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Predicting Success in Higher Education: The Value of Criterion and Norm-referenced Assessments

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### **Abstract:**

Higher education's ability to retain students through to graduation appears to be an international challenge. This is also the case in South Africa where only 27% of student complete their studies in minimum time and where 55% are unlikely to ever graduate. These challenges have meant that extended degree programmes, where degrees are formally done over a longer period of time, have become a feature of South African education. One challenge is determining which students will benefit from an extended programme. In South Africa there are two sets of assessments that are pertinent to this debate: the national school leaving examinations (a statutory requirement for entry into higher education) and the National Benchmark Tests. The national school leaving assessments are norm-referenced, making it often difficult to interpret the results for placement purposes. The National Benchmark Tests are criterion-referenced, and are thus better suited for this placement. This paper describes the two assessments, and tracks the academic standing of a cohort of students over six years at one higher education institution. It argues that using the results of the two assessments in complementary ways is the most productive approach for the purpose of placement at this institution and others in South Africa. The implications of considering these assessments is briefly explored in broader higher education contexts.

### **Keywords**

Admissions, Assessment, Selection, Placement, Higher education, Extended degrees, Flexible degree structures.

### **Introduction**

Most higher education systems internationally struggle with the challenges of low throughput rates and high dropout rates. Among the 18 Organisation for Economic Co-operation and Development (OECD) countries for which data were available in 2010, some 31% of students who enter higher education fail to graduate. Graduation rates differ widely by country with some (Mexico, New Zealand, Sweden and the United States) having more than 40% of their higher education students not graduating, whereas for others (Belgium (Fl), Denmark, France, Japan, Korea, Spain and the Russian Federation) this proportion is less than 25% (OECD 2010).

For South African higher education only 27% graduate in minimum time, the majority of students take up to two years more than the minimum time for their degree studies and 55% of them never graduate (Scott et. al. 2007, Council on Higher Education 2013). These low throughput rates and high dropout rates exacerbate the problem of students taking longer than the minimum time. Extended degree programmes structure the curricula in such a manner that students can typically undertake their degree studies over the minimum time plus one year. One difficulty is how best to determine which students would benefit most from an extended degree programme and which students would most likely cope with doing the degree in minimum time. In South Africa there are two assessments of school-leavers that are pertinent to this debate. The first is the national school leaving examination, the National Senior Certificate (NSC), which is a statutory requirement for entry into

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higher education. The results of the NSC are often difficult to interpret for the purposes of admission and placement. The second assessment is the National Benchmark Tests (NBT) (Griesel 2006). Two of the NBT Project objectives are a) to provide a service to higher education institutions requiring additional information to assist in admission<sup>1</sup> (selection and placement) of students in appropriate curricular routes and b) to assist with curriculum development, particularly in relation to foundation and augmented courses (Griesel 2006, 4). The NBT through its conceptualisation, design and implementation is particularly well placed to provide information for the purpose of placement.

It is not only the content that is taught in the National Curriculum Statement (the school curriculum) that is essential for performing well in South African higher education. More important are the cognitive abilities and skills underlying the school curriculum content domains that are learned in one context and are believed to be transferable to another. The NBT therefore focus on the application of knowledge acquired in the school context, in the higher education context. The NBTP is thus designed to provide the kind of information which the South African higher education sector requires in order to make decisions about the most appropriate curriculum structures for students.

This paper argues that ranking applicants for selection is important, but there are two even more important considerations when making selection decisions. The one is placing students in appropriate curriculum structures and the second is that the curriculum structures themselves should take into account what students can and cannot do. Without mechanisms for appropriately placing students and identifying how the curricula should respond to the students who are admitted, the South African higher education sector is likely to continue to fail students. I argue that the extended degree programmes, which serve approximately fifteen percent of the first year higher education population, should become the norm, and what are often referred to as regular or mainstream programmes should progressively become the exception. I use tracking information of students who entered three faculties (Commerce, Engineering and the Built Environment and Science) at a South African higher education institution for the first time in 2009 and their subsequent academic standing information, in terms of whether they have graduated, dropped out or are still studying, after six years. I argue that the criterion-referenced information gained through the NBTP could fruitfully complement the NSC norm-referenced assessment to address the main challenge for South African higher education, which is to find a mechanism to place students in the two curricula routes that is both credible and valid.

### **The South African higher education context**

South African higher education is marked by low graduation rates and high levels of failure and dropout. These continue to affect the historical apartheid 'African', 'Coloured' and 'Indian' racial groupings the most. Thus far the basis on which South African higher education admissions decisions have been made has largely been performance on the NSC assessments. The consequences of this have been in part racialized patterns of participation, where 60% of the 20-24 White age group participate while only 12% of both Coloured and African in the 20-24 age groups participate (Scott et. al. 2007). The graduation and dropout rates equally reflect the racialized patterns with White students being 1.8 times more likely to complete a Mathematical Sciences degree within five years than their African counterparts, and White students being 2.5 times more likely to graduate with a Business or Management degree within five years than their African counterparts (Scott et. al. 2007, 16). The current admission requirements and curricula appear to reproduce the historical apartheid patterns.

