ANALYSIS OF STUDENTS' SCHOOL RESULTS AND PERFORMANCE
IN ENGINEERING PROGRAMS – A CASE STUDY

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ABSTRACT

Retention and performance of students in engineering programs has been a topic of concern globally. Various factors involved need to be investigated and understood. The present case study analyzes relationship between students' school results and their performance in engineering programs.

Statistical data from three campuses of Ajman University of Science and Technology, UAE, were used for 3 undergraduate engineering programs. Data for 661 students, with a minimum school score of 70%, enrolled over ten years were investigated.

From the students group with 'high' performance in school, 53%, 46% and 1% performed 'high', 'medium' and 'low' in their programs, respectively.

From students near 'minimum' score in school, 6%, 87% and 7% performed 'high', 'medium' and 'low' in their programs, respectively.

The analysis suggests that students with relatively 'high' scores in school may not maintain their performance in engineering programs, while students with relatively 'low' scores in school could improve significantly. Further investigations are recommended.

Key Words: Engineering Education, Performance in Engineering.

INTRODUCTION

Several studies have analyzed students' performance in engineering programs. Also, retention of students, particularly in their early years of college education, has been a concern globally.

Admission to engineering programs requires a minimum acceptable level of performance in school with science background. The performance of the admitted students in their programs, however, varies significantly. Several studies have been conducted related to the students' skills, knowledge, anxiety and perception, etc. of their

program courses and their performance in science and engineering programs [Ali and Ali (2010), Imran et. al. (2011), Shivy and Sullivan (2005), Suther et al. (2010), Vitasari et. al. (2010) (a), Vitasari et al. (2010) (b)]. However, there is a lack of analysis related to the students' performance in schools and their overall academic achievement in the engineering programs. Understanding of such relationship could help in taking an early action for those students who are expected to perform badly because of weaknesses in these courses. Also, students who are expected to achieve high results could be picked early.

This is a retrospective study in which students' performance in engineering programs is compared with their final school results. The analysis is also carried out for the male and female sub-groups of students. In the study, ten year data on students' grades were analyzed in three undergraduate engineering programs offered at Ajman University of Science and Technology. The programs are accredited with the Commission for Academic Accreditation, U.A.E.

METHODOLOGY

Data from 661 students comprising of 528 male and 133 female students were used who were admitted to three undergraduate degree programs in engineering during the academic years 1999-2000 to 2008-09. The programs were electronics engineering (EE), communication engineering (CE) and instrumentation and control engineering (ICE). The ICE program started during the year 2006-07. All the students satisfied program eligibility criteria for admission, with a minimum 70% or equivalent result in school (science stream). In this group 409 male and 104 female students either graduated or were in their senior level. The students were from various cultural and academic backgrounds (science stream) and each course in the program was taught by more than one teacher during the selected period.

The study group included only those students who had completed a minimum of 95 credit hours in the program. Cumulative Grade Point Average (CGPA) on a 4.5 scale was used as the overall performance in the program. To pass a course, minimum 1 grade point on this scale is required. However, a student is not allowed to continue in a program if his / her overall CGPA remains less than 2 for at most three consecutive semesters.

Students' school results were classified into three categories as follows:
S-High   –   90% or more.
S-Medium   –   80% – 89.99%.
S-Low   –   70% – 79.99%.

Similarly, students' performance (CGPA) in their respective engineering programs were also classified into three categories as follows:
P-High   –   3.26 – 4.50.
P-Medium   –   2.00 – 3.25.
P-Low   –   < 2.00

This classification, similar to that for the school results, is based on about equal distribution of grade points in the three categories with the consideration that students with less than 2 CGPA are academically warned.

RESULTS

For each of the three categories of school results, figure 1 gives percentage of students who scored P-High (P1), P-Medium (P2) and P-Low (P3) in the engineering programs.

Similar to figure 1, figures 2 and 3 classify the results for the male and female sub-groups.
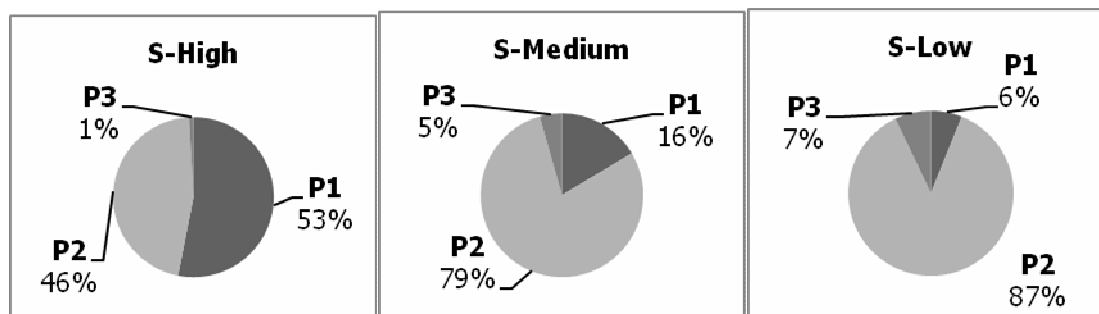

