

# NBTP NATIONAL REPORT: 2017 INTAKE CYCLE

Centre for Educational Testing for Access and Placement (CETAP):  
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## EXECUTIVE SUMMARY

The objective of this report is to provide an initial analysis of the National Benchmark Tests written by candidates for entry into higher education institutions in the 2017 academic year. Candidates considered in this report will have written the NBT between 1 May 2016 and 28 February 2017.

In the 2017 National Benchmark Tests (NBT) intake cycle, 83,114 Academic Literacy (AL) test scores, 83,110 Quantitative Literacy (QL) test scores and 61,118 Mathematics (MAT) test scores were obtained. In 2016 these scores were, respectively, 81,669 (AL), 81,694 (QL) and 59,644 (MAT). This suggests that the NBT project is increasing its national footprint within South African high schools and higher education institutions. There were 111 national test sites and 1065 test sessions in 2016.

The 2017 NBT intake cohort consisted of approximately 59% women; approximately 62% black and 20% white; approximately 95% were South African citizens and approximately 31% reported English as their home language. This information is all based on self-classified data collected at the time the tests were written.

The mean and median scores for AL, QL and MAT are all in the Intermediate band. All scores are provided in the body of the report.

Slightly more than 10% of the national candidates wrote the Afrikaans AL, QL and MAT tests. Their mean and median performance was better than those of the English candidates in each domain.

Candidates intending to study Engineering and Science performed better than those intending to study Humanities and Law in all test domains. The performance of candidates intending to study Education was particularly low.

The 2016 and 2017 intake proficiency categories at national level are quite consistent. Although the 2017 intake results differ slightly from the 2015 intake results, the changes in all domain scores are consistent with the changes that would be expected within a one year period.

The second last section of the report uses national data to show the additional information for teaching and learning that can be obtained from the NBT. Sub-domain analyses in AL, QL and MAT of NBT results from the 2017 intake cohort identified areas of strengths and weaknesses.

The last section of the report investigates the relationships between the NBT domains AL, QL and MAT and cognate NSC subjects: Mathematics, Mathematical Literacy, Physical Science, English Home Language and English First Additional Language for those NBT candidates who also wrote the NSC examinations. This section clearly shows the complementarity of the information provided by the NBT to that provided by the NSC.

# THE NATIONAL BENCHMARK TESTS - IMPROVING ACCESS AND SUCCESS IN HIGHER EDUCATION

## 1. INTRODUCTION

The National Benchmark Tests Project (NBTP) was commissioned in 2005 by Higher Education South Africa (HESA), now called Universities South Africa (USAf). The main objective of the project was to assess the entry level academic skills of candidates in Academic Literacy (AL), Quantitative Literacy (QL) and Mathematics (MAT). In addition, the project also provided a service to Higher Education Institutions requiring additional information to assist in selection and placement of prospective students in appropriate curricular routes. The project has also assisted with curriculum development through first year teaching and learning forums and in relation to foundation, extended and augmented courses.

The National Benchmark Tests (NBTs) are designed to provide complementary criterion-referenced information to supplement norm-referenced school-leaving results such as those provided by the National Senior Certificate (NSC). The NBTs assess a candidate's competence in the three domains of AL, QL and MAT. The tests are described below.

## 2. PURPOSE OF THE REPORT

### OBJECTIVE

The objective of this report is to provide an initial analysis of the National Benchmark Tests written by candidates for entry into higher education institutions in the 2017 academic year. Candidates considered in this report will have written the NBTs between 1 May 2016 and 29 February 2017.

This report is intended for distribution to Universities South Africa, South African higher education institutions, institutions supporting or complementing higher education in South Africa e.g. Umalusi, government departments, institutions (other than higher education) which make use of the NBT - for example those offering bursaries - and schools.

### DESCRIPTION OF THE SAMPLE

The sample considered for the 2017 report consists of all NBT candidates who wrote the tests by 28 February 2017, i.e., not the full 2017 intake cohort. Outstanding scores consisted of results from special sessions (sessions at the express request of particular institutions). The number of candidates in these sessions was relatively small and should not impact substantially on the results reported below. However, the difference has not been evaluated statistically.

Section 8 considers a subsample of the 2017 NBT intake cohort relating specifically to candidates who have NSC results as well. More detailed notes on this sample are provided in that section.

## LIMITATIONS

The results reported here are limited by the following factors:

- o NBT candidates do not indicate whether they intend to study at degree or diploma level. Therefore, apart from Section 8 where NSC data is used, all results are benchmarked against degree level criteria.
- o Candidates are asked to indicate their first, second and third choice of faculty to which they have applied or will apply. Only the first choice of intended faculty was used in this analysis. Data are not collected by the National Benchmark Tests Project on actual placement of all the candidates within faculties or institutions. Caution should therefore be used when drawing conclusions based on the results from intended faculty of study.

## PLANNED RESEARCH

CETAP does research on the NBTs and general preparedness of students beyond that presented in this report. This includes more detailed analysis of the data used in this report and can be requested from the Test Development Coordinator.

### 3. DESCRIPTION OF THE TESTS

#### PURPOSES OF THE TESTS

The National Benchmark Tests are designed specifically:

- To perform a function that is complementary to that of the National Senior Certificate. They act as a provider of augmented independent and objective information against which the performance of students on the National Senior Certificate can be compared and calibrated. They assess candidates' levels of academic readiness at a particular point in time, i.e. prior to possible entry to higher education.
- With the aim of providing information that makes it possible for candidates to be placed more accurately in programmes of higher education, based on their performance on the tests. The tests comprise constructs in three broad domains, which enable the assessment of students' readiness to cope with differing forms (e.g. mainstream, foundation) of curriculum. Minimum (benchmark) scores on the constructs of the tests represent levels at which a student would be expected to perform in order to be deemed "recommendable" for different forms of educational provision.
- The tests are designed to assess entry-level preparedness of students in terms of the key areas of academic literacy, quantitative literacy and mathematics. The domains represent core areas of competency in which students entering any form of higher education would be expected to display minimum levels of proficiency. The tests are criterion-referenced, i.e. they are aimed at assessing students' academic and quantitative literacy and mathematics competence against standard levels of performance regarded by experts in the fields as being acceptable for entry into higher education in the three fields.

#### AIMS OF THE TESTS

The NBT are aimed at assessing the school-leaving higher education applicant pool, i.e. the national cohort of school-leavers wishing to access higher education in any one year. The tests aim to address the following question:

What are the academic literacy, quantitative literacy and mathematics levels of proficiencies of the school-leaving population, who wish to continue with higher education, at the point prior to their entry into higher education at which they could realistically be expected to cope with the demands of higher education study?

The constructs and domains of the three tests are based on testing this question, and the levels of the tests have been set with the notion of levels of proficiency as focus.

#### TEST DOMAINS

##### *ACADEMIC LITERACY (AL)*

The National Benchmark Test in Academic Literacy aims to assess candidates' ability to:

- read carefully and make meaning from texts that are typical of the kinds that they will encounter in their studies;
- understand vocabulary, including vocabulary related to academic study, in their contexts;

- identify and track points and claims being made in texts.
- understand and evaluate the evidence that is used to support claims made by writers of texts; extrapolate and draw inferences and conclusions from what is stated or given in text;
- identify main from supporting ideas in the overall and specific organisation of a text;
- identify and understand the different types and purposes of communication in texts;
- be aware of and identify text differences that relate to writers' different purposes; audiences, and kinds of communication.

### *QUANTITATIVE LITERACY (QL)*

The National Benchmark Test in Quantitative Literacy aims to assess candidates' ability to:

- select and use a range of quantitative terms and phrases;
- apply quantitative procedures in various situations;
- formulate and apply simple formulae;
- read and interpret tables, graphs, charts and text and integrate information from different sources; and
- accurately do simple calculations involving multiple steps;
- identify trends and patterns in various situations;
- reason logically;
- understand and interpret information that is presented visually (e.g., in graphs, tables, flow-charts);
- understand basic numerical concepts and information used in text, and do basic numerical manipulations;
- competently interpret quantitative information.

### *MATHEMATICS (MAT)*

The National Benchmark Test in mathematics, referred to as the NBT MAT test, aims to assess candidates' ability with respect to a number of mathematical topics:

- Problem solving and modelling, requiring the use of algebraic processes, as well as understanding and using functions represented in different ways.
- Basic trigonometry, including graphs of trigonometric functions, problems requiring solution of trigonometric equations and application of trigonometric concepts.
- Spatial perception (angles, symmetries, measurements, etc.), including representation and interpretation of two and three dimensional objects; analytic geometry and circle geometry.
- Data handling and probability.
- Competent use of logical skills.

It is not the intention of the MAT tests to replicate either the NSC or the Mathematics Olympiad. The point of departure of the tests is the expectations of the Curriculum and Assessment Policy Statement (CAPS). The Department of Basic Education provides educators with a pace-setter document which guides the planning of lessons in order to assist them to complete the curriculum before the period of revision and final examinations. The NBT MAT tests are designed with the pace-setter document in

mind. The assumption is made that if a student is to achieve a competent pass in the NSC, a certain level of content and procedural competence will have been reached by the time the first MAT tests are written. The MAT tests are explicitly designed to probe higher education competencies (i.e. depth of understanding and knowledge) within the context of the NSC curriculum.

#### RECOMMENDED USES OF THE TESTS

As stated above, the tests are recommended for use as an assessment of students' levels of readiness to cope with the typical demands of higher education in the three domains specified. Whereas the two literacy tests are recommended for use for all prospective higher education students, the mathematics test should typically be administered to students who wish to study courses with greater demand for mathematical competence.

Benchmark levels on the tests are intended for use in placing students in different forms of higher education curriculum provision, with different levels of possible support.

#### INFERENCES TO BE MADE FROM TEST SCORES

As the NBT are criterion-referenced tests, inferences about the results of writers of the tests should be focused on interpreting the extent to which students have met the expected standards set for each domain, and on the extent to which curriculum provision will be able to support students who are deemed not to be competent to cope with the demands of mainstream higher education provision without appropriate levels of support. It is appropriate to interpret certain (lower) levels of performance on the tests as meaning students will require extensive levels of academic support if they are going to cope with the demands of higher education.

Table 1 shows the interpretations of the benchmark levels of performance, aligned to the level of institutional response deemed appropriate to meet candidates' educational needs.

*Table 1 Description of NBT tests*

<p><b>Academic and Quantitative Literacy test (3 hours)</b> The results of the two sections of the AL and QL tests are reported separately as percentages and benchmark levels.</p>	<p><b>The test targets students'</b></p> <ul style="list-style-type: none"> <li>○ Capacity to engage successfully with the reading and reasoning demands of academic study in the medium of instruction; and</li> <li>○ ability to solve problems in a real context that is relevant to higher education study, using basic quantitative information that may be presented verbally, graphically, in tabular or symbolic form as related to both the NSC subjects of Mathematics and Mathematical Literacy.</li> </ul>
<p><b>The Mathematics test (3 hours)</b> The results of the test are reported as a percentage and in terms of benchmark levels.</p>	<p><b>The test targets candidates' ability</b> related to mathematical concepts formally regarded as part of the secondary school Mathematics curriculum.</p>

#### DURATION OF THE TESTS

The two test domains, Academic Literacy (AL) and Quantitative Literacy (QL), have been compiled into one test, namely the Academic and Quantitative Literacy (AQL) test, and the Mathematics (MAT) domain is administered as a separate test. The two tests are administered separately and are

three hours' duration each, written on the same day. All applicants will write the Academic and Quantitative Literacy (AQL) Test. The proportions of items in each domain of this test are as follows: Academic Literacy 60 – 70%; Quantitative Literacy 30 – 40%. The AL component of the AQL test currently consists of 74 items and the QL component of the test currently consists of 50 items. Time allocation for the AL and QL sections of the test is two hours and one hour, respectively. The MAT test consists of 60 items. The results of each test domain are reported separately. At the request of certain organisations or departments some candidates will write only the AL or QL test. However, as stated above, the tests have been designed to be written as a set.

#### LANGUAGE OF THE TESTS

The tests are available in English and Afrikaans - the two languages of instruction in higher education in South Africa.

#### TEST ITEM-TYPES

Test questions are select response (multiple-choice) items, with four options for each item.

#### TEST SCORING

Writers' responses are recorded on mark-reading sheets that are scanned using Optical Scanner technology. Responses are scored using the uni-dimensional three parameter (a, b, c<sup>1</sup>) Item Response Theory (IRT) model for the AL, QL and MAT tests.

Items are scored dichotomously, i.e. either as right or wrong. Since all tests are power tests, missing responses are scored as wrong. This is valid, given that piloting and the experience of several years shows that sufficient time has been allocated to each of the domains.

#### TEST REPORTING

Test results are reported to institutions and candidates in two forms: as two (AL / QL) or three (AL / QL / MAT) scores as a percentage as well as by benchmark category. As Table 2 indicates, they are also informed about the level of institutional response deemed appropriate to meet educational needs.

#### TEST ADMINISTRATION

The tests are pencil-and-paper instruments and are administered under standardised conditions, as set out in a Test Administration Manual. These procedures are the same as those under which the pilot tests were administered, and which have remained unchanged since the tests first became operational in 2009. These procedures are available from the Centre for Educational Testing for Access and Placement (CETAP) at UCT.

#### ITEM AND TEST DEVELOPMENT

Item and test development teams are comprised of academics from all higher education institutions in South Africa as well as practising teachers. In addition to calls on academics to put themselves forward and participate in these teams, the NBTP regularly appeals to senior academic staff (relevant Deputy Vice Chancellors and Deans) to identify appropriate staff. Ongoing efforts are made to ensure

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<sup>1</sup> Where a = discrimination, b = difficulty, and c = guessing/pseudo-chance.

the teams are representative of all higher education institution types and disciplinary areas. To date, around 500 academics have participated in one or more ways in the NBTP.

The teams are constructed on the basis of the expertise of the participants in what constitutes proficiency of test writers at the school-leaving stage wishing to enter higher education. Language and disciplinary experts drawn from outside the test development teams function as reviewers of the tests in terms of their language, content and format appropriateness, construct representation, and bias and fairness. Items are assessed by review panels constituted from academics and teachers for bias, fairness, content and construct representation, and statistical processes (Item Response and Classical Test Theory) are used to investigate any Differential Item Functioning.

The item and test development and review cycle relating to the tests featured in this report was largely carried out from November 2015 to February 2016. The NBTP organised and hosted item and test review workshops for AL, QL and MAT for the 2017 intake cycle tests. Item and test review reports are available on request from the CETAP Test Development Coordinator.

#### NBTP ANNUAL CYCLE

The NBTP follows an annual cycle of:

- o Item development and item review workshops;
- o Populating the Item Banks;
- o Test assembly and preparation of tests in each domain for each testing session;
- o Test administration, scoring, and score reporting to writers and institutions;
- o Data analysis as part of continual item and test development and improvement;
- o Contribution towards the NBT Stakeholders Consultative Forum;
- o Annual reporting to Universities South Africa;
- o Dissemination of information about the NBTP to the higher education sector, the Department of Higher Education and Training sector (DHET) and the Department of Basic Education (DBE);
- o Revision and resetting of benchmarks for Degree and Diploma study every three years.

#### THE NBT BENCHMARKS

The NBTP aims to deliver information against benchmarked categories of performance for formal study at institutions of higher learning. Table 2 provides a description of benchmark levels and what institutional response to candidates performing at these levels should be. More detailed description of benchmark levels for each of the NBT domain tests is available on request from the CETAP Test Development Coordinator.



Table 2 NBT overall benchmark descriptors

Proficient	Performance in domain areas suggests that academic performance will not be adversely affected in cognate domains. If admitted, students should be placed on regular programmes of study.
Intermediate	Challenges in domain areas identified such that it is predicted that academic progress in cognate domains will be affected. If admitted, students' educational needs should be met in a way deemed appropriate by the institution (e.g. extended or augmented programmes, special skills provision).
Basic	Serious learning challenges identified. Students will not cope with university study.

The score range at which the benchmarks are defined were first set in May 2009 by panels drawn from across the country, comprising academics who were at that stage engaged in mainstream teaching relevant to the domain and who had not previously been involved in any NBTP test development processes. Benchmarks are revised every three years, as part of good testing practice. Benchmarks were set again in October 2015. More detailed description of benchmark levels for each of the NBT domain tests set in October 2015 is available on request from the CETAP Test Development Coordinator. Table 3 shows the benchmarks for degree study as well as those for diploma/certificate study which were set in 2015 and were used to determine the proficiency of the 2017 intake candidates.

Table 3 NBT benchmarks set in 2015 for degree and diploma/certificate study

	100%	
Proficient		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. Degree: AL [68%]; QL [70%] MAT [69%] Diploma/Certificate: AL [61%]; QL [66%] MAT [67%]
Intermediate		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). Degree: AL [39%]; QL [40%]; MAT [35%] Diploma/Certificate: AL [33%]; QL [34%] MAT [38%]
Basic		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 FET provision. Institutions admitting students performing at this level would need to provide such support themselves.
	0%	

In addition, the Intermediate performance band is divided into Upper and Lower Intermediate as shown in Table 4. The Intermediate band represented the majority of the applicant pool, and this is the pool for which educational institutions should be prepared to address educational needs with extended or augmented support programmes to enable students to succeed in their degree studies.

Table 4 NBT Intermediate benchmarks and how they should be interpreted

	Upper intermediate	Assessment of need	Lower Intermediate	Assessment of need
AL	Degree: [54-67] Diploma/Certificate: [47-60]	Students are likely to need complementary support (additional tutorials, workshops, augmented courses, language intensive work)	Degree: [39-53] Diploma/Certificate: [33-46]	Students need to be placed in an extended programme
QL	Degree: [55-69] Diploma/Certificate: [50-65]		Degree: [40-54] Diploma/Certificate: [34-49]	
MAT	Degree: [52-68] Diploma/Certificate: [51-66]		Degree: [35-51] Diploma/Certificate: [35-50]	

## INSTITUTIONS AND ORGANIZATIONS USING THE NBT

Fifty-one institutions requested and received scores from the NBTP during the 2017 intake cycle by February 2017. NBTs were used for a variety of reasons by institutions (and, in many cases, in different ways by individuals or faculties or departments within an institution), including admission, placement, research and bursary allocation. Of the institutions receiving scores, this includes 13 Universities. Due to the delayed academic year experienced by most universities this number will increase once student intake lists are finalised in March/April. In excess of 675 000 AL, QL and MAT scores have to date been provided to institutions.

A short survey of universities using the NBTs was undertaken in 2016. The survey indicated that 16 universities make use of NBT scores for admissions, placement, diagnostic and research purposes, 3 universities are currently exploring the use of the NBTs, and 5 universities do not make use of NBT scores.

## ACCESSIBILITY OF THE NBT PROJECT

In the 2017 intake cycle 31 different AQL tests were written by 83,114<sup>2</sup> candidates and 29 different MAT tests were written by 61,118 candidates (different tests are written to maintain the security and integrity of the tests). This represents a 2% increase in the number of candidates from 2016.

The NBTP places great importance on the accessibility of the tests, and, in particular searches for ways to expand the number of test centres, particularly in the rural areas. In the 2017 intake test cycle, the project increased the number of test centres and test sessions in the following regions:

The Eastern Cape increased test sessions by 10%

Free State increased test sessions by 29%

KZN centres by 5% and sessions by 33 %

Limpopo centres by 25% and sessions by 13 %

Mpumalanga increased test sessions by 22%

Mpumalanga increased test sessions by 20%

<sup>2</sup> Although the AL and QL tests are designed to be written together, four candidates only wrote the AL test. The total number of tests administered therefore differs from the total number of candidates in the sample by four.

Mpumalanga increased test sessions by 11%

Western Cape centres by 23% and sessions by 10 %

Gauteng centres by 27% and sessions by 4 %

Nationally numbers of test centres has increased by 10% and the number of sessions by 15%.

Table 5 below provides details of the number of national test sessions and test centres by provinces, and Figures 1 and 2 below illustrate this graphically.

*Table 5 Number of national test centres and test sessions by province for NBT 2015 intake, NBT 2016 intake and NBT 2017 intake cycles*

Province/ Region	Province	Number of NBT test centres in 2016 Intake Cycle	Number of NBT test sessions in 2016 Intake Cycle	Number of NBT test centres in 2017 Intake Cycle	Number of NBT test sessions in 2017 Intake Cycle	Percentage change 2016 - 2017 Intake: Number of NBT test centres	Percentage change 2016 - 2017 Intake: Number of NBT test sessions
EASTERN CAPE	EC	16	157	16	173	0%	10%
FREE STATE	FS	6	72	6	93	0%	29%
GAUTENG	GP	11	136	14	141	27%	4%
KWAZULU -NATAL	KZN	19	146	20	194	5%	33%
LIMPOPO	LP	4	61	5	69	25%	13%
MPUMAL ANGA	MP	8	68	8	83	0%	22%
NORTHER N CAPE	NC	6	46	6	55	0%	20%
NORTH- WEST	NW	3	35	3	39	0%	11%
WESTERN CAPE	WP	13	141	16	155	23%	10%
INTERNAT IONAL	International	15	67	17	63	13%	-6%
Grand Total		101	929	111	1065	10%	15%

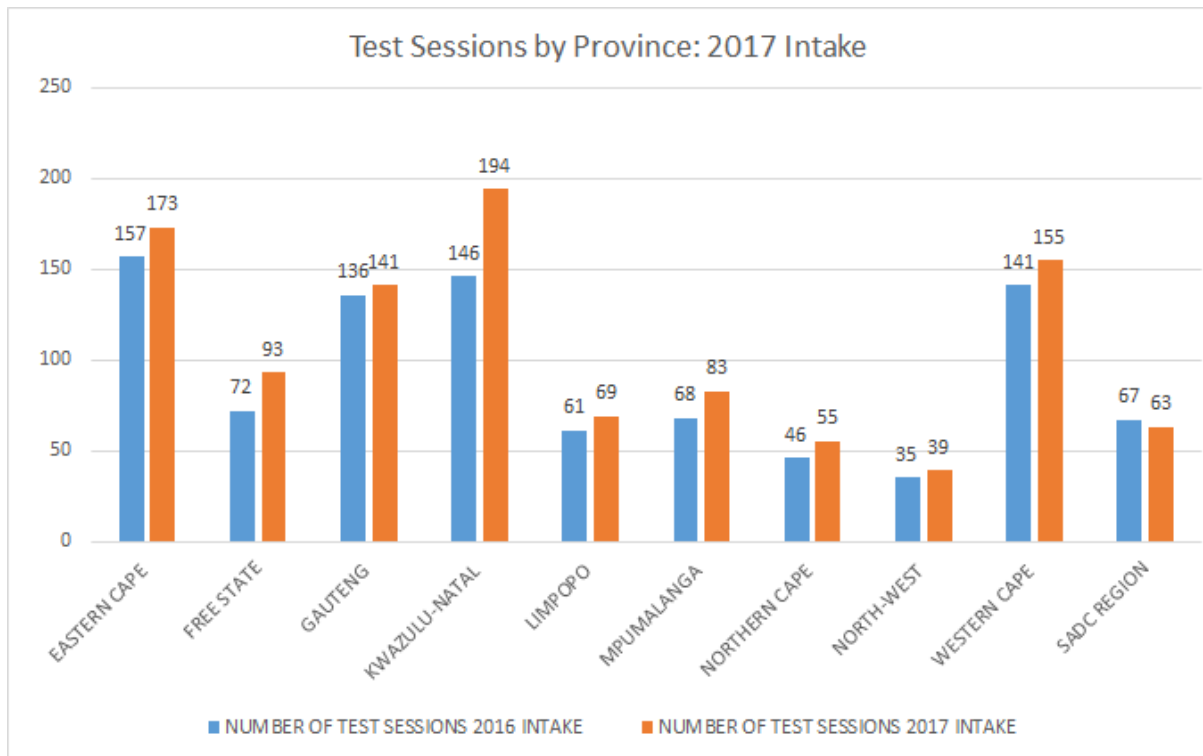


Figure 1 NBT test sessions for the 2016 and 2017 intake cycle

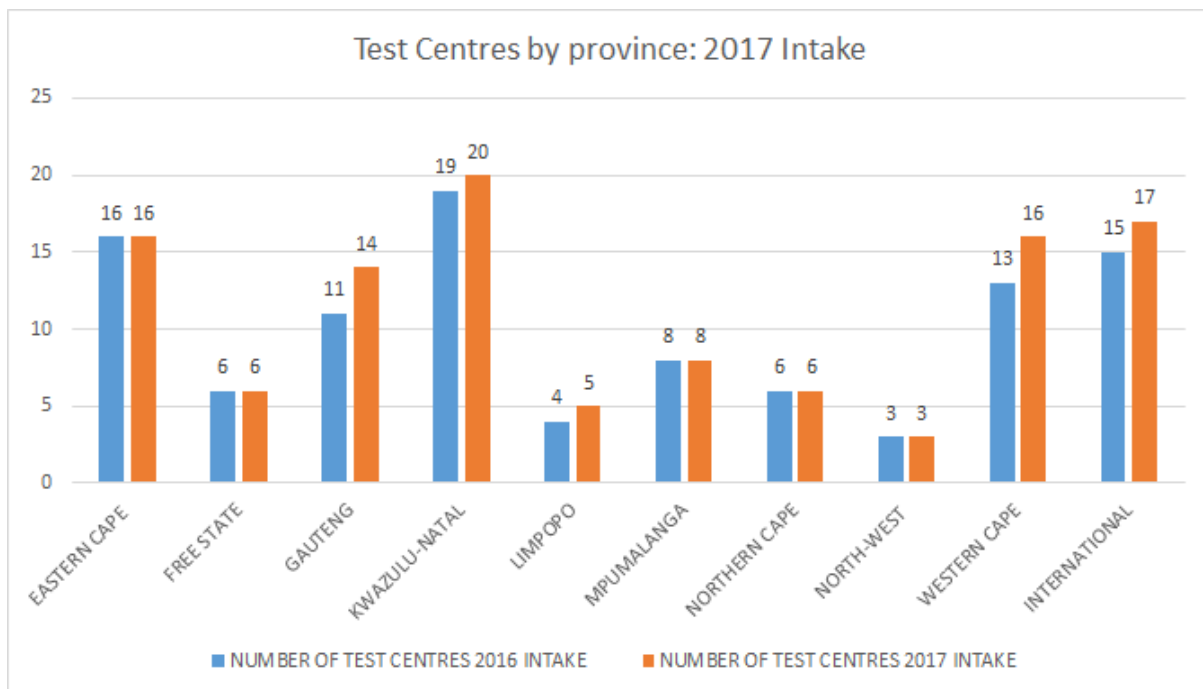


Figure 2 NBT test centres for the 2016 and 2017 intake cycle

## EXPANSION OF THE NBT FOOTPRINT

As part of the ongoing strategy of CETAP to ensure that all prospective writers have access to venues, CETAP embarked on a GIS study of its footprint to identify areas that are under-represented in the 2016 footprint. CETAP identified and contacted 44 potential venues and these will be evaluated to establish if they meet the required standard for a national session venue. This aggressive expansion of

the NBT footprint should now address the few areas that were not adequately covered within the existing test venue footprint in order to ensure easy access to all writers. The coverage of the current venues is as follows.