If South African higher education is to seriously attempt to change these patterns it will have to ensure that curricula are better aligned to student needs. This is not to say that standards should be reduced, but rather that standards should be maintained so that students are able to navigate their

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<sup>1</sup> Here selection has the usual meaning and placement means being placed on extended programmes rather than being placed on completely different programmes as it might be understood.

studies in a manner that best suits their levels of preparedness. Higher education institutions have autonomy over their admission criteria and admissions decisions are often sites of contestation. Admission criteria as well as the assumptions underlying these criteria and its consequences for both admission and teaching and learning need to be questioned, but it is not the purpose of the current paper to do so. The manner in which the South African education sector reproduces the historical inequalities and how the higher education admission criteria feeds into this should also be questioned. Admissions decisions must take into account the manner in which schooling is racialized and that racial classifications continue to play out in terms of higher education participation, graduation and drop-out rates.

A number of mistaken views still prevail. Some myths that need to be dispelled are that students take three years for three year degree programmes and four years for four year degree programmes (only 27% of first time entrants do so); that extended degree programmes are for the minority and are inferior to the regular programmes. The higher education sector has much to do to address the stigma associated with extended degree programmes, since there are often notions of deficit attached to those students who could benefit from these programmes. There is a need for both students and institutions who are reluctant to embrace extended degree programmes to have a sober look at the realities and to consider the admission and curricular options that would best serve the students, individual higher education institutions, and the sector as a whole.

### **The criterion-referenced and the norm-referenced assessments**

The two sets of assessments in the South African national landscape are fundamentally different in terms of purpose, intentions, design and manner of delivery. The National Benchmark Tests are criterion-referenced, which means that they are “constructed to provide information about the level of a test-taker’s performance in relation to clearly defined domains of content and/or behaviours (e.g. reading, writing, mathematics) that require mastery” (Foxcroft 2006, 9) while the National Senior Certificate examinations are norm-referenced, which means that performance in a particular year is normed to a “norm group”. Norm-referenced tests are designed to sort and rank students, usually ‘on a curve’, not to see if they meet a standard or criterion. The National Senior Certificate attempts to answer the question whether scholars are ready to exit the school system while the National Benchmark Tests attempt to answer the question how ready are prospective higher education students for the demands of higher education.

### **The criterion-referenced National Benchmark Tests**

The NBTs are based on academically researched test specifications and use modern test theories (Yen and Fitzpatrick 2006) to determine test scores. They use criterion-referenced benchmarks set through standard setting methods to place candidates in proficiency bands which describe both their preparedness for the demands of higher education and the extent to which the curricula should be responsive to the preparedness of the candidates that are admitted. The NBTs assess students and prospective students in the three domains of Academic Literacy; Quantitative Literacy and Mathematics in the languages of instruction, namely English and Afrikaans.

The Academic Literacy test assesses a students’ capacity to engage successfully with the language demands of academic study. The test is an assessment of the generic academic reading and reasoning ability of prospective applicants. The construct of academic literacy (Cliff and Yeld 2006) on which the test is based has a well-theorised history (Bachman and Palmer 1996; Cummins 2000; Yeld 2001; Cliff, Yeld and Hanslo 2003) and empirical studies have been reported exploring associations between performance on this construct and academic performance in a wide range of South African higher education contexts (Cliff, Ramaboa and Pearce 2007; Cliff and Hanslo 2009). The Quantitative Literacy test assesses a students’ ability to manage situations or solve problems of a quantitative (mathematical and statistical) nature in real contexts relevant to quantitative

disciplines in higher education (Prince and Archer 2006; Prince and Archer 2008; Prince and Simpson 2016). The definition of quantitative literacy and the construct which underpins the NBT Quantitative Literacy test (Frith and Prince 2006; Frith and Prince 2009) is strongly influenced by the definition of numerate behaviour underlying the assessment of numeracy in the Adult Literacy and Lifeskills (ALL) Survey (Gal, van Groenestijn, Manly, Schmitt & Tout 2005, 152) and the New Literacies Studies' view of literacy as social practice (Street 2005; Street & Baker 2006; Kelly, Johnston & Baynham 2007).

While the Academic Literacy and Quantitative Literacy assessments are generic in nature the Mathematics test assesses a students' manifest ability related to mathematical concepts formally part of the school Mathematics curriculum relevant to the subject Mathematics itself and mathematical disciplines such as Physics and Chemistry. The Mathematics assessment therefore assesses the degree to which learners have achieved the ability to manipulate, synthesise a number of different mathematical concepts, and draw strictly logical conclusions in abstract symbolic contexts (Bohlmann and Braun 2006). These higher-order skills underlie success in higher education mathematics.

The Academic Literacy, Quantitative Literacy and Mathematics assessments make use of multiple choice items that are mapped onto the respective test specification tables. Responses are scored using the unidimensional three-parameter (a, b, c) Item Response Theory (IRT) model, where a = discrimination, b = difficulty, and c = guessing/pseudo-chance (Yen and Fitzpatrick 2006, 114). Academic Literacy, Quantitative Literacy and Mathematics items are scored dichotomously, that is either as right or wrong. All three assessments contain common items and modern test theories are used to ensure that the scores on different versions of the assessments are linked and equated (Holland and Dorans 2006) to ensure that performance on different versions of the test is comparable and is not a function of the version of the test that the candidate has written. The standard-setting method that is employed to determine the benchmarks is the modified Angoff method (Hambleton and Pitoniak 2006, 435). Table 1 provides a description of the Academic Literacy (AL), Quantitative Literacy (QL) and Mathematics (MAT) performance standards defining proficiency levels for degree study, the score ranges and suggested institutional responses to candidates performing at these levels. Performance standards have also been set for Diploma and Higher Certificate study and these are different to the ones for Degree study.

