozcelik, 2018; Zekarias, Aba-Milki, & Mikre 2015). Most persistent and precisely quantified variable that keeps a track record of students' academic progress remains their previous academic performance. Academic qualification scores of students are often studied in association with their performance at higher education level and also as its predictors.

Several studies, across the world, have used previous academic scores of students to predict the Cumulative Grade Point Average (CGPA) at the university level. Studies from Ethiopia report significant correlation between prior academic scores and university scores. For example, Olani (2009) studied prior academic achievement scores of students and predicted 17% of the first semester CGPA of 3301 students at university level in Ethiopia. The prior academic achievement scores included high school CGPA, entrance test scores, and aptitude test scores.

Another study conducted by Zekarias, Aba-Milki, and Mikre (2015) in Ethiopia examined the predictions of first semester university grades of 345 sample students from their previous grades and entry examination scores. They found out that previous grades were showing strong positive significant correlation (r= 0.653) with first semester university grades and university entry exam scores were also positive and significantly correlated (r= 0.265) with university score. Combining the two scores i.e. previous grades and entry exam scores the predictions of university first semester scores was adjusted R^2 0.431.

Similarly, Sahin, Cekin and Ozcelik (2018) conducted a study on 127 physical education and sports students at a university in Turkey. They found positive significant correlation between high school grades

and university first year CGPA and significant contributions of high school grades in predicting university CGPA.

Cerdeira, Nunes, Reis, and Seabra (2018) in Portuguese analyzed the predictions of students' success in higher education based on secondary school scores and national examinations. They found that the grades of secondary schools were a better predictor of bachelor degrees' final average score than the national examination scores.

In architecture programs, using machine learning modeling techniques, Aluko, Adenuga, Kukoyi, Soyingbe, and Oyedeji (2016) observed significant impact of the previous grades obtained in mathematics subject on the academic success of 102 undergraduate engineering students in Nigeria.

Roy and Chadalawada (2014) found significant correlations between the previous academic scores and university scores of 147 students of a medical university in India. They observed a fair prediction of 45% in university performance but other variables were also included in the regression analysis such as attendance and place of residence.

There is a debate in the literature on the value of standardized tests in predicting future academic performance. There are numerous advocate studies of standardized tests around the world, some recent of them are (Kuncel & Hezlett, 2007; Meylani, Bitter, & Castaneda, 2014; Sulphey, Al-Kahtani, & Syed, 2018). However, in the literature voluminous studies are available that do not predict significant contributions in students' performance from standardized tests and term them as measuring different skill sets (such as Davison & Dustova, 2017; Wittmann, 2003).

In the context of Pakistan, there are studies that show predictions of previous academic scores for university performance. Abdullah and Mirza (2018) studied the correlations and predictions of cumulative scores and university CGPA in different two years' master degree programs and found significant correlation values and predictions. Multiple other studies have been conducted in Pakistan that analyzed various predictors of students' achievement (see Athar & Jamal, 2017; Hayat, ul-Haq, Sajjad, Abbas, & Raza, 2018; Nisar, Mahmood, & Dogar, 2017; Sarwar, Bashir, & Aslam, 2010). Asif, Merceron and Pathan (2015) using data mining technique analyzed 347 undergraduate students in four cohort groups and found significant correlations between their pre-university grades and performances in different subjects at a Pakistani university.

Pakistan has a huge proportion of youth in its population and issues such as demand and supply, access, equity and equality in education are

prevalent, especially at higher education. The need of online education arises to address this gap. Virtual University of Pakistan (VU) is the only full-fledged online university that provides access of higher education to the masses across the length and breadth of Pakistan. This university is providing a number of undergraduate and postgraduate degree programs through online satellite technology and every year there is an increase in its admissions (Virtual University of Pakistan, 2018). The earlier research on this subject is generally conducted in the conventional modes of learning. Therefore, this is high time to study predictors of students' performance in an online university.

This research may be helpful to other researchers who intend to study previous qualifications, cumulative scores and students' performances as well as it could be informative and useful for admission officials and policy makers in VU specifically and other higher education institutions in general. The outcomes of this research may be helpful to other universities in Pakistan that are planning to initiate online degree programs. Hence, this study was undertaken to determine predictions of students' achievement at VU from their previous qualifications and cumulative scores. Most of the entrants in this university have acquired previous qualifications in conventional mode. A correlational study examining the previous cumulative performances and VU performance might help infer the validity and effectiveness of online mode. This study might also be useful for universities or other higher education institutions that try to find ways to identify low achievers in order to help them improving their learning and performances.

Objectives of the Study

The study pursued the following objectives:
i.   Examine correlations of previous cumulative examination scores and entry qualification scores of students with their academic achievement at VU.
ii. Predict students' performance at the university based on their previous cumulative examination scores.

Methodology

Predictive correlation design was used in this research. Pearson Product Moment correlation and multiple regression analysis were used to analyze the data. Cumulative scores of previous academic examination were calculated and their correlations with CGPA of different degree

programs at VU were examined. In multiple regressions analysis VUCGPA was taken as criterion and previous degree scores were taken as predictor.

