



A COMPARATIVE ANALYSIS OF THE PERFORMANCE OF CIVIL ENGINEERING STUDENTS ENROLLED FOR A 3 YEAR DIPLOMA AND 3,5 YEAR EXTENDED PROGRAMME OVER A 5 YEAR PERIOD AT THE TSHWANE UNIVERSITY OF TECHNOLOGY

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ABSTRACT- The objective of this paper is to report on a comparative analysis of student performance in a traditional 3 year National Diploma (ND) and 3,5 year extended programme (EP) at the Tshwane University of Technology (TUT). The Civil Engineering groups (3 year programme) were compared to the 3,5 year National Diploma: Civil Engineering (Extended) students over a 5 year period (2010-2014). The aim of the EP's is to provide access to students who do not meet the minimum entrance requirements of the Institution, but do however have the potential to complete an engineering programme successfully. The intention is to increase the retention and throughput in Engineering whilst at the same time ensuring quality of teaching and learning. This analysis makes use of data gathered from the Information Technology System (ITS) of TUT. Specific cohorts are compared looking in depth at the first semester (year) subjects. Furthermore their performance in following years is evaluated. Drop-outs and final diplomas awarded between the two groups are also compared. The conclusion made is that EP is indeed effective and its objectives regarding "access with success" have been achieved.

Key words: Civil Engineering; Extended programmes; retention; throughput

1. INTRODUCTION

The student success rate in the public higher education (HE) system illustrated the dysfunctionality of the education system. Less than one-third of the students completed a qualification within the required minimum time (Du Plessis & Gerber, 2012). Only 30 percent of first-time entering students had graduated after 5 years. By the end of 2004 (five years after entering) 56 per cent had left their original institutions and only about 14 percent were still in the system. This is the shocking findings from a Department of Education study on graduation rates at South African higher education institutions (Scott, Yeld & Hendry, 2007).

In order to address some of these problems a number of academic support/development programmes were put into place during the past two decades, for example bridging courses, Foundation programmes and Extended programmes amongst other Institutional based programmes. This paper reports on a comparative analysis of student performance in a traditional 3 year ND and 3,5 year EP at TUT. The paper is structured as follows. Firstly, the context of the study is outlined and the rationale for introducing the EP is explained. This is followed by a review of the literature on EP's. The research design and methodology are discussed and the findings are listed thereafter, followed by a data analysis, conclusion and recommendations.

1.1 The context of the study

Since 2008 Engineering Foundation programmes for Civil, Electrical, Industrial, Mechanical and Mechatronics Engineering have been offered at TUT. In 2010 this changed to Engineering EP's, where the first semester (S1) of the diploma studies are offered over a year. Students placed in these programmes do not meet the minimum requirements for direct entry into diploma courses and normally have deficiencies in terms of background knowledge and skills, especially in

mathematics and science. The minimum requirements to be placed on the EP are Mathematics - 4, Physical Science - 3 and English First or Second Language - 4 for Grade 12 with an APS of 20 - 27. Experienced lecturers with a solid understanding regarding problematic areas normally encountered by students are used to teach these subjects.

1.2 The rationale for introducing Engineering Extended programmes

According to Koch and Snyders (2001, p.138) numerous students are still receiving schooling that can be regarded as below standard. As a result they experience problems with especially mathematics and science subjects. These problems are often related to their inability to deal with mathematical thinking. Nolte, Heyns and Venter (1997, p.167) state that many educational institutions have tried to address the problem by developing academic support programmes or development programmes. The aim of such programmes is to bridge the gap between secondary and tertiary education.

EP's for Civil, Electrical, Mechanical, Mechatronics and Industrial Engineering at TUT started running in January 2010.

In light of this background this study seeks to compare the cohort students enrolled directly into the National Diploma Civil Engineering with the students enrolled in the 3,5 years National Diploma Civil Engineering (Extended) students, and to determine if the EP are efficient and in fact supporting Civil Engineering students placed on EP's to successfully complete their qualification.

2. REVIEW OF THE LITERATURE

In this section the literature on academic support programmes are reviewed. Because the focus of this study was to report on a comparative analysis of student performance in a traditional 3 year ND and 3,5 year EP at TUT, the review of the literature cover different support programmes with a focus on EP's, the purpose of foundation/extended provisioning and different offering styles of support/extended programmes; as well as the National Diploma: Civil Engineering offered at TUT.

2.1. The purpose of foundation/extended provisioning

The primary purpose of foundation provision is to improve the academic performance of students who are at risk, mainly due to their educational backgrounds. The majority of students who are at risk because of disadvantaged educational backgrounds are directly admitted into the mainstream programmes. The reason for this is that a significant number of students who do meet the minimum admissions criteria, are un/underprepared for regular programmes. They either do not succeed or simply drop out after a while. A key role of foundation provision is therefor to place these students in an EP that will give them the academic foundation to successfully complete their studies.

2.2. Offering styles of support/extended programmes

2.2.1 Bridging programmes

According to Felix (2002), a bridging programme has no effect on the mainstream curriculum. The only purpose of a bridging programme is to prepare students for the mainstream by providing remedial support prior to mainstream curriculum. The bridging programme is only seen as an add-on to the mainstream curriculum. Felix distinguishes between short bridging programmes, full bridging programmes and other bridging programmes. In some instances bridging programmes are also used for screening purposes before selection for the mainstream takes place.

Snyders (2002) also see a bridging programme as a programme that tends to be a repetition of something that was done previously, i.e. schooling was not good enough and must be repeated to improve it.

Port Elizabeth Technikon started with a six-month bridging course for engineering and science students in 1989. Underprepared African and coloured students were the majority students on the course. The programme consisted of mathematics, physics, technical English, a choice between chemistry and technology and life skills.



Sharwood (1995) reports that the success rate of students in their first year of mainstream who did continue their studies at Technikon was as follows: 59% of Pre-Technician students passed all their subjects compared to 47% other students. More detailed research results were unfortunately not available.

2.2.2 Foundation programmes

As stated above a bridging programme tries to correct something that was not done well in the past. A foundation program, however, has as its primary aim the preparation of students for further studies.

According to Scott (2002, p.2) a foundation programme can be seen as:

- Addressing the secondary-tertiary articulation gap.
- Facilitating responsible widening of access.

Felix (2002, p.3) is of the opinion that a foundation programme is a type of EP where a three-year qualification is stretched over four years. Students are allowed to spread their first year credits over a period of two years. They get additional support like tutorials, preparatory courses and life skills in addition to their first year credit courses. The workload is therefore reduced.

Warren (1998, p.80) states that the UCT has continued with academic support and were using a “flexible” foundational model, which allows students to take combinations of “bridging” and regular courses as also favored at other universities in South Africa. Institutional commitment to accommodate a more diverse student intake in well-designed and flexible curricula has been reinforced by the national reform in higher education. These programmes must foster students’ academic development and so offer a chance of redress with success.