- Secondary Schools within 50 km - 68% / and within 100km - 93%
- Quintile 1 and 2 Secondary Schools within 50 km – 58% / and within 100 km 90%
- Population of 15 – 25 year olds (2011 Census) within 50 km – 79% / and within 100 km - 96%

The NBT project test venues’ reach has achieved over 90% coverage of all secondary schools in South Africa within 100 km. The NBTP is cognisant of the fact that travel is costly and hence the NBTP aims to ensure that 75% of NBT writers need not travel further than 50km to a testing venue. The NBT project has proposed 44 potential new venues for the 2018 Intake Cycle. This will further improve coverage. These new venues are presented in the Figure 3 below. These proposed venues will improve the NBT coverage to:

- Schools within 50 km of NBT Venue: 78% (10% increase in coverage)
- 1 & 2 Quintile Schools within 50 km of NBT Venue: 71% (13% increase in coverage)
- 2011 Ward 15-24 Population within 50 km of NBT Venue: 88% (9% increase in coverage)

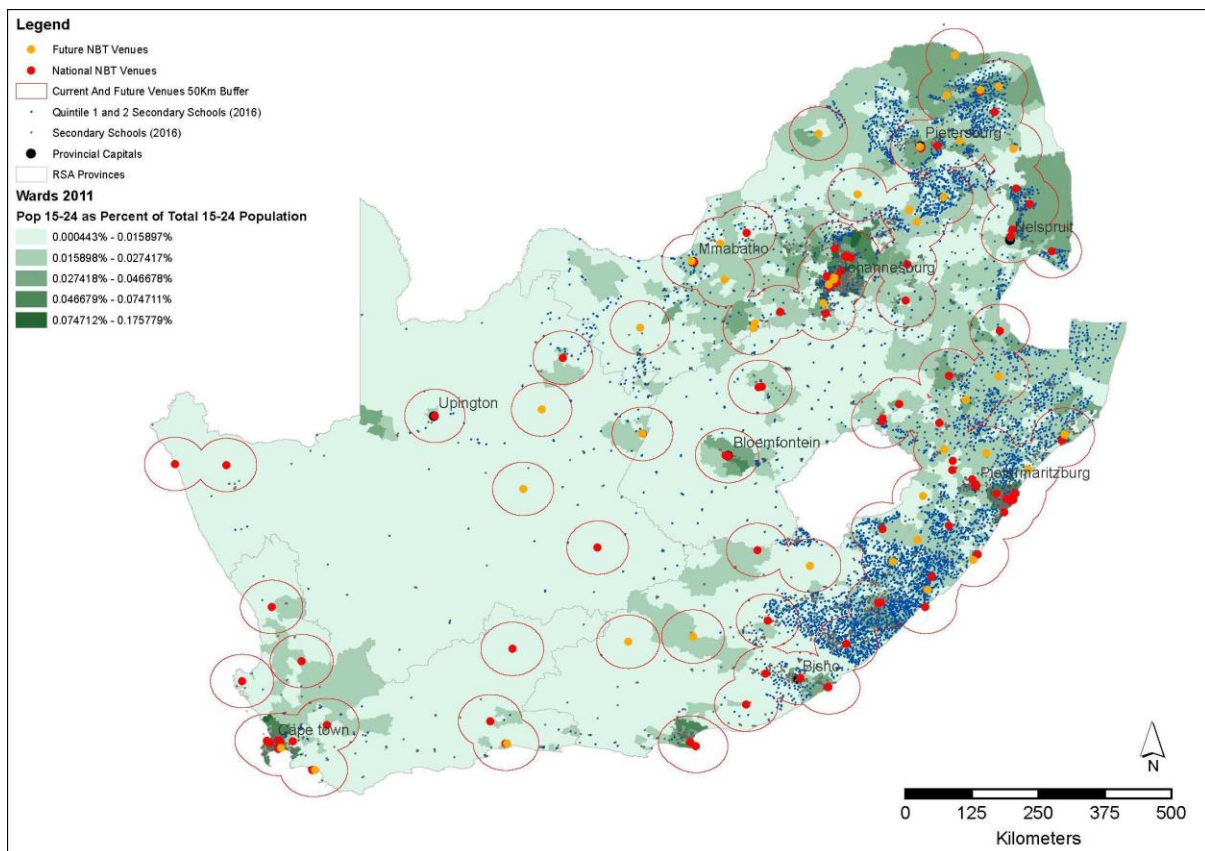


Figure 3 Map of Proposed and Current NBT venues and all Secondary Schools

## 4. DEMOGRAPHIC CHARACTERISTICS OF THE 2017 NBTP CANDIDATES

Candidates writing the NBTs for the 2017 intake cycle provided demographic information through self-reporting. The demographic information is provided when the candidates write the actual tests.

Selected self-reported demographic characteristics are reported in Table 6. The table reflects the frequencies based on writers of each test. For example, the subsample of AL writers consisted of 59.33% women, and 62.34% indicated their population group as black.

*Table 6 Frequency tables for selected self-reported demographic characteristics for the 2017 NBT cohort*

	Wrote AL		Wrote QL		Wrote Maths	
	Count	%	Count	%	Count	%
<b>GENDER</b>						
Male	33,804	40.67	33,802	40.67	26,585	43.50
Female	49,310	59.33	49,308	59.33	34,533	56.50
Missing						
<b>Total</b>	83,114	100	83,110	100	61,118	100
<b>POPULATION GROUP</b>						
Black	51,814	62.34	51,810	62.34	39,328	64.35
Coloured	9,278	11.16	9,278	11.16	5,509	9.010
Indian/Asian	5,376	6.470	5,376	6.470	4,302	7.040
White	16,286	19.59	16,286	19.60	11,742	19.21
Other	360	0.430	360	0.430	237	0.390
Missing						
<b>Total</b>	83,114	100	83,110	100	61,118	100
<b>CITIZENSHIP</b>						
South African	78,655	94.64	78,651	94.63	57,628	94.29
SADC county	2,897	3.490	2,897	3.490	2,265	3.710
Other African country	853	1.030	853	1.030	668	1.090
Other	709	0.850	709	0.850	557	0.910
<b>Total</b>	83,114	100	83,110	100	61,118	100
<b>GR 12 LANGUAGE</b>						
Afrikaans	8,479	10.20	8,479	10.20	5,760	9.420
English	72,752	87.53	72,748	87.53	53,960	88.29
Other	1,883	2.270	1,883	2.270	1,398	2.290
<b>Total</b>	83,114	100	83,110	100	61,118	100
<b>HOME LANGUAGE</b>						
Afrikaans	9,288	11.18	9,288	11.18	6,413	10.49
English	25,482	30.66	25,482	30.66	17,673	28.92
isiNdebele	844	1.020	844	1.020	660	1.080
isiXhosa	11,485	13.82	11,483	13.82	8,112	13.27
isiZulu	9,265	11.15	9,264	11.15	7,001	11.45
Sesotho	6,563	7.900	6,563	7.900	4,633	7.580
Sesotho sa Leboa	6,196	7.450	6,196	7.460	5,224	8.550
Setswana	4,420	5.320	4,420	5.320	3,239	5.300
siSwati	1,869	2.250	1,869	2.250	1,548	2.530
Tshivenda	2,702	3.250	2,702	3.250	2,481	4.060
Xitsonga	3,001	3.610	3,000	3.610	2,504	4.100
Other Language	1,999	2.410	1,999	2.410	1,630	2.670
<b>Total</b>	83,114	100	83,110	100	61,118	100

## 5. TEST PERFORMANCE OF THE 2017 INTAKE NBTP CANDIDATES

The tests were made available in both English and Afrikaans, the two official languages of instruction at South African Higher Education Institutions for the 2017 intake cycle. For the 2017 intake, registration opened on the 1<sup>st</sup> of April 2016.

The scores indicated below show the scores of candidates that wrote the NBTs by 28 February 2017.

It is encouraging that the uptake of NBT is on the increase. The number of AQL scores increased from 81,669 in 2016 to 83,114 in 2017, an increase of 1,415 (1.7%) in one year. The number of MAT writers increased from 59,644 in 2016 to 61,118 in 2017, an increase of 1,474 (2.5%) in one year. The NBT candidates represent the demographic characteristics of the national higher education applicant cohort.

The actual number of 2017 intake cycle test scores is slightly larger because the scores of the candidates who wrote the NBT after 28 February 2017 but before the 2018 intake cycle are not included in the 2017 intake cycle report.

The NBT candidates include both those who wrote as part of their application for tertiary study and those who wrote for placement purposes after admission. This section reports the descriptive statistics for the three NBT scores as well as the frequency tables for the benchmark bands. Table 7 shows the descriptive statistics for the cohort as a whole. Both the mean and median scores fall within the Intermediate benchmark categories for all three domains, as in 2016. The distributions on both the QL and MAT were positively skewed (see histograms in Figure 4).

### DESCRIPTIVE STATISTICS

*Table 7 Descriptive statistics for AL, QL and MAT for the 2017 NBT cohort*

<b>NBT Test</b>	<b>n</b>	<b>Mean</b>	<b>SD</b>	<b>Minimum</b>	<b>1st Quartile</b>	<b>Median</b>	<b>3rd Quartile</b>	<b>Maximum</b>
<b>AL</b>	83114	54.53	14.19	18.00	42.00	53.00	66.00	94.00
<b>QL</b>	83110	47.20	15.75	9.00	35.00	42.00	57.00	98.00
<b>MAT</b>	61118	40.12	16.14	1.00	28.00	34.00	48.00	98.00

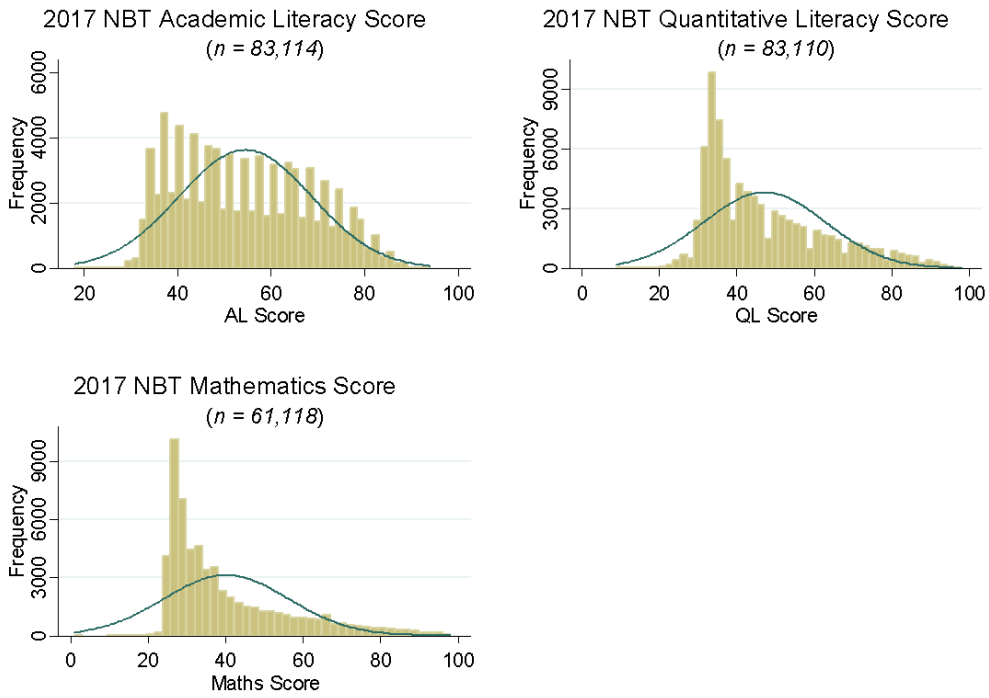


Figure 4 NBT test scores

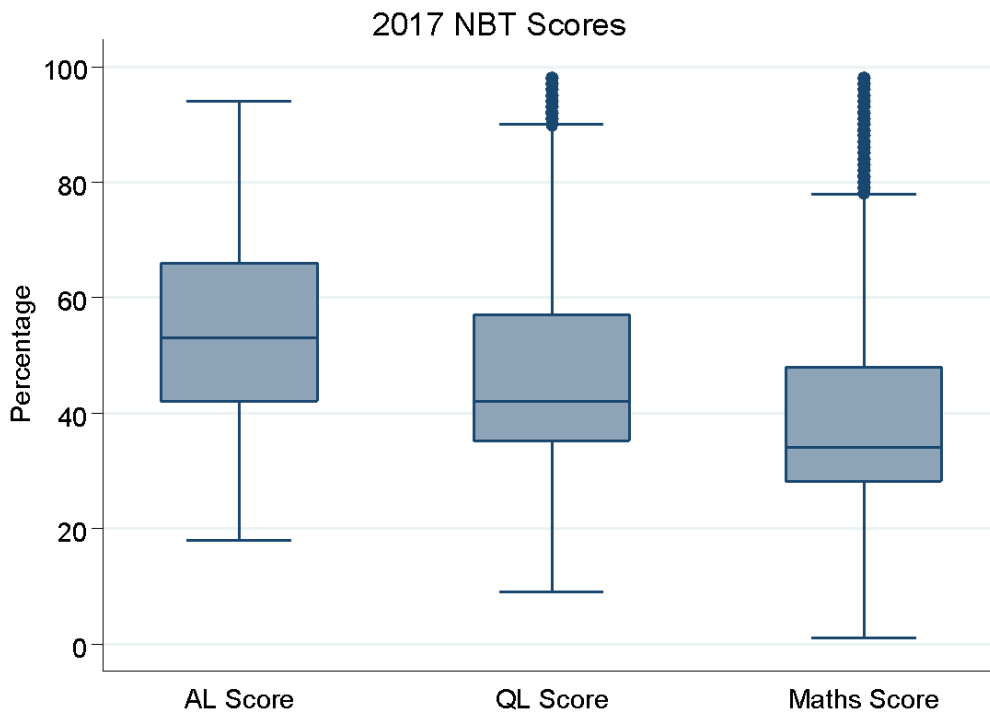


Figure 5 NBT test scores



## 2017 NBT COHORT BY PERFORMANCE LEVELS

Table 8 represents the performance within criterion-referenced degree benchmark levels for the 2017 NBT cohort as a whole. These candidates were placed into four degree benchmark levels: Basic, Intermediate Lower, Intermediate Upper and Proficient. The interpretation of benchmark levels was discussed in section 3.3.14 of this document.

*Table 8 Frequency tables for the degree benchmark levels of the 2017 NBT cohort*

NBT tests	Basic	Intermediate Lower	Intermediate Upper	Proficient	Total (N)
<b>Academic Literacy</b>	12,712 (15.29%)	29,345 (35.31%)	22,795 (27.43%)	18,262 (21.97%)	81,669
<b>Quantitative Literacy</b>	35,712 (42.97%)	24,278 (29.21%)	13,390 (16.11%)	9,730 (11.71%)	81,694
<b>Mathematics</b>	30,583 (50.04%)	17,703 (28.97%)	7,766 (12.71%)	5,066 (8.29%)	59,644

The performance of the 2017 cohort strongly suggests that higher education institutions need to be prepared to provide extensive support in QL and MAT, since as many as ninety percent (90%) of their prospective students are likely to have scores that fall within the Basic and Intermediate benchmark bands.

### **Intermediate band**

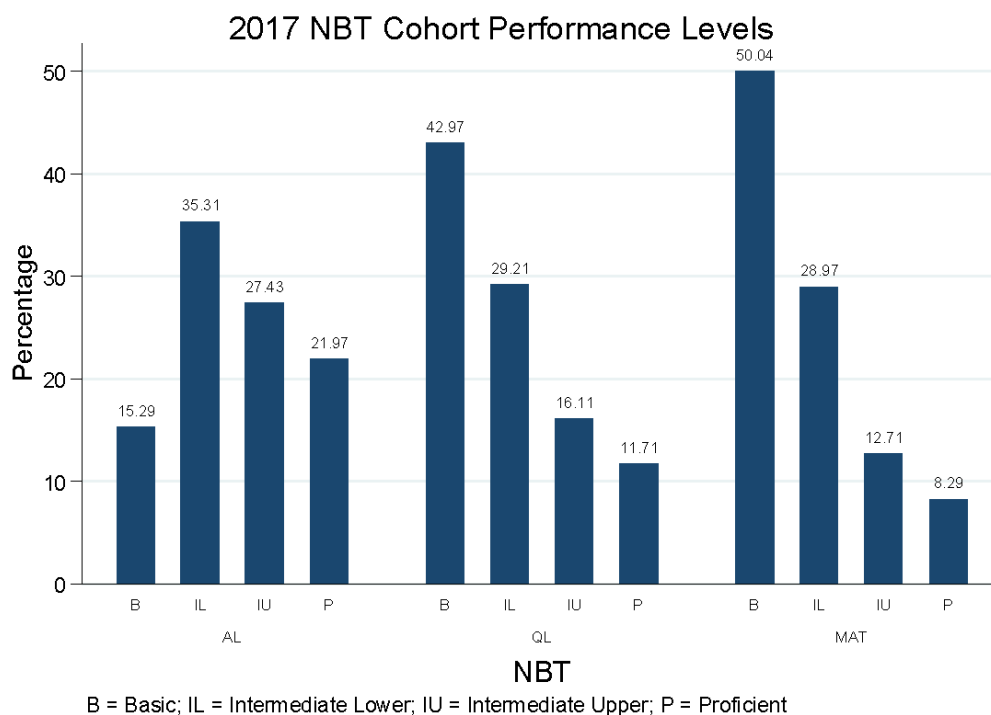
Table 8 above shows that 63% of candidates had scores in the Intermediate benchmark level for AL and 45% of candidates had scores in the Intermediate benchmark level for QL, while 42% of the MAT candidates had scores in the Intermediate category.

### **Basic band**

The number of candidates with scores in the Basic band changed slightly from 2016. For AL, 15% of candidates had scores in the Basic category in 2017 compared to 14% in 2016; 43% of QL writers had scores in the Basic category compared to 38% in 2016; 50% of MAT writers had scores in the Basic category for both years. The prediction is that these candidates will require extensive support if they are to have a chance of succeeding in higher education degree study.

### **Proficient band**

The Proficient band can be interpreted to mean that academic progress in higher education ought not to be limited or negatively affected by ability in this domain. As can be seen from Table 8 above, the percentage of candidates with Proficient scores in QL and MAT is quite low, namely 12% for QL, and 8% for MAT. Although the percentage of candidates with Proficient scores in AL is higher, at approximately 22%, this still does not represent the majority of the candidates.



*Figure 6 2017 NBT performance levels for AL, QL and MAT*

#### PERFORMANCE ON NBT BY INTENDED FACULTY

Candidates are asked to indicate their first, second and third choice of faculty to which they have applied or will apply. Only the first choice of intended faculty was used in this analysis. All applicants to the majority of Health Science faculties are required to write the NBTs as part of the admission requirements. The use of NBT for admission, placement and teaching and learning in other programmes varies across institutions and faculties. Degree benchmarks are applied in this section as we do not know which programme of study candidates will embark upon. In section 8, Degree and Diploma/Higher certificate benchmarks will be reported separately when the NSC subsample is considered and reported depending on the NSC level of achievement.

## AL PERFORMANCE BY INTENDED FACULTY

Candidates who indicated that they intended to apply to Faculties of Hospitality/Tourism and Law made up the highest proportion of scores in the Proficient band, with over 25%. Law is notable, in that the highest proportion of scores fell into the Proficient band for AL. These are students who will not require additional AL support once admitted.

Faculties where the largest proportion of intended applicants fell into the Intermediate Upper or Lower bands, and therefore would need AL support, were ICT (66%) and Education (67%), while Art/Design, Business/Commerce Management, Health Sciences, and Humanities had 64% of intended applicants who would potentially need AL support.

Of concern is the 35% of scores in the Basic band for intended applicants to Allied Healthcare/Nursing, as these applicants would need considerable AL support, or could be deemed under-prepared for academic study.

### 2017 NBT Cohort Academic Literacy Performance Levels By Intended Faculty of Study

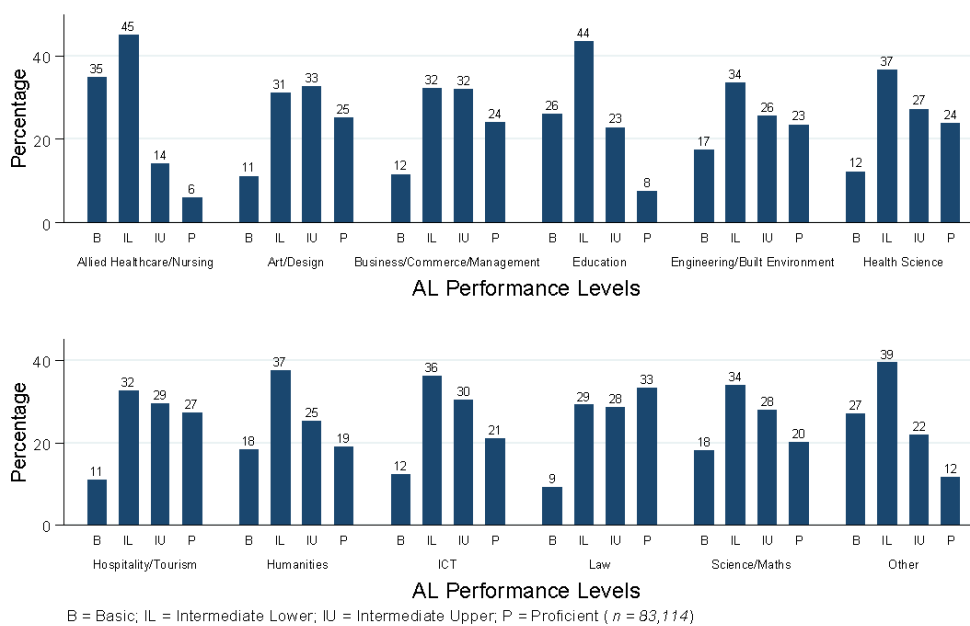


Figure 7 2017 NBT Academic Literacy performance levels by intended faculty of study

## QL PERFORMANCE BY INTENDED FACULTY

Figure 8 shows the QL performance of candidates across all the faculties. The QL performance for this cohort was considered low. There were four faculties, namely Allied Healthcare/Nursing, Education, ICTs and the “Other” where more than 50% of the candidates’ QL performance fell within the Basic performance band.

### **Proficient band**

Overall the proportion of candidates with scores in the Proficient band for the faculties was below 20%, with only one faculty, that of Law, recording above 20% (23%) of candidates who were deemed proficient. Of the proportion of candidates applying to the faculty of Engineering and Built Environment, only 20% of the scores were in the QL Proficient band. The small proportion of candidates with scores in the Proficient band in the various faculties is an indication of the low number of candidates who would be expected to cope with academic study at university without additional QL support.

### **Intermediate band**

The candidates with scores in the Lower Intermediate performance bands in Health Sciences (38%), Engineering and the Built Environment (28%), ICT (31%), and Science and Maths (27%) is an indication of the proportion of candidates who would require additional QL support while undertaking their academic studies at universities. These courses are reliant on quantitative literacy and candidates will need support. Not all candidates may require QL support to the same extent, as this is dependent on the courses they undertake, and some courses have minimal or no QL content.

### **Basic band**

A worrying trend is the high proportion of candidates whose scores fall within the Basic performance band in terms of QL performance across all the faculties. The proportion of candidates in the Allied Healthcare/Nursing faculty was very high with nearly two-thirds of the candidates with QL scores in the Basic band. The proportions of the scores of candidates in faculties such as Education (68%), ICT (51%), Hospitality/Tourism (48%) and Science/Maths (48%) were also high, which means that these candidates would require considerable QL support in order to cope with the academic demands of tertiary level study. The faculties of Engineering and the Built Environment (34%) and Law (26%) had the smallest proportions of candidates with scores in the Basic performance band.

