Terminated Students' Academic Performance: A Preliminary Assessment

Faridah B, Noreliza A.M, Noraini M.N, Fadhilah A.R

Abstract:*The College of Engineering in Universiti TenagaNasional aims to continuously achieve higher rate of its engineering graduates. However, the rate of students been terminated from pursuing their studies due to their failure in achieving the academic standard set by the university is a major concern. This paper is a preliminary study on the terminated students' academic performance. It analyses the correlation between mathematics courses with some other early engineering courses taken by the terminated students and finds that prior qualification relates to the students general success in academics. This study also finds that the trend in the number of terminated students is decreasing over the years of study.*

Keywords:*Dropouts, Engineering Students, Attitude, Academic Performance, Prior Qualification, Correlation.*

I. INTRODUCTION

Many studies have been made to determine the factors that cause students to cease their studies before completing their degree. It has been reported that about 40% of students seeking bachelor's degrees are unable to complete their degree within six years [1]. The students have lost their time and money that they have earlier spent to get enrolled in the university. Several researchers have indicated that both academic and non-academic factors contribute to students' decision to pursue or quit their university degree. These include individual attributes such as race, gender, and academic ability; precollege experiences such as students' school achievements and social attainments; and family social status and expectations [2]. Other reasons students dropping out of a particular degree program relate to career direction and purpose, subject range, peer bonding, teaching quality, illness, finances and employment [3].

The rates of drop-out vary among programs and institutions, and usually, programs with larger numbers of less well-prepared students tend to have higher drop-out rates [4]. Universities providing engineering programs are finding difficulties in keeping their retention rates. Students who dropped out from pursuing their engineering degree cited reasons such as poor teaching and advising, difficulty of the engineering curriculum and a lack of 'belonging' within engineering [5].

Revised Manuscript Received on September 22, 2019.

Faridah B, College of Engineering, Universiti TenagaNasionalKm 7, Jalan IKRAM-UNITEN, 43000 Kajang, Selangor, Malaysia

Noreliza A.M, College of Engineering, Universiti TenagaNasionalKm 7, Jalan IKRAM-UNITEN, 43000 Kajang, Selangor, Malaysia

Noraini M.N, College of Engineering, Universiti TenagaNasionalKm 7, Jalan IKRAM-UNITEN, 43000 Kajang, Selangor, Malaysia

Fadhilah A.R, College of Engineering, Universiti TenagaNasionalKm 7, Jalan IKRAM-UNITEN, 43000 Kajang, Selangor, Malaysia

Other factors that have been identified include classroom and academic climate, grades and conceptual understanding, self-efficacy and self-confidence, high school preparation, interest and career goals [6].

There has been an increasing concern over engineering students failing to complete their degrees due to poor academic achievement. Academic achievement is an important determinant [7] as low performance leads to stress and dissatisfaction [8] resulting in students distancing themselves from their classmates, university degree courses and institutions [9]. Students with low level of academic performance and success have a higher probability of abandoning their course programs [10]. Dropout rate is higher among students with relatively low levels of prior qualifications [11]. Since 1997, many institutions have chosen to expel students who did not meet the academic standard set by the program and the institution [12]. The dismissal policy firstly allows students to realize at an early stage whether they are fit to stay in the program and secondly enables programs to filter the talented and motivated students after the first year [13].

The College of Engineering (COE) in Universiti TenagaNasional (UNITEN) aspires to produce well-rounded and competent engineering graduates who will be readily employed by the industries. To achieve this goal, the college prepares engineering programs that provide innovative educational experiences for the students. The quality of the mechanical, electrical and civil engineering programs are all checked and accredited by the Malaysian Qualification Agency (MQA) and recognized by the Engineering Accreditation Council (EAC). In their efforts to attract new potential students and produce quality professional engineers, the college faces problems in dealing with first and second year students who struggled in their courses, and finally got terminated due to poor academic performances.

The engineering students are expected to meet the academic standards set by the College and show progress towards getting a degree. Their eligibility to remain in the engineering program is determined by their academic standing. At the end of every regular semester, student will know their level of academic standing. If their CGPA for a regular semester is not less than 2.00, they will be granted a "Good" standing. If less than 2.00, their status will be under "Probation". Students obtaining CGPA of less than 2.00 for two consecutive regular semesters will have their studies terminated. Thus, students who receive the first academic warning on their probation status are required to demonstrate improvement in their academic performances to

avoid dismissal from the college. Students who got terminated are allowed to appeal to continue studying, and in some cases, students' appeals are successful.