| <b>Table 1.</b> National Benchmark Test degree performance standards and their interpretations. |   |  |
|---|---|--|
| Performance band  | Score Range                                   | Description  |
| Proficient  | AL: 64%-100%<br>QL: 70%-100%<br>MAT: 68%-100% | Test performance suggests that future academic performance will not be adversely affected (students may pass or fail at university, but this is highly unlikely to be attributable to strengths or weaknesses in the domains tested). If admitted, students may be placed into regular programmes of study.  |
| Intermediate  | AL: 38%-63%<br>QL: 38%-69%<br>MAT: 35%-67%    | The challenges identified are such that it is predicted that academic progress will be adversely affected. If admitted, students' educational needs should be met as deemed appropriate by the institution (e.g. extended or augmented programmes, special skills provision).  |
| Basic   | AL: 0%-37%<br>QL: 0%-37%<br>MAT: 0%-34%       | Test performance reveals serious learning challenges: it is predicted that students will not cope with degree-level study without extensive and long-term support, perhaps best provided through bridging programmes (i.e. non-credit preparatory courses, special skills provision) or further education and training provision. Institutions admitting students performing at this level would need to provide such support. |

Since the majority of the South African higher education cohort scores have placed them in the Intermediate band, it has been found productive to divide the Academic Literacy (AL), Quantitative Literacy (QL) and Mathematics (MAT) intermediate performance band into two bands, the Intermediate Upper and Lower bands as shown in Table 2. It is important to note that this division was not done through the standard-setting exercise but rather through taking the interval mean values.

| <b>Table 2.</b> National Benchmark Test degree Intermediate performance standards and their interpretations. |   |   |
|--|---|---|
| Intermediate performance band  | Score Range                             | Description   |
| Intermediate Upper   | AL:51%-63%<br>QL:54%-69%<br>MAT:52%-67% | Students are likely to need complementary support (additional tutorials, workshops, augmented courses, language intensive work) |
| Intermediate Lower   | AL:38%-50%<br>QL:38%-53%<br>MAT:35%-51% | Students need to be placed in an extended degree programme  |

I have described the NBTs as criterion-referenced assessments which aim to deliver information against benchmarked categories of performance for formal study at institutions of higher learning. I will now describe the norm-referenced school-leavers assessment, the National Senior Certificate.

### The norm-referenced National Senior Certificate

The NSC assessments are norm referenced and therefore cannot easily be used to assess whether candidates meet a certain standard in a subject or domain. For the NSC, part of the final score is made up of the course mark and then the scores are 'standardised' or 'normed' to the 5-year rolling average score for each subject. So while a candidate may perform well compared to the norm, they may still fail to meet a certain standard in the domain being tested.

The Department of Basic Education approved the achievement scale for NSC subjects (DBE 2011, 9) given in Table 3 below. The descriptions against the rating codes are not benchmarks or standards, but rather descriptive labels of percentage score ranges.

**Table 3.** National Senior Certificate scale of achievement Grades 10-12.

| Rating Code | Description                    | Score  |
|-------------|--------------------------------|--------|
| 7           | <i>Outstanding achievement</i> | 80-100 |
| 6           | <i>Meritorious achievement</i> | 70-79  |
| 5           | <i>Substantial achievement</i> | 60-69  |
| 4           | <i>Adequate achievement</i>    | 50-59  |
| 3           | <i>Moderate achievement</i>    | 40-49  |
| 2           | Elementary achievement         | 30-39  |
| 1           | Not achieved                   | 0-29   |

On completing the NSC, a candidate can qualify for higher certificate, diploma or degree study. Table 4 describes the criteria, from the Department of Basic Education (DBE) (2008, 8), for entry into Higher Certificate, Diploma or Degree Study that are used in South Africa.

**Table 4.** National Senior Certificate Criteria for Higher certificate, Diploma and Degree study.

| Qualification      | Minimum Entry requirement   |
|--------------------|---|
| Higher Certificate | Pass NSC with at least rating of 2 (30-39%) for the Language of Learning and Teaching of higher education institution   |
| Diploma            | Pass NSC with an achievement rating of 3 (40-49%) or better in four subjects. At least rating of 2 (30-39%) for the Language of Learning and Teaching of the higher education institution.                          |
| Bachelor Degree    | Pass NSC with an achievement rating of 4 (50-59%) or better in four subjects from the designated list. At least rating of 2 (30-39%) for the Language of Learning and teaching of the higher education institution. |

The Department of Basic Education employs some form of standard setting (DBE op.cit., 19), with the question papers set by a panel of 3-5 members representative of as many provinces as possible and with the right subject expertise. The department also engages in language simplification by checking correlations between Afrikaans and English versions of the question papers. The comparisons of the two assessments are summarised in Table 5.