## 2017 NBT Cohort Quantitative Literacy Performance Levels By Intended Faculty of Study

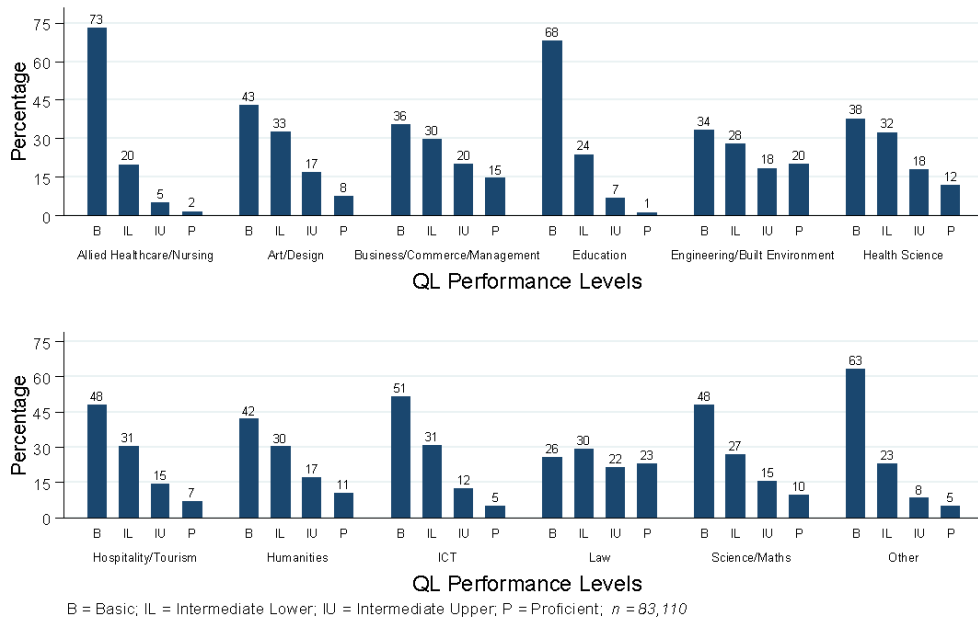


Figure 8 2017 NBT Quantitative Literacy performance levels by intended faculty of study

### MAT PERFORMANCE BY INTENDED FACULTY

Figure 9 indicates that MAT proficiency is very low among all the candidates.

#### Proficient band

The highest numbers of Proficient scores in MAT are reflect candidates intending to study Law (15%), and Engineering and the Built Environment (12%). In Allied Healthcare and Nursing, the number of Proficient scores in MAT is close to 1%. This is a matter of concern if any of these programmes include mathematics courses. The percentage is the same in Education, and this certainly presents a problem if a sizeable proportion of these candidates are intending to become mathematics teachers.

#### Intermediate band

A sizeable proportion of candidates' MAT scores are in the Intermediate band. These candidates will all require additional curriculum-integrated support if they are to succeed in the mathematics courses they undertake. There are some faculties (such as Law, Hospitality/Tourism) in which programmes do not have a Mathematics component, but for those that do (such as Engineering and the Built Environment) faculties will need to consider carefully the extent and type of support that they need to provide.

#### Basic band

The highest percentages of scores in the Basic group in MAT represent candidates intending to study Allied Healthcare and Nursing, and Education. It is unlikely that these candidates will cope with the Mathematics component of their courses.

## 2017 NBT cohort Mathematics Performance Levels by Intended Faculty of Study

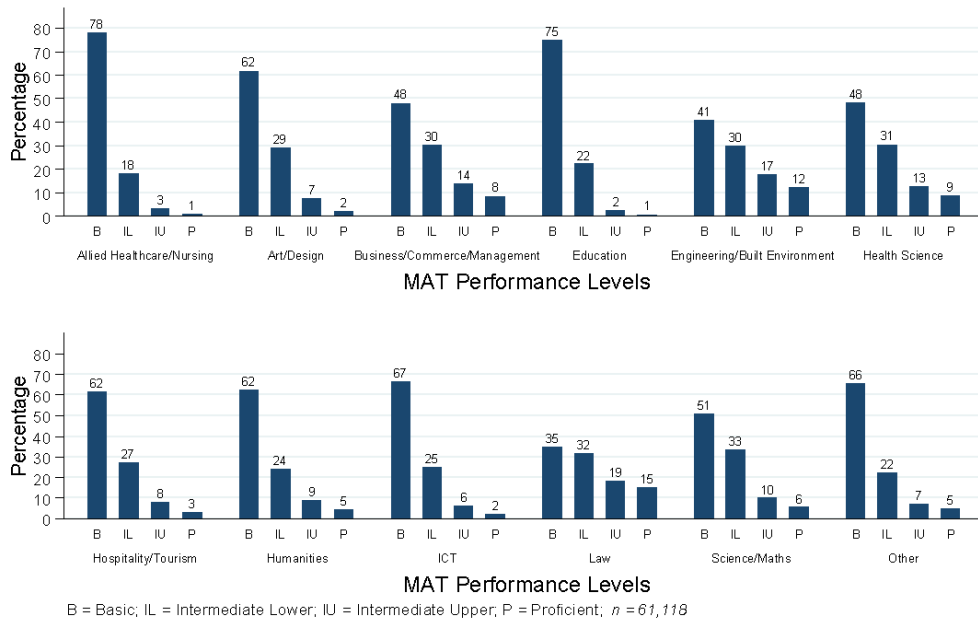


Figure 9 MAT performance levels by intended programme of study, NBT 2017 intake cycle

### PERFORMANCE ON THE NBT BY TEST LANGUAGE

This section reports a comparison in performance by candidates who wrote the NBT in English and Afrikaans. A total of 7,706 (8.07%) candidates wrote the NBT AQL in Afrikaans while 4,957 (8.11%) candidates wrote the NBT MAT in Afrikaans. This information is summarised in Table 9 below.

Table 9 MAT performance levels by intended programme of study, NBT 2017 intake cycle

AQL/MAT test language	Wrote AL		Wrote QL		Wrote MAT	
	Count	%	Count	%	Count	%
Afrikaans	6706	8.07	6706	8.07	4957	8.11
English	76408	91.93	76404	91.93	56160	91.89
<b>Total</b>	<b>83,114</b>	<b>100.00</b>	<b>83,110</b>	<b>100.00</b>	<b>61,117</b>	<b>100.00</b>

Table 10 reports the descriptive statistics for the 2017 Afrikaans and English NBT cohort. Inspection of the means suggests that the Afrikaans cohort obtained higher mean scores on all the tests compared to the English cohort. Analysis of the tests has shown that at item and test level, there is no language DIF (differential item functioning, commonly referred to as bias). Factors beyond the test may therefore explain any statistically significant performance differences between those who wrote the test in English and those who wrote it in Afrikaans, but further research and analysis is required (including testing the significance of the difference).

Table 10 Descriptive statistics for AL, QL, and MAT of the 2017NBT cohort by test language

NBT Test	Test language	n	Mean	SD	Min.	1st Quartile	Media n	3rd Quartile	Max.
AL	Afrikaans	6706	62.15	10.96	25	55	64	70	90
	English	76408	53.87	14.25	18	42	52	65	94
QL	Afrikaans	6706	55.39	16.39	17	41	55	68	98
	English	76404	46.48	15.49	9	34	41	55	98
MAT	Afrikaans	4964	49.93	15.40	14	37	45	60	98
	English	56154	39.25	15.92	1	27	33	46	97

*AL PERFORMANCE ON TESTS WRITTEN IN AFRIKAANS AND ENGLISH*

A higher proportion of candidates (35%) who wrote the NBT AL in Afrikaans had scores in the Proficient band compared to those writing the test in English (21%), while a higher proportion of those writing in English (16%) had scores in the Basic band compared to those writing in Afrikaans (3%). Taking into account the proportions of scores falling into the Intermediate bands (43% of Afrikaans candidates' scores, and 37% of English candidates' scores), it is clear that overall the performance of those who wrote the test in Afrikaans was better than that of the candidates who wrote the tests in English.

2017 NBT Academic Literacy Performance Levels by Test Language  
(n = 83,114)

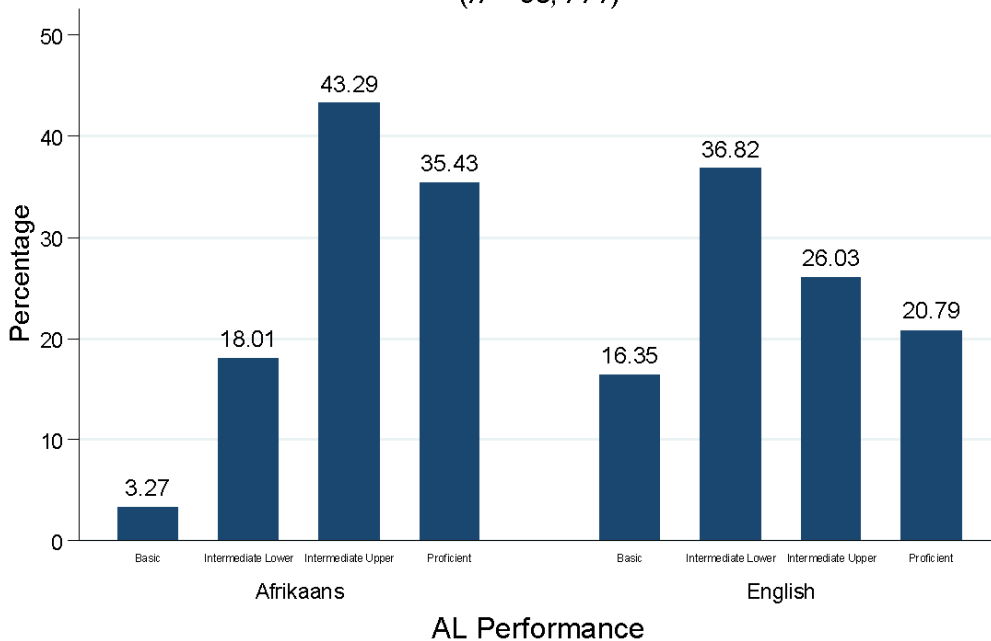


Figure 10 2017 NBT AL Performance Levels by test language

### QL PERFORMANCE ON TESTS WRITTEN IN AFRIKAANS AND ENGLISH

The Afrikaans writers represented 8.09% of the total number of candidates who wrote the QL tests in 2016. Of these, 22.14% of the scores fell in the Proficient band and 21.37% of the scores were in the Basic band. The English writers on the other hand showed a slightly different performance picture. The English writers represented 91.89% of the total candidates and 44.87% of their scores fell within the Basic performance band, while 10.79% of the scores fell within the Proficient performance band. Despite the Afrikaans writers being a smaller proportion of all candidates their overall performance was better than that of the English writers across the four performance categories, as shown in Figure 9 below.

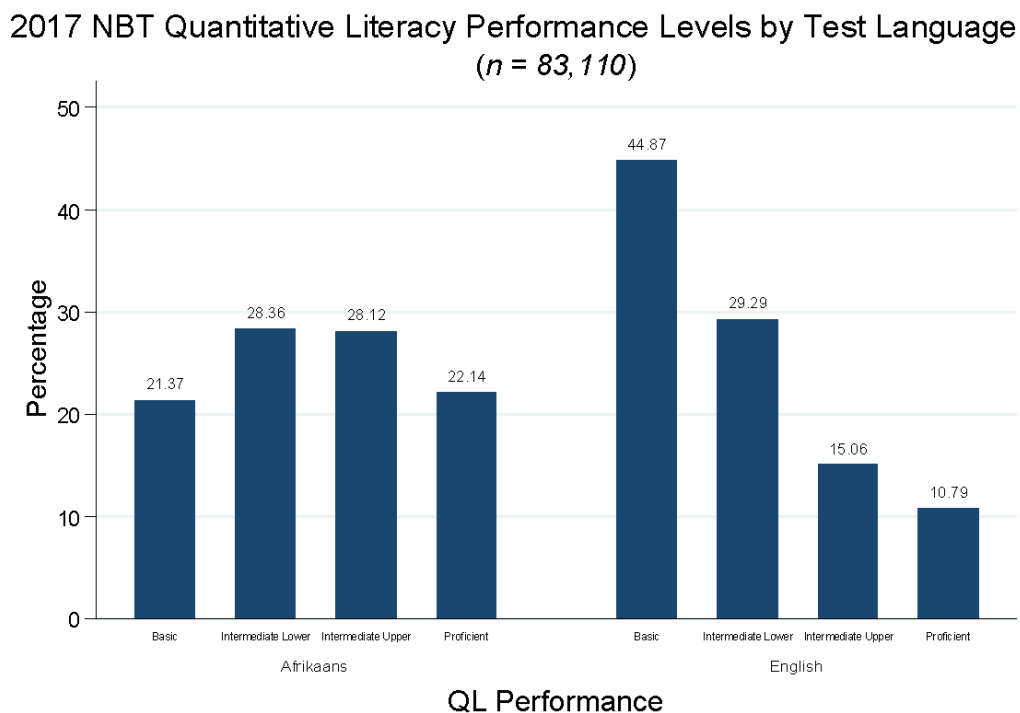


Figure 11 2017 NBT QL Performance Levels by test language

### MAT PERFORMANCE ON TESTS WRITTEN IN AFRIKAANS AND ENGLISH

Slightly more than 15% of those who wrote the Afrikaans MAT test had scores in the Proficient category compared to just under 8% of the English group. Six percent (6%) of those who wrote the Afrikaans MAT test had scores in the Basic category compared to 54% of the candidates in the English group.



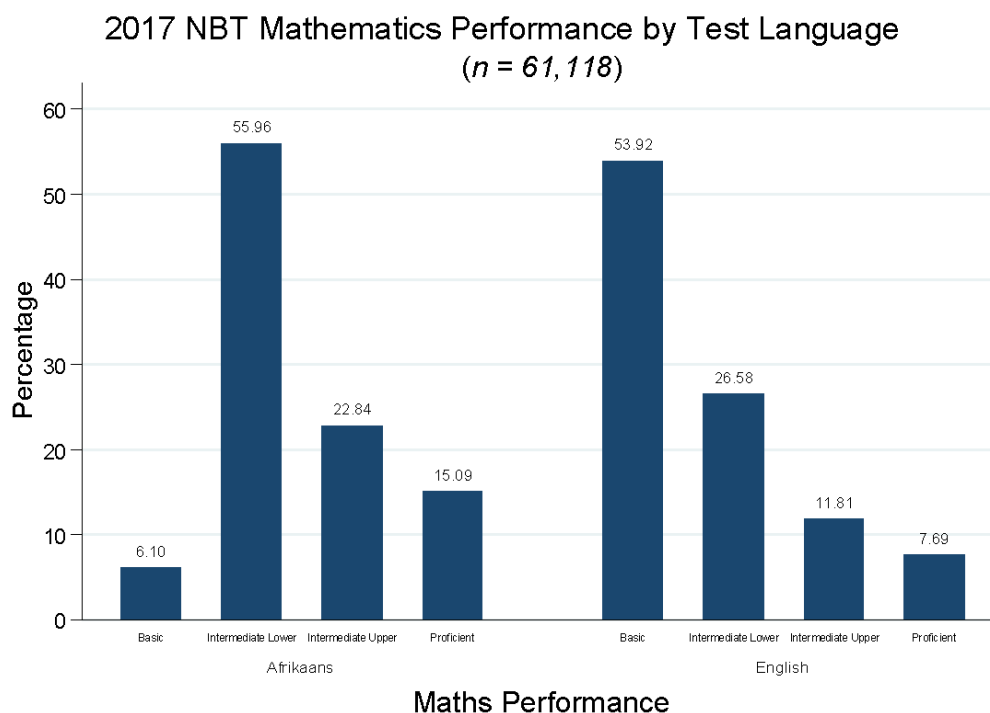


Figure 12 2017 NBT QL Performance Levels by test language

#### COMPARISON: NBT PERFORMANCE LEVELS BY INTENDED FACULTIES OF STUDY, TESTS WRITTEN IN ENGLISH AND AFRIKAANS

This section reports the comparison between candidates by intended faculty of study separately for English and Afrikaans writers.

##### *AL PERFORMANCE BY INTENDED FACULTY OF STUDY, TESTS WRITTEN IN ENGLISH AND AFRIKAANS*

In general, performance of candidates who wrote the NBT AL in Afrikaans was better than that of those who wrote it in English. It can be seen from Figures 13 and 14 that the scores for Afrikaans writers were higher in the Proficient band for the faculties of Allied Healthcare/Nursing, Business/Commerce/Management, Engineering/Built Environment, Health Sciences and Law, for example, when compared to those of the candidates who wrote the test in English. The proportions of the scores in the Proficient band for the former group in these faculties were 29%, 36%, 45%, 49% and 48% respectively, as opposed to 4%, 23%, 22%, 22%, and 32% for the latter group. Similarly, the proportions of the scores in the Basic band for Afrikaans writers in these faculties tended to be lower when compared to those for English writers. These proportions were at most 7% for the former group (apart from those in the 'Other' faculty) as opposed to more than 10% for English writers in these faculties.

## 2017 NBT cohort Academic Literacy Performance Levels by Intended Faculty of Study, Afrikaans

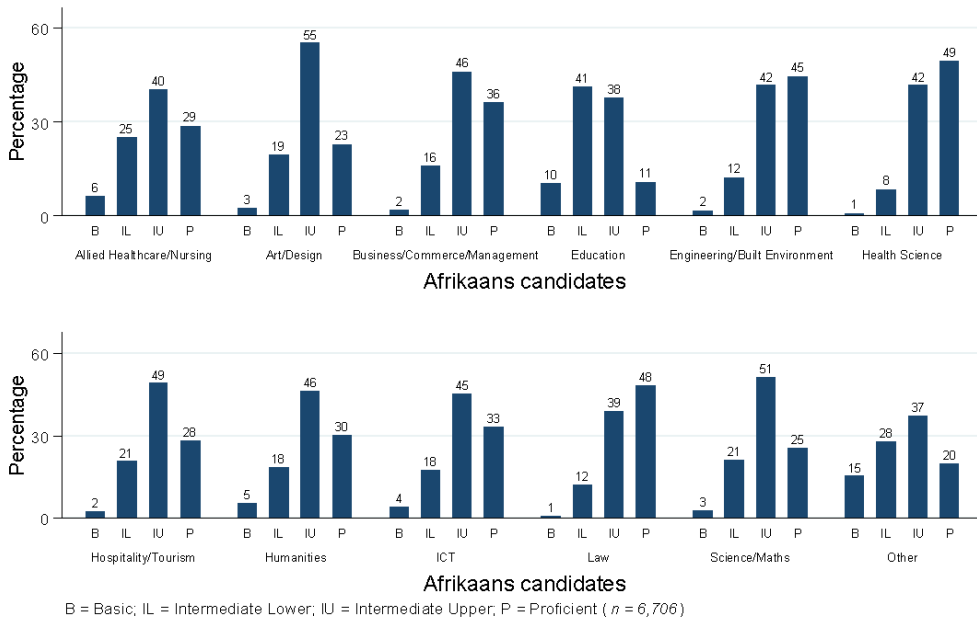


Figure 13 2017 NBT AL Performance Levels by intended programme of study for Afrikaans writers

## 2017 NBT cohort Academic Literacy Performance Levels by Intended Faculty of Study, English

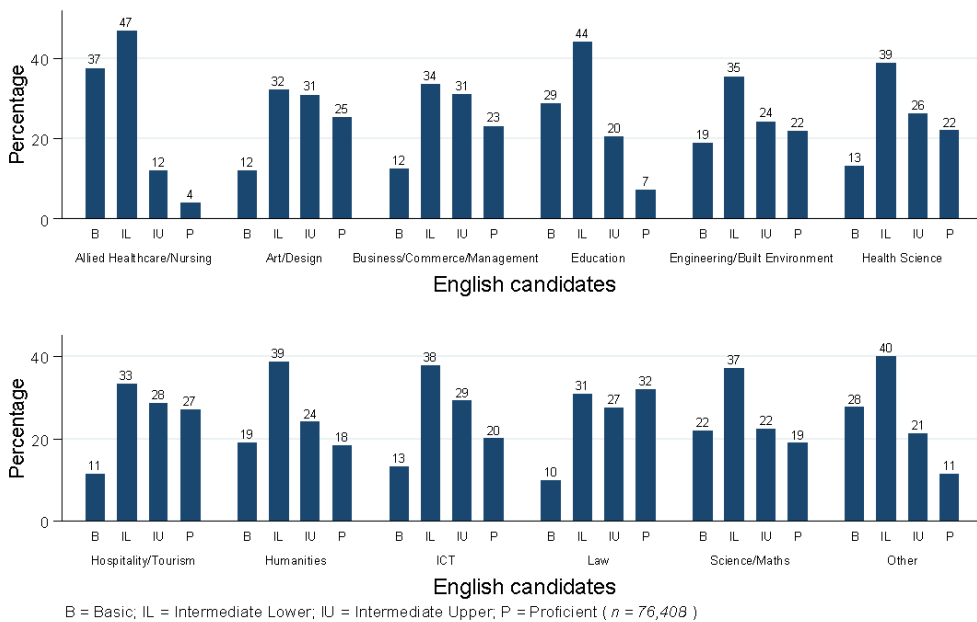
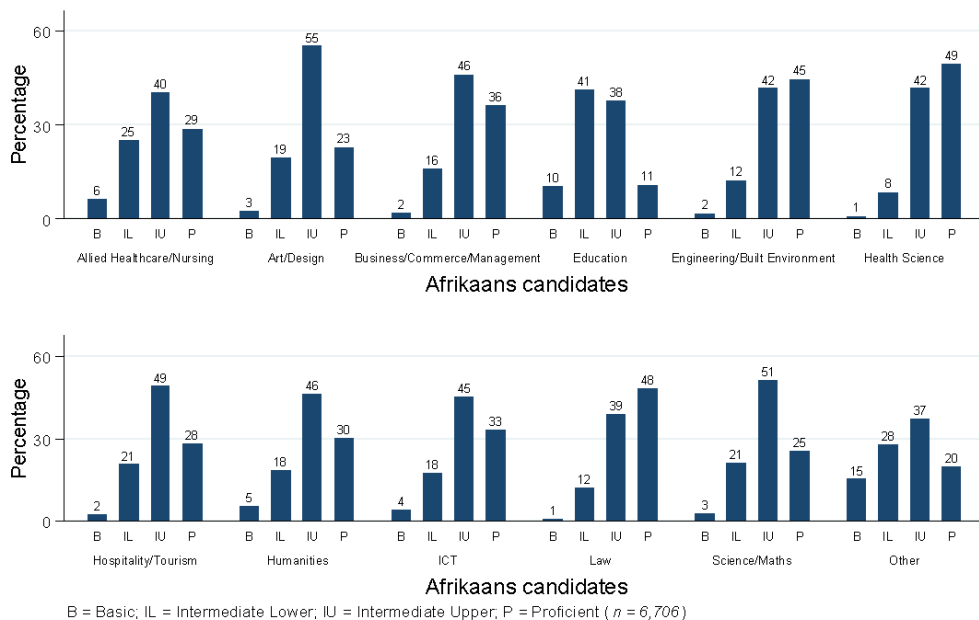


Figure 14 2017 NBT AL performance levels by intended programme of study for English writers

*QL PERFORMANCE BY INTENDED FACULTY OF STUDY, TESTS WRITTEN IN ENGLISH AND AFRIKAANS*

The QL performance of candidates who wrote in Afrikaans was generally higher than that of the candidates who wrote in English. The proportions of candidates who wrote in Afrikaans and had scores in the Proficient band for the Engineering and the Built Environment (45%), Health Sciences (49%), Humanities (28%) and Law (48%) were higher than their English counterparts, which were respectively 18%, 11%, 10% and 22%. The proportions of candidates who wrote in Afrikaans whose scores fell in the Basic band in QL, were relatively low compared to the proportions of candidates who wrote in English. A high proportion of candidates who wrote in English are classified Basic. The candidates applying to Allied Healthcare/Nursing (76%) and Education (70%) faculties showed the largest proportions of candidates in the Basic performance band.