2.2.3 Extended programmes

Yeld (2010) states that EP’s are not “remedial” in the traditional sense of redoing work of a previous level (school work). They build on the reality that the majority of students take at least an extra year to complete a degree and that this extra time should be used sensibly. While ensuring that all work in EP’s is at an appropriately demanding, higher education level, EP’s should look to future demands and focus on conceptual development and key academic skills.

There are different models of Extended programmes that are funded by DoHET:

- Model 1: Extended curriculum incorporating a “fully foundational year”.
- Model 2: Regular first-year curriculum taken over two years with incorporation of substantial foundation provision.
- Model 3: Regular first-year curriculum taken over two years with combination of foundational and regular courses.
- Model 4: Using “augmenting” courses.

2.3 National Diploma: Civil Engineering

The minimum duration of a ND in Civil Engineering offered at TUT is 3 years. It comprises of four semesters theoretical training and two semesters of experiential learning.

After completion of the ND a student may continue with studies towards a B Tech Degree in engineering in various specialization fields in the different disciplines.

3. RESEARCH DESIGN AND METHODS

In this section the research design and methodology used during this study is discussed.

3.1. Research design

The research design for the purposes of this paper was that of a descriptive, exploratory study, making use of information requested from the Information Technology System (ITS) of the TUT. Information requested consisted of academic results of the students enrolled for ND: Civil Engineering (Extended) during 2010 – 2014, as well as students enrolled for mainstream ND: Civil Engineering during the same period. The results of all these students were analysed individually to compare the different cohorts and their performance relative to each other, if they had graduated in minimum time, whether they were still registered and the number of subjects completed to date. The same method of analysis was used for all cohorts.

3.2 Participants

The population consists of the following cohorts of all the students enrolled at TUT for ND: Civil Engineering (Extended) as well as ND: Civil Engineering for the years 2010 – 2014 as seen in table 3.1 below.

Table 3.1 Population: ND: Civil Engineering (Extended) students vs students enrolled directly on ND: Civil Engineering

Sem/Year	ND: Civil Engineering (Extended)	Sem/Year	ND: Civil Engineering
1/2010	34	2/2010	50
1/2011	39	2/2011	75
1/2012	36	2/2012	73
1/2013	78	2/2013	29
1/2014	77	2/2014	35

3.3 Data collection

Data was extracted from the Information Technology System (ITS) of the TUT and contained information regarding academic results of the students enrolled for ND: Civil Engineering (Extended) during 2010 – 2014, as well as students enrolled for mainstream ND: Civil Engineering during the same period for the first time. As the EP students complete their S1 over a year compared to the 6 months of the ND students, it was not possible to compare students who entered the same semester. To ensure validity and reliability it was decided to compare the cohorts who wrote the same examination papers, hence semester 1/2010 EP students were compared to semester 2/2010 ND students, and so forth. This ensured that the standard of the examination were the same for both cohorts

3.4 Data Analysis

Descriptive statistics were used to analyse the data. The collected data was analysed by means of tabular and/or graphical statistical techniques, performed on Excel and Word. Histograms were also used to compare the different variables.

The data obtained from the results received from the Information Technology System (ITS) were analysed by making use of SAS, a statistical software program. The two groups that were compared were the EP students versus the ND students. The *t*-test was used to compare the performance between the EP and ND students within the same subject. In all the tests, a 0.05 level of significant was used.

4. RESEARCH FINDINGS AND DISCUSSION

The findings and results are divided into the five different cohorts. In each of these sections an indication is given of the number of enrollments, cancellations, change of course and students that

qualified for diplomas where applicable. The results of the statistical analysis are shown and a breakdown of the first level subjects that students were enrolled for as well as their averages. A discussion of the students' performance in the following levels of studies was made with regard to their progress in each semester. An indication is also given of the number of subjects that the students have already completed towards obtaining their diploma. At the end a summary of all the semesters are given.

4.1 Overview

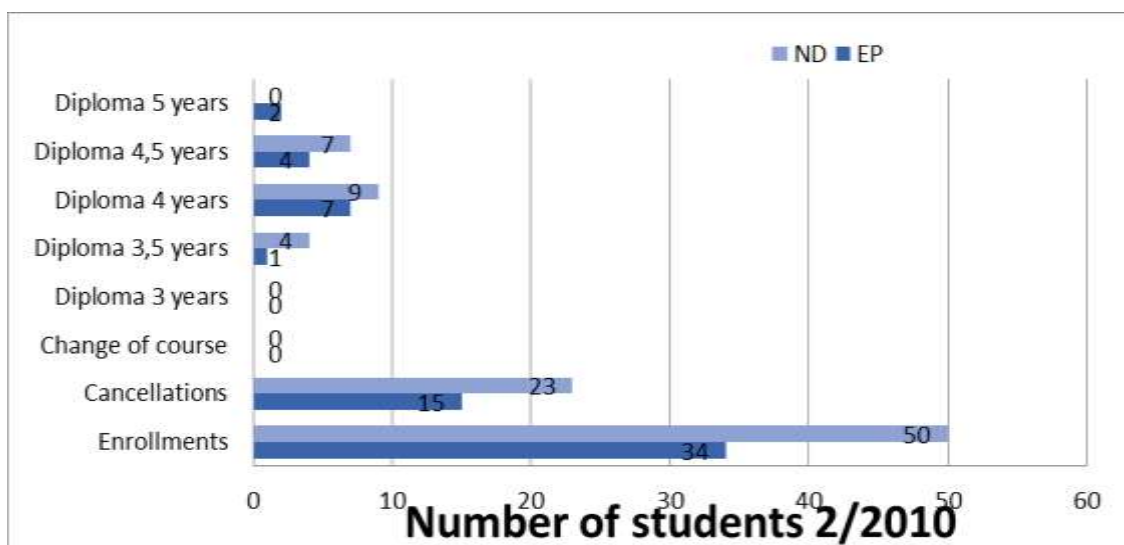
During the period of this research there were 264 EP and 262 ND students enrolled for Civil Engineering studies. Of these enrollments 25 of the EP students and 30 of the ND students have already obtained their diplomas. This is not a significant difference. The performance between the EP and the ND students are very much the same with the EP students performing better in some of the first level subjects than the ND students. The performances of the EP students in the higher levels of studies are the same and even better in certain subjects with no major fall-outs that could be picked up in this study. The conclusion that can be made from this is that the EP is effective and that students are definitely brought on par with the ND students' level.

4.2 Cohort analysis

4.2.1 Year 2010 - Semester 2

4.2.1.1 Number of enrollments, cancellations, change of course and students qualifying for diplomas

Graph 4.1 shows a breakdown of the 2010 semester 2 cohort. There were more ND students that cancelled/dropped out their courses compared to the EP students, with no change of courses. There were no students in the ND group that qualified for their diplomas in minimum time where 1 EP student qualified in minimum time. In total 20 (40%) of the ND students completed their studies compared to 14 (41%) of the EP students. Considering that the EP students would not have been admitted to Engineering studies at all this shows the EP are achieving its purpose, namely creating access with success. The number of cancellations/drop-outs was rather high in both groups in relation to the actual enrolments.



