Benguet State University Research Journal (BRJ) January-March 2016, 75: 112-117 Copyright 2016, Benguet State University

MODELS OF SCREENING BACHELOR OF SCIENCE IN APPLIED STATISTICS AND BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY FRESHMEN APPLICANTS

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ABSTRACT

The study determined the initial mathematical models of screening freshmen applicants for Bachelor of Science in Applied Statistics (BSAS) and Bachelor of Science in Information Technology (BSIT) programs based on their input variables such as IQ and prior achievements in English, Mathematics and Science. It also investigated the impacts of these variables on the students' college first semester performances during SY 2011-2012. The respondents were classified and profiled based on their data and corresponding models were formulated using Discriminant Analysis method. The difference of the respondents' college performances were tested using T-test. The profile of the BSIT students showed that group1 has higher IQ and lower grades while group 2 has lower IQ but higher grades. The model yielded showed that grade in Science has the stronger discriminating power. IQ has still the greatest discriminating power. The model's Y-value of 84.86 serves as the reference value. Group 1 has Y-values higher than 84.86 while group 2 has Y-values lower than 84.86.The profile of the BSAS students showed that, except for their IQ, the two groups are not completely separated. The model showed that grades in English and Mathematics have stronger discriminating powers, next to IQ which has the greatest discriminating power. The model's Y-value is 104.03 and group 1 has Y-values higher than 104.03 while group 2 has Y-values lower than 104.03. In both BSIT and BSAS, groups 1 and 2 showed no significant difference in their first semester college performances, indicating that at the moment group assignment is yet to be a determinant of academic achievement. The primary implication of the study is that screening can be made objective, efficient and cost-saving by mathematically modeling the process.

Keywords*: mathematical models, BSAS and BSIT freshman applicants*

INTRODUCTION

Screening applicants is a very crucial activity of the University because the decision to be made not only defines the career of the applicants but also shapes the image of the University as a credible learning institution. The purpose of screening is to see to it that those with higher chances of finishing the programs are the ones admitted as student's success is the primary concern of any learning institution such as Benguet State University. If those who are admitted possess desirable learning characteristics as can be gleaned from their prior academic achievements and IQ scores, then the University can be assured that these students can finish their chosen courses and their performances during and after schooling could make the University proud. This is because the quality of graduates gauged from their employability and contributions to society is always the litmus test of the University's credibility. Also, if those accepted are the right students for the course, then mortality due to academic deficiencies such as incomplete, failure, dropping and shifting would be minimized.

Presently, mathematical models for screening applicants for the different degree programs in Benguet State University do not exist. Each department or college does manual screening based on its own admission requirements of assessing the

fitness of the applicants in a particular program. In the case of the Mathematics Department, the admission requirements include satisfaction of at least 85 percent grades in English, Mathematics, Science and Grade Weighted Average (GWA) and at least 90 percent IQ score. The inclusion of these variables in admission is because of their believed predictive value in the students' future academic performances and successes.

The problem with the current practice of screening in the Mathematics Department and elsewhere in the University is that it is a very tedious process because the admission requirements lack standard and is arbitrarily set and based on experience. Students seldom meet them, thus forcing the admitting officers to exercise their subjective judgments in determining who should be accepted to a particular program. The soundness of subjective judgment is oftentimes affected by the maturity and personal bias of the admitting officer, especially in handling situations that tend to compromise the attainment of the screening objective which is to admit only those with higher chances of finishing their courses.

Thus, there is a need to frame a mathematical model of the screening process in order to minimize, if not eliminate, the errors sprouting from subjective judgment as well as to make the process objective, efficient and accurate. This assures the University that those admitted are really the ones with higher chances of performing well and successfully finishing their degree programs. If the screening process is mathematically modeled, then it can be digitized and delegated as a staff work in a department or college thus relieving the Chairperson or College Secretary from the tedious work of screening. With the model in place, it is doable to centralize the screening of all freshman applicants to a staff unit in the University which can easily upload the results in the University website for quick access by the applicants. This not only simplifies the screening process and takes advantage of existing technology in disseminating information but also saves the applicants time and money from being physically present during screening and that can afford them enough time to look for other courses in case they are not qualified.

For a model to be viable, its components must have educational relevance and have been firmly established in literature as predictive of academic success. The model must reflect the power of the components in discriminating between those who belong and who not belong to a particular group. In the present study, students' prior academic achievements and IQ scores are included as major components of the models because, as literature show, they are reflections of the students' possession or lack thereof of the qualities that are contributory to academic success.