**2017 NBT cohort Academic Literacy Performance Levels by Intended Faculty of Study, Afrikaans**



*Figure 15 2107 NBT QL performance levels by intended faculty of study for Afrikaans writers*

## 2017 NBT cohort Quantitative Literacy Performance Levels by intended faculty of study, English

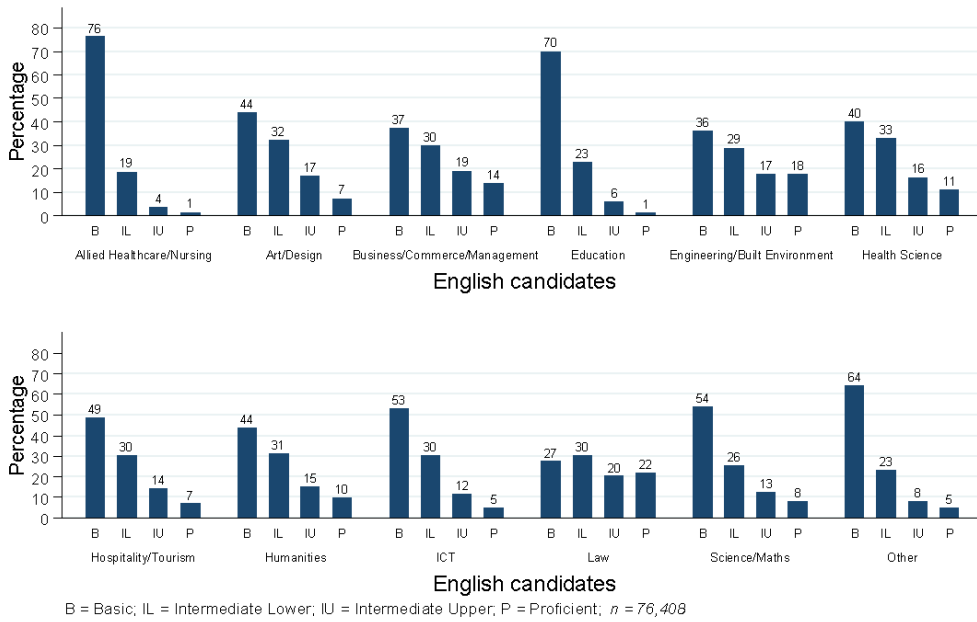
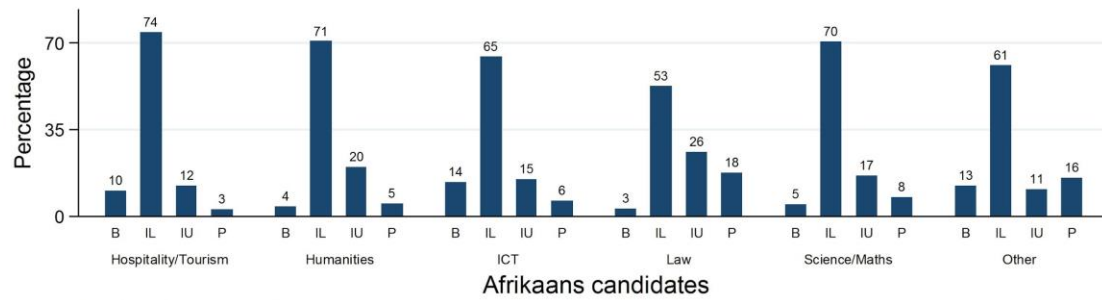
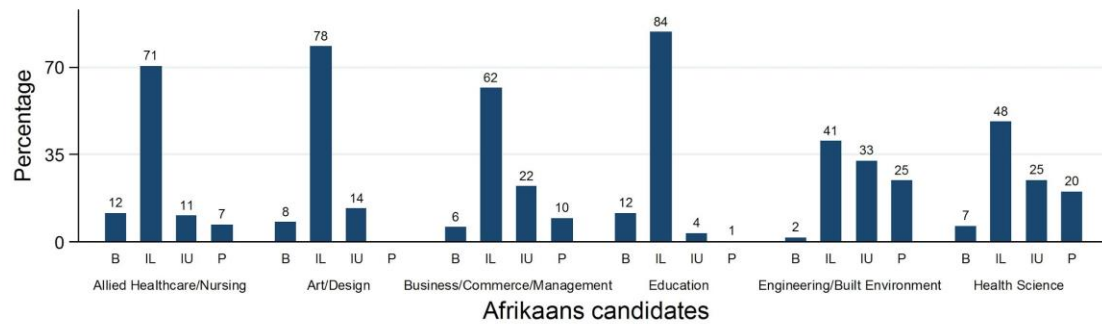


Figure 16 2017 NBT QL performance levels by intended faculty of study for English writers

### *MAT PERFORMANCE BY INTENDED FACULTY OF STUDY, TESTS WRITTEN IN ENGLISH AND AFRIKAANS*

MAT performance of candidates who wrote in Afrikaans was generally higher than that of candidates who wrote in English. This is noticeable in most cases. Specifically, if we consider Health Sciences, Engineering and the Built Environment, and Science/Mathematics, we see that the percentages of candidates who wrote in Afrikaans and fell in the Proficient band in these areas were respectively 25%, 49% and 17%, against the percentages of the candidates who wrote in English and fell in the Proficient band which were respectively 8%, 11% and 5%. Also noticeable are the differences in the Basic category. In the areas of Nursing and Education, for example, the percentages of the candidates who wrote in Afrikaans and whose scores were in the Basic category in these two areas were respectively 37% and 56%, against 83% in both these faculties for the candidates who wrote in English.

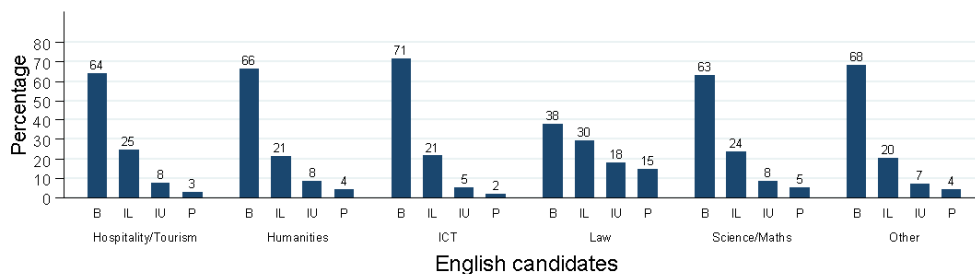
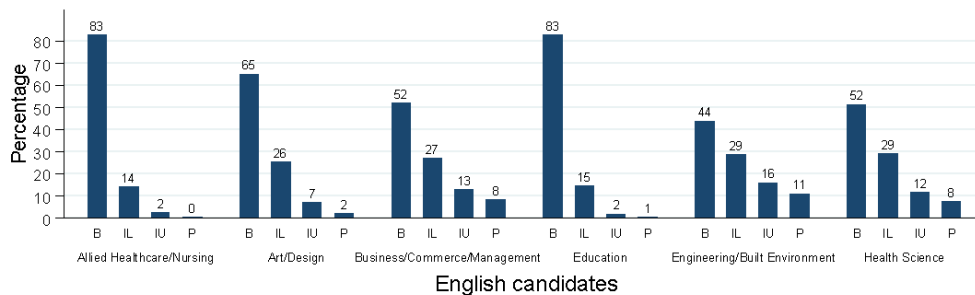
## 2017 NBT cohort Mathematics Performance Levels by Intended Faculty of Study, Afrikaans



B = Basic; IL = Intermediate Lower; IU = Intermediate Upper; P = Proficient; n = 4,965

Figure 17 2017 NBT MAT performance levels by intended programme of study

## 2017 NBT Cohort Mathematics Performance Levels By Intended Faculty of Study, English



B = Basic; IL = Intermediate Lower; IU = Intermediate Upper; P = Proficient; n = 56,156

Figure 18 2017 NBT MAT performance levels by intended programme of study for English writers

## PERFORMANCE PROFILE OF SOUTH AFRICAN AND NON-SOUTH AFRICAN CANDIDATES

This section reports the comparisons between South African citizens and non-South African candidates. The 2017 NBT cohort consisted of 3,279 (5.5%) candidates who reported themselves as non-South African citizens. This included candidates who reported themselves as having SADC citizenship, citizenship from other African countries, and elsewhere.

Table 11 Number of test writers: SA citizens vs non-SA candidates

	Wrote AL		Wrote QL		Wrote MAT	
	n	%	n	%	n	%
South African	78,655	94.64	78,651	94.63	57,628	94.29
non-South African	4,459	5.36	4,459	5.37	3,490	5.71
<b>Total</b>	<b>83,114</b>	<b>100</b>	<b>83,110</b>	<b>100</b>	<b>61,118</b>	<b>100</b>

Table 12 Scores: SA citizens vs non-SA candidates

AL Score	n	Mean	sd	min	p25	p50	p75	max
<b>AL SCORE</b>								
South African	78655	54.25	14.23	18.00	42.00	53.00	66.00	94.00
non-South African	4459	59.57	12.45	22.00	50.00	60.00	69.00	91.00
<b>Total</b>	<b>83114</b>	<b>54.53</b>	<b>14.19</b>	<b>18.00</b>	<b>42.00</b>	<b>53.00</b>	<b>66.00</b>	<b>94.00</b>
<b>QL SCORE</b>								
South African	78651	46.83	15.64	10.00	34.00	42.00	56.00	98.00
non-South African	4459	53.66	16.23	9.00	40.00	52.00	65.00	97.00
<b>Total</b>	<b>83110</b>	<b>47.20</b>	<b>15.75</b>	<b>9.00</b>	<b>35.00</b>	<b>42.00</b>	<b>57.00</b>	<b>98.00</b>
<b>MAT SCORE</b>								
South African	57628	39.94	16.07	1	28	34	47	98
non-South African	3490	43.10	17.10	12	29	37	54	97
<b>Total</b>	<b>61118</b>	<b>40.12</b>	<b>16.14</b>	<b>1</b>	<b>28</b>	<b>34</b>	<b>48</b>	<b>98</b>

### AL PERFORMANCE BY CITIZENSHIP

The non-South African candidates performed slightly better than the South African candidates. Of the non-South African candidates, 30% had scores in the Proficient band in AL compared to 22% of the South African candidates, while 5% of the non-South African candidates had scores in the Basic category compared to 15% of the South African candidates. Finally, slightly more South African candidates (65%) had scores in the Intermediate bands compared to their non-South African counterparts (63%).

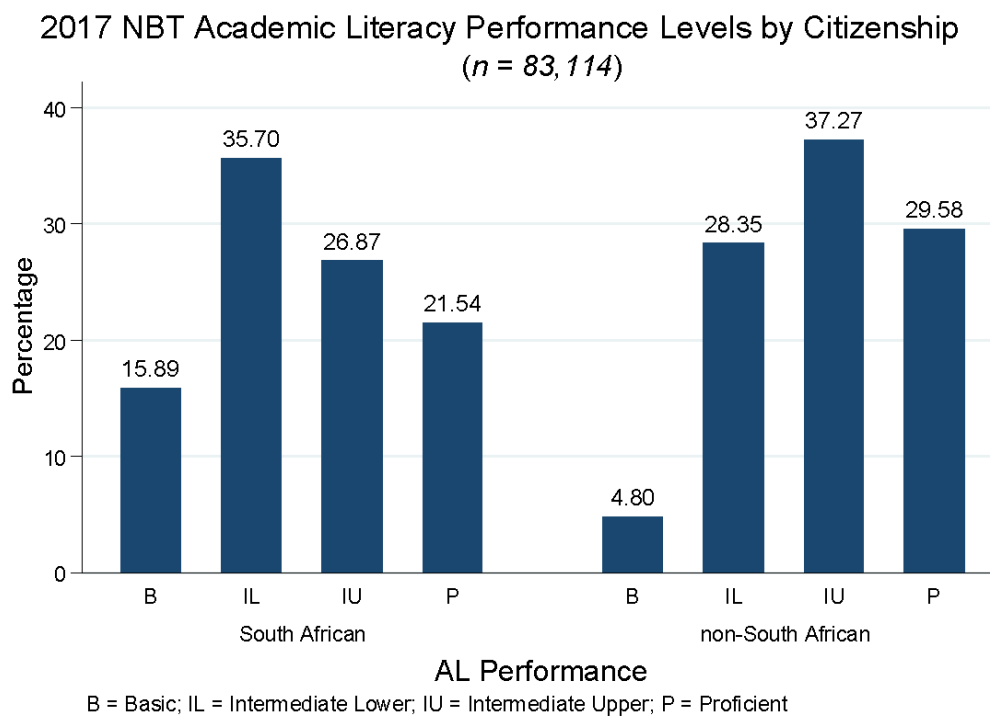


Figure 19 2017 NBT AL performance levels by citizenship

### QL PERFORMANCE BY CITIZENSHIP

Non-South African candidates also write the NBT and this group represented 5.37% of the total number of candidates who wrote the QL tests. This small proportion of candidates performed better than their South African counterparts. The results show that 19.11% of non-South Africans were Proficient in QL compared to 11.29% of the South African group. The proportion of candidates with scores in the Basic category for the South African group was 44.12% compared to the non-South African group of 22.70%. In the Intermediate performance category, the non-South African candidates fared better than their South African counterparts. The non-South African candidates in the Intermediate Upper represented 25.19% of the total number of candidates compared with 15.60% for the South African candidates. It would appear that fewer non-South African candidates (44.30%) would require QL support than their South African counterparts (73.12%).

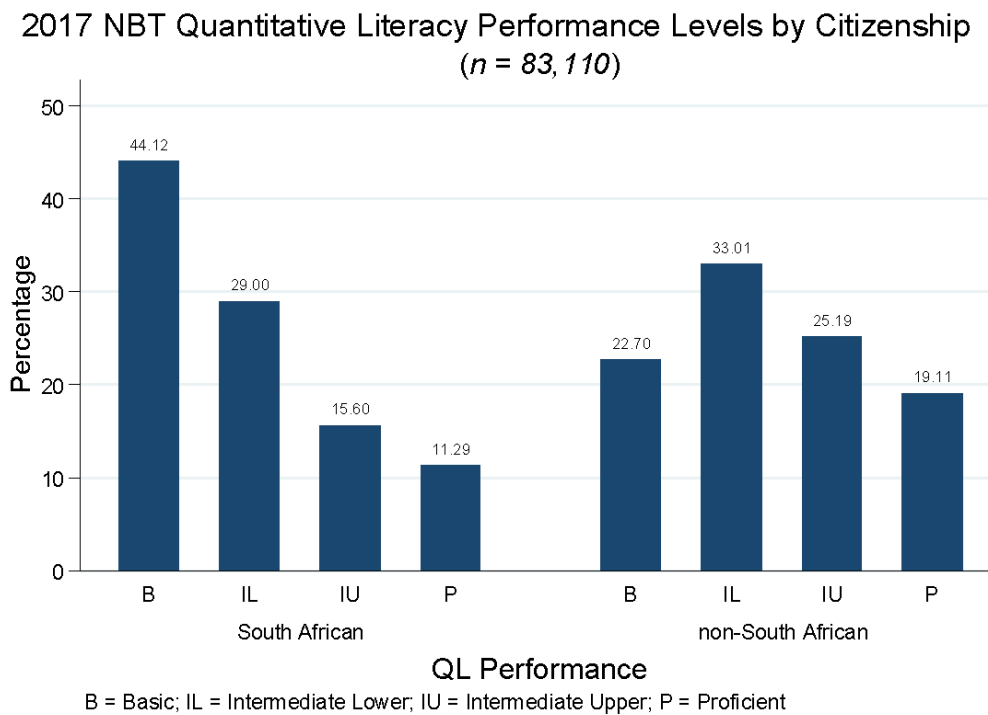


Figure 20 2017 NBT QL performance levels by citizenship



### MAT PERFORMANCE BY CITIZENSHIP

MAT performance among the non-South African candidates was a little better than that of the South African candidates. Of the non-South African candidates, 10.23% had scores in the Proficient band in MAT compared to 8.17% of the South African candidates; 42.01% of the non-South African candidates had scores in the Basic category for MAT compared to 53.63% of the South African candidates whose scores were in the Basic category in MAT. The difference in the Basic category (8.52% more in the South African group) is somewhat offset by the difference in the Intermediate Lower category (8.52% more in the South African group) is somewhat offset by the difference in the Intermediate Lower category (1.49% more in the non-South African group).

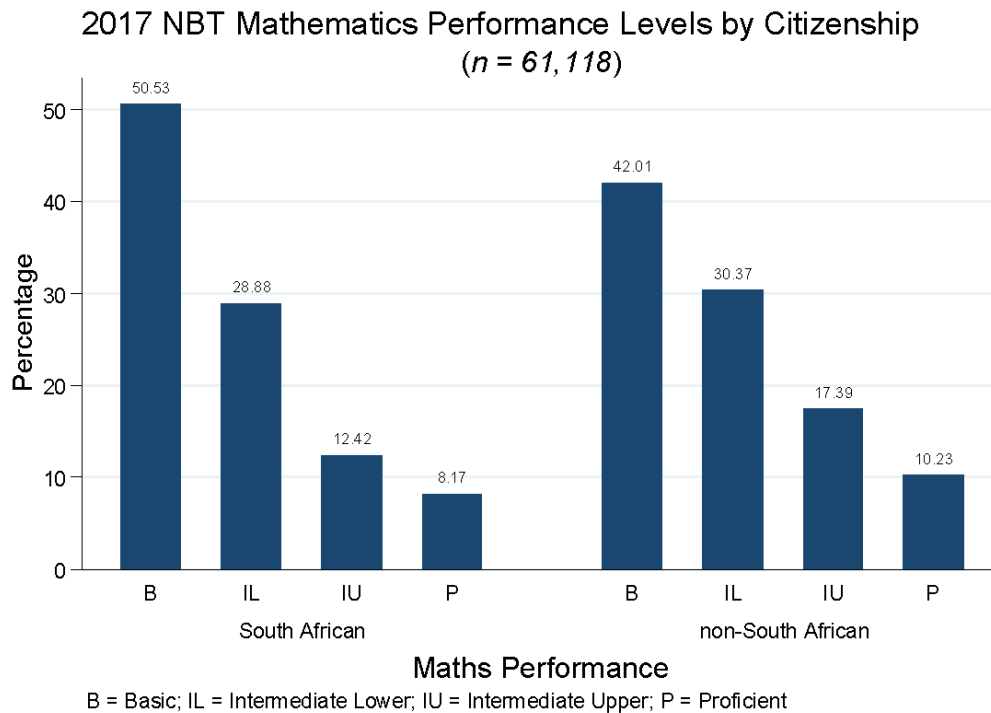


Figure 21 2017 NBT MAT performance levels by citizenship

The non-South African candidates appeared to have performed slightly better in AL, QL and MAT than the South African candidates.

## 6. COMPARISON OF THE 2017 INTAKE RESULTS TO THE 2016 INTAKE RESULTS

In this section we examine the performance in AL, QL and MAT of the candidates in the 2016 and 2017 intake cycles to investigate broad trends of the NBT over time. In broad terms, the 2017 intake cohort performed fairly similarly to the 2016 intake cohort in terms of QL and MAT proficiency categories but slightly differently for AL.

### NATIONAL COHORT

Figure 22 shows that there was a slight decline in performance on AL from 2016 to 2017. The proportion of scores in the Proficient category for this domain decreased from 30.09% in 2016 to 21.97% in 2017, while the proportion of the scores in the Basic category increased slightly from 13.78% in 2016 to 15.29% in 2017. Also, the proportion of the scores in the Intermediate bands has increased considerably from 56.13% in 2016 to 62.74% in 2017.

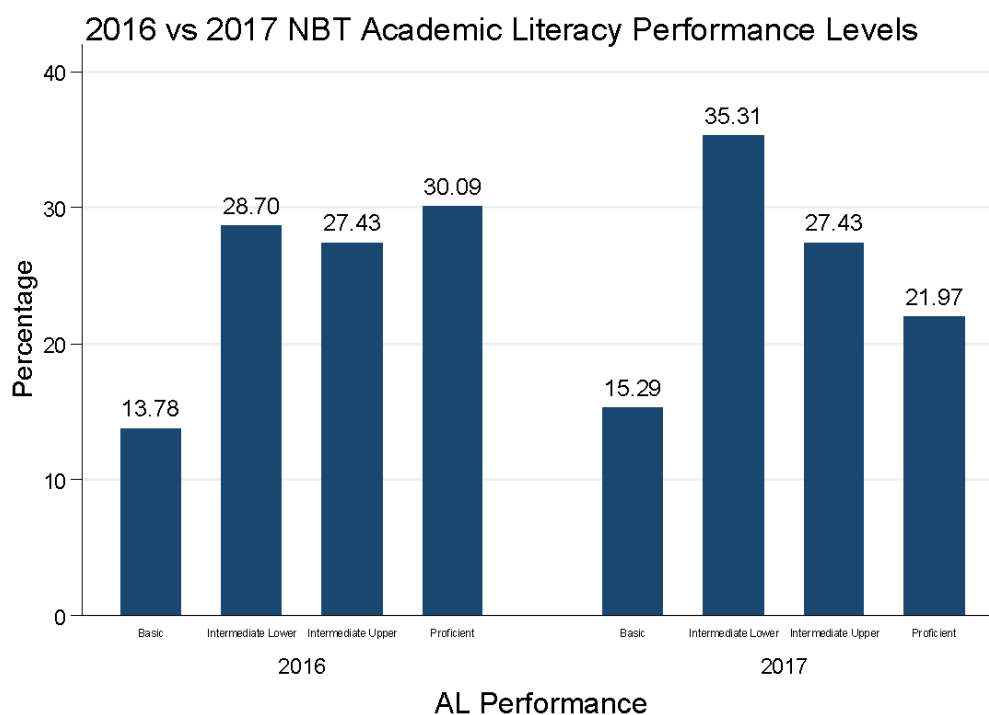
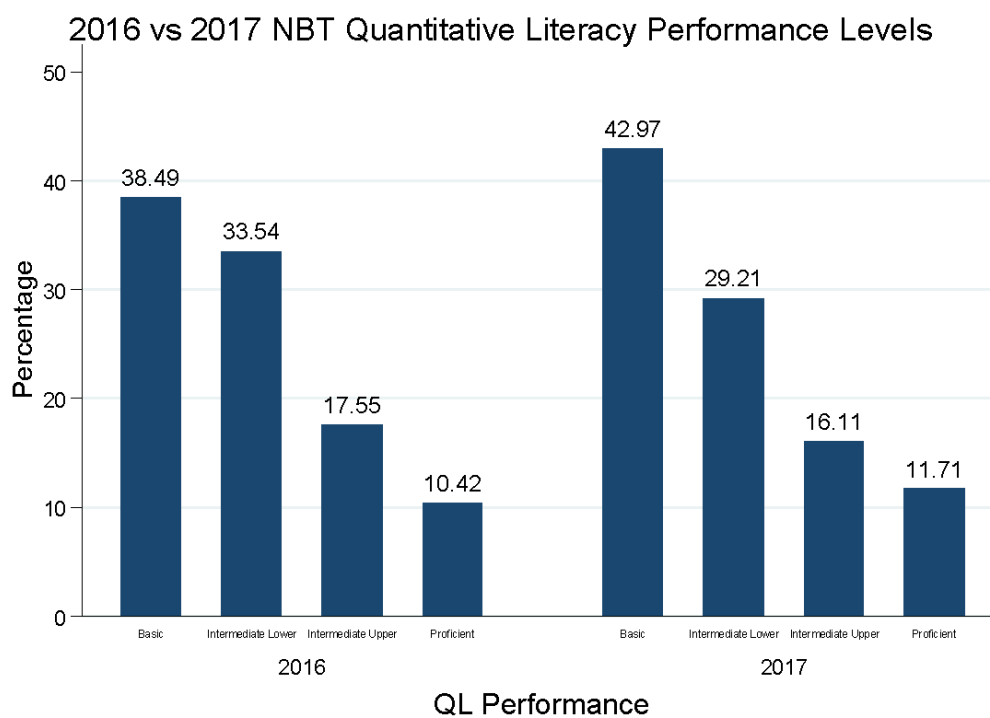


Figure 22 Performance in AL, 2016 and 2017 intake cycles

Overall, the QL performance has stayed the same over the last two years with marginal shifts in the four performance categories. The proportions of candidates whose QL scores were in the Basic band increased from 38.49% in 2016 to 42.97% in 2017. There have also been slight decreases in the proportions in the Intermediate performance bands between 2016 and 2017: a drop from 17.55% to 16.11% for the Upper Intermediate band and from 33.54% to 29.21% for the Lower Intermediate band. There was a slight decline in the proportions of candidates with scores in the Basic band in QL between 2015 and 2016, namely 40.38% in 2015 and 38.49% in 2016; there was then a slight increase to 42.97% in 2017. This may indicate that candidates wishing to enter higher education will be increasingly less prepared for the demands of academic study.



*Figure 23 Performance in QL, 2016 and 2017 intake cycles*

Performance in MAT has declined somewhat at the Proficient level. The proportions of scores in the Basic category have decreased slightly from 50.19% in 2016 to 50.04% in 2017. In the Proficient category the scores moved down slightly from 9.03% in 2016 to 8.29% in 2017. The proportions in the two Intermediate categories (Lower and Upper considered together) increased slightly, from 40.77% in 2016 to 41.68% in 2017. It would seem that the increase in the Intermediate band was a result of the decrease in the Proficient band.