Graph 4.1 Number of enrollments, cancellations, change of course and students qualifying for diplomas for the year 2010, semester 2

4.2.1.2 Statistical analysis

No significant difference was found between the EP and the ND students on the first level as shown in table 4.1.

Table 4.1 Statistical analysis of the results of first level subjects for civil engineering for the year 2010, semester 2

	Mean		Standard deviation		T-test
	EP	ND	EP	ND	
Applied Mechanics I	52.63	50.39	10.18142	10.15053	-0.9481
Computer Skills I	65.35	74.51	15.0914	9.251402	3.4247
Construction Materials I	65.88	58.59	7.326141	9.361483	-3.401364
Drawing I	55.94	62.97	12.58345	12.84756	-2.4923
Mathematics I	58.52	61.36	12.13774	16.10081	0.8155
Surveying I: Theory	57.85	51.68	13.4528	14.11677	-2.0046
Surveying I: Practical	63.03	48.92	10.60156	15.20048	-4.6883

4.2.1.3 Breakdown of results of first level subjects

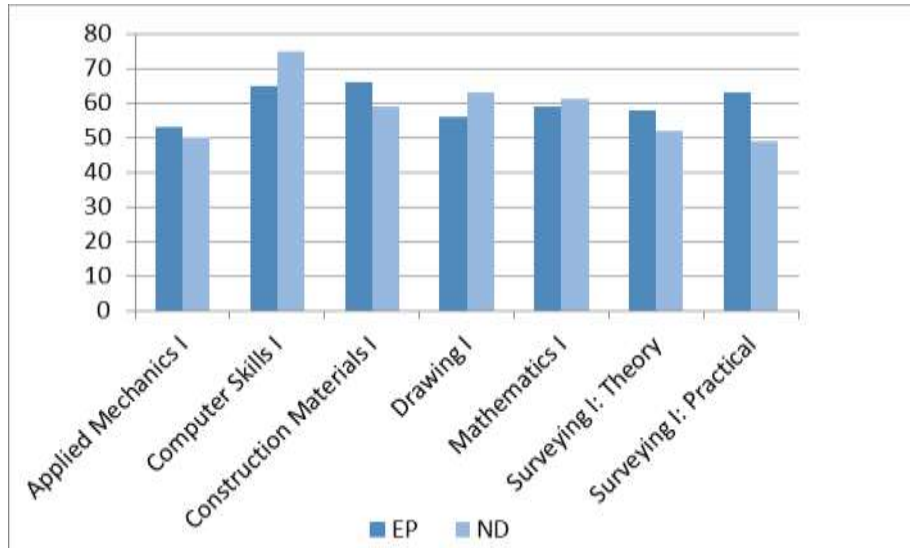
Table 4.2 shows the breakdown of the results of first level subjects for civil engineering for semester 2 of 2010.

Table 4.2 Breakdown of results of first level subjects for civil engineering for the year 2010 semester 2

	Applied Mechanics I		Computer Skills I		Construction Materials I		Drawing I		Mathematics I		Surveying I: Theory		Surveying I: Practical	
	EP	ND	EP	ND	EP	ND	EP	ND	EP	ND	EP	ND	EP	ND
MEAN	53	50	65	75	66	59	56	63	59	61	58	52	63	49
Pass	21	26	23	25	28	40	24	35	21	24	24	27	28	30
Pass with Distinction	1	0	9	24	5	2	7	3	4	7	3	4	1	1
Fail	10	17	2	1	0	5	3	12	6	8	7	3	21	19
No Admission	2	0	---	---	0	0	---	---	3	9	0	0	---	---
Absent	0	6	---	---	1	3	---	---	0	2	0	0	---	---
Re-exam	7	22	---	---	0	5	---	---	3	3	0	0	---	---

Overall the average of EP as well as the ND students was very good for most of the subjects. The ND students did however not achieve a pass average of 50% for Surveying I: Practical. The performance in both groups was similar with no major concerns. Keeping in mind that the EP students would not have been allowed to enroll for the diploma in the first instance this is very encouraging. It is not expected that these students should perform better than the ND students. It is of interest to note that 22 of the ND students qualified for a re-examination compared to only 7 of the EP group in Applied Mechanics I. This is one of the subjects on S1 level with a low success rate.

Graph 4.2 shows the average achieved by students.



Graph 4.2 Average of first level subjects for the year 2010 semester 2

Table 4.3 and 4.4 shows the number of subjects passed the first semester and the number of diplomas completed for the EP and ND students. It is interesting to see that 53% of the EP students passed all 8 subjects on their first attempt compared to only 28% of the ND students. One EP student qualified for diploma in minimum time with no ND students qualifying in minimum time. Students passing all their subjects were finishing in less time than students failing subjects. This can be a result of timetable clashes when carrying subjects to the following level. In this cohort students failing more than half of their subjects on the S1 level did not complete their studies yet. There were still 5 EP students and 6 ND students registered in semester 1 of 2015, so these figures may still change.

Table 4.3 EP students S1 number of subjects passed first semester and diplomas completed for the year 2010 semester 2 cohort

# S1 subjects passed first semester	0	1	2	3	4	5	6	7	8
# Students passed	1	0	0	1	1	4	4	5	18
%Students passed	2.941176	0	0	2.941176	2.941176	11.76471	11.76471	14.70588	52.94118
Completed diploma							1(4,5yrs)	1(4,5yrs) 2(5yrs)	1(3,5yrs) 8(4yrs) 2(4,5yrs)

Table 4.4 ND students S1 number of subjects passed first semester and diplomas completed for the year 2010 semester 2 cohort

# S1 subjects passed first semester	0	1	2	3	4	5	6	7
# Students passed	1	1	7	3	6	7	11	14
%Students passed	2	2	14	6	12	14	22	28
Completed diploma					1(4,5yrs)	3(4yrs)	1(3,5yrs) 1(4yrs) 2(4,5yrs)	3(3,5yrs) 5(4yrs) 4(4,5yrs)

4.2.1.4 Performance in the following levels of studies

Table 4.5 and 4.6 shows a summary of the number of subjects completed during 2010 – 2014 for this cohort. Of the EP students 56% completed all 27 their subjects, 47% completed their Practical 1 and 41% completed Practical 2. From the ND students, 54% completed all 27 their subjects, 54% completed their Practical 1 and 48% completed their Practical 2.