The students' performance is usually assessed based on continuous assessments which include scheduled tests, assignments, mini projects and quizzes and final examination. Students who fail a compulsory subject are required to retake the subject until they obtain a passing grade. All subjects registered including the failed subjects will be taken into account in the calculation of the CGPA. The CGPA will be recalculated when a student repeats a subject, where the best grade will in used in the new CGPA calculation. Students are allowed to repeat subjects throughout their study period but within the maximum study period as stipulated in the Academic Regulation.

This research is motivated by the evidence that students who are weak in their mathematics background could not perform in the engineering courses. This paper seeks to find the correlation between mathematics courses with some other early engineering courses, describes the relation between the terminated students and their pre-university level of studies and determines the trend in the number of terminated students over the years of study.

II. METHODOLOGY

The data compiled in this research showed that the affected students were mostly terminated during their first or second year of study. They failed either their mathematics or early engineering courses or both. A sample of 194 terminated students' grades for a period of 13 semesters inclusive of short semesters beginning Semester 1, 2013/2014 until Semester 1, 2017/2018 were applied in this study. The breakdowns according to programs are as given in Fig. 1.

The data values were further broken down to subject failures according to the program for the yearly selected semesters. Two mathematics and four engineering courses grades were considered for the study. The courses were Advanced Calculus, Differential Equations, Mechanic Statics, Circuit Analysis, Mechanic of Fluid and Mechanic of Materials. The charts depicting the distribution of terminated students in the selected courses according to the year and program are as given in Fig. 2, 3, 4 and 5.

The grades obtained by the terminated students in the selected subjects were converted to points according to Table 1.

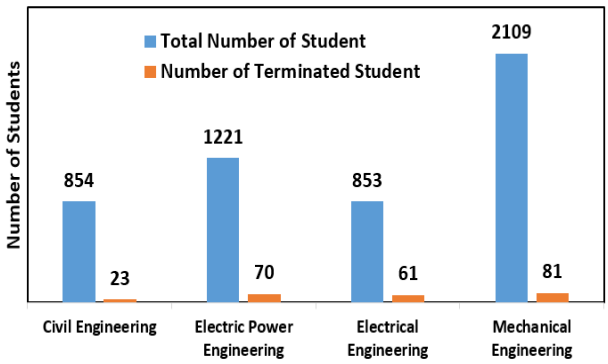

Fig.1Bar chart representing the total number of students and number of terminated students according to programs

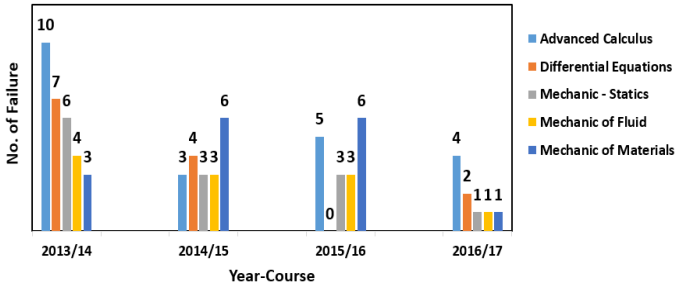

Fig. 2 The yearly number of terminated students who failed Advanced Calculus, Differential Equations, Mechanic Statics, Mechanic of Fluid and Mechanic of Materials in Civil engineering program

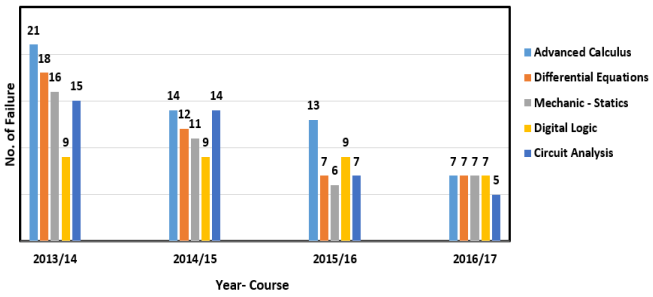

Fig. 3 The yearly number of terminated students who failed Advanced Calculus, Differential Equations, Mechanic Statics, Digital Logic and Circuit Analysis in Electrical Power engineering program