In literature, studies about screening models are yet to be available. However, studies related to the components of the screening models in the present study are abounding, especially those of determining the predictive values of students' variables to their academic performance. In this area, the common thread of ideas running in the fabric of studies point to the following intellective and non-intellective predictors of academic achievement across educational levels from elementary to tertiary: "general intelligence" (Snow, 1996; Lubinski, 2000; Balter, 2011), "emotional intelligence" Ogundokun and Ademeyo, 2010; Schuttle *et al*., 1998; Koifman, 1998; Sutarso *et al*., 1996; Hyena, 1984; Tapia, 1998), "self-discipline" (Duckworth and Seligman, 2005), "motivation" (Steer and Porter, 1991; Salami, 1998; Ogundokun, 2007; Hoyenga and Hoyenga, 1984) and "learning styles" (Busato *et al.*, 1999; Vermut, 1998). Other contributory factors to academic performance include "personal confidence and feeling of competence in learning, hopeful but realistic projection into the future occupational and social roles, emotional stability, temperament towards introversion, relative independence from teachers, and tacit acceptance of curricular and work demand." (Wanskowski, 1991).

According to the authors, the above characteristics are keys to academic success and their variance of possession distinguish between achievers from non-achievers.

In the light of the foregoing, this study sought to determine the mathematical models of screening that could accurately account the discriminating powers of the variables and impacts of the

following variables on the students' first semester overall college performances:(a) IQ score and (b) Grades in English, Mathematics & Science.

MATERIALS AND METHODS

The respondents of the study are the bona fide freshman applicants who have been admitted to BSAS and BSIT programs during School Year 2011-2012. The data gathered from them include: fourth year high school grades in Mathematics, Science and English; scores in the University Qualifying Examination (IQ); and the students' first semester GPA. These data were processed via discriminant analysis to classify the respondents in some appropriate groupings and to formulate corresponding models showing the discriminating powers of the students' variables. In order to determine whether the students' IQ scores, prior academic achievements and first semester college performances are significantly different between groups, a test of difference was performed using T-test.

RESULTS AND DISCUSSIONS

Based on the data of the BSIT students' prior academic achievements and IQ scores, the respondents were classified into two completely different groups wherein group 1 consisted of students with significantly higher IQ scores and lower prior academic achievements while group 2 consisted of those with lower IQ scores and significantly higher prior academic achievements, as shown in Table 1.

The model indicates that students who belong to group 1 are those with higher IQ and higher grade in English, while students who belong to group 2 are those with lower IQ and higher grades in Mathematics and Science.

When the mean values of the students' variables are inputted to the model, the Y-value of 84.36 is yielded. Students whose Y-values are higher than 84.36 are classified to group 1, while those below are classified to group 2.

Table 1. Prior and Post Grouping of Respondents

Input Variables	Prior Grouping			Post Grouping		
	G1	G2	T-value	G1	G2	T-value
English	87.46	89.92	1.53NS	87.22	90.13	2.52*
Mathematics	86.98	90.80	1.88NS	86.65	90.04	2.96**
Science	86.96	90.21	1.88NS	86.7	90.13	3.83**
IQ	120.30	93.83	6.67**	121.63	99	8.60**

Legend: NS :Not Significant
* :Significant
** :Highly Significant

The specific mathematical model that fits the above data is given below.

$$Y=0.065x_1-0.045x_2-0.392x_3+0.972x_4$$

Those of group 1 may be considered under performing because they perform below what is expected of them on account of their higher mental abilities while those of group 2 are considered achievers because they are comparatively either very well maximizing their talents or performing above what are expected of them on account of their lower mental abilities.