Table 4.5 EP students subjects completed 2010 – 2014 for the year 2010 semester 2 cohort

# Subjects to date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	P1	P2
# Students passed	1					1					1		1		1			1		1		1	1	2	1	2	1	19	16	14
%Students passed	0	0	0	0	0	3	0	0	0	0	3	0	3	0	3	0	0	3	0	3	0	3	3	6	3	6	3	56	47	41

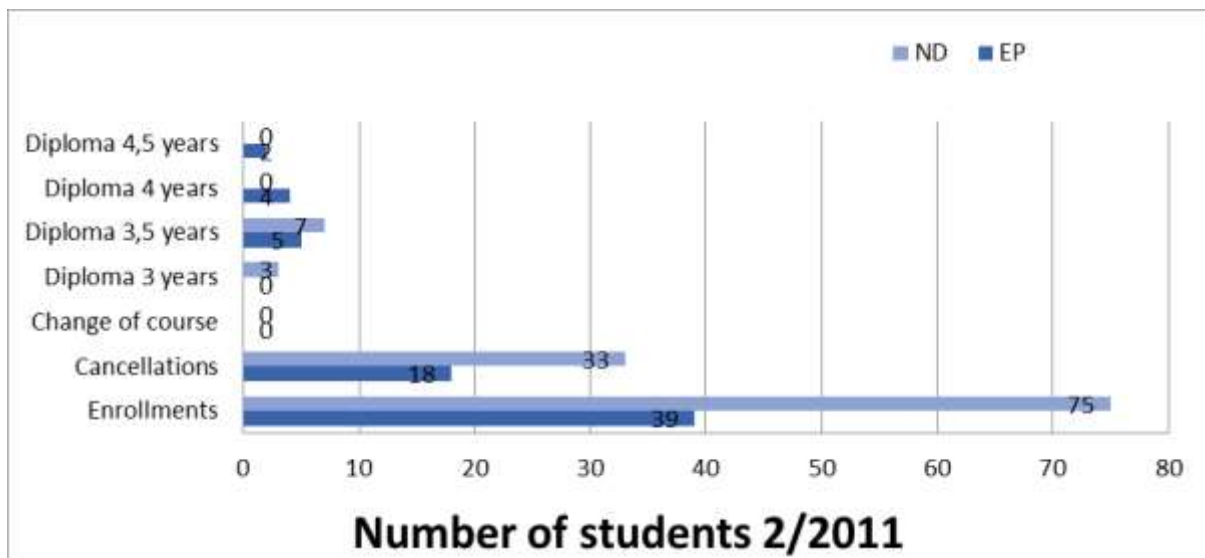
Table 4.6 ND students subjects completed 2010 – 2014 for the year 2010 semester 2 cohort

# Subjects to date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	P1	P2
# Students passed	1	1	1			1		1	1			1		2	1			1	2	1	3					1	5	27	27	24
%Students passed	2	2	2	0	0	2	0	2	2	0	0	2	0	4	2	0	0	2	4	2	6	0	0	0	0	2	10	54	54	48

4.2.2 Year 2011 - Semester 2

4.2.2.1 *Number of enrollments, cancellations, change of course and students qualifying for diplomas*

Graph 4.3 shows a breakdown of the 2011 semester 2 cohort. There were 3 students in the ND group that qualified for their diplomas in minimum time and 5 of the EP group. In total 10 (13%) of the ND students completed their studies compared to 11 (28%) of the EP students. Percentage wise more than double the EP students qualified for their diplomas compared to the ND students. The number of cancellations/drop-outs was again high in both groups. This raises the question if the admissions and placements were done appropriately. Would those 33 ND students not have performed better if they were placed on the EP?



Graph 4.1 Number of enrollments, cancellations, change of course and students qualifying for diplomas for the year 2011, semester 2.

4.2.2.2 *Statistical analysis*

No significant difference was found between the EP and the ND students on the first level as shown in table 4.7.

Table 4.7 Statistical analysis of the results of first level subjects for civil engineering for the year 2011, semester 2.

	Mean		Standard deviation		T-test
	EP	ND	EP	ND	
Applied Mechanics I	52.97	51.98	13.22998	12.42856	0.3392
Computer Skills I	59.03	55.18	15.0324	15.91188	1.2459
Construction Materials I	65.63	65.04	11.01699	8.601418	0.3110
Drawing I	65.62	61.93	14.53058	12.63575	1.4048

Mathematics I	56.97	52.20	12.32459	10.59976	1.9270
Surveying I: Theory	61.92	51.6	15.66489	12.2695	3.8683
Surveying I: Practical	63.33	57.133	19.38846	16.07864	1.8182

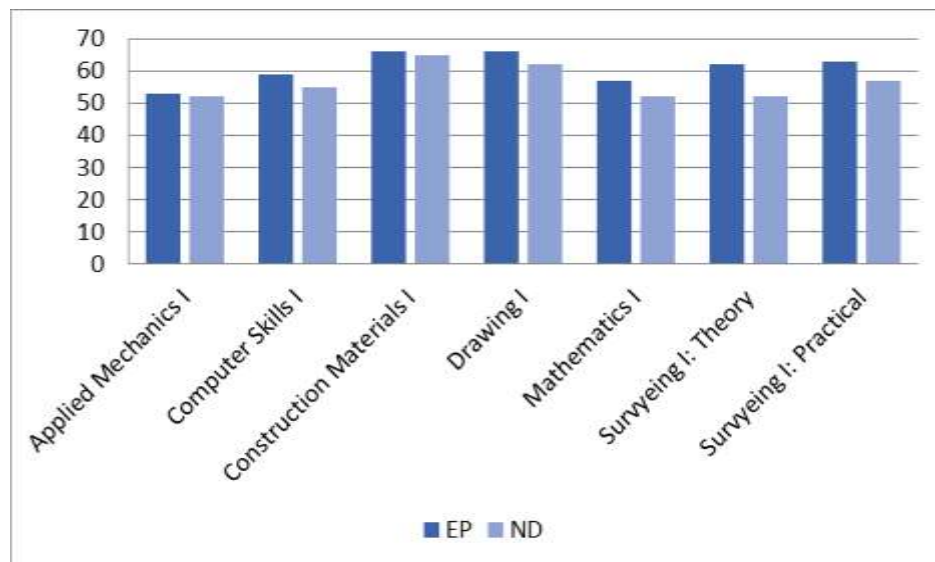
4.2.2.3 Breakdown of results of first level subjects

Table 4.8 Breakdown of results of first level subjects for civil engineering for the year 2011 semester 2

	Applied Mechanics I		Computer Skills I		Construction Materials I		Drawing I		Mathematics I		Surveying I: Theory		Surveying I: Practical	
	EP	ND	EP	ND	EP	ND	EP	ND	EP	ND	EP	ND	EP	ND
MEAN	53	52	59	55	66	65	66	62	57	52	62	52	63	57
Pass	19	25	23	42	25	60	23	59	20	42	23	22	51	51
Pass with Distinction	2	2	7	7	11	12	12	10	3	3	9	10	3	8
Fail	10	22	9	24	2	0	4	6	7	19	7	7	21	16
No Admission	6	25	---	---	1	1	---	---	9	9	0	0	---	---
Absent	2	1	---	---	0	1	---	---	0	1	0	0	---	---
Re-exam	0	0	---	---	0	0	---	---	0	0	0	0	---	---

Table 4.8 shows the breakdown of the results of first level subjects for civil engineering for semester 2 of 2011. Overall the average of EP as well as the ND students was very good for most of the subjects with the EP students achieving higher averages than the ND students in all of the subjects. In Applied Mechanics I 25 of the ND students and 10 of the EP students didn't achieve a 40% predicate and therefore did not have admission to write examinations.