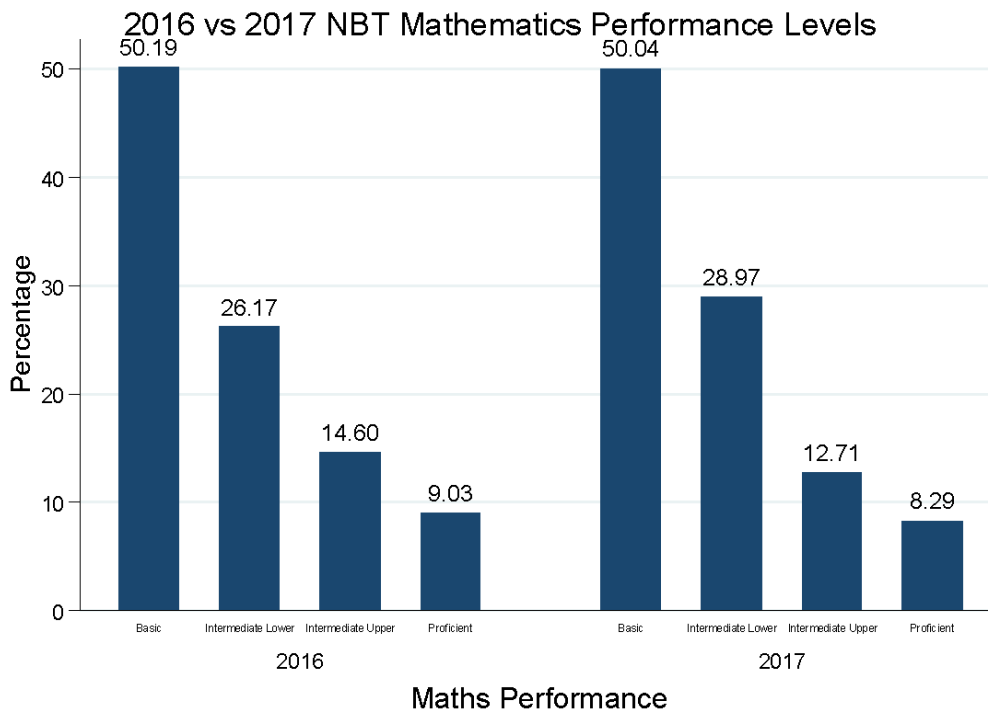


Figure 24 Performance in MAT, 2016 and 2017 intake cycles

#### TEST LANGUAGE

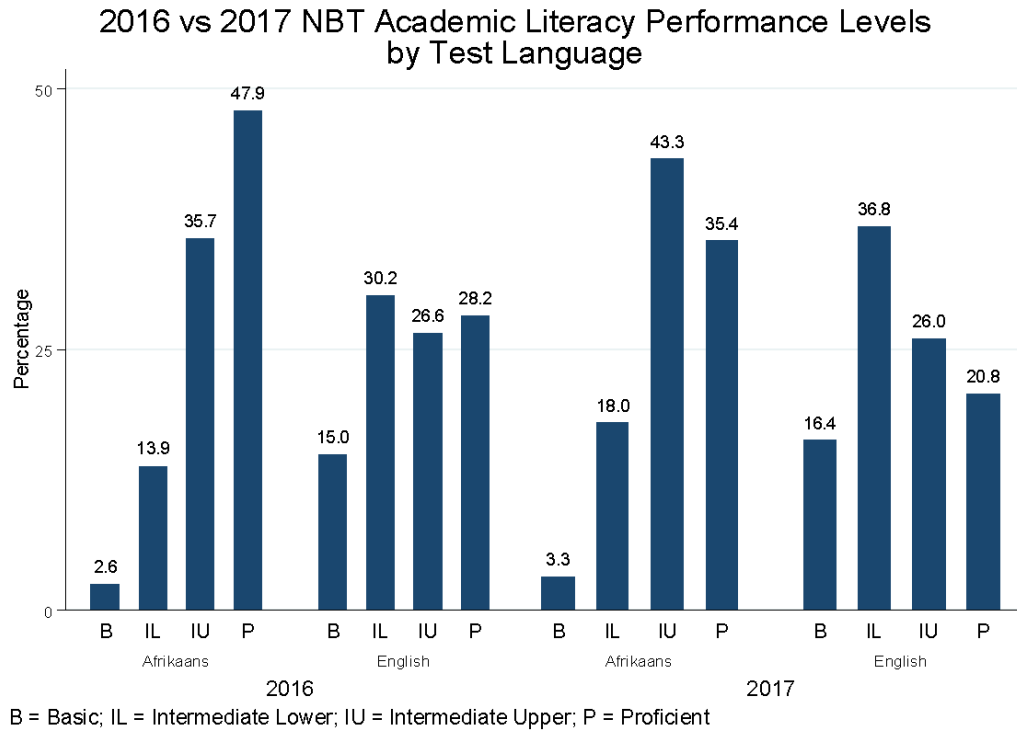
Figure 25 below contains statistical data comparing the performance of candidates who wrote the AL test in Afrikaans and candidates who wrote the AL test in English respectively.

It is clear from this graph that for the 2016 cohort, there were more English (16.7%) than Afrikaans (1.5%) candidates with scores in the Basic category. The Afrikaans group constituted a lower proportion in the Intermediate Lower category (13.2%) than their English counterparts (30.6%); the Afrikaans candidates constituted a higher proportion of those in the Intermediate Upper band (37.6%) than their English counterparts (25.8%) and the English candidates constituted a lower percentage in the Proficient band (26.9%) than the Afrikaans group (47.9%).

For the 2017 intake, there were also more English (15.0%) than Afrikaans candidates (2.6%) with scores in the Basic category (2.6%), fewer Afrikaans candidates had scores in the Intermediate Lower band (13.9%) than their English counterparts (30.2%), more Afrikaans candidates had scores in the Intermediate Upper band (35.7%) than the English group (26.6%), and a higher proportion of the Afrikaans candidates (47.9%) had scores in the Proficient category than the English group (28.2%).

What is evident from these comparisons is that Afrikaans NBT AL candidates tended to perform

better than their English counterparts in both 2016 and 2017. A possible explanation for this is that the majority of candidates who tend to choose to take the test in English are speakers of English as an additional language (rather than as a home language) and regard themselves as more proficient in English than in Afrikaans, whereas the majority of those who write the test in Afrikaans are home language speakers of this language, which possibly gave them some advantage.



*Figure 25 AL performance of Afrikaans candidates 2016 and 2017 intake cycles*

The proportion of candidates who wrote the QL test in Afrikaans is small. These candidates are most likely first language speakers of Afrikaans or candidates who intend studying in Afrikaans. The candidates who wrote the QL tests in English comprised a larger proportion of the total writers. These included English first language speakers as well as second and third language speakers of English.

The proportion of candidates who wrote the QL test in Afrikaans and whose scores were in the Proficient performance band increased slightly from 20.7% in 2016 to 22.1% in 2017. The proportion of candidates who wrote the test in English showed a similar marginal increase from 9.3% in 2016 to 10.8% in 2017. What may be a concern is the increase in the proportion of candidates who wrote in English whose scores were within the Basic performance band: an increase from 40.03% in 2016 to 44.9% in 2017.

Generally the performance for the English candidates was weaker, with increases in the proportions in the Basic performance band and slight decreases in the Proficient and Upper Intermediate performance bands. Overall, the performance of the candidates who wrote the QL test in Afrikaans stayed the same and these candidates consistently performed better than those who wrote the QL test in English.

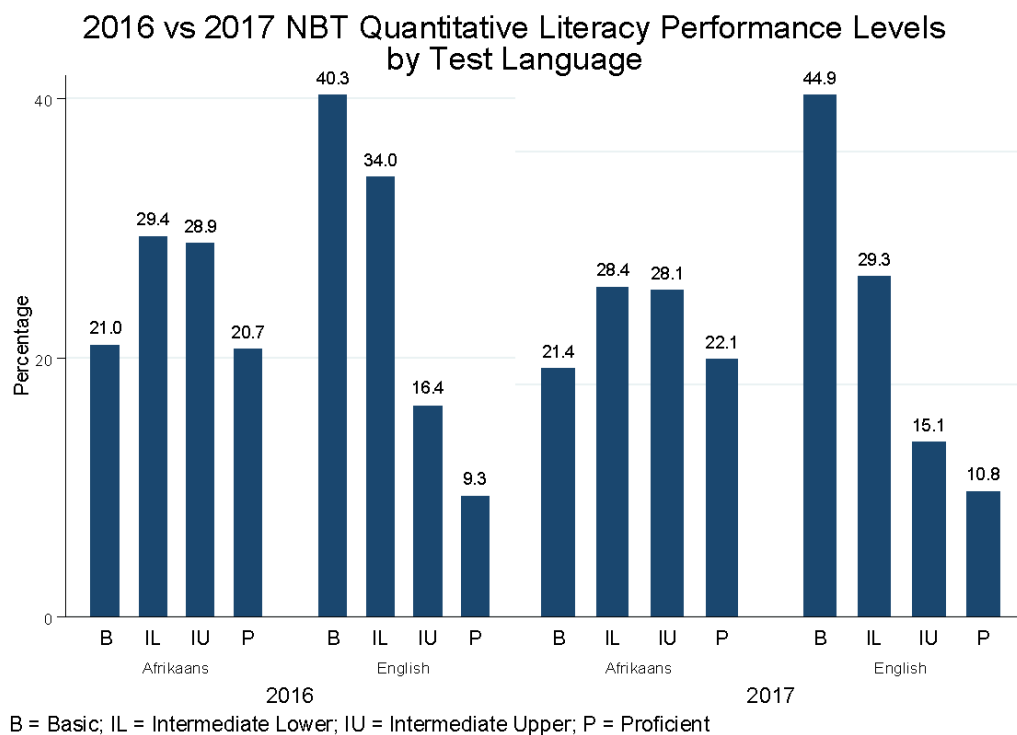


Figure 26 QL performance of Afrikaans candidates NBT 2016 and 2017 intake cycles

Between 2016 and 2017 the performance of the Afrikaans candidates on the MAT test declined, while the performance of the English candidates remained much the same. In both 2016 and 2017, the candidates who wrote the MAT test in Afrikaans outperformed the candidates who wrote the MAT test in English. The differences remained large: in 2016, 19.5% of the Afrikaans candidates had scores in the Basic band, compared to 47.8% of the English cohort; 22.5% of the Afrikaans candidates' scores were in the Proficient band compared to 9.7% in the case of the English candidates. In 2017 the pattern is similar: 27% of the Afrikaans candidates and 52.5% of the English candidates had scores in the Basic band; 17.0% of the Afrikaans cohort and 8.2% of the English cohort had scores in the Proficient band. Note however that the proportions of candidates in the two language groups differ considerably. The Afrikaans group comprised 9.19% of the cohort, while the English group comprised 90.81% of the cohort. The Afrikaans group most likely represents a more homogeneous population, in that their first language is probably Afrikaans. Those who wrote the test in English are representative of all the other language groups. These results are illustrated in Figure 25 below.

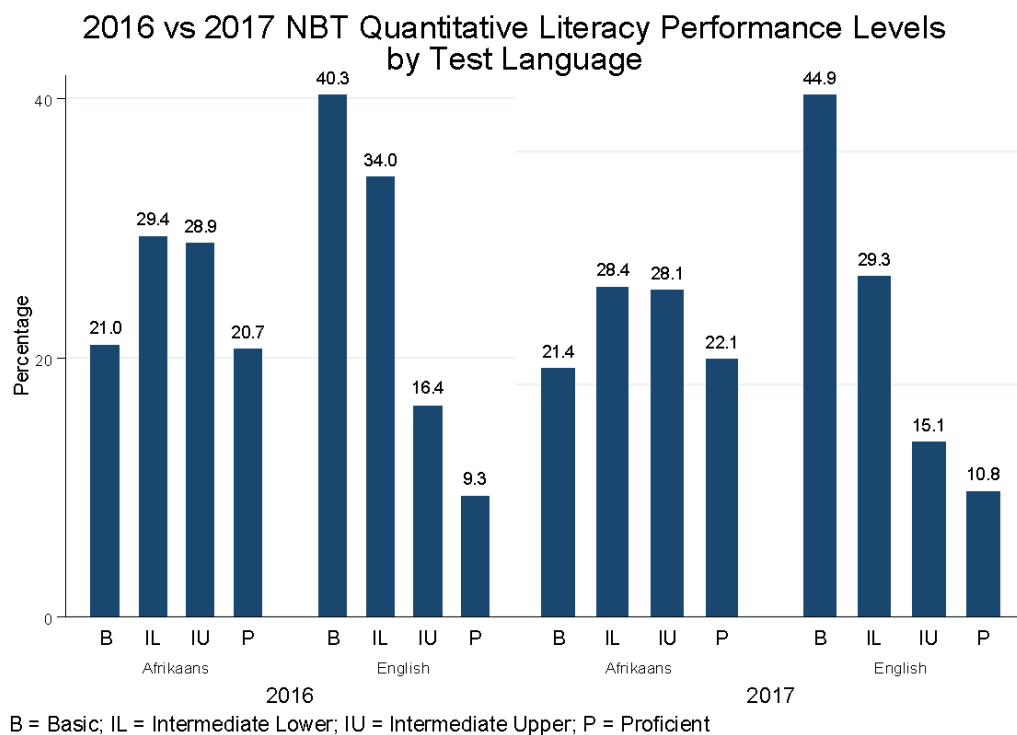


Figure 27 MAT performance of Afrikaans candidates NBT 2016 and 2017 intake cycles

## CITIZENSHIP

Figure 28 below depicts a comparison of performance on the NBT AL by South African citizens and non-South African citizens in 2016 and 2017. As can be seen from the graph, for the 2016 intake, more South African candidates were in the Basic category (14%) than their non-South African counterparts (5%), more South African candidates were in the Intermediate Lower (29%) than the non-South African candidates (20%), fewer non-South Africans were in the Upper Intermediate band (27%) than their South African counterparts (35%) and more non-South African writers were in the Proficient band (40%) than South African candidates (30%).

For the 2017 intake, more South Africans were in the Basic category (16%) than non-South Africans (5%), more non-South Africans were in the Intermediate Lower category (37%) than the non-South African writers (36%), more non-South Africans were in the Intermediate Upper band (30%) than their South African counterparts (27%) and more non-South Africans were in the Proficient band (30%) than South Africans (22%).

It is clear from this graph that in general, non-South African candidates performed better on the NBT AL than South African candidates both in 2016 and 2017. The possible explanation for this is that non-South African candidates are exposed to a wider range of AL related tasks earlier in their schooling than the South African candidates.

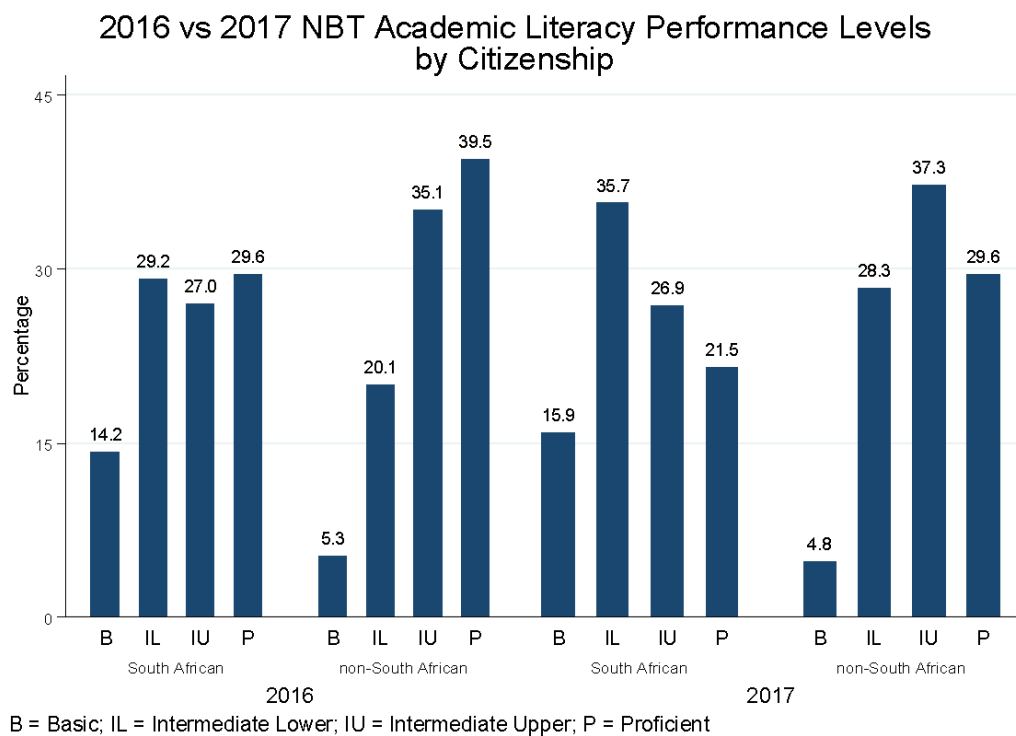
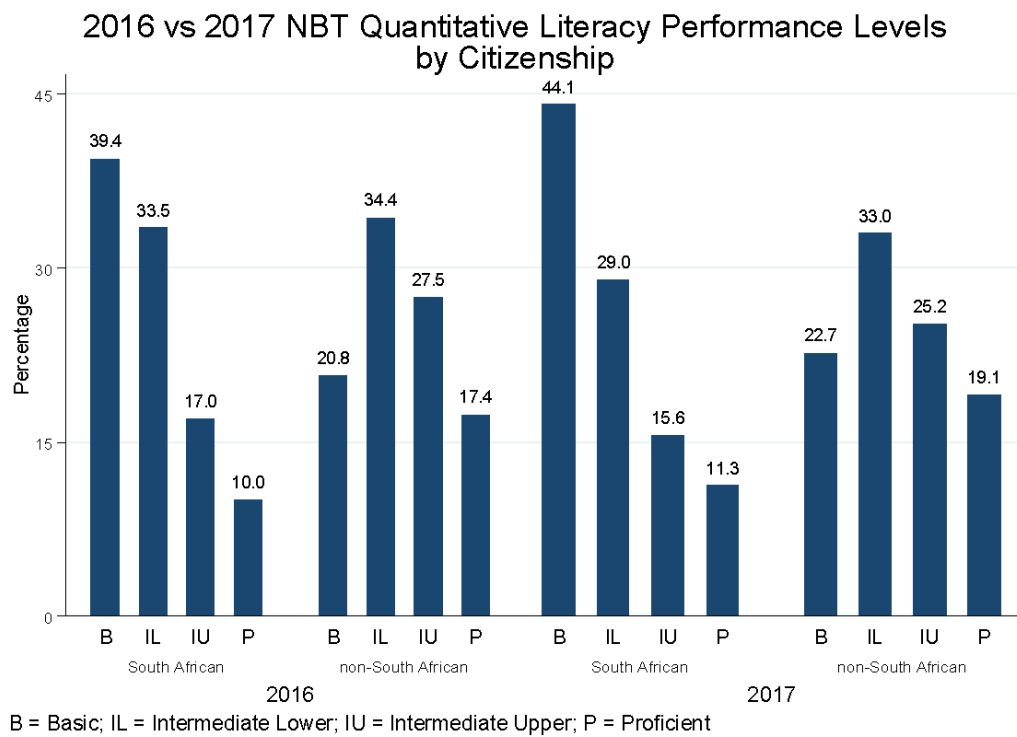


Figure 28 NBT Academic Literacy performance levels by citizenship



In QL the non-South African candidates outperformed the South African candidates in 2016 and 2017. In both years, the proportion of non-South African candidates (17.4% and 19.1%) whose scores were in the Proficient performance band was higher than that for the South African candidates (10.0% and 11.3%). There has been a slight increase in the proportions of QL candidates with scores in the Basic band for both the South African and non-South African candidates over the two years. The South African candidates whose scores were in the Basic band in QL in 2017 increased to 44.1% (up from 39.4% in 2016) compared to the non-South African group where the scores in the Basic band in 2017 increased to 22.7% (up from 20.8% in 2016). The fact that the non-South Africans are performing better in QL than the South African candidates could possibly be ascribed to the schooling systems in their countries.



*Figure 29 NBT Quantitative Literacy performance levels by citizenship*

In both 2016 and 2017, non-South African candidates performed better in the MAT tests than the South African candidates. The difference in performance between the two years, for the two groups, is more noticeable for scores in the Basic and Intermediate bands than it is for the Proficient band. In 2017, in the Basic category, there was a difference of 8.5% in the percentage of non-South African candidates (42%) compared to the South African candidates (50.5%). This difference in 2016 was 8%, with 50.6% and 42.6% of South African and non-South African candidates, respectively, having scores in the Basic band. In the Intermediate category (considering both Lower and Upper Intermediate together) there is no difference between the two groups: 6.5% in 2016, and 6.5% in 2017. In the Proficient category the difference in performance between the two groups is less: in 2016 there was a 1.6% difference in performance (8.9% of the South African candidates and 10.5% of the non-South African candidates had MAT test scores in this band). In 2017 the corresponding figures are 10.2% (non-South African) and 8.2% (South African), i.e. a difference of 2%.

The larger differences at the Basic and Intermediate levels may indicate differences in schooling.

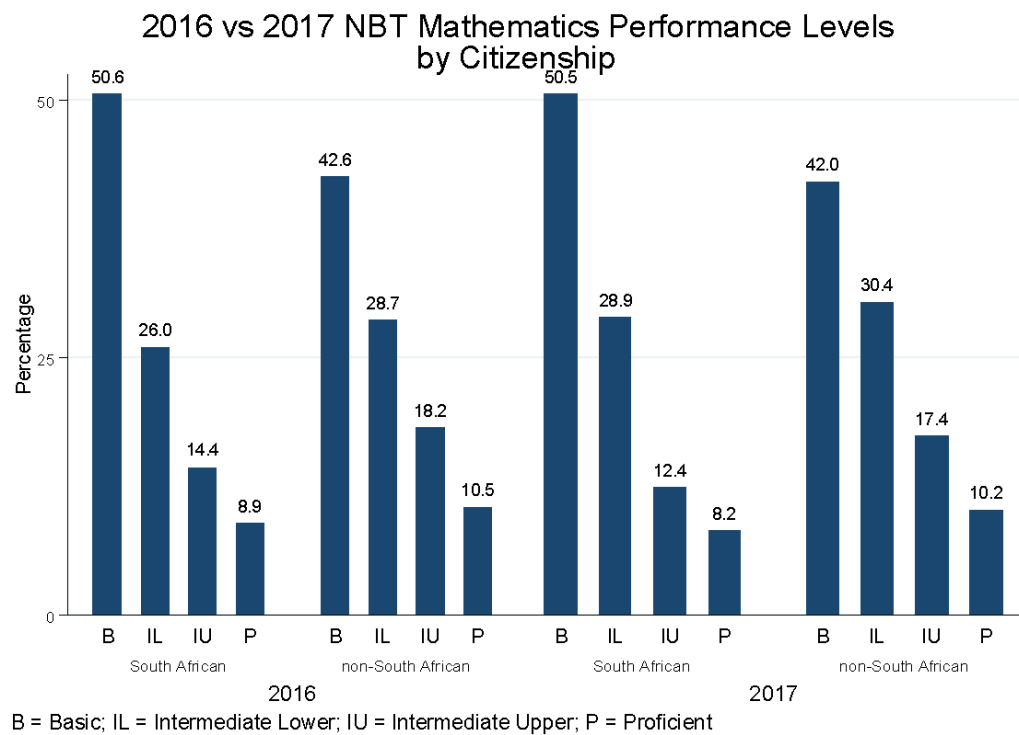


Figure 30 NBT MAT performance levels by citizenship

## 7. PERFORMANCE ON NBT AT SUBDOMAIN LEVEL

The main uses of NBT data by institutions are for the selection and placement of students. Once these students are accepted at institutions, NBT can be used for providing information about the academic needs of accepted students. In order to use NBT diagnostic information for this purpose, institutions need to provide the NBTP with the actual list of their registered students.

This analysis can also be done for a particular course or programme, giving lecturers a useful tool for aligning their teaching with the students they actually have. The subdomain analysis for the various faculties gives an indication of the competence areas in which NBT candidates have particular strengths and areas in which they are likely to experience difficulties. The subdomain analyses also highlight the competence areas where prospective students may experience challenges when faced with the demands of higher education that are aligned with the NBT domains.

An understanding of the difficulties that students/learners experience is useful for teaching and learning as it can aid educators at schools as well as lecturers at university in changing, adapting or improving their teaching strategies.

This section presents the results on the various subdomains of AL, QL and MAT for the 2017 NBT cohort. This analysis has great potential to contribute to making institutional teaching and learning initiatives more responsive to the actual needs of students.

The analysis by sub-domain is based on the intended faculty of study indicated by the candidates when they write the NBT. Candidates are asked to indicate their first, second and third choice of faculty to which they have applied or will apply. Only the first choice of intended faculty was used in this analysis. Data is not collected by the NBT project on actual placement of all the candidates within faculties or institutions. Caution should therefore be used when decisions are made based on the results from intended faculty of study.

### THE CONSTRUCT OF THE AL TEST

The NBT AL test is an assessment of the generic academic reading ability of applicants entering courses of higher education study. The construct of academic literacy on which the test is based has a well-theorised history (see, for example, Bachman and Palmer, 1996; Cummins, 2000; Yeld, 2001; Cliff, Yeld and Hanslo, 2003; Cliff and Yeld, 2006) 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 (cf. Cliff, Ramaboa and Pearce, 2007; Cliff and Hanslo, 2009). The construct of the test is summarised in the table below:

Table 13 NBT MAT performance levels by citizenship

Skill Assessed	Explanation of Skill Area
Perceiving and understanding cohesion in text	Readers' abilities to be able to 'see' anaphoric and cataphoric links in text, as well as other mechanisms that connect parts of text to their antecedents or to what follows
Understanding the communicative function of sentences	Readers' abilities to 'see' how parts of sentences / discourse define other parts; or are examples of ideas; or are supports for arguments; or attempts to persuade
Understanding discourse relations between parts of text	Readers' capacities to 'see' the structure and organisation of discourse and argument, by paying attention – within and between paragraphs in text – to transitions in argument; superordinate and subordinate ideas; introductions and conclusions; logical development
Separating the essential from the non-essential	Readers' capacities to 'see' main ideas and supporting detail; statements and examples; facts and opinions; propositions and their arguments; being able to classify, categorise and 'label'
Grammar / syntax as these affect academic meaning and interpretation	Readers' abilities to understand and analyse the extent to which grammatical and sentence structures are organised in academic language, and the extent to which these structures affect and can change meaning
Extrapolation, application and inferencing	Readers' capacities to draw conclusions and apply insights, either on the basis of what is stated in texts or is implied by these texts.
Metaphorical expression	Readers' abilities to understand and work with metaphor in language. This includes their capacity to perceive language connotation, word play, ambiguity, idiomatic expressions, and so on
Understanding text <i>genre</i>	Readers' abilities to perceive 'audience' in text and purpose in writing, including an ability to understand text register (formality / informality) and tone (didactic / informative / persuasive / etc.)
Vocabulary	Readers' abilities to derive/work out word meanings from their context

The boxplots that follow provide performance information for the NBT AL candidates in the 2017 intake year. The candidates were asked to indicate their first choice of field of study and the associated faculty at the institution at which they wished to study. The boxplots are for eleven faculties and show the distributions of student scores on the different subdomains of the NBT AL.