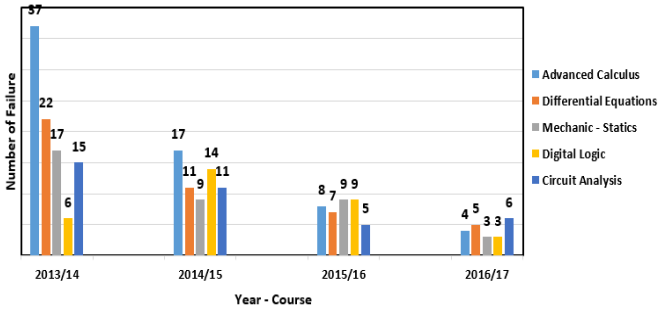

Fig. 4 The yearly number of terminated students who failed Advanced Calculus, Differential Equations, Mechanic Statics, Digital Logic and Circuit Analysis in Electrical Electronics engineering program

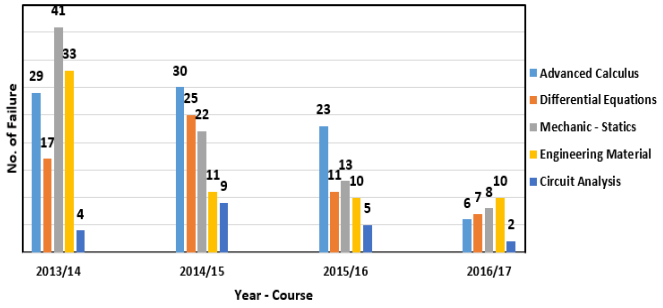

Fig. 5 The yearly number of terminated students who failed Advanced Calculus, Differential Equations, Mechanic Statics, Engineering Material and Circuit Analysis in Mechanical engineering program

Table. 1 Grade Converted To Points

Grades	Grade-Points
E	4
D	3.67
D+	3.33
C-	3
C	2.67
C+	2.33
B-	2
B	1.67
B+	1.33
A-	1
A	0
A+	0

Majority of the terminated students obtained grades of C- and below for all the selected courses.

III. RESULT & DISCUSSION

The data in the form of grades acquired by the terminated students in two mathematics and three engineering courses were analysed using SPSS version 23. Bivariate correlation tests and paired sample tests on the scores assigned for each grade are as shown in Tables II – V.

Bivariate correlation tests and paired sample tests for Advanced Calculus and Differential Equations in four programs are as given in Tables II and III.

The results from Table II showed that mechanical engineering students performed better in Advanced Calculus and students in Civil engineering performed better in Differential Equations, with means of 0.3996 and 0.4438 respectively. However, there was no significant correlation between the performances of terminated students in Advanced Calculus and Differential Equations for all programs as the correlation coefficient r values range from 0.004 to 0.421.

The *t*–test was performed on the two means to determine whether there are any significant differences. The results from Table III shows there is no significant difference between the two means as $|t|<2$.

Bivariate correlation test and paired sample test for three engineering courses in four programs are as given in Table IV.

The results in Table IV indicated that there was no significant correlation between the performances of terminated students in three engineering courses for all programs as the correlation coefficient r values range from -0.308 to 0.260. The performances of students in engineering courses varied according to programs. Students in Mechanical Engineering program performed better in Mechanic Statics and Circuit Analysis and students in Electrical Power performed better in Digital Logic.

Only selected *t*–test results on engineering courses which showed significant differences are listed in Table V. There were significant mean differences in the selected courses as $|t|>2$.

The results did not show significant correlations between grades obtained in Advanced Calculus, Differential Equations, Mechanic Statics, Circuit Analysis, Digital Logic, Mechanic of Fluid and Engineering Materials among the terminated students even though the students failed almost all of these courses during the first two years of their studies. One of the reasons could be that several of these courses were taken concurrently. It is worth mentioning that the courses are not the pre-requisite to each other.

Fig. 6 shows the various levels of pre-university programs which the terminated students, local and foreign, engaged in before enrolling into the engineering degree program in UNITEN. There were students who did their A-level, diploma, UNITEN foundation, matriculation program while few sat for their STPM and other certificates that qualified them to enter the degree program.

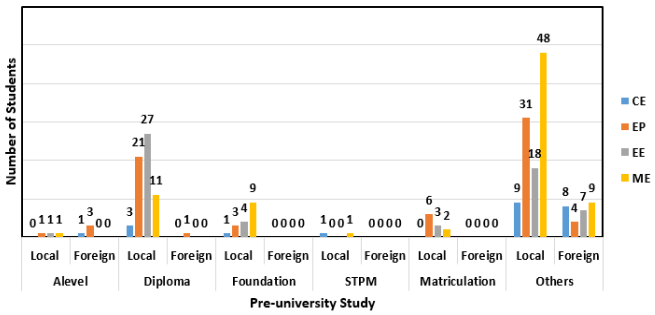

Fig. 6 Number of terminated students based on their pre-university studies from the year 2013-2017