| <b>Table 5.</b> Comparison of the National Senior Certificate (NSC) and National Benchmark Tests (NBT) Assessments. |   |  |
|---|---|--|
|   | National Senior Certificate (NSC) Assessments   | National Benchmark Tests (NBT) Assessments   |
| The purpose of the assessments  | To what extent do NSC candidates meet the curriculum statement expectations as expressed in the Subject Assessment Guidelines?                              | To what extent do students aiming to enter higher education meet the core academic literacy, quantitative literacy and mathematics competencies required by schoolleavers on entry to higher education study?  |
| The assessment type   | Norm-referenced achievement assessments   | Criterion-referenced proficiency assessments   |
| The measurement theory employed by the assessments  | Classical Test Theory:  | Modern Test Theory:<br><br>Unidimensional three-parameter (a, b, c) Item Response Theory (IRT) model, where a is discrimination, b is difficulty, and c is guessing/pseudo-chance  |
| Score ranges:   | 0% – 100%   | 0% - 100%  |
| The Rating/Proficiency Levels employed and how these are determined   | Rating codes of 1 – 7 determined through dividing performance into 0-29 % for band 1, 30-39 %, 40-49 %, ... 70-79 % for bands 2 to 6 and 80-100% for band 7 | Proficiency levels of 'Proficient', 'Intermediate' and 'Basic' determined through the modified Angoff standard setting method and the 'Intermediate' proficiency level split into 'Upper' and 'Lower' using the midpoint between the Basic/Intermediate score and the Intermediate/Proficient score. |
| The number of times the assessment can be taken in one assessment cycle   | Candidates can only write the NSC assessments once at the end of the school year  | Candidates can write the NBTs twice during any one higher education intake cycle   |
| How the assessment scores are determined and whether they are comparable from one assessment instance to the next   | In-class assessment scores are combined with examination scores to arrive at the final assessment score   | Assessments have common items embedded into them. Responses to items on the assessments are used to determine raw scores and the common items are used to link and equate the assessments  |

This brief overview of differences between the two assessment systems explicate the concept of the complementary nature of a norm-referenced assessment such as the NSC and criterion-referenced

tests such as the NBTs. Their combined value in informing admission decisions and particularly decisions about placement into extended and regular degree curriculum structures will now be explored using an institutional case study.

### **The case of three faculties at a South African higher education institution**

The NBTP is by design an attempt to address the throughput challenges faced by higher education in South Africa. When institutions admit students with the full knowledge of their levels of academic preparedness it is imperative that appropriate teaching and learning environments be created. However, too often higher education institutions are not sufficiently responsive to the needs of the students and in the process students have a particularly bad teaching and learning experience and may even drop out. To investigate how the two tests together could predict first time entrants' performance at the end of six years, I track the 2 566 first time entering students who entered three faculties (Commerce, Engineering and the Built Environment, and Science) at a South African University in 2009 over six years, and classify their last academic standing code into one of three categories, 'Fail', 'Continuing' and 'Graduate'. The academic standing code is a code of achievement (or performance) at the end of each year at this particular higher education institution. Of the 2 566 first time entrants 2 375 wrote the NBT Academic Literacy and Quantitative Literacy assessment and 2 253 wrote the NBT Mathematics assessment at the beginning of their studies in 2009. Of the 2 566 first time entering students 2 035 wrote the NSC English assessment (designated by EN, either Home Language or First Additional Language, and for this study performance on these two assessments were treated as equivalent) and 2 027 wrote the NSC Mathematics assessment (designated by MTHN).

After providing the background characteristics of the entire sample, I present the overall distribution of scores for those who wrote the two NSC and three NBT assessments. In addition, I report on the academic standing of the sample of students after six years and the associations between performance on the two NSC and three NBT assessments and academic standing for the cohort of students who wrote these assessments.

Some self-reported demographic characteristics of this sample are shown in Table 6. The majority of candidates were African (39.95%) and the majority speak English (62.04%) as their home language. There were more male students (56.27%) than females in this sample.

| <b>Table 6.</b> Demographic characteristics of the 2 566 First Time Entrants. |        |        |
|---|--------|--------|
|   | number | %      |
| <b>Gender</b>   |        |        |
| Male  | 1 444  | 56.27% |
| Female  | 1 119  | 43.61% |
| Not specified   | 3      | 0.12%  |
| <b>Population group</b>   |        |        |
| African   | 1 025  | 39.95% |
| Coloured  | 305    | 11.89% |
| Indian  | 322    | 12.55% |
| White   | 890    | 34.68% |
| Not specified   | 24     | 0.94%  |
| <b>Home language</b>  |        |        |
| Afrikaans   | 60     | 2.34%  |
| English   | 1 592  | 62.04% |
| isiNdebele  | 9      | 0.35%  |
| isiXhosa  | 250    | 9.74%  |
| isiZulu   | 218    | 8.50%  |
| Sesotho   | 73     | 2.84%  |
| Sesotho sa Leboa  | 464    | 7.3%   |
| Setswana  | 79     | 3.08%  |
| siSwati   | 32     | 1.25%  |
| Tshivenda   | 55     | 2.14%  |
| Xitsonga  | 27     | 1.05%  |
| Other   | 97     | 3.78%  |

Table 7 shows how the students performed on the two NSC assessments and Table 8 shows how the scores of the sample of students were distributed among the NSC rating codes.

| <b>Table 7.</b> Descriptive statistics for the First Time Entrants on the NSC assessments. |          |       |      |         |                             |        |                             |         |
|--|----------|-------|------|---------|-----------------------------|--------|-----------------------------|---------|
| Assessment   | <i>n</i> | Mean  | SD   | Minimum | 25 <sup>th</sup> percentile | Median | 75 <sup>th</sup> percentile | Maximum |
| EN   | 2034     | 73.07 | 9.20 | 43      | 67                          | 73     | 80                          | 96      |
| MTHN   | 2027     | 83.94 | 9.59 | 45      | 78                          | 85     | 91                          | 100     |