Graph 4.4 shows the average achieved by students.



Graph 4.4 Average of first level subjects for the year 2011 semester 2

Table 4.9 and 4.10 below shows the number of subjects passed the first semester and the number of diplomas completed for the EP and ND students.



Table 4.9 EP students S1 number of subjects passed first semester and diplomas completed for the year 2011 semester 2 cohort

# S1 subjects passed first semester	0	1	2	3	4	5	6	7	8
# Students passed	1	2	3	0	1	4	5	5	18
%Students passed	2.564103	5.128205	7.692308	0	2.564103	10.25641	12.82051	12.82051	46.15385
Completed diploma									5(3,5yrs) 4(4yrs) 2(4,5yrs)

Table 4.10 ND students S1 number of subjects passed first semester and diplomas completed for the year 2011 semester 2 cohort

# S1 subjects passed first semester	0	1	2	3	4	5	6	7
# Students passed	1	2	4	4	15	16	16	17
%Students passed	1.333333	2.666667	5.333333	5.333333	20	21.33333	21.33333	22.66667
Completed diploma							2(3,5yrs)	3(3yrs) 5(3,5yrs)

Of the EP cohort 46% passed all 8 subjects on their first attempt compared to only 23% of the ND students passing all 7 their S1 subjects on their first attempt. There were 10 EP students and 32 ND students registered in semester 1 of 2015, so these figures may still change substantially as more students complete their studies.

4.2.2.4 Performance in the following levels of studies

Table 4.11 and 4.12 below shows a summary of the number of subjects completed during 2011 – 2014 for this cohort. Of the EP students 51% completed all 27 their subjects, 56% completed their Practical 1 and 33% completed Practical 2. From the ND students, 53% completed all 27 their subjects, 42% completed their Practical 1 and 18% completed their Practical 2.

Table 4.11 EP students subjects completed 2011 – 2014 for the year 2011 semester 2 cohort

# Subjects to date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	E1	E2
# Students passed		2	2			1	1							1					1			2		2	1		6	20	22	13
%Students passed	0	5	5	0	0	3	3	0	0	0	0	0	0	3	0	0	0	0	3	0	0	5	0	5	3	0	15	51	56	33

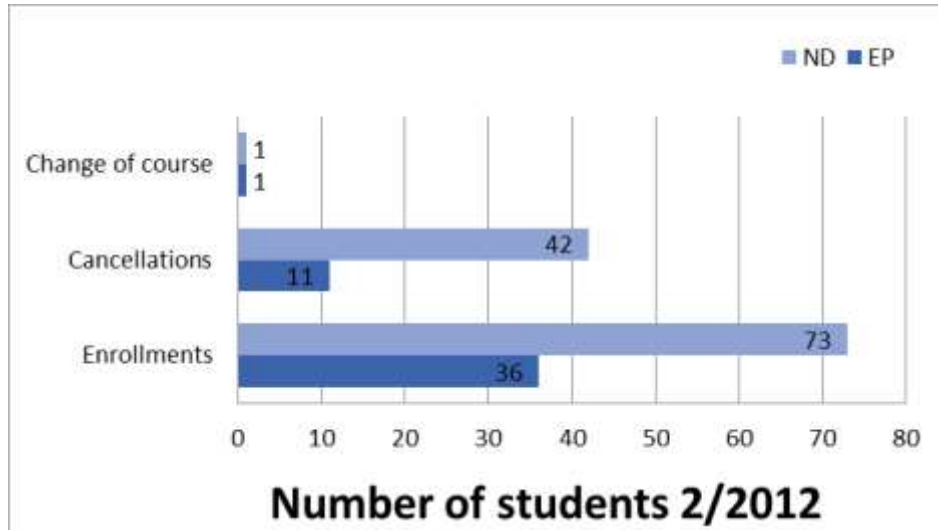
Table 4.12 ND students subjects completed 2010 – 2014 for the year 2011 semester 2 cohort

# Subjects to date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	E1	E2
# Students passed		1	1		3		1	1	2			2		1					1	1	3	1	1	2	5	3	7	40	32	14
%Students passed	0	1	1	0	4	0	1	1	3	0	0	3	0	1	0	0	0	0	1	1	4	1	1	3	7	4	9	53	42	18

4.2.3 Year 2012 - Semester 2

4.2.3.1 Number of enrollments, cancellations and change of course

In graph 4.5 the number of enrollments, cancellations and change of course for the year 2012, semester 2 is shown. There were more ND students that cancelled/dropped out their course compared to the EP students.



Graph 4.5 Number of enrollments, cancellations and change of course for the year 2012, semester 2.

4.2.3.2 Statistical analysis

No significant difference was found between the EP and the ND students on the first level as shown in table 4.13.

Table 4.13 Statistical analysis of the results of first level subjects for civil engineering for the year 2012, semester 2

	Mean		Standard deviation		T-test
	EP	ND	EP	ND	
Applied Mechanics I	62.3	60.17	10.19855	14.83624	0.7174
Computer Skills I	67.19	55.41	11.38626	16.64884	3.8627
Construction Materials I	68.77	73.30	8.321078	61.53064	-0.4323
Drawing I	70.75	59.5	13.85512	17.01526	3.4793
Mathematics I	62.09	62.09	9.020977	12.50969	0.0028
Surveying I: Theory	51.64	55.51	10.36795	12.14678	-1.6597
Surveying I: Practical	51.22	55.26	16.06969	15.9998	-1.2566

4.2.3.3 Breakdown of results of first level subjects

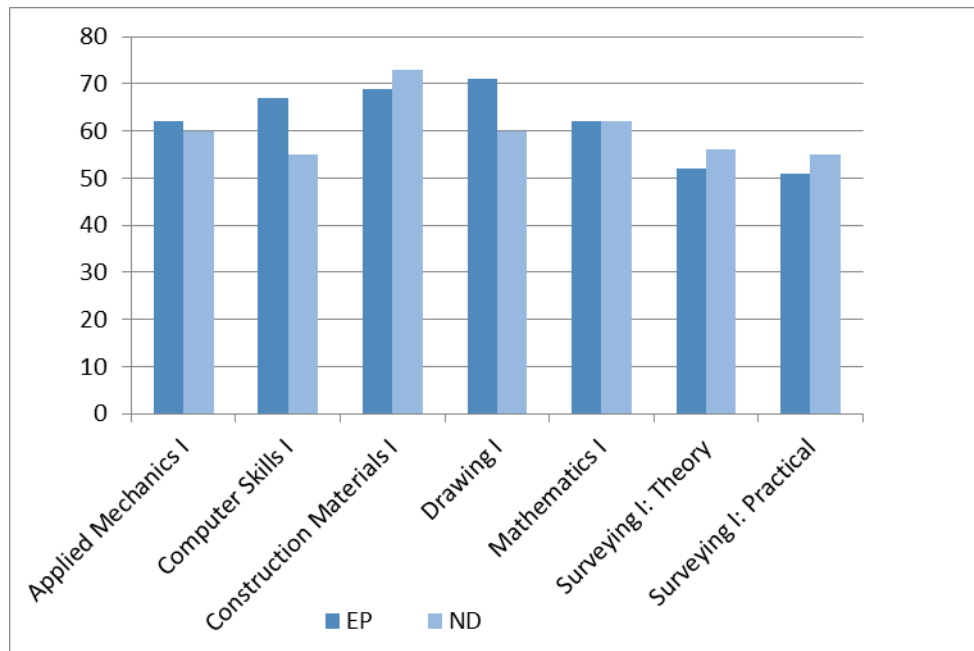
Table 4.14 shows the breakdown of the results of first level subjects for semester 2 of 2012. Once again 19 of the ND students and 5 of the EP students didn't achieve a 40% predicate and therefore did not have admission to write examinations for Applied Mechanics I.