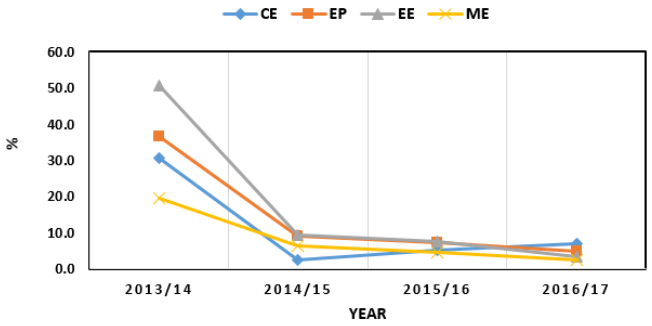

Fig. 7 Percentage of Terminated Students according to Program from 2013 until 2017

It is found that most of the terminated students were diploma holders or other certificate holders. This is consistent with a recent study which reveals that students from the UNITEN Foundation program generally performs better than those entering with diploma [14], since the former has the advantage of studying a series of basic calculus courses throughout their foundation year, with more emphasis on understanding concepts and problem-solving skills. As for the students with diploma, their understanding of concepts and skills in mathematics vary according to which institutions they came from. Furthermore, some of the diploma holders stop studying for a certain period of time for a job placement before enrolling in their first-year degree programs. This causes them to have difficulties in trying to retrieve or recall most of what they have learned in the past. In general, this study finds that low level prior qualification affects students' performances in their degree program.

The results of the study also showed that there was a decreasing trend in the number of terminated students from the year 2013 until 2017 as can be seen from Fig. 7.

The decrease in the number of students who were terminated during their first two years of studies could be affected by the decline in the number of new intake of students, the quality of the students (students with better foundation results) and the improvement in the teaching and learning process.

IV. CONCLUSIONS

In order to determine the existence of significant correlations between the selected courses, the data should not be limited to only the terminatedstudents. All students' grades should be analyzed. Other factors such as students' maturity and attitude, lecturers' teaching styles and marking schemes, and other contributing factors to the academic performance of student should be taken into account.

Most researches indicate that motivation and study habits are the main cause of students' failure at the college level. Thus colleges and faculties members are encouraged to help students become motivated, academically prepared, develop better attitude towards learning and education and develop effective study habit.

Students who are under probation status should be strongly urged to identify the issues that affect or hinder their academic progress, and seek help and advice from academic advisors, instructors, peers and other support groups. In order to reduce the number of terminated students, proactive actions must be taken such as lecturers identify the engineering students who struggled in their first-year studies, have weak foundation in mathematics and sciences, have bad attitude problems and have no interest in studies. These students will then be advised to attend motivational talks and counselling services, coaching classes and other activities that will motivate them towards improving their learning skills and attitudes. Lecturers on the other hands must be willing to conduct remedial classes, improve their teaching skills and apply technologies in addressing the courses during classes.

ACKNOWLEDGMENT

The authors would like to thank Innovation & Research Management Centre (iRMC) of UNITEN for providing the research grant (UNIIG2017) and UNITEN's IT & Multimedia Services (ITMS) for the data.

REFERENCES

1. NCES. Fast Facts (Retrieved April. 2016). Technical report, National Center for Education Statistics, 2015. URL https://nces.ed.gov/fastfacts/display.asp?id=40.
2. V. Tinto, Review of Educational Research 45 (1), 89–125 (1975).
3. K. Mestan, "Why students drop out of the Bachelor of Arts" Higher Education Research & Development (2016).
4. Information on oecd.org. "Responding to new demand on tertiary education".
5. M. Matthews, Retention project: Engineering: Stay with it. [online] [13.03.2016]. Information on https://www.asee.org/retention-project/keeping-students-in-engineering-a-research-guide-to mproving-Retention.
6. B. N. Geisinger and D. R. Raman, International Journal of Engineering Education 29(4), 914–925 (2013).
7. X. Oriol, M. Mendonza, C. G. Covarrubias and V.M. Molina, Revista de Psicodidáctica, 22(1), 45-53 (2017).
8. F. Belloc, A. Maruotti and L. Petrella, Journal of Applied Statistics, 38(10), 2225-2239. (2011).
9. J. Gairín, X. M. Triado, M. Feixas, P. Figuera, P. Aparicio-Chueca and M. Torrado, Quality in Higher Education, 20(2), 165-182 (2014).
10. A. Francisco, R. Concepción, S. Alberto, Computers & Education 53, 563–574 (2009).
11. W. Arulampalam, R. a. Naylor and J.P. Smith, (2005). Economics of Education Review, 24(3), 251–262 (2005).
12. S. Eline and D. W. Kristof, "The effect of an academic dismissal policy on dropout, graduation rates and student satisfaction. Evidence from the Netherlands" (Studies in Higher Education, 2015).
13. B. B. De Koning, S. M. M. Loyens, R. M. J. P. Rikers, G. Smeets and H. T. van der Molen, Studies in Higher Education,39(5), 1-13 (2014).