Population of the study

Graduates of different four years and two years' programs for the years 2015 and 2016 from VU were the population. The four years' programs were BS Business Administration, Computer Science, Information Technology, Accounting and Finance, Psychology, Mass Communication, Commerce; while two years' programs included: BA Business Administration, Mass Communication, Psychology, BSc Computer Science, and B.Com.

Sample Description

Using census method all the graduates as mentioned in the population were selected as a sample. The number of graduates from the four years and two years' programs was 1025 and 2008, respectively. Hence the overall sample size was 3033, but the analyses were run separately for each program.

Definition of key terms

The important terms used in this research have been defined operationally as under:

Previous cumulative examination scores Cumulative scores is the sum of all previous examinations' grades and scores adjusted on a common baseline score. A baseline score was determined as VU has students from different Boards of Pakistan as well as international students with GCE and other educational certificates.

Entry qualification scores The examination score of students revised on a baseline score in the entry qualification is referred to as entry qualification score. Intermediate / equivalent examination was the entry qualification for four year programs and two-year graduation programs.

Students' academic achievement Students' academic achievement means the CGPA obtained by a student at the completion of a degree program at VU.

Data Analysis Techniques

The analysis was done separately for the programs of two-time duration. Pearson product moment correlations were applied to calculate the correlation and multiple regression analysis was used for predicting CGPAs of students from the cumulative scores.

Table 1 presents correlation and multiple regression analysis of cumulative academic scores and VUCGPA of two different duration degree programs. Correlations in all types of programs were significant and positive, the r values show the higher correlation of VUCGPA for the four years BS programs (r= 0.413) as compared with the two years' degree programs (r= 0.300). The same pattern was observed in the predictions using multiple regression analyses by taking VUCGPA as criterion and previous cumulative examination scores as predictors. The previous cumulative examination scores predicted (17.2%) in four years BS programs with standardized beta values of (.156 and .320, p< 0.01) for matric and intermediate scores, respectively. Prediction of 8.9% were observed for two years' programs with the standardized beta values of (.160 and .190, p< 0.01) for the matric and intermediate scores, respectively.

Table 1

Correlation and multiple regression of previous academic qualifications and VUCGPA of different programs of different duration

Program	N	VUCGPA r	Multiple regression Adjusted R^2	Standardized Coefficients Beta	*t value*	*p*
2 years bachelor	2008	0.300*	0.089		29.325	.000
Matric				.160	6.653	.000
Inter				.190	7.901	.000
4 years BS	1025	0.413*	0.172		18.285	.000
Matric				.156	4.809	.000
Inter				.320	9.896	.000

*p< 0.01

Table 2 explains the categorization of students into high, average and low achievers on the basis of cumulative scores. The previous cumulative scores were arranged in ascending order and then divided into three categories i.e. low, average and high achievers.

Table 2

By program categorization of cumulative scores of previous academic qualification in terms of low, average and high achievers

Category	Two years Programs		4 years BS programs	
	Range	*N*	*Range*	*N*
Low achievers	750-1097	673	870-1143	342
Average achievers	1098-1238	666	1144-1296	340
High achievers	1239-1758	669	1297-1780	343
All	750-1758	2008	870-1780	1025

Table 3 shows that the three categories of students of the two different duration degree programs had positive correlation between cumulative scores and the VUCGPA. Similar to the overall correlation coefficient each of the cumulative scores based category of four years' degrees exhibited high correlation with CGPA as compared with those of two year degrees' graduates. It is also observed that high achievers on previous cumulative scores had higher correlation with VUCGPA with the highest r for high achievers followed by average and the lowest by the low achievers for the four years as well as for the two years' programs.

Table 3

By program correlation between VU CGPA and previous cumulative academic scores by categories as low, average, high achievers

Category	2 years Programs	4 years BS
Low achievers	.026	.114*
Average achievers	.134**	.167**
High achievers	.295**	.336**

*p< 0.05, **p< 0.01

The entry qualification scores of students of different degree programs were also grouped into three categories i.e. low, average and high achievers. The entry qualification for two years graduation and four years BS programs was intermediate.

Table 4

By program categorization into low, average and high achievers on entry qualification scores

Categories	Two years programs		Four years BS programs	
	Range	*N*	*Range*	*N*
Low achievers	363-494	134	437-492	27
Average achievers	495-559	486	495-659	569
High achievers	560-980	1388	660-959	429
All	400-980	2008	437-959	1025

Table 5 represents correlations of VUCGPA of different programs displayed with overall, low, average and high achievers on the basis of entry qualification scores. The overall correlation was significant and positive with 4 years BS programs (r= 0.394) and 2 years' graduation (r= 0.265). The high achievers on entry qualification had the highest and significant correlation with the VUCGPA followed by the average achievers in each of the two types of degree programs. However, low achievers on entry qualification showed insignificant correlations with VUCGPA of four years BS program and a negative correlation with two years' programs. It may be inferred that variation in the VUCGPA is much less as compared with the scores in earlier examinations.