Table 4.14 Breakdown of results of first level subjects for civil engineering for the year 2012 semester 2

	Applied Mechanics I		Computer Skills I		Construction Materials I		Drawing I		Mathematics I		Surveying I: Theory		Surveying I: Practical	
	EP	ND	EP	ND	EP	ND	EP	ND	EP	ND	EP	ND	EP	ND
MEAN	62	60	67	55	69	73	71	60	62	62	52	56	51	55
Pass	22	30	23	41	23	58	18	45	30	31	25	23	58	58
Pass with	6	10	12	7	12	8	16	15	2	3	1	3	5	6

Distinction														
Fail	2	9	1	24	0	1	2	12	0	24	10	10	9	8
No Admission	5	19	---	---	0	3	---	---	4	10	0	0	---	---
Absent	1	4	---	---	1	2	---	---	0	4	0	0	---	---
Re-exam	0	0	---	---	0	0	---	---	0	0	0	0	---	---

Graph 4.6 shows the average achieved by students.



Graph 4.6 Average of first level subjects for the year 2012 semester 2.

Table 4.15 and 4.16 below shows the number of subjects passed the first semester for the EP and ND students. The first students will only be qualifying for diplomas in July 2015 so no information is available yet. Of the EP cohort 61% passed all 8 subjects on their first attempt compared to only 28% of the ND students passing all 7 their S1 subjects on their first attempt. There were 25 EP students and 31 ND students registered in semester 1 of 2015.

Table 4.15 EP students S1 number of subjects passed first semester for the year 2012 semester 2 cohort

# S1 subjects passed first semester	0	1	2	3	4	5	6	7	8
# Students passed	1	0	0	0	4	2	1	6	22
%Students passed	2.777778	0	0	0	11.111111	5.555556	2.777778	16.666667	61.111111
Completed diploma									

Table 4.16 ND students S1 number of subjects passed first semester for the year 2012 semester 2 cohort

# S1 subjects passed first semester	0	1	2	3	4	5	6	7
# Students passed	1	3	2	7	9	15	15	21
%Students passed	1.351351	4.054054	2.702703	9.459459	12.16216	20.27027	20.27027	28.37838
Completed diploma								

4.2.3.4 Performance in the following levels of studies

Table 4.17 and 4.18 shows a summary of the number of subjects completed during 2012 – 2014 for this cohort. Of the EP students only 3% completed all 27 their subjects, while 53% completed 25 subjects, and 8% completed their Practical 1. From the ND students, 32% completed all 27 their subjects, 11% completed their Practical 1 and 1% completed their Practical 2. Although it seems as if



the ND students are performing better, the picture may change as the 53% EP students with the 25 subjects may complete the subjects whilst enrolled for practical. This in effect means that more EP students will finish in comparison with the ND students.

Table 4.17 EP students subjects completed 2012 – 2014 for the year 2012 semester 2 cohort

# Subjects to date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	E1	E2
# Students passed	1						1	1						1				1			1		1	3	6	19		1	3	
%Students passed	3	0	0	0	0	0	3	3	0	0	0	0	0	3	0	0	0	3	0	0	3	0	3	8	17	53	0	3	8	0

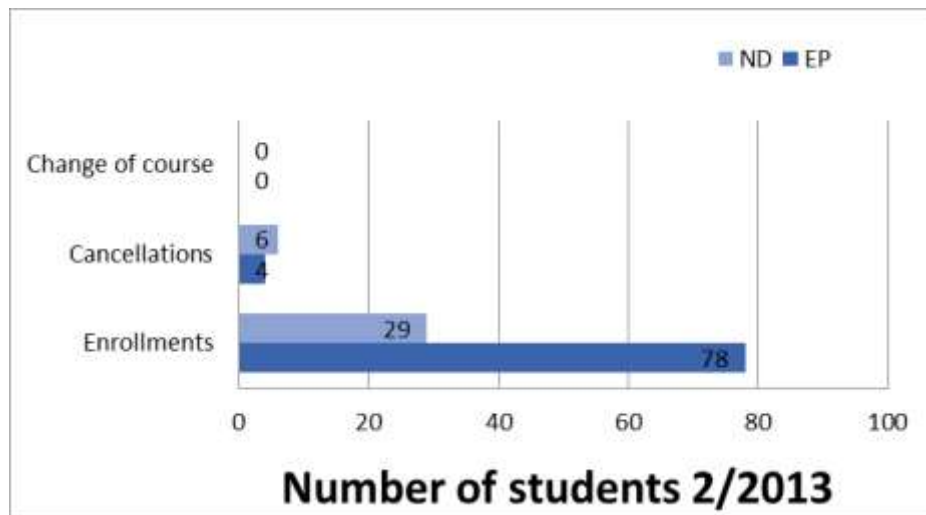
Table 4.18 ND students subjects completed 2012 – 2014 for the year 2012 semester 2 cohort

# Subjects to date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	E1	E2
# Students passed	1	1		1	4	1	2	1	2	3	1	1		3	1			2	2	2	3	5	4	2	1	5	2	23	8	1
%Students passed	1	1	0	1	5	1	3	1	3	4	1	1	0	4	1	0	0	3	3	3	4	7	5	3	1	7	3	32	11	1

4.2.4 Year 2013 - Semester 2

4.2.4.1 Number of enrollments, cancellations and change of course

In graph 4.7 the number of enrollments, cancellations and change of course for the year 2013, semester 2 is shown. There were 6 ND students that cancelled/dropped out their course compared to 4 EP students.



Graph 4.7 Number of enrollments, cancellations and change of course for the year 2013, semester 2.

4.2.4.2 Statistical analysis

No significant difference was found between the EP and the ND students on the first level as shown in table 4.19.