For the purpose of this report, performance on the NBT AL subdomains by candidates who had indicated their intention to enrol for courses in various faculties was examined. These faculties included the following: Allied Health Care/Nursing, Art/Design, Business/Commerce/Management, Education, Engineering/Built Environment, Health Science, Hospitality/Tourism, Humanities, Information and Communication Technology, Law, and Science/Mathematics. The general picture of performance by candidates planning to study in all these faculties is that Metaphorical expression, Text Genre and Vocabulary seemed the most challenging for them and that performance on the remaining subdomains was relatively better. However, it is also clear that students in all these faculties would benefit from academic literacy support in all the subdomains that are assessed in the NBT AL.

As can be seen in Figure 31, for candidates who intended to enrol in the Allied Healthcare/Nursing faculty, the mean score was lowest for Text Genre, although for all subdomains 75% of all candidates scored roughly 60% or below (at most 50% in Metaphorical expression, Text Genre and Vocabulary). It is also clear from the graph that less than 25% of these candidates scored in the Proficient band (the benchmark is 68%) on all subdomains, an indication that they would struggle with the discourse demands of academic education and that they would need support in all areas of academic literacy, particularly those with the greatest relevance to the courses they would be likely to study.

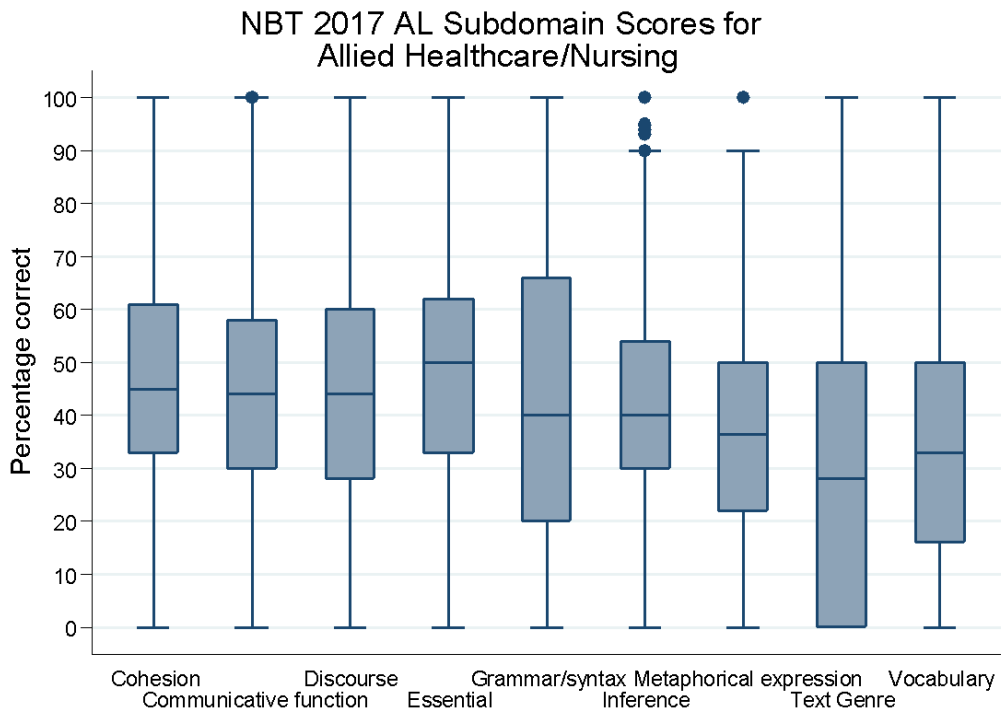


Figure 31 Allied Healthcare and Nursing AL subdomain performance, NBT 2017

A graphic representation of the AL performance of the candidates who planned to enrol in courses in the Art and Design faculty is captured in the boxplots in Figure 32. It is clear from these boxplots that the median scores of these candidates are in the Intermediate band in all subdomains. Of all candidates, 75% scored at or below the Intermediate benchmark in the Vocabulary subdomain, and below a value only slightly above the Intermediate benchmark in most other subdomains, apart from discourse, where there were more candidates scoring between the Intermediate benchmark and 80%. The boxplots suggest that most students in this faculty would struggle with the language demands of university education and that they would benefit from academic literacy intervention focusing on all these subdomains.

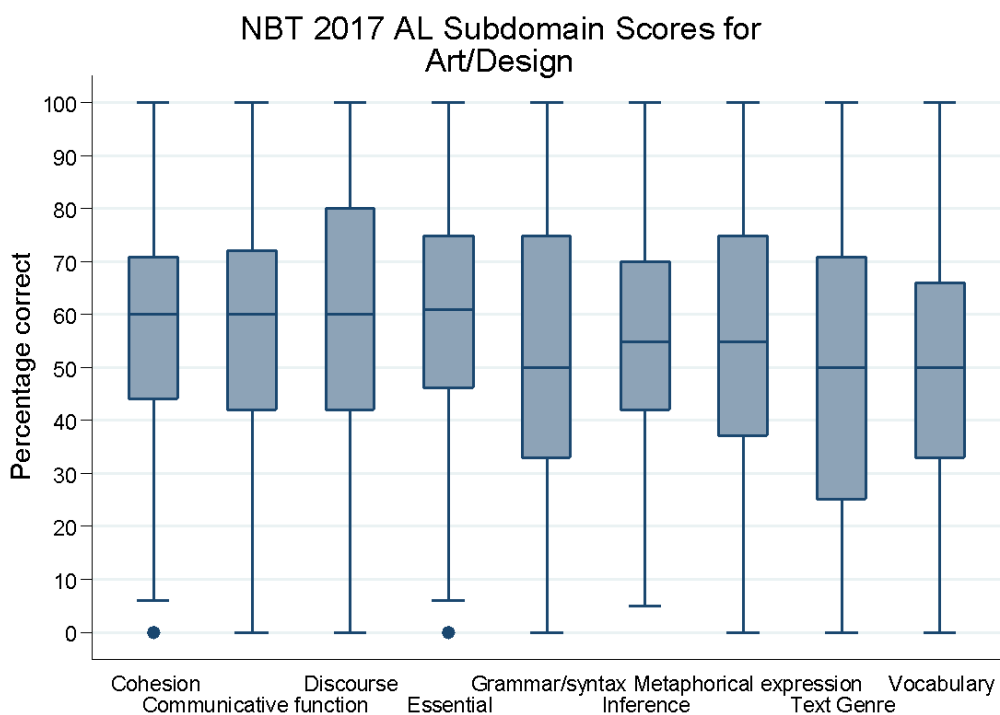


Figure 32 Art and Design AL subdomain performance, NBT 2017

In the boxplots in Figure 33, the NBT AL subdomain performance of candidates who were planning to apply for admission to the Business/Commerce/ Management faculty is graphically presented. The median scores for this group are all within the Intermediate band, with the median for Text Genre very close to the Basic benchmark (39%). In all subdomains there are relatively few candidates with scores in the Proficient band (above 68%). The general picture therefore is that most of the candidates would need curriculum support in all the NBT AL subdomains in order to reach the required levels of proficiency in AL.

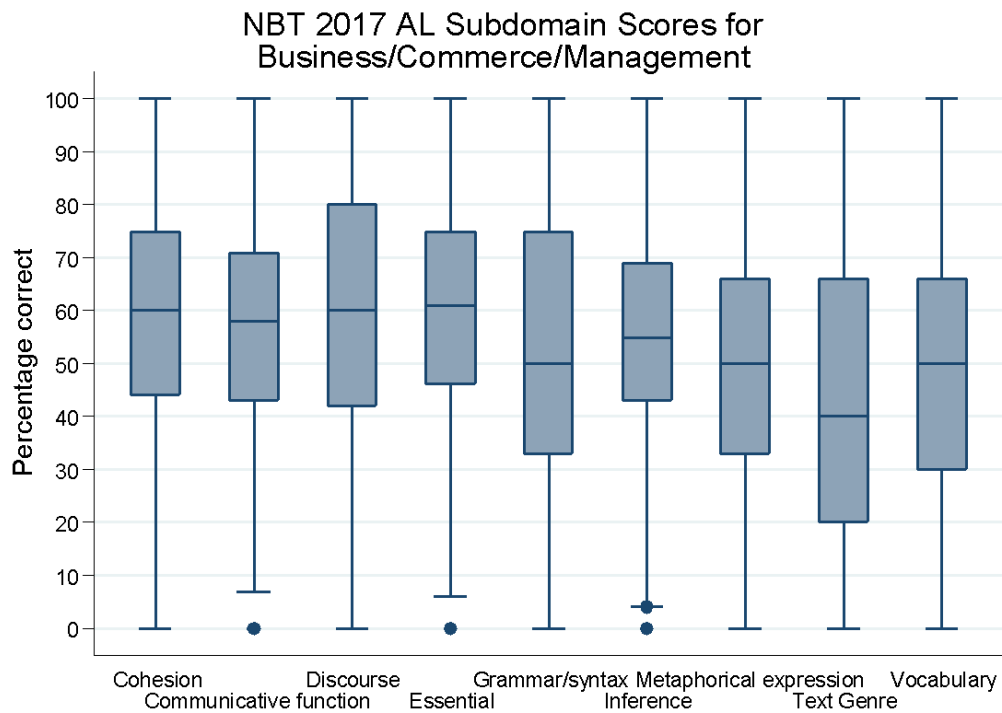


Figure 33 Business/Commerce and Management AL subdomain performance, NBT 2017

The performance of those who indicated that they intended to apply for admission to the faculty of Education on the subdomains of the NBT AL is presented in the boxplots in Figure 34. It can be seen from these boxplots that medians were in the Intermediate band, apart from the median for Text Genre, which is in the Basic band. In the subdomains Cohesion, Discourse, Communicative function, Essential/non-essential and Grammar/syntax, 75% of the candidates of all scored roughly 67% or less. In the remaining subdomains 75% of the candidates scored 60% or below (50% or less in the case of Text Genre). In general the median performance in all subdomains was below what would be required at tertiary level. AL instructional support would help boost their academic literacy levels and would, in turn, improve their chances of success at academic study, and better equip them to become effective educators.

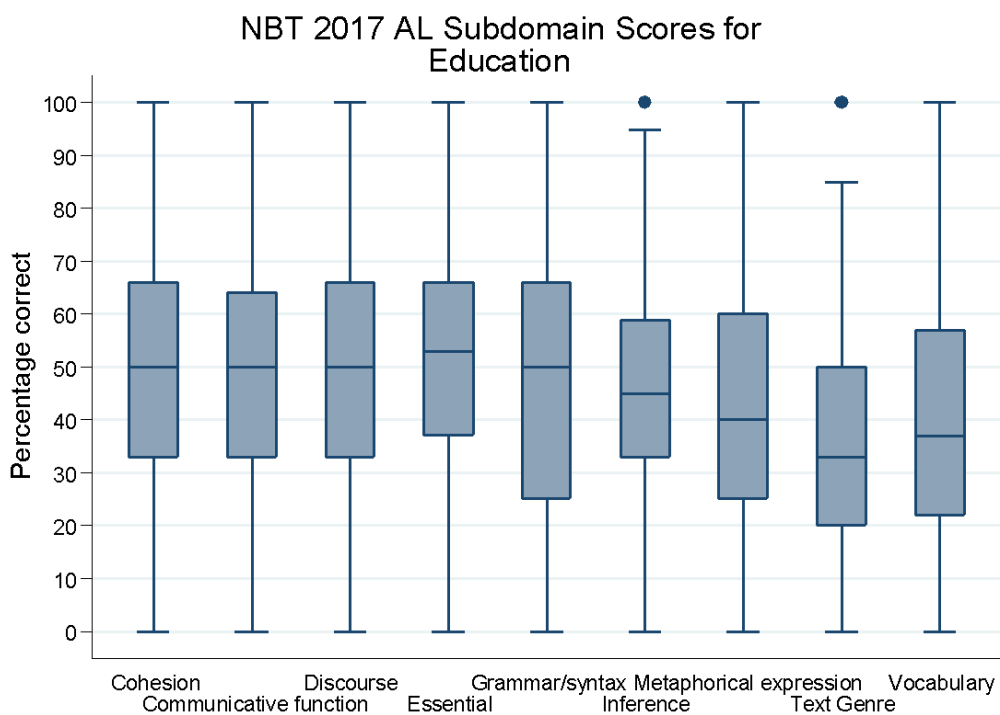


Figure 34 Education AL subdomain performance, NBT 2017



Figure 35 contains a boxplot representation of the NBT AL subdomain performance of candidates who intended to apply for studies in the Faculty of Engineering and Built Environment. The boxplots show once again that in all subdomains the median scores are in the Intermediate band (or at the Basic benchmark, in the case of Text Genre). It is also clear that the majority of the candidates also scored below the Proficient band. This suggests that these candidates would need extra support in the domain of academic literacy as a whole if they are to cope sufficiently well with the AL demands of academic study. Arguably, the AL subdomain in which the median score for these candidates is lowest (Text Genre) may not have the greatest relevance for Engineering students; however, shortfalls in any of the subdomains could impede comprehension, and any AL curriculum intervention for those who enrol in these areas should give attention to all these subdomains.

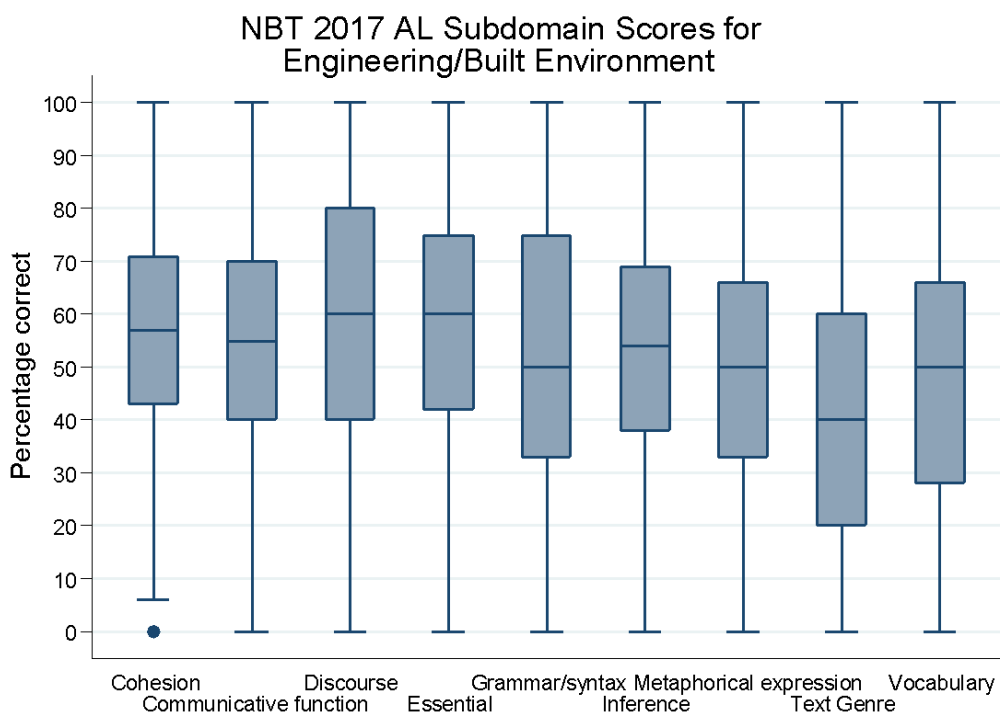


Figure 35 Engineering and Built Environment AL subdomain performance, NBT 2017

The NBT AL subdomain performance by candidates who intended to apply for courses in the Health Sciences is graphically presented in the boxplots in Figure 36. The overall picture is that the median in all subdomains fell within the Intermediate band, (with the median for Text Genre again the lowest, and almost at the Basic benchmark). This again suggests that most of these candidates would struggle to some extent with the demands of academic literacy that are typical of higher education, and that they would need relevant intervention to increase their chances of success at academic study.

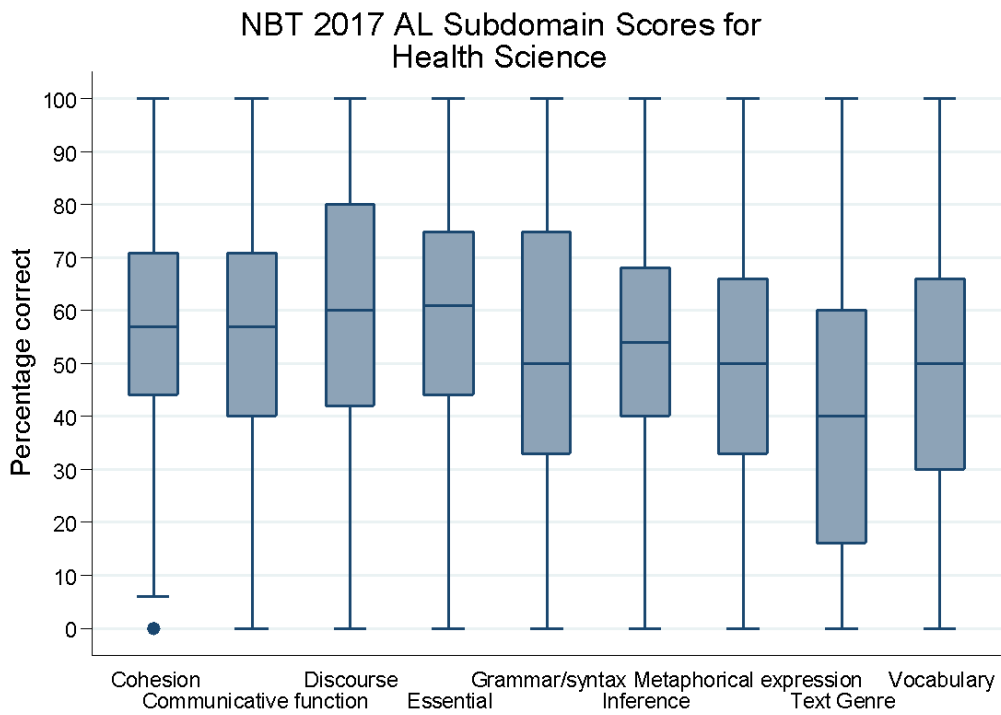


Figure 36 Health Science AL subdomain performance, NBT 2017

Figure 37 is a graphic representation of performance by candidates who intended to pursue studies in the Faculty of Hospitality and Tourism Management. As can be seen from this graph, the lowest median scores for this group were on Grammar/syntax, Metaphorical expression, Text Genre and Vocabulary. It is also clear, however, that while the median scores on the other subdomains were higher, they were all in the Intermediate band. This suggests that an academic literacy intervention that focuses on all AL subdomains would help these candidates cope with the academic literacy demands of their courses.

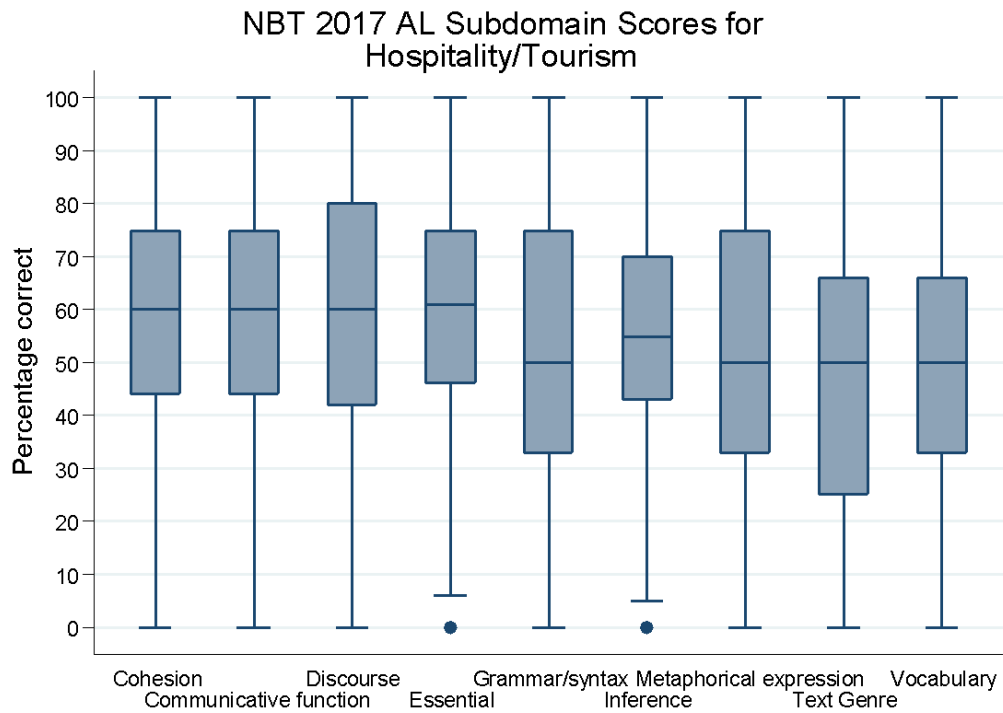


Figure 37 Hospitality/Tourism AL subdomain performance, NBT 2017

The NBT AL performance by candidates who intended to apply for admission to the Humanities faculty is captured in Figure 38. It is clear from this representation that median scores for these candidates was low on Grammar/syntax, Metaphorical expression, Text Genre and Vocabulary, with the median for Text Genre in the Basic band. The majority of these candidates scored below the Proficient band. The ability to process texts is key to success in most courses offered in the Humanities. It is a cause for concern therefore that the majority of candidates who intended to pursue their studies in this faculty did not obtain scores in the AL Proficient band. These candidates would therefore need extra support in academic literacy to succeed at university.

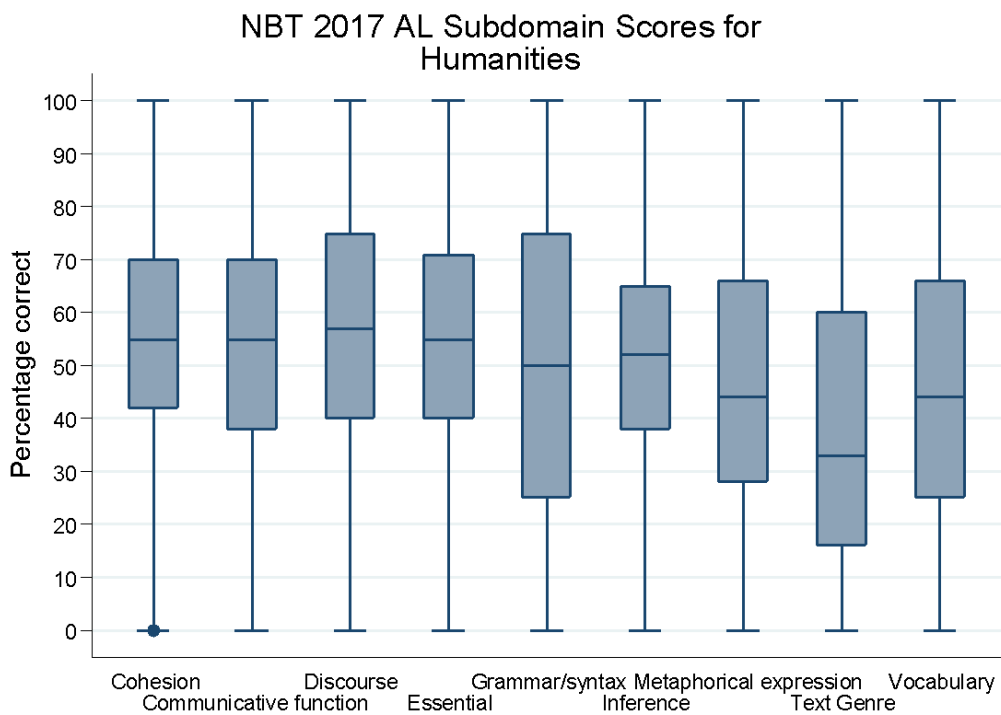


Figure 38 Humanities AL subdomain performance, NBT 2017

Performance in the subdomains of the NBT AL by candidates who planned to enrol for courses in Information and Communication Technology is captured in Figure 39. As can be seen from this graph, median scores of these candidates was in the Intermediate band in all subdomains, an indication that the majority would struggle with the academic literacy challenges of university education. The overall picture therefore is that these candidates would benefit from instructional support on all subdomains, including those in which performance was not quite as weak.