14. R. Fadhilah, A. M. Noreliza and R. Norshahida, "A Comparison of Mathematics Course Outcome Attainment Between Transfer And Former Foundation Uniten Students" (IEEE International Conference on Teaching and Learning in Education, 2016), pp. 129-134.

Table. 2 Paired Sample Statistics on Advanced Calculus and Differential Equations

Program	Course	Mean	N	Std. deviation	Std. error mean	Pearson correlation, *r* (at 0.01 sig. level)
Civil Engineering	Advanced Calculus	0.7087	16	0.84224	0.21056	0.421
	Differential Equations	0.4438	16	0.57500	0.14375	
Electrical Power Engineering	Advanced Calculus	0.5625	84	0.78534	0.08549	0.051
	Differential Equations	0.7489	84	0.57500	0.09950	
Electrical Electronics Engineering	Advanced Calculus	0.4834	74	0.4834	0.07495	0.004
	Differential Equations	0.5693	74	0.76717	0.08918	
Mechanical Engineering	Advanced Calculus	0.3996	89	0.66147	0.07012	0.043
	Differential Equations	0.4712	89	0.73402	0.07781	

Table. 3Paired Sample Tests on Advanced Calculus and Differential Equations

Program	Mean	Std deviation	Std error mean	95% confidence interval of the difference		t	df	Sig.(2 tailed)
Civil Engineering	0.26500	0.79541	0.19885	-0.15885	0.68885	1.333	15	0.203
Electrical Power	0.18643	1.17139	0.12781	-0.44064	0.06778	-1.459	83	0.148
Electrical Electronics	0.08595	1.00017	0.11627	-0.14577	0.14577	-0.739	73	0.462
Mechanical	0.07169	1.00902	0.10696	-0.28424	0.14087	-0.670	88	0.504

Table. 4 Paired Sample Tests on Engineering Courses for all Programs

Program	Course	Mean	N	Std. deviation	Std. error mean	Pearson correlation, *r* (at 0.01 sig. level)
Civil Engineering	Mechanic Statics	0.9339	18	0.98303	0.23170	MS and MM : 0.192
	Mechanic of Materials	0.9811	18	1.08055	0.25469	MM and MF:- 0.308
	Mechanic Fluid	9517	18	0.87456	0.20614	MS and MF : 0.228
Electrical Power Engineering	Mechanic Statics	0.8004	55	0.88332	0.10068	MS and CA : 0.139
	Circuit Analysis	0.8255	55	0.88883	0.10129	CA and DL : 0.080
	Digital Logic	0.5538	55	0.77153	0.10403	MS and DL : -0.039
Electrical Electronics Engineering	Mechanic Statics	0.6973	71	0.75502	0.08718	MS and CA : 0.076
	Circuit Analysis	1.0465	71	1.03854	0.11992	CA and DL : 0.197
	Digital Logic	0.7413	71	0.88506	0.10504	MS and DL : 0.002
Mechanical Engineering	Mechanic Statics	0.6278	36	0.93695	0.15616	MS and CA : 0.260
	Circuit Analysis	0.7450	36	0.79928	0.13321	CA and DL : 0.067
	Engineering Materials	1.1039	36	1.00433	0.10145	MS and DL : 0.131

Table. 5 Selected Paired Sample Tests on Engineering Courses

Program		Mean	Std deviation	Std error mean	95% confidence interval of the difference		t	df	Sig. (2 tailed)
Electrical Electronics	Mechanic Statics and Circuit Analysis	-0.34920	1.23643	0.14277	-0.63368	-0.06472	-2.446	70	0.017
	Circuit Analysis and Digital Logic	0.32718	1.22467	0.14534	0.03731	0.61708	2.251	70	0.028
Mechanical	Mechanic Statics and Engineering Materials	-0.35888	1.25325	0.12660	-0.61014	-0.10762	-2.835	35	0.006
	Circuit Analysis and Engineering Materials	-0.70306	1.24819	0.20803	-1.12538	-0.28073	-3.380	35	0.002