**Table 8.** Frequencies of performance for the First Time Entrants on the NSC assessments.

| Rating code                | NSC EN   |        | NSC MTHN |        |
|----------------------------|----------|--------|----------|--------|
|                            | <i>n</i> | %      | <i>n</i> | %      |
| 3: Moderate achievement    | 11       | 0.54   |          |        |
| 4: Adequate achievement    | 148      | 7.28   | 27       | 1.33   |
| 5: Substantial achievement | 545      | 26.79  | 120      | 5.92   |
| 6: Meritorious achievement | 795      | 39.09  | 442      | 21.82  |
| 7: Outstanding achievement | 535      | 26.30  | 1437     | 70.93  |
| Total                      | 2034     | 100.00 | 2253     | 100.00 |

It is clear that the majority (65.39%) were classified as having achieved the NSC at either Meritorious or Outstanding levels in English, while nearly all (92.74%) were classified as having achieved the NSC at either Meritorious or Outstanding levels in Mathematics. These results would suggest that the majority of these students would have been able to cope with the Language, Quantitative Literacy and Mathematics demands of higher education.

Table 9 shows how the students performed on the NBT assessments of Academic Literacy (AL), Quantitative Literacy (QL) and Mathematics (MAT).

**Table 9.** Descriptive statistics for the First Time Entrants on the NBT assessments.

| Domain | <i>n</i> | Mean  | SD    | Minimum | 25 <sup>th</sup> percentile | Median | 75 <sup>th</sup> percentile | Maximum |
|--------|----------|-------|-------|---------|-----------------------------|--------|-----------------------------|---------|
| AL     | 2375     | 68.23 | 11.80 | 26      | 61                          | 70     | 78                          | 92      |
| QL     | 2375     | 62.31 | 17.05 | 14      | 49                          | 64     | 76                          | 96      |
| MAT    | 2253     | 48.78 | 11.85 | 0       | 40                          | 48     | 55                          | 80      |

Table 10 shows how the scores of the sample of students were distributed among the Academic Literacy (AL), Quantitative Literacy (QL) and Mathematics (MAT) proficiency bands. It is clear that the majority (67.28%) were classified as proficient in Academic Literacy, while less than half (46.15%) were classified as proficient in Quantitative Literacy and only 14.91% were considered proficient in Mathematics. Most of the students (76.25%) had scores in the Intermediate band. These results suggests that the majority of these students would have needed some kind of extended support in Mathematics, more than half would have needed supplementary support in Quantitative Literacy and about a third would have required supplementary support in Academic Literacy.

**Table 10.** Frequencies of performance for the First Time Entrants on the NBT assessments.

| Benchmark band | AL       |      | QL       |      | MAT      |      |
|----------------|----------|------|----------|------|----------|------|
|                | <i>n</i> | %    | <i>n</i> | %    | <i>n</i> | %    |
| Basic          | 60       | 2.52 | 211      | 8.88 | 199      | 8.83 |

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|                    |      |        |      |        |      |        |
|--------------------|------|--------|------|--------|------|--------|
| Intermediate Lower | 241  | 10.15  | 462  | 19.45  | 847  | 37.59  |
| Intermediate Upper | 476  | 20.04  | 606  | 25.52  | 871  | 38.66  |
| Proficient         | 1598 | 67.28  | 1096 | 46.15  | 336  | 14.91  |
| Total              | 2375 | 100.00 | 2375 | 100.00 | 2253 | 100.00 |

The academic standing results are presented for the entire sample (n = 2 566) of first time entrants into the Commerce, Engineering and the Built Environment, and Science faculties at a South Africa university. Table 11 indicate that two thirds of the students graduated and just under a quarter failed while 9% are still studying.

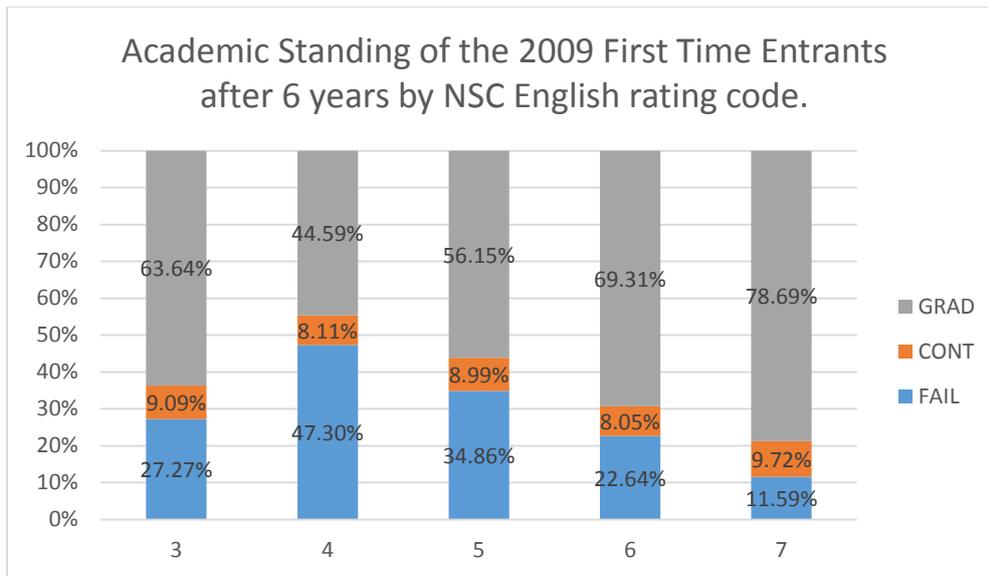
| <b>Table 11.</b> Frequencies of Academic standing at the end of six years for the First Time Entrants. |           |            |
|--|-----------|------------|
| Academic standing  | Frequency | Percentage |
| Graduation (GRAD)  | 1719      | 66.99%     |
| Continue (CONT)  | 231       | 9.00%      |
| Dropped out (FAIL)   | 616       | 24.01%     |
| Grand Total  | 2566      | 100.00%    |