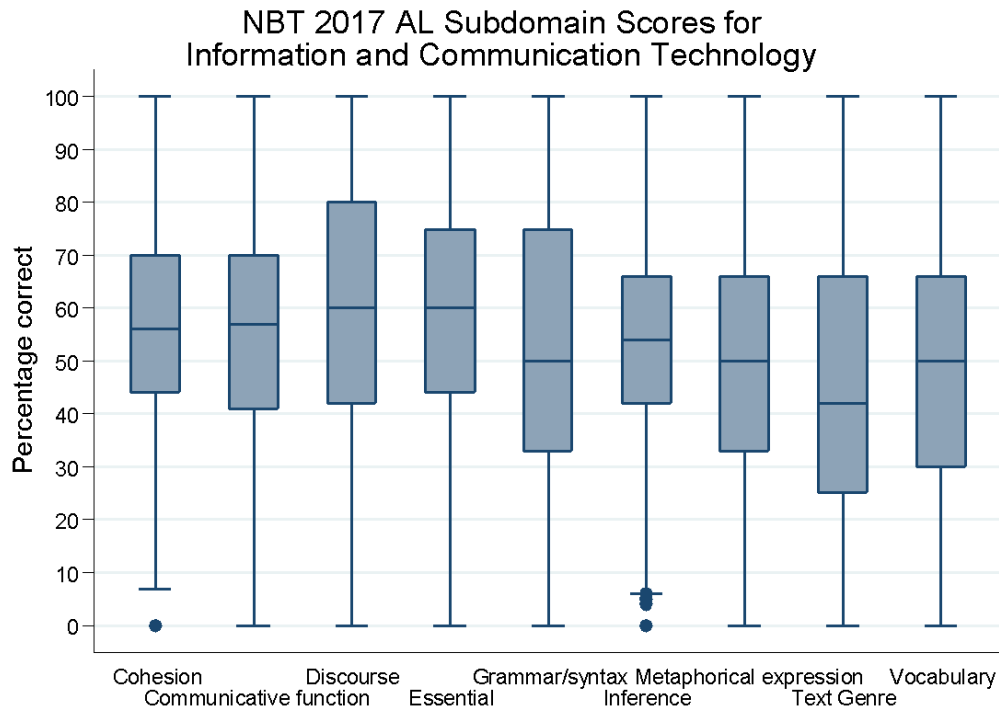


Figure 39 Information and Communication Technology AL subdomain performance, NBT 2017

The NBT AL performance by candidates who intended to study Law is captured in the boxplots in Figure 40. The highest median score was for the subdomain Discourse (close to the Proficient benchmark of 68%), and the lowest for the subdomain Text Genre (as is the case for most other faculties). It is clear from these boxplots that performance by these candidates was the lowest on Metaphorical expression, Text Genre and Vocabulary. A large proportion of the scores were in the Intermediate band, an indication that a substantial proportion of this cohort would face academic literacy difficulties in their studies and that they would need assistance in this regard.

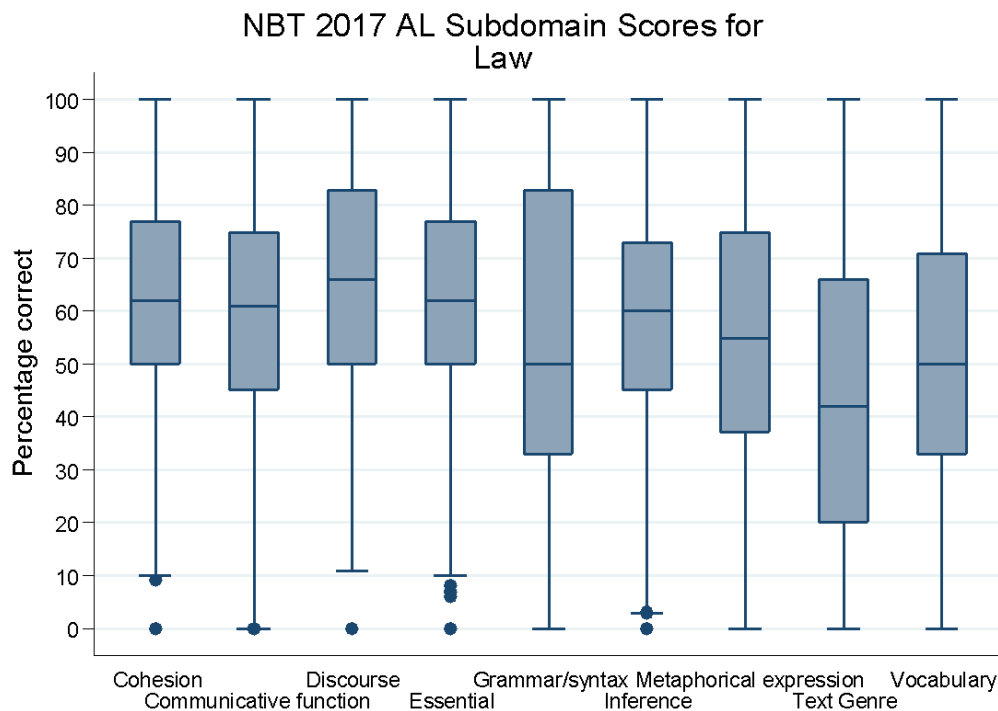


Figure 40 Law AL subdomain performance, NBT 2017

The NBT AL sub-domain performance of candidates intending to enrol for Science/Mathematics is visually presented in Figure 41. It is clear from this graph that the median scores of these candidates was lowest in the subdomains of Grammar/syntax and Text Genre. In the case of these candidates too, the largest proportion of the scores was in the Intermediate band. Although it is at times mistakenly assumed that many of the Sciences and most of Mathematics are symbol-based and largely “language-free”, understanding mathematical and scientific discourse is dependent on a sound grasp of the language of instruction. The boxplots indicate that most of these students were not adequately prepared to cope with the academic literacy demands of Science/Mathematics study and that they would need relevant support in academic literacy to improve their chances of academic success.

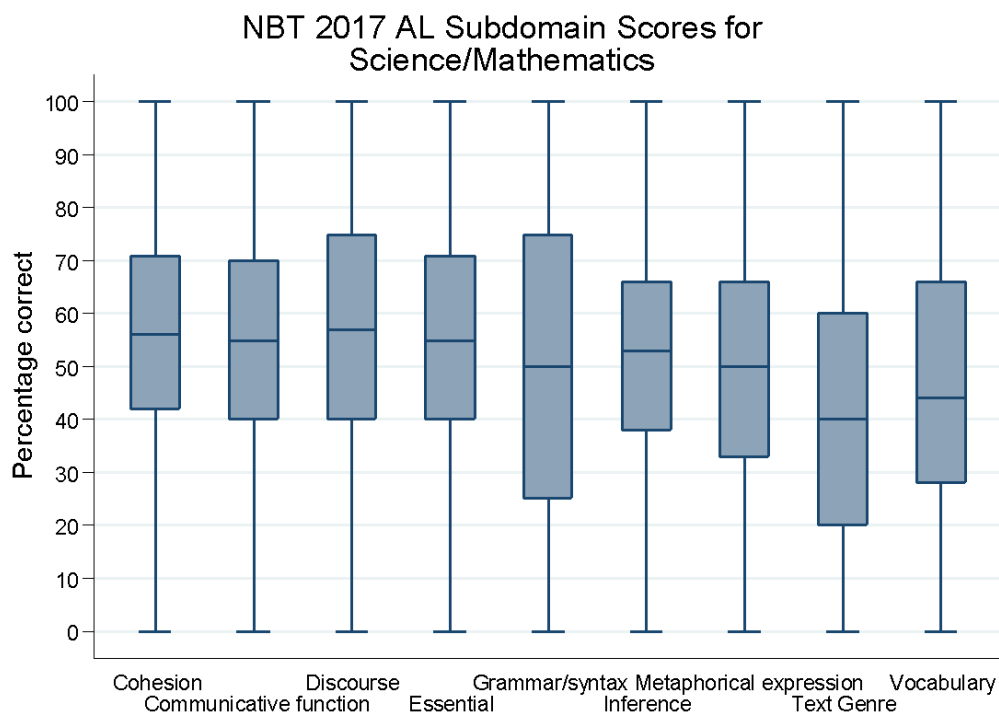


Figure 41 Science/Mathematics AL subdomain performance, NBT 2017

## THE CONSTRUCT OF THE QL TEST

The definition of quantitative literacy that underpins the NBT QL test is as follows:

Quantitative literacy is the ability to manage situations or solve problems in practice, and involves responding to quantitative (mathematical and statistical) information that may be presented verbally, graphically, in tabular or symbolic form; it requires the activation of a range of enabling knowledge, behaviours and processes and it can be observed when it is expressed in the form of a communication, in written, oral or visual mode. (Frith and Prince, 2006:30)

The development of this definition was most 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). Lynn Steen (2004: 25) describes Quantitative Literacy as "QL is not a discipline but a literacy, not a set of skills but a habit of mind." He goes on to say that "...quantitative literacy is not really about [algorithmic abilities] but about challenging college-level settings in which quantitative analysis is intertwined with political, scientific, historical or artistic contexts. ..." The items in the Quantitative Literacy test are grouped into sub-domains according to the six main mathematical and statistical ideas dimension tested by the questions. Table 14 gives a description and specification of the mathematical and statistical ideas dimension of the construct tested by the QL test.

*Table 14 Competency specification for the Quantitative Literacy test by Mathematical and Statistical Ideas*

Skill Assessed	Description of skill
Quantity, number and operations.	<ul style="list-style-type: none"> <li>The ability to order quantities, calculate and estimate the answers to computations required by a context, using numbers (whole numbers, fractions, decimals, percentages, ratios, scientific notation) and simple operations (+, -, ×, ÷, positive exponentiation) on them.</li> <li>The ability to express the same decimal number in alternative ways (such as by converting a fraction to a percentage, a common fraction to a decimal fraction and so on)</li> <li>The ability to interpret the words and phrases used to describe ratios (relative differences) between quantities within a context, to convert such phrases to numerical representations, to perform calculations with them and to interpret the result in the original context. The ability to work similarly with ratios between quantities represented in tables and charts, and in scale diagrams.</li> </ul>
Shape, dimension and space.	<ul style="list-style-type: none"> <li>The ability to understand the conventions for the measurement and description (representation) of 2- and 3-dimensional objects, angles and direction,</li> <li>The ability to perform simple calculations involving areas, perimeters and volumes of simple shapes such as rectangles and cuboids.</li> </ul>
Relationships, pattern, permutation	<ul style="list-style-type: none"> <li>The ability to recognize, interpret and represent relationships and patterns in a variety of ways (graphs, tables, words and symbols)</li> <li>The ability to manipulate simple algebraic expressions using simple arithmetic operations.</li> </ul>



Change and rates	<ul style="list-style-type: none"> <li>• The ability to distinguish between changes (or differences in magnitudes) expressed in absolute terms and those expressed in relative terms (for example as percentage change)</li> <li>• The ability to quantify and reason about changes or differences.</li> <li>• The ability to calculate average rates of change and to recognise that the steepness of a graph represents the rate of change of the dependent variable with respect to the independent variable.</li> <li>• The ability to interpret curvature of graphs in terms of changes in rate.</li> </ul>
Data representation and analysis	<ul style="list-style-type: none"> <li>• The ability to derive and use information from representations of contextualised data in tables (several rows and columns and with data of different types combined), charts (pie, bar, compound bar, stacked bar, ‘broken’ line, scatter plots) graphs and diagrams (such as tree diagrams) and to interpret the meaning of this information.</li> <li>• The ability to represent data in simple tables and charts, such as bar or line charts.</li> </ul>
Chance and uncertainty	<ul style="list-style-type: none"> <li>• The ability to appreciate that many phenomena are uncertain and to quantify the chance of uncertain events using empirically derived data. This includes understanding the idea of taking a random sample.</li> <li>• The ability to represent a probability as a number between 0 and 1, with 0 representing impossibility and 1 representing certainty.</li> </ul>

The boxplots that follow reflect information regarding the candidates of the NBT QL test in the 2017 intake year. The candidates were asked to indicate their first choice for field of study and the associated faculty at the institution at which they wished to study. The boxplots are for the eleven faculties and show the distributions of candidates’ scores on different subdomains of questions in the Quantitative Literacy test.

The candidates who intended to study in the Allied Healthcare and Nursing faculty fared consistently poorly across the six competence areas (subdomains). The boxplots in Figure 42 indicate that the median scores varied across the six competence areas, ranging between 26% and 39%. The median scores for the six subdomains all fall within the Basic performance band. For the Quantity, number and operations subdomain, there is a large tail of outliers indicating the few candidates obtaining scores between 60% - 92%. This large tail is an indication of a skewed distribution with the majority of candidates performing poorly and a few candidates (outliers) falling within the Proficient band. In most academic programmes in the Allied Healthcare/Nursing faculty, the content is dependent on competency in QL and candidates would need to be quantitatively literate. Candidates would benefit from QL interventions that are geared specifically to Allied Healthcare and Nursing courses.

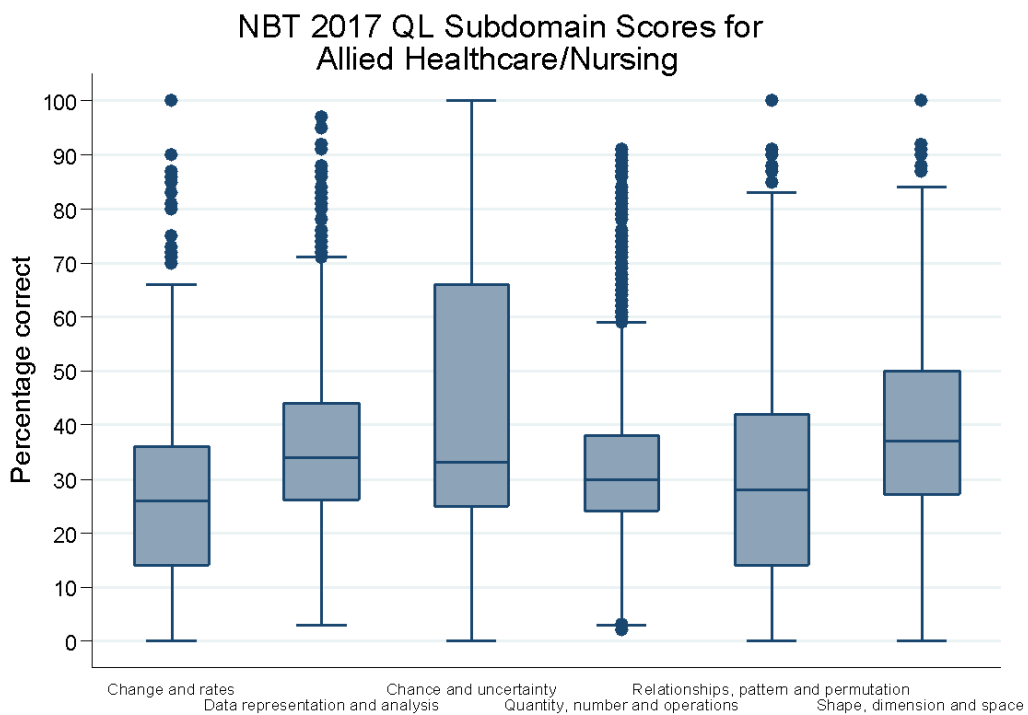


Figure 42 Allied Healthcare and Nursing subdomain QL performance, NBT 2017

For the candidates who indicated that they intended to study Art and Design, their QL performance on the six subdomains ranged between 32% - 50% which falls within the Basic and Lower Intermediate performance bands. The spread of scores in the box for the Chance and uncertainty subdomain is larger than that in the other boxes, indicating that 50% of the scores fall within this range. Shape, dimension and space, and Relationships, pattern and permutation are aspects of quantitative literacy that candidates in this faculty may be required to know. Interventions should take this into account.

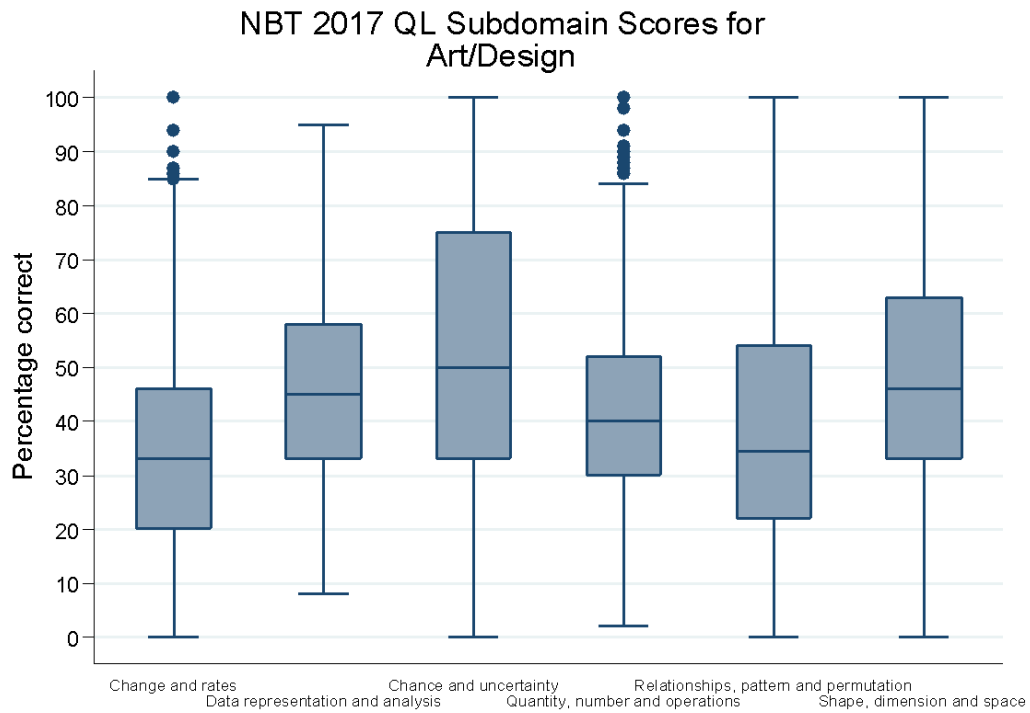


Figure 43 Art and Design subdomain QL performance, NBT 2017

The QL performance for candidates applying to the Business/Commerce and Management faculty was a slight improvement from the subdomain performance in the previous faculties. The medians for the six subdomains range between 40% and 67%, and all fall within the Intermediate performance band. The subdomain Chance and uncertainty has a median score of 67%, and 50% of the scores are located between 32% and 74%. In this faculty, a large component of the coursework deals with aspects of Change and rates, Chance and uncertainty, and Quantity, number and operations, and the fact that the medians are in the Lower and Upper Intermediate performance bands suggests that the candidates would be well served with QL support provided as part of their regular curriculum.

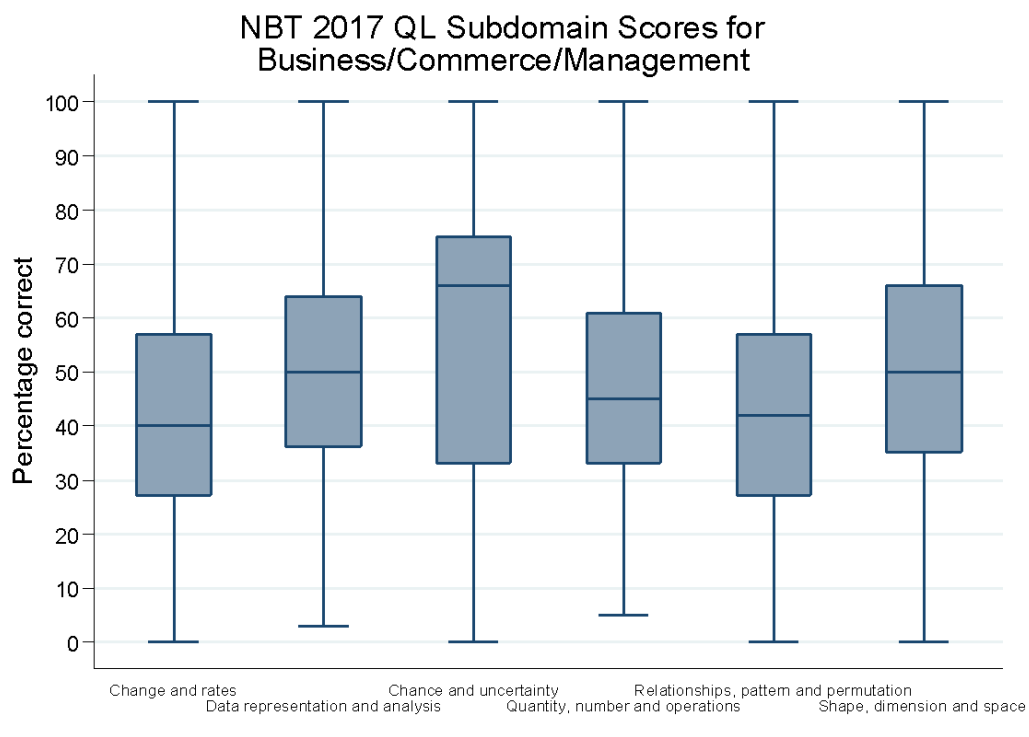


Figure 44 Business/Commerce and Management QL performance, NBT 2017

The QL performance of the Education candidates was very poor across the six subdomains and the medians were all in the Basic performance band. The median scores for candidates applying to this faculty ranges between 28% and 38% across the six subdomains. All subdomains are extremely relevant for all potential educators. The low median scores are an indication that the majority of the candidates would require extensive support in QL. If candidates teach any aspects of Mathematics, Geography, Biology or Science they will require targeted QL support relevant to their subjects during their training. Some courses may be less dependent on QL and candidates might be able to cope with the demands of tertiary education in this faculty without additional support.

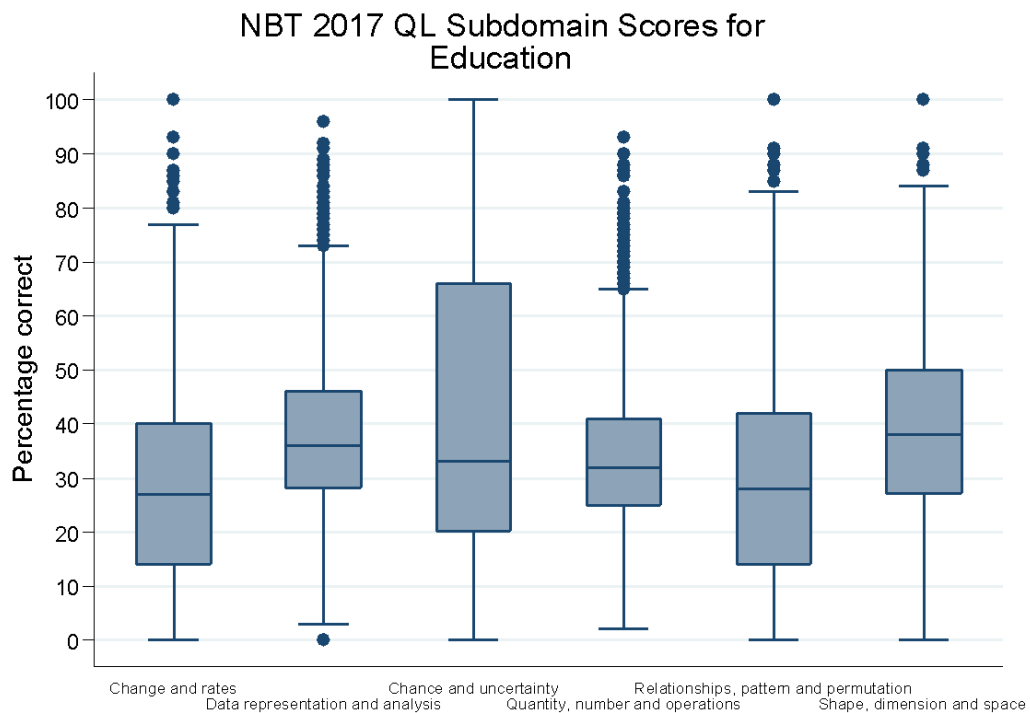


Figure 45 Education subdomain QL performance, NBT 2017

The QL performance of the candidates applying to the Engineering and Built Environment faculty was surprisingly low considering all the course content in this faculty is heavily dependent on mathematical and quantitative knowledge and skills. Across the six subdomains, the median scores were between 40% and 67%, placing them within the Intermediate performance band. Candidates intending to study in this faculty would need a good understanding of all six subdomains, as a large component of the work in this faculty involves calculations and manipulation of numbers. The performance across the six subdomains indicate that many candidates will require QL support to cope with the heavily mathematical and quantitatively demanding courses they will study.