Table 5

By category and overall correlations between VU CGPA and entry qualifications for various degree programs of two time durations

Category	2 years Program	4 years BS
Low achievers	-.164	.070
Average achievers	.131**	.192**
High achievers	.300**	.350**
Overall	.265**	.394**

**p< 0.01

Discussion

In this section important findings are discussed in line with the research objectives.

Research objective 1 was to examine the correlations of previous cumulative scores and entry qualification scores of students with their academic achievement at VU. To achieve this objective, the correlation analysis was done separately for cumulative scores and entry qualification scores with the VUCGPA. Cumulative scores were positively correlated with the VUCGPA in all degree programs and were statistically significant. To analyze this correlation further, cumulative scores and entry qualification scores were categorized in terms of low, average and high achievers. By category correlations between cumulative scores and VUCGPA and between entry qualification scores and VUCGPA were examined. Positive significant correlation was observed between the earlier scores and VUCGPA for the high achievers. However, average scorers for 2 years' programs and 4 years' programs exhibited significant but low positive correlation.

These weak correlations of average achievers may be interpreted as better performances at VU but this cannot be said with certainty. There might be some other reasons such as change of mode of education i.e. from conventional to virtual. To some students this mode might suit and others might not adjust well with it. This is a limitation of this study as it did not account for the mode of previous education of students. Knowing previous mode of education and then comparing these results might add to the understanding of VU students' performances.

For low achievers on cumulative scores, the correlation of two years' graduation programs was insignificant while that of four years BS program were positive and significant. This insignificant correlation means that these students performed well at VU that is why their previous cumulative scores show insignificant correlations with their current performance, however, low achievers who showed significant positive but low correlations in their cumulative scores and VUCGPA for BS programs mean that there is little association in their previous performances and current performance. This paper is exploring the correlations and predicting the performances only, it did not explore the reasons of improvements or consistencies of low or average achievers.

The entry qualification scores of low achievers of 4 years' program were not showing any significant correlations with VUCGPA while that of 2 years programs showed a negative correlation which means that they performed well in VU. This better performance of previously low achievers might be because of the equal learning opportunities provided by VU and the fair assessment system (Abdullah & Mirza, 2018). However, average and high achievers were showing positive significant correlation values with VUCGPA in all degree programs. These results are consistent with relevant studies in the literature. Thiele, Singleton, Pope, and Stan street (2016) found out that students who outperformed others at high school level were not significantly different in their performances from other students at university level.

Research objective 2 aimed to predict students' performance at university based on their previous cumulative examination scores. To achieve this objective multiple regression analysis was used that predicted CGPA of VU students based on their previous cumulative examination scores. The prediction of 17.2% was found in four years BS programs which included matriculation and intermediate scores. The lower prediction was for the degree programs of two years' duration i.e. 8.9% predicted by combined matriculation and intermediate examination scores. This variation in the predictions needs to be understood before drawing any inferences. The higher prediction for four years BS

programs might be attributed to the relatively longer stay of students at VU. That might be providing them more learning opportunities and experiences to adapt their learning styles in order to improve learning outcomes.

The low prediction for two years' graduation programs could be ascribed to the change in the mode of education. As matriculation and intermediate exams—the previous cumulative examination scores for two years' programs— are generally offered through formal education in Pakistan. Therefore, a change from formal education to online education for limited time duration of two years only might be one of the few other reasons of this low prediction. However, these are entirely contextual discussion points and are limited to the sample description only; other similar studies might find other patterns in the predictions and other reasons to support their findings.

Asif, Merceron and Pathan (2015) discussed that size of the group determines the level of significance and unbalanced group size may give inconsistent results. Therefore, the researchers might suggest equal number in the groups for further studies to compare and analyze the patterns in the correlations and predictions.

Conclusions and Recommendations

The previous cumulative examination scores and entry qualification scores correlated positively and significantly with the performances of the students in various degree programs of two years and four years' duration. Analyses by the duration of degree programs lead to infer that the duration of students at VU, their previous cumulative examination score and entry qualification score play a significant role in the variation in predictions of their performances at VU. The learning opportunities and environment provided in online educational institution might facilitate students to progress from low achievement to average and/ or high achievement. It is further concluded that previous cumulative examination score and entry qualification scores predict learners' academic achievement at VU but there is a need to study those with confounding variables that are specific to the institution such as learning environment, resources, opportunities that may vary with the change in the context.

Based on the findings and conclusions, the study recommends that admission criterion might include and rationalize the weightage of previous cumulative examination scores and entry qualification scores. VU should look into the factors contributing to better grades earned by

the low achievers at this University and determine effective learning opportunities and experiences to enhance learners' outcomes. Further studies may be conducted by the mode of learning at matric and intermediate examinations to analyze student performance at VU.

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