When we look at the association between student performances on the two NSC and three NBT assessments at the beginning of their studies with their subsequent academic standing after six years we find that it is high for all five assessments.

From the Pearson Chi-square test statistics in Table 12, there is a statistically significant (simulated  $P < 0.001$ ) association between performance in each of the three NBTs, Academic Literacy (AL), Quantitative Literacy (QL) and Mathematics (MAT), and the two NSC assessments, English (EN) and Mathematics (MTHN), and Academic Standing at the end of six years. The large Chi-square values and narrow confidence intervals for the simulated p-values suggest that these associations are strong.

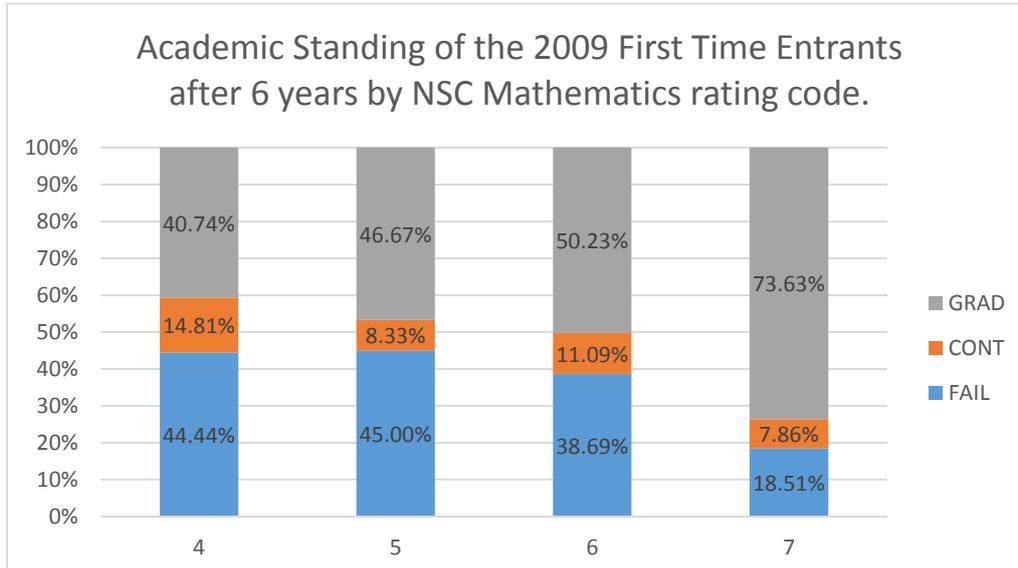
| <b>Table 12.</b> Pearson's Chi-squared test for measuring the association between the NSC and NBT assessments and Academic Standing categories at the end of six years. |                  |                  |                  |                  |                  |
|---|------------------|------------------|------------------|------------------|------------------|
| Pearson's Chi-squared test  | NSC EN           | NSC MTHN         | NBT AL           | NBT QL           | NBT MAT          |
| Chi-square  | 125.0658         | 127.6819         | 150.3343         | 174.0292         | 156.7539         |
| two-sided P-value   | 2.98E-23         | 8.55E-24         | 6.58E-30         | 6.28E-35         | 2.88E-31         |
| simulated P-value   | 0                | 0                | 0                | 0                | 0                |
| 99%CI of simulated P-value  | 0 to 0.000460411 |
| Number of simulations   | 10000            | 10000            | 10000            | 10000            | 10000            |

The following five charts in Figures 1 to 5 clearly show these associations, and the statistics generated with the Microsoft Excel add-in for the statistical analysis of contingency tables (Slezak et al. 2014) in Table 12 support the conclusion that the associations are significant.