Table 4.19 Statistical analysis of the results of first level subjects for civil engineering for the year 2013, semester 2

	Mean		Standard deviation		T-test
	EP	ND	EP	ND	
Applied Mechanics I	61.94	63.97	8.245171	14.93629	-1.0517
Computer Skills I	71.01	70.47	8.891107	11.93386	0.3173
Construction Materials I	70.13	72.41	7.594186	11.89866	-1.4210
Drawing I	73.67	61.70	8.71134	14.58466	6.2100
Mathematics I	53.33	54.41	10.77298	13.55973	-0.5091
Surveying I: Theory	66.47	55.31	9.013301	10.53223	7.0923
Surveying I: Practical	70.28	54.53	9.569836	14.99349	7.8055

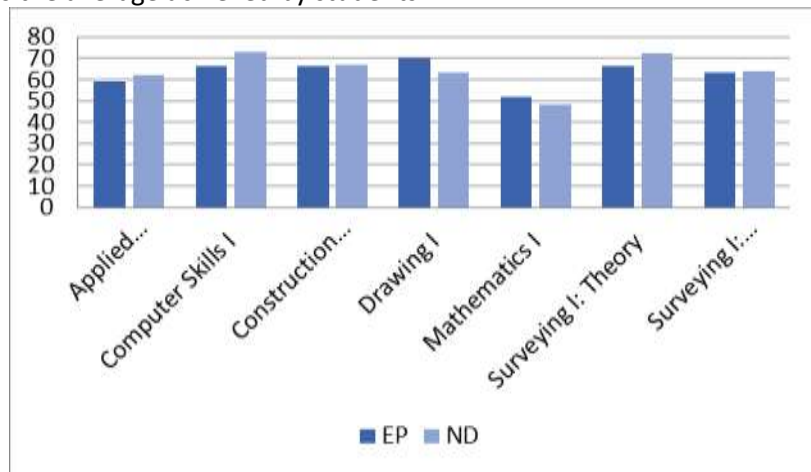
4.2.4.3 Breakdown of results of first level subjects

Table 4.20 shows the breakdown of the results of first level subjects for civil engineering for semester 2 of 2013. Overall the average of EP as well as the ND students was very good for most of the subjects with the exception of Mathematics I.

Table 4.20 Breakdown of results of first level subjects for civil engineering for the year 2013 semester 2

	Applied Mechanics I		Computer Skills I		Construction Materials I		Drawing I		Mathematics I		Surveying I: Theory		Surveying I: Practical	
	EP	ND	EP	ND	EP	ND	EP	ND	EP	ND	EP	ND	EP	ND
MEAN	62	64	71	71	70	72	74	62	53	54	67	55	70	55
Pass	67	13	47	13	53	24	37	17	51	7	60	44	20	19
Pass with Distinction	8	9	31	14	25	4	40	9	2	4	17	31	6	7
Fail	3	7	0	2	0	1	0	3	20	16	1	3	3	3
No Admission	0	0	---	---	0	0	---	---	1	1	0	0	---	---
Absent	0	0	---	---	0	0	---	---	1	1	0	0	---	---
Re-exam	0	0	---	---	0	0	---	---	0	0	0	0	---	---

Graph 4.8 shows the average achieved by students.



Graph 4.8 Average of first level subjects for the year 2013 semester 2.

Table 4.21 and 4.22 below shows the number of subjects passed the first semester. Of the EP cohort 67% passed all 8 subjects on their first attempt compared to only 31% of the ND. There were 74 EP students and 23 ND students registered in semester 1 of 2015.

Table 4.21 EP students S1 number of subjects passed first semester and diplomas completed for the year 2013 semester 2 cohort

# S1 subjects passed first semester	0	1	2	3	4	5	6	7	8
# Students passed	0	0	0	0	0	0	5	21	52
%Students passed	0	0	0	0	0	0	6.410256	26.92308	66.66667

Table 4.22 ND students S1 number of subjects passed first semester and diplomas completed for the year 2013 semester 2 cohort

# S1 subjects passed first semester	0	1	2	3	4	5	6	7
# Students passed	1	0	0	1	2	3	13	9
%Students passed	3.448276	0	0	3.448276	6.896552	10.34483	44.82759	31.03448

4.2.4.4 Performance in the following levels of studies

Table 4.23 and 4.24 below shows a summary of the number of subjects completed during 2013 – 2014 for this cohort. Out of a possible 21 subjects, only 49% completed 21 subjects and 38% ND students completed 21 subjects.

Table 4.23 EP students subjects completed 2013 – 2014 for the year 2013 semester 2 cohort

# Subjects to date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
# Students passed							1			1			1	1	1	2	7	2	3	7	14	38
%Students passed	0	0	0	0	0	0	1	0	0	1	0	0	1	1	1	3	9	3	4	9	18	49

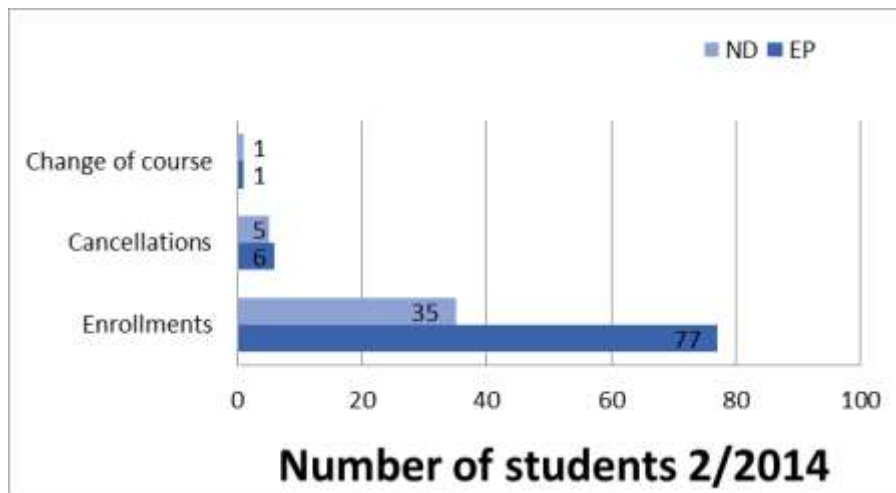
Table 4.24 ND students subjects completed 2013 – 2014 for the year 2013 semester 2 cohort

# Subjects to date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
# Students passed	1						1	2	2			1	1		1	1			2	2	4	11
%Students passed	3	0	0	0	0	0	3	7	7	0	0	3	3	0	3	3	0	0	7	7	14	38

4.2.5 Year 2014 - Semester 2

4.2.5.1 Number of enrollments, cancellations, change of course and students qualifying for diplomas

In graph 4.9 the number of enrollments, cancellations and change of course for the year 2014, semester 2 is shown. There were 5 ND students that cancelled/dropped out their course compared to 6 EP students.



Graph 4.9 Number of enrollments, cancellations and change of course for the year 2014, semester 2.

4.2.5.2 Statistical analysis

No significant difference was found between the EP and the ND students on the first level as shown in table 4.25.

Table 4.25 Statistical analysis of the results of first level subjects for civil engineering for the year 2014, semester 2.