Table 2. First Semester Academic Achievement of the BSIT students

	Mean	Tc
Group 1	2.35	0.020NS
Group 2	2.38	

Legend: NS – Not Significant

The result indicates that members of group 1 may have relied heavily on their intellectual abilities in order to perform because they have higher IQ scores which are a measure of intellectual abilities and lower prior academic achievements which are evidence of lack of internalization of some important learning skills. Those of group 2 may have relied more heavily on their learning skills and enabling personal characteristics which have been shown in literature as predictors of academic performance such as "motivation, emotional intelligence, self-discipline, learning styles" (Ogundokun and

Table 3. Prior and Post Groupings of the Respondents

Input	Prior Grouping			Post Grouping		
Variables	G1	G2	T-value	G1	G2	T-value
English	87.64	85.40	-0.92NS	86.42	86.25	0.14NS
Mathematics	88.01	87.20	0.41NS	87.38	88.62	-0.73NS
Science	86.26	84.60	0.75NS	85.86	85.93	-0.04NS
IQ	114.41	94.40	3.77**	116.57	98.12	4.41NS

Legend: NS – Not Significant, ** - Highly Significant

Adeyemo, 2010; Tapia, 1998), "extraversion, conscientiousness, persistence, self-control and dependability" (De Raad, 1996) because of their higher prior academic achievements and lower IQ scores. The results confirmed the claim in literature that there is not a single route to academic success. One route is what group 1 showed that people can perform based mainly on the strength of their intellectual abilities and the other route is what group 2 showed that people can perform as good as those more intellectually gifted ones by the strength of their efforts and possession of desirable personal characteristics such as those mentioned above.

The results indicate that members of both groups have exhibited similar pattern of academic performance in the indicated key subject areas which means that there are students with higher IQ who performed high as well as those who performed low. Likewise, there are those with lower IQ who performed very well and also low. The results indicate that the two groups of students have equal chances of performing well as well as risks of performing poorly which means that IQ scores do not necessarily discriminate between those who can perform high and those who can perform poorly.

The model of classifying BSAS applicants whether they belong to group 1 or to group 2 is indicated below.

$$Y=0.33X_1- 0.442X_2-0.097X_3+1.091X_4$$

Based on the model, students who belong to group 1 are those with higher IQ and higher grade in English while students belonging to group 2 are those with lower IQ and higher grades in Mathematics and Science.

When the mean values of the students' variables are inputted, the model's Y-value of 104.03 is yielded. Members of group1 have Y-values greater than 104.03 while those of group 2 have Y-values lower than 104.03.

First Semester Academic Achievement of BSAS Students (SY 2011–2012)

As shown in Table 6, there is no significant difference between the two groups' first semester academic achievements in college.

In consideration of the fact that the freshman students' first semester in college is their adjustment period in which it is possible that their academic achievements are not fully reflective of what they truly can do under normal times it appears proper to monitor their semestral academic achievements in order to determine how an individual truly perform overtime.

Table 4. First Semester Academic Achievement of the BSIT students

	Mean	Tc
Group 1	2.44	-0.186NS
Group 2	2.48	

Legend: NS – Not Significant

It remains to be seen which group will perform better in the next semesters to come and which one has better survival rate. If over time it appears that a particular group has better performance, then the characteristics of that group should be given more

weight in screening because they are the more fruitful ones.

CONCLUSIONS AND RECOMMENDATIONS

The mathematical model of classifying group membership is course specific.

For BSIT, members of group 1 are considered under performing while those of group 2 are considered achievers.

For BSAS, members of each group showed the presence of high achieving as well as under achieving students.

The impacts of prior academic achievements and IQ on the first semester college achievements of both BSIT and BSAS students are similar and thus membership in a particular group is yet to appear as a determinant of academic success.

Since both IQ scores and prior academic achievements have similar impact on the students' present academic achievements, no major characteristics of a particular group should be made as the primary factor, or given more weight, in screening applicants.

The study should be conducted with different batches of applicants for about three successive years to determine if there is a common model and Y-value that can be used to screen future applicants under each course.

The semestral group GPAs of the students in both BSAS and BSIT courses should be monitored until they graduate to determine which of the given factors have better long term influence to the students' overall academic success.

ACKNOWLEDGMENT

Our deepest thanks to our families for their support, understanding and bearing with us especially during those times when they have to give way for us in using home facilities such as "computer and internet", papers and inks and other facilities necessary for the completion of the research.

Our thanks to Benguet State University for the use of office papers and ink for the reproduction of the manuscript and for giving us the opportunity to present the paper during the in-house review of researches. We thank the evaluators for their invaluable comments and suggestions which led to the improvement of the paper. We thank all people whom we cannot identify at the moment but through whose efforts the information from this study may be communicated to end users.

Above all we thank the Lord Almighty for our health, guidance and wisdom which make possible the conduct of the research and the completion of the manuscript. We thank the Lord for giving us the thirst to quest for knowledge as it is by this means that educators take their humble share in the collective efforts of enlightenment.

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