Figure 1: For each category of school results, the program results classified as the percentage of students achieving P-High (1), P-Medium (2) and P-Low (3).
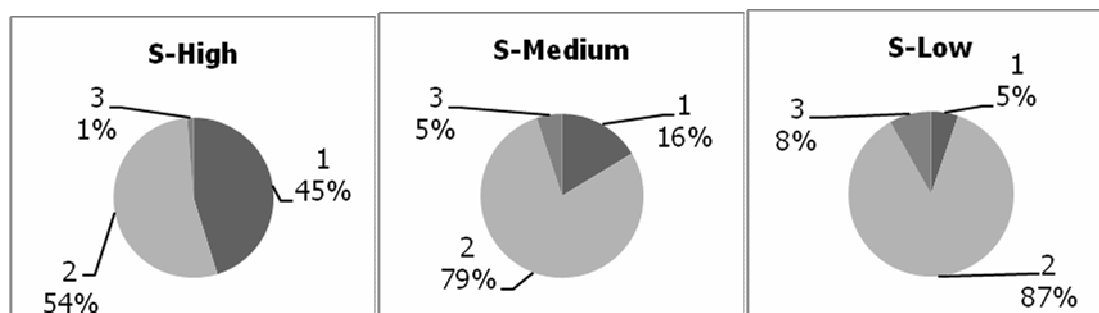

Figure 2: For the male sub-group, in each category of school results, the program results classified as the percentage of students achieving P-High (1), P-Medium (2) and P-Low (3).
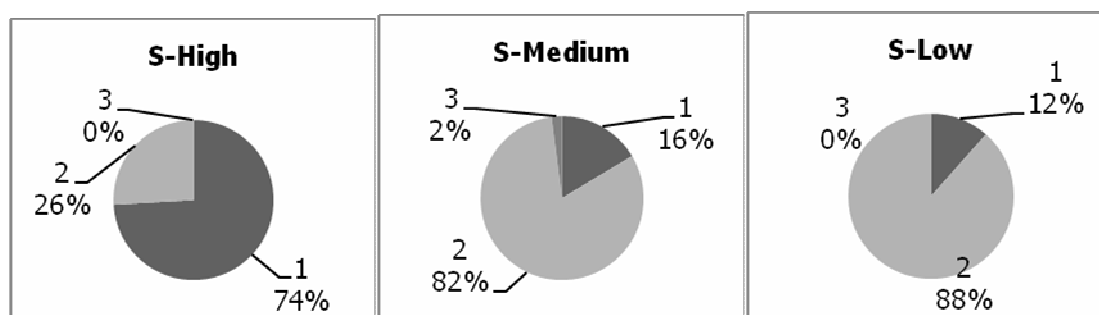

Figure 3: For the female sub-group, in each category of school results, the program results classified as the percentage of students achieving P-High (1), P-Medium (2) and P-Low (3).

ANALYSIS

With reference to Figure 1, from the students with school result S-High, 53%, 46% and 1% scored P-High, P-Medium and P-Low, respectively. This suggests that about half of the students with high performance in school maintained high performance in their engineering programs, while almost all the remaining students achieved medium level performance.

From the students with school results S-Medium or S-Low, 79% and 87% students ,respectively, achieved medium level performance in their programs, while 16% and 6% students, respectively, achieved high level performance.

With reference to Figures 2 and 3, the male group comprised 80% of the total. The comparisons between the male and the total groups are closer as against the comparisons between the female and the total. In the category S-High, 45% male compared to 74% female students maintained high performance in their programs. Both the sub-groups in the S-Medium category and the male sub-group in the S-Low category, performed similar to total group. Interestingly, however, significantly more female students in the S-Low category showed improvement in their program performance; while 12% females achieved high performance, no female had a low performance in her program.

This data suggest that a significant percentage of students with high scores in school may not maintain their performance in the engineering programs. On the other hand, a significant percentage of students with medium or low scores in school can maintain or even improve their program performance.

The patterns in this data suggest further investigation into why a significant percentage of students with high scores in school did not maintain their performance in the university. Also, for students with S-Medium and S-Low results, it would be useful to understand the influencing factors that allowed such students to maintain and even improve their performance in the university.

In a related study [Imran et. al. (2010)], we have analyzed the influence of mathematics and science courses on students' performance in engineering programs. The study suggests that students who performed well in mathematics courses were expected to perform well overall. As these courses are taken early in the programs, the mathematics courses could possibly show a trend towards overall program performance. Similar studies on other influencing factors would help in monitoring the students' university performance and in timely intervention.

CONCLUSIONS

The analysis suggests that students with relatively 'high' scores in school may not maintain their performance in engineering programs at university, while students with relatively 'low' scores in school could improve significantly. Further investigations are recommended. A higher percentage of female students in comparison to the male either maintained or showed improved performance in their university studies.

The study brings out the need to determine and understand the factors that influence students' performance in engineering programs. Further, similar studies from other universities and regions would be required before generalizing any such conclusions.

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