	Mean		Standard deviation		T-test
	EP	ND	EP	ND	
Applied Mechanics I	65.39	59.63	14.1813	17.82445	1.8351
Computer Skills I	72.90	59.34	14.74126	16.7331	4.3215
Construction Materials I	65.26	55.23	6.965789	17.83764	4.2196
Drawing I	66.85	56.09	12.05471	17.96135	3.7089

Mathematics I	62.38	65.62	14.24223	10.21348	-1.1171
Surveying I: Theory	59.49	50.37	12.20723	20.08963	2.9654
Surveying I: Practical	59.64	57.89	15.84207	18.69692	0.5119

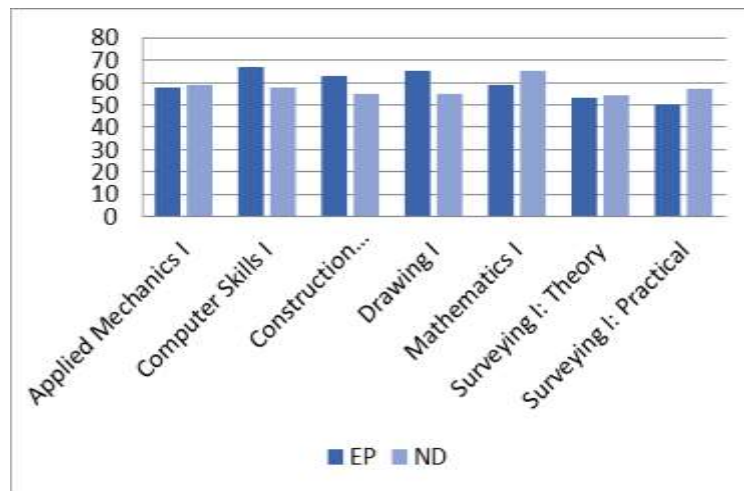
4.2.5.3 Breakdown of results of first level subjects

Table 4.26 shows the breakdown of the results of first level subjects. Overall the average of EP as well as the ND students was very good.

Table 4.26 Breakdown of results of first level subjects for civil engineering for the year 2014 semester 2

	Applied Mechanics I		Computer Skills I		Construction Materials I		Drawing I		Mathematics I		Surveying I: Theory		Surveying I: Practical	
	EP	ND	EP	ND	EP	ND	EP	ND	EP	ND	EP	ND	EP	ND
MEAN	58	59	67	58	63	55	65	55	59	65	53	54	50	57
Pass	57	18	29	20	66	28	51	21	49	23	64	59	22	21
Pass with Distinction	16	10	44	9	7	1	22	5	15	6	6	10	2	7
Fail	4	7	4	6	3	6	3	9	10	0	7	8	11	7
No Admission	0	0	---	---	0	0	---	---	0	0	0	0	---	---
Absent	0	0	---	---	0	0	---	---	2	6	0	0	---	---
Re-exam	0	0	---	---	0	0	---	---	0	0	0	0	---	---

Graph 4.10 shows the average achieved by students.



Graph 4.10 Average of first level subjects for the year 2014 semester 2.

Tables 4.27 and 4.28 below shows the number of subjects passed the first semester. Of the EP cohort 77% passed all 8 subjects on their first attempt compared to only 57% of the ND students passing all 7 their S1 subjects on their first attempt. There were 71 EP students and 30 ND students registered in semester 1 of 2015.

Table 4.27 EP students subjects completed in 2014 for the year 2014 semester 2 cohort

# Subjects to date	0	1	2	3	4	5	6	7	8
# Students passed	2	1	0	0	2	2	5	6	59
%Students passed	3	1	0	0	3	3	6	8	77

Table 4.28 ND students subjects completed in 2014 for the year 2014 semester 2 cohort

# Subjects to date	0	1	2	3	4	5	6	7
# Students passed	3	2			2	2	5	21
% Students passed	9	6	0	0	6	6	14	57

4.2.2.4 Performance in the following levels of studies

Students are currently registered for S2 so no additional data are available yet.

4.3 Summary

Table 4.29 Comparison for civil engineering 2010 – 2014 cohorts

YEAR	#students enrolled		Registered 2015		Qualifications awarded		Qualifications awarded in:									
	Foundation	ND	Foundation	ND	Foundation	ND	3 yrs		3,5 yrs		4 yrs		4,5 yrs		5 yrs	
							Foundation	ND	Foundation	ND	Foundation	ND	Foundation	ND	Foundation	ND
2010	34	50	5(15%)	7(14%)	14(41%)	20(40%)		0	1(3%)	4(8%)	7(21%)	9(18%)	4(12%)	7(14%)	2(6%)	
2011	39	75	10(26%)	32(42%)	11(28%)	10(13%)		3(4%)	5(13%)	7(9%)	4(10%)		2(5%)			
2012	36	73	25(69%)	31(43%)												
2013	78	29	74(95%)	23(79%)												
2014	77	35	71(92%)	30(86%)												

The comparison for civil engineering is shown in table 4.29. The “Registered 2015” as indicated on the table are students that registered in 2015. The percentage indicated in brackets is the percentage of registrations with regard to the enrollments for that specific group. It is of importance to note that more EP students are still registered compared to the ND students in the 2012 – 2014 cohorts. A situation that is worrying is the relative low percentage of students that obtained their diploma in minimum time. This could indicate an admission and placement problem and necessitates further investigation. As mentioned previously no formal selection tests are done but students are placed according to their NSC results. In both the 2010 and 2011 cohorts more EP students qualified for diplomas compared to ND students. In 2011 there were 28% students that qualified compared to only 13% of ND students. This is very encouraging. Students failing any subjects on their first year level face challenges when continuing with their studies. They often experience time-table clashes between S1 and S2 subjects and are therefore forced to choose which classes to attend. Although students are not allowed to register for subjects that clash on the timetable, this is not regulated and some students do register for both subjects simultaneously. In the majority of the cases this leads to failure of one or both subjects. Some students also enroll for full S2 subject load and the subjects that they need to repeat, leading to an overload of subjects and work to be mastered, and once again more failures. This problem continue in the higher levels of studies as discussed in previous research by Machika (2012, p.998), and she argues that multiple unsuccessful attempts could contribute to students’ demotivation and negatively affect their academic self-image, which could ultimately lead to drop-out without obtaining a qualification.

5. CONCLUSION AND RECOMMENDATIONS

The results and discussion as described above is certainly very encouraging. According to the details it seems that the EP is effective, keeping in mind these students would not have been admitted to diploma studies at TUT at all. It seems however that there are a number of students that are placed on the wrong programme. This can be seen from the number of cancellations/exclusions/drop-outs in every cohort. Students dropping out from ND studies may have been successful if they started with the EP. At the same time there are a number of students on EP that fail that should not have been admitted at all. With the low admission criteria for EP, this could however be expected.



Recommendations from this study would be:

- Critically evaluate the admission requirements as well as the placement of students in either the ND or the EP.
- Students have to be followed up individually and their performance in all their subjects must be monitored in all their subjects for every semester.
- Students that don't enroll the following semester and don't qualify for a diploma yet should be contacted to determine why they didn't enroll. It was clear from the results that students that drop out for a semester or two and then continue normally fail more subjects when they continue again. Problems should be identified and students must be assisted during their studies.

The throughput could be improved taking the above recommendations into consideration and with proper placement of students in the beginning of their studies.

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