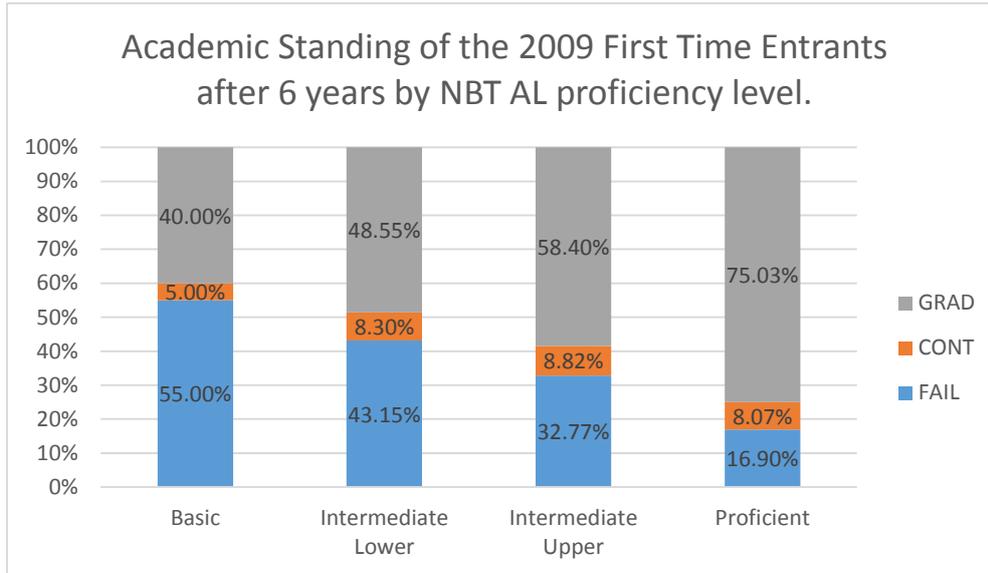
**Figure 1.** Percentage of 2009 First Time Entrants in the three academic standing categories by NSC English rating codes.

In Figure 1, except for the level 3 students, graduation (GRAD) patterns at the end of six years increased from low to high NSC English results, and failure (FAIL) on the other hand decreased from low to high NSC English results at the end of this period. From Table 12, the probability associated with the Chi-square statistic of 125.0658 is less than 0.001 and the confidence intervals for the simulated p-value are very narrow, suggesting that there is a significant relationship between the NSC English assessment levels and Academic Standing variables.



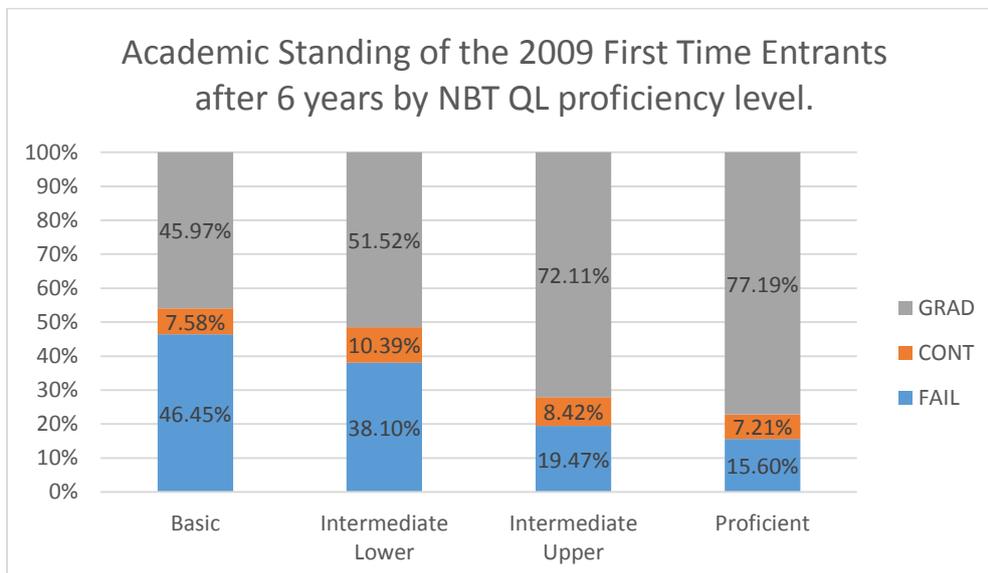
**Figure 2.** Percentage of 2009 First Time Entrants in the three Academic Standing categories by NSC Mathematics rating codes.

In Figure 2, graduation (GRAD) and failure (FAIL) patterns at the end of six years were similar for the students with NSC Mathematics levels rating codes 4 to 6, and those with NSC Mathematics level 7 results performed substantially better both in terms of graduation and failure. From Table 12, the probability associated with the Chi-square statistic of 127.6818 is less than 0.001 and the confidence intervals for the simulated p-value are very narrow, suggesting that there is a significant relationship between the NSC Mathematics assessment levels and Academic Standing variables.



**Figure 3.** Percentage of 2009 First Time Entrants in the three outcome categories by Academic Literacy proficiency bands.

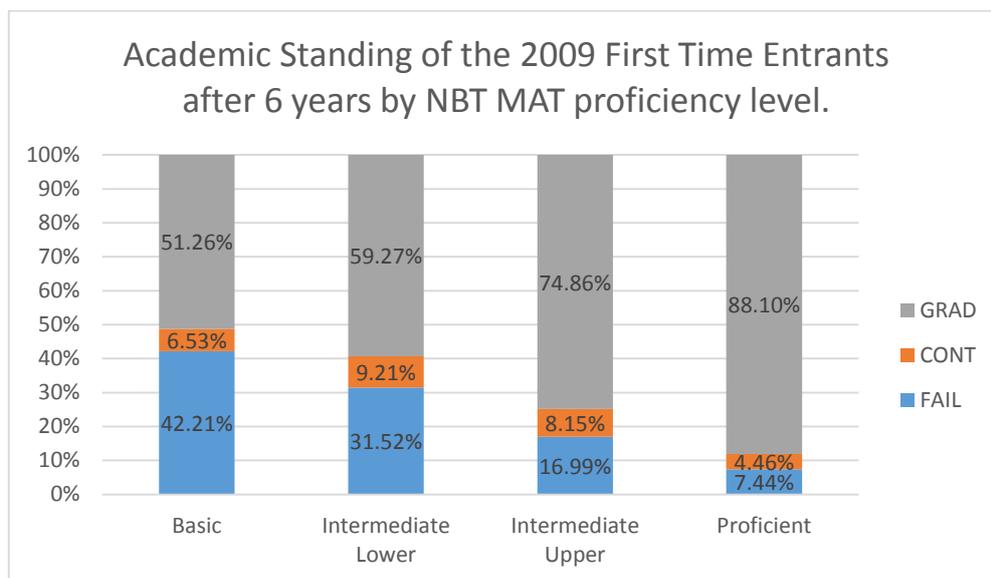
In Figure 3, graduation (GRAD) patterns at the end of six years increased from low NBT Academic Literacy performance levels to high levels and failure (FAIL) on the other hand decreased from low to high performance levels in the Academic Literacy test. From Table 12, the probability associated with the Chi-square statistic of 150.3343 is less than 0.001 and the confidence intervals for the simulated p-value are very narrow, suggesting a significant relationship between the NBT Academic Literacy assessment levels and Academic Standing variables.



**Figure 4.** Percentage of 2009 First Time Entrants in the three outcome categories by Quantitative Literacy proficiency bands.

In Figure 4, graduation (GRAD) patterns at the end of six years increased from low to high NBT Quantitative Literacy performance levels. Failure (FAIL), on the other hand, decreased from low to high performance levels. From Table 11, the probability associated with the Chi-square statistic of 174.0292 is less than 0.001 and the confidence intervals for the simulated p-value are very narrow,

suggesting that there is a significant relationship between the NBT Quantitative Literacy assessment scores and Academic Standing variables.



**Figure 5:** Percentage of 2009 First Time Entrants in the three outcome categories by Mathematics proficiency bands.

In Figure 5, graduation (GRAD) patterns at the end of six years increased from low to high NBT Mathematics performance levels and failure (FAIL) on the other hand decreased from low to high performance levels. From Table 11, the probability associated with the Chi-square statistic of 156.7539 is less than 0.001 and the confidence intervals for the simulated p-value are very narrow, suggesting that there is a significant relationship between the NBT Mathematics assessment scores and Academic Standing variables.

This institutional case study clearly indicates that for this institution performance on the two NSC and three NBT assessments are associated with subsequent academic standing and that it would have been appropriate for this institution to consider the use of the NBT scores to place students in extended degree programmes and to ensure that these students were provided with appropriate teaching and learning environments.

### Implications for Higher Education

The notion of under-preparedness can be applied to both students and higher education institutions. Boughey (2009, 4) stresses that the notion of under-preparedness implies 'deficiency' in the students only and does not recognise that higher education institutions themselves are underprepared to meet the needs of the students that they admit. University admissions and teaching need to take into account the capabilities of the students that they accept, place them appropriately and make changes to the curriculum to address the 'articulation gap' (Scott, Yeld and Hendry 2007, 42) between the demands of curricula and the level of many students' academic literacies. In order to design a more responsive curriculum, lecturers and curriculum developers in higher education need the kind of information provided by the two different forms of assessment about the capabilities of students.

In order to transform the South African higher education sector it is necessary to admit students from educationally disadvantaged backgrounds. Some of the criteria associated with educational disadvantage are home and school backgrounds, whether these students are first generation higher education students and whether they have gone to private schools or the equivalent. If students are

to be admitted into higher education they need to be placed in curricula that are most appropriate for their needs. It is for this purpose that extended curricula programmes exist; the NBTs are well suited to identify those students who have the potential to succeed if they are provided with the appropriate supportive teaching and learning environments.

There are variations of these extended degree programmes within and between institutions. Some programmes do the first year over two years while others use the first year as a foundation year. Essentially these extended degree models all subscribe to the idea of 'more time on task' to achieve their goals of providing a more appropriate teaching and learning environment. The problem however is that while students may be able to cope with the reduced curriculum in the first year, the second year then becomes the barrier. In "A proposal for undergraduate reform in South Africa: The case for a flexible curriculum structure" (Council on Higher Education 2013) a more bold approach is proposed. The approach that is proposed here is to go beyond seeing the first year as needing special attention and to focus instead on the entire curriculum programme. This is done for example by spreading the three-year curriculum over four years and the four-year curriculum programme over five years. In both conceptualizations of the extended foundation programme, whether it is the first year or the entire programme that is extended, the placement issue is of key importance.

The South African graduation and dropout rates are of concern but even more alarming are the racialized patterns of these rates (Scott et. al. 2007, 16). The current admission requirements and curricula appear to reproduce the historical apartheid patterns. Higher education policies and practices need to mitigate against the racialized schooling and the manner in which racial classifications continue to play out in terms of higher education participation, graduation and drop-out rates.

This paper has argued that the need for extended curriculum provision in the higher education landscape is necessary and should continue into the foreseeable future. It is necessary to use a means to determine which of the extended curriculum or regular programmes are best suited to individual students. While norm-referenced assessments may be statutory requirement for higher education study, criterion-referenced assessments such as the National Benchmark Tests may play a bigger role in improving graduation rates and addressing drop-out rates, by providing the kind of information which is needed to make decisions about which curricular route best suits students.

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