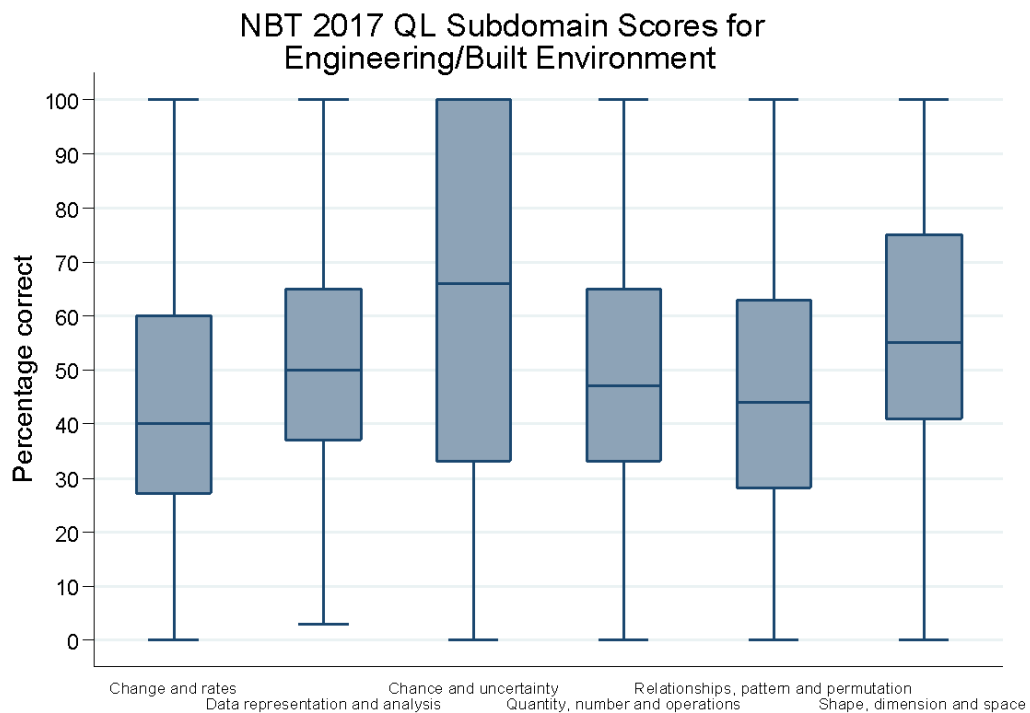


Figure 46 Engineering and Built Environment QL subdomain performance, NBT 2017

For the Health Sciences faculty, the median scores across the six subdomains ranged between 38% and 66%, which falls within the Intermediate performance band. The candidates' performance on the subdomain of Chance and uncertainty was the best for this group. The results for the six subdomains suggests that the majority of students in the Health Sciences faculty could benefit from QL support. Since this faculty includes inter-disciplinary professions, quantitative literacy interventions could be aligned with their specific disciplinary needs. However, the results indicate that all Health Sciences students may benefit from generic QL interventions.

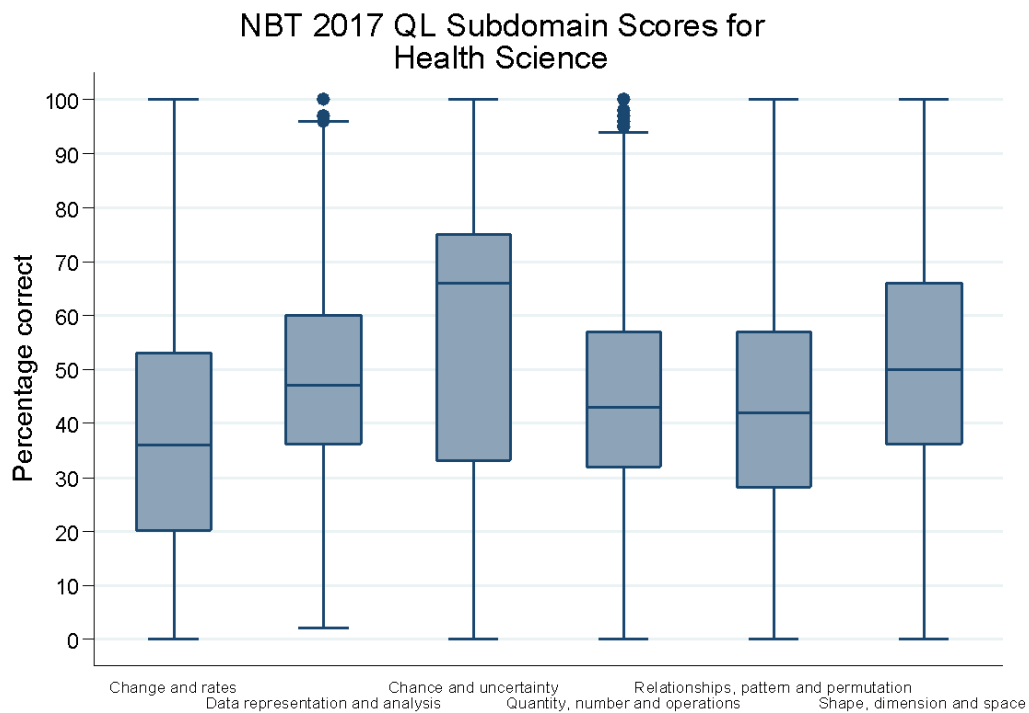


Figure 47 Health Sciences QL subdomain performance, NBT 2017

The median scores of the NBT QL candidates who indicated that they applied to the Hospitality and Tourism faculty ranged between 30% and 50% across the six subdomains. The medians for Change and rates, and Relationship, pattern are in the Basic band; the remaining medians fall within the Intermediate performance band. The subdomain Quantity, number and operations had a large number of outliers. Candidates in this faculty may be required to read graphs, charts and tables and hence the subdomain Data representation and analysis will be relevant for these candidates. This subdomain's median is 42% and the 3rd quartile point is 55%. Some candidates in this faculty may not need extensive QL support, however for those whose courses comprise various aspects of QL, some specifically targeted support will be beneficial.

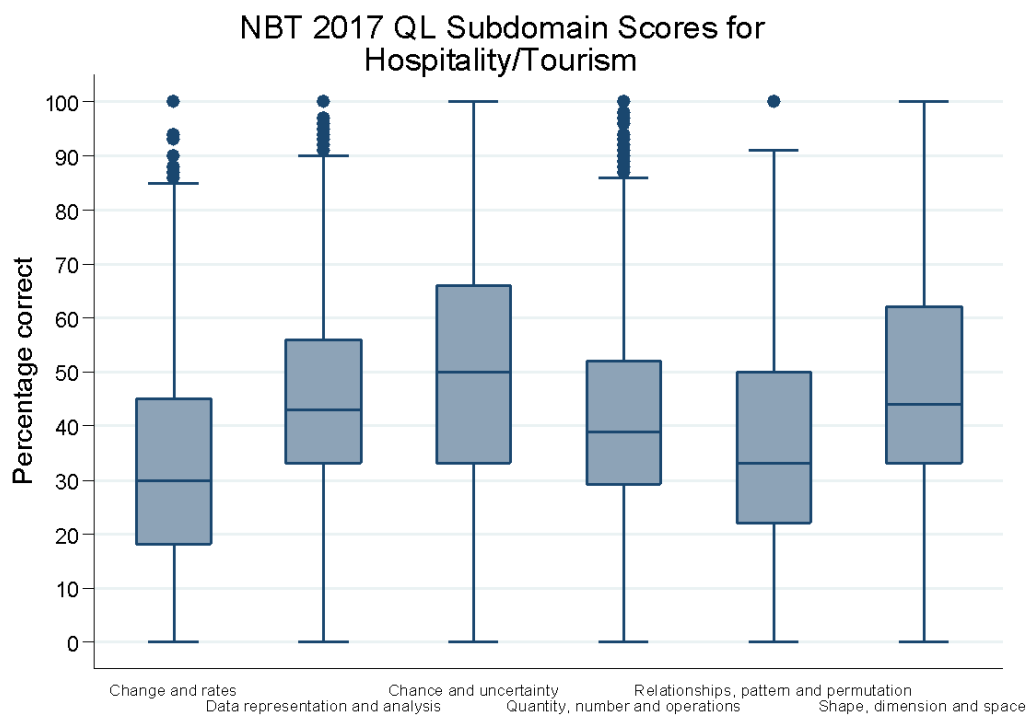


Figure 48 Hospitality and Tourism QL subdomain performance, NBT 2017



The median scores across the six subdomains for the Humanities faculty ranges between 37% and 50%. The medians for Change and rates, Quantity, number and operations, and Relationship, pattern and permutation fall at or within the Basic performance band; the medians in the remaining subdomains are all in the Lower Intermediate band. Some departments in this faculty may have a large proportion of work that requires quantitative reasoning and the performance across the six subdomains suggests that for these candidates targeted support will be necessary. The candidates performed slightly better on the subdomain Chance and uncertainty, and Shape, dimension and space, with median scores of 50% (still in the Lower Intermediate band). The subdomain Change and rates had a rather low median score of 37%, and 50% of the candidates' scores were located between 20% and 52%.

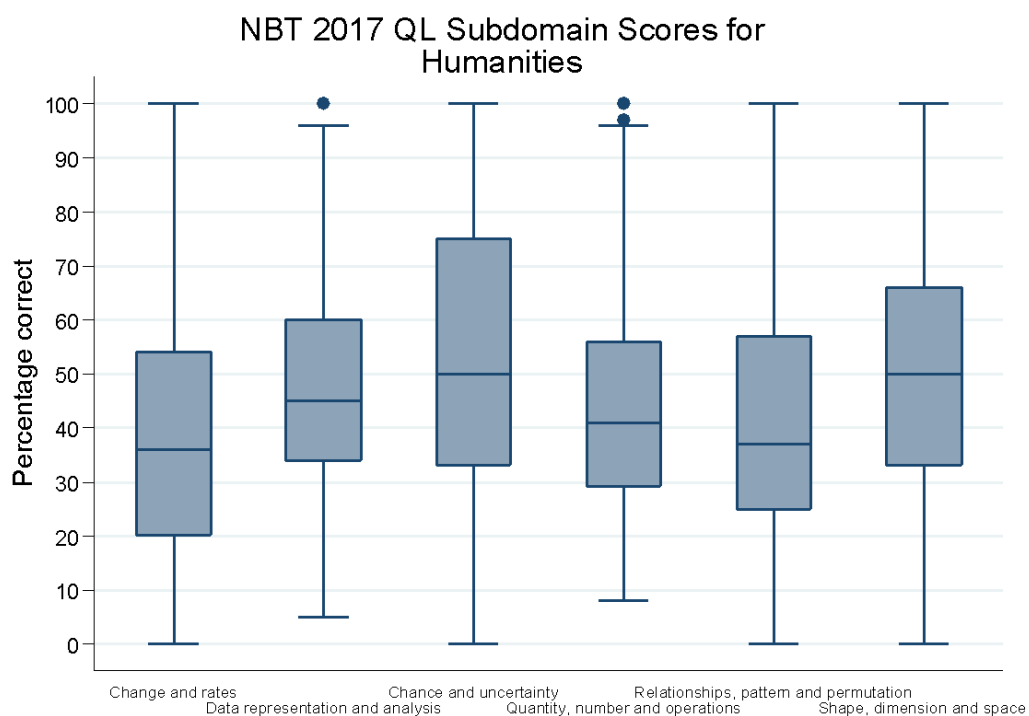


Figure 49 Humanities QL subdomain performance, NBT 2017

The QL performance of the candidates applying to study ICT is surprisingly low considering that the courses in this faculty is heavily dependent on QL. Candidates in this faculty are expected to have good mathematical and quantitative reasoning skills, as most of the courses require computations and quantitative manipulations. The median scores across the six subdomains ranged between 28% and 50% with the subdomain Chance and uncertainty being 50% and the medians for the other five subdomains well below 50%. The subdomain Change and rates had the lowest performance, with a median of 28%. Many of these candidates would benefit from support or interventions in QL in order to meet the required quantitative demands of their courses.

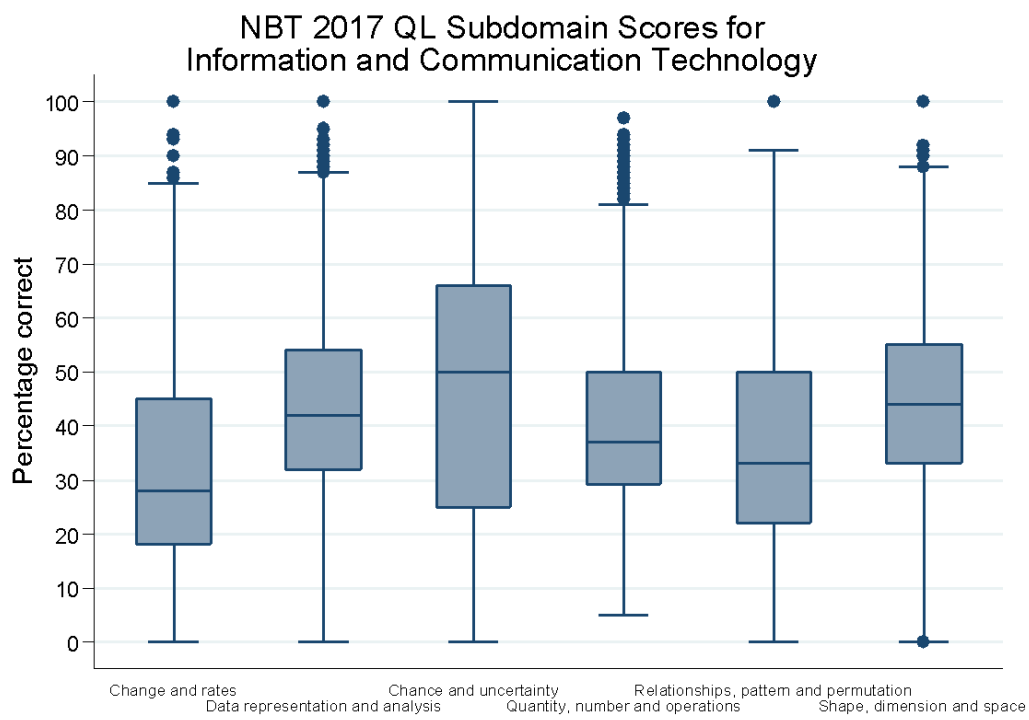


Figure 50 Information and Communication Technology QL subdomain performance, NBT 2017

The median scores of the candidates who applied to study Law ranged between 41% and 68% across the six subdomains. These medians fall within the Intermediate performance band suggesting that some candidates may require QL support. Some courses in the Law faculty may require a certain degree of quantitative reasoning ability; Law practitioners would be expected to have acceptable levels of quantitative competency, and Law programmes need to make provision for this.

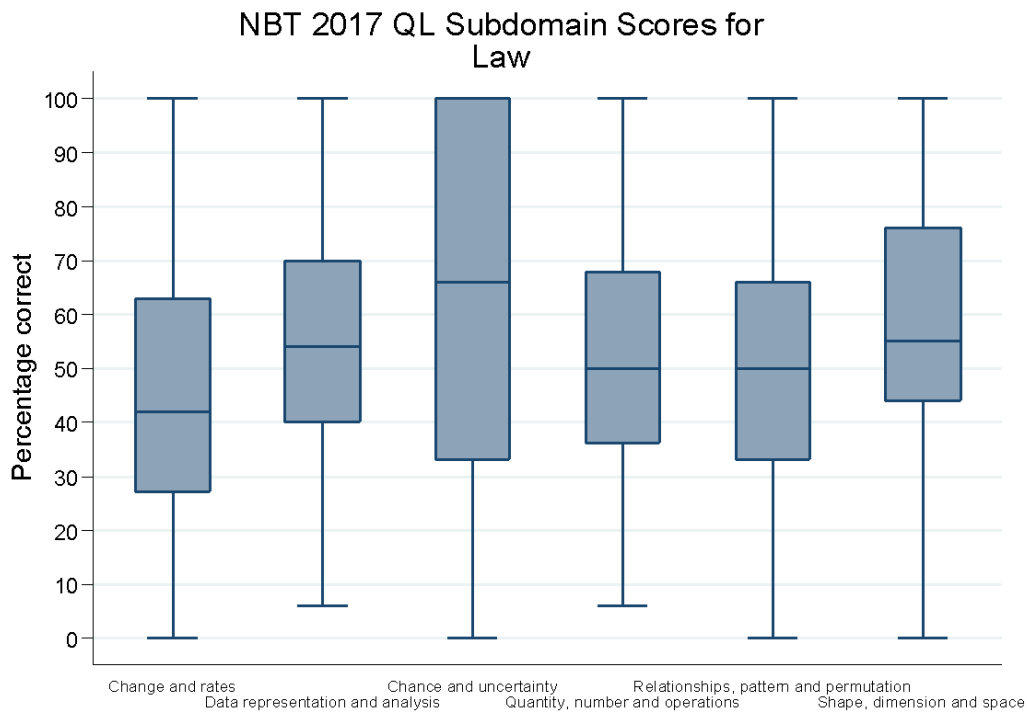


Figure 51 Law QL subdomain performance, NBT 2017

The performance for candidates in the Science/Mathematics faculty is rather disturbing. The course content in these faculties is heavily dependent on quantitative reasoning, mathematical knowledge and skills. Candidates will be doing mathematical computations and manipulations and basic foundational competence in mathematics is required, as well as a thorough grasp of all aspects of QL. The median scores ranged between 30% and 50% and are particularly low for the subdomains Change and rates (30%), Quantity, numbers and operations (39%) and Relationships, pattern and permutations (38%). These candidates will need a good grounding in quantitative skills, knowledge and understanding in order meet the demands of tertiary Science or Mathematics courses. These candidates are likely to require extensive QL support relevant to their academic studies.

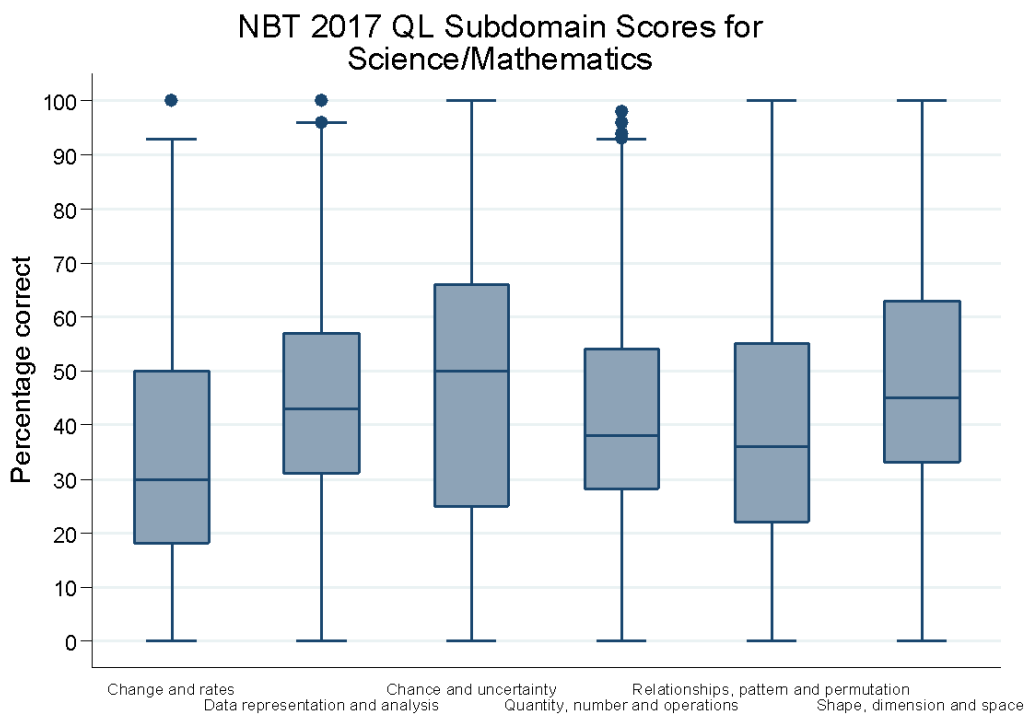


Figure 52 Science and Mathematics QL subdomain performance, NBT 2017

## THE CONSTRUCT OF THE MAT TEST

The boxplots that follow later in this section reflect information from the candidates who wrote the NBT MAT test in 2016. The candidates were asked to indicate their first choice for field of study and the associated faculty at the institution they wish to study. Eleven faculties are reflected. The boxplots show the distributions of student scores on different subdomains of questions in the Mathematics test.

The content of the MAT test is embedded in the NSC Mathematics curriculum (the CAPS, taking into account the pace-setter guidelines for teaching), but aligned with first year mainstream needs (content selected in consultation with academics teaching courses requiring mathematics). The MAT test specification comprises items which are distributed over six competence areas, subdivided into different sub-areas, and categorised according to cognitive level. For teaching and learning diagnostic purposes, different aspects are grouped together into five subdomains. The subdomains are Algebraic processing, Number sense, Functions and graphs, Trigonometric functions and graphs, and Geometric reasoning. It should be noted that the MAT subdomains Number sense and Geometric reasoning are associated with the QL subdomains Quantity, number and operation, and Shape, dimension and space, but are essentially different, especially in the sense that for QL no specific school curriculum knowledge is required, whereas the MAT subdomains are integrally related to the CAPS.

The NSC exam (school exit, norm-referenced) and NBT (university entry, criterion-referenced) are complementary but different forms of assessment. Not all school topics are necessarily tested in the MAT tests. The focus is on the areas that have most significance for first year mathematics courses.

The patterns of performance in the subdomains differ across faculties, with lower performance in the faculties of Art and Design, Humanities, Law and Education. In all cases the median values lie in the Lower Intermediate or in the Basic band, indicating a need for support in all mathematical subdomain areas for most students.

This analysis can also be done for a particular cohort of students (e.g. all those registered for a specific module), giving lecturers a useful tool for aligning their teaching with the needs of their students. The subdomain analysis for the various faculties gives an indication of the degrees of difficulty experienced within the different subdomains. This analysis highlights the subdomains in which prospective students may experience challenges when faced with mathematical courses and modules at university. An understanding of the difficulties that students/learners experience can improve teaching and learning practices at university; it can also aid educators at schools to change, adapt or improve their teaching strategies.

In a large number of institutions worldwide, for many years there has been an increased focus on preparatory, introductory or other support courses in Mathematics. In 1996 Hillel (see Hillel, 1996, in Mamona-Downs & Downs, 2002) noted that

“The problem of the mathematical preparation of incoming students, their different socio-cultural background, age, and expectations is evidently a worldwide phenomenon. The traditional image of a mathematics student as well prepared, selected, and highly motivated simply doesn’t fit present-day realities. Consequently, mathematics departments find themselves with a new set of challenges” (p. 166).

Central to the issues of teaching and learning mathematics is the idea that mathematics has to be learnt

through active engagement (Mason, 2002). The sub-domain information facilitates both prospective students' and lecturers' active engagement with the mathematical content they will need to deal with.

Table 15 Science and Mathematics QL subdomain performance, NBT 2017

Skill assessed	Explanation of skill area
Algebraic processes	<ul style="list-style-type: none"> <li>• Pattern recognition, sequences and series, use of sigma notation.</li> <li>• Operations involving relationships such as ratios and percentages.</li> <li>• Modelling situations by making use of mathematical process skills (translation from language to algebra, solution of problems).</li> <li>• Operations involving surds, logarithms and exponents, including solution of exponential equations.</li> <li>• Financial calculations (compound interest, appreciation, future value, etc.).</li> <li>• Number sense – manipulations/simple calculations involving integers, rational and irrational numbers.</li> <li>• Algebraic manipulation (includes expressions, equations, inequalities, simplification, factorisation, completing the square).</li> </ul>
Functions represented by graphs and equations; 'functions' to include linear, quadratic, hyperbola, cubic, exponential and logarithmic. Other graphs such as circles are also included.	<ul style="list-style-type: none"> <li>• Comprehension of function notation, substitution, domain, range.</li> <li>• Function representation (algebraic and graphic); properties of functions and graphs (such as intercepts, turning points, asymptotes); relationship between graphs and their equations; interpretation of graphical information.</li> <li>• Transformations of graphs of the functions noted above; solution of related problems; inverses of functions.</li> <li>• Applications of principles of differential calculus and related problems involving simple linear, non-linear functions (i.e. critical points, increasing/decreasing functions, tangents); interpretation of behaviour of function from derivative and vice versa.</li> </ul>
Basic trigonometry, including graphs of trigonometric functions, problems requiring solutions of trigonometric equations and application of trigonometric concepts.	<ul style="list-style-type: none"> <li>• Definitions of trigonometric ratios (sine, cosine, tangent).</li> <li>• Characteristics and interpretations of trigonometric functions and their graphs (e.g. domain, range, period, amplitude), including transformations of trigonometric functions.</li> <li>• Solving of trigonometric equations and using identities; simplification of trigonometric expressions using identities and reduction formulae where necessary; special angles; compound and double angles.</li> <li>• Application of area, sine and cosine rules</li> <li>• Application of trigonometric concepts in solving problems, including two- and three-dimensional problems.</li> </ul>
Spatial perception including angles, symmetries, measurements, representations and interpretation of two-dimensional and three-dimensional shapes.	<ul style="list-style-type: none"> <li>• Geometric objects</li> <li>• Properties of 2D figures and 3D objects (such as the circle, rectangle, trapezium, sphere, cone, pyramid).</li> <li>• Scale factor</li> <li>• Perimeter, area, volume (also of composite figures and objects)</li> <li>• Analytic geometry (linking geometric and algebraic properties in the Cartesian plane).</li> <li>• Circle Geometry</li> <li>• Cyclic quadrilaterals</li> <li>• Relationships between tangents, and chords, and angles in a circle</li> </ul>
Data handling and Probability	<ul style="list-style-type: none"> <li>• Measurement (and related interpretations).</li> <li>• Representation (such as histograms, line graphs, pie charts, ogives, box-and-</li> </ul>

	whisker plots) and related interpretations). <ul style="list-style-type: none"> <li>• Probability</li> </ul>
Competent use of logical skills in making deductions and determining the validity of given assertions	

Some of the candidates who have applied to study in the area of the Allied Healthcare/Nursing may need to take Mathematics courses in order to study other subjects such as Physics, Chemistry and Biology. The boxplots show median scores of about 30% or less in all subdomains, i.e. in the Basic band. Apart from quite a large number of outliers in all subdomains other than Number sense, the scores are a matter of concern, and these applicants will need fairly extensive support in all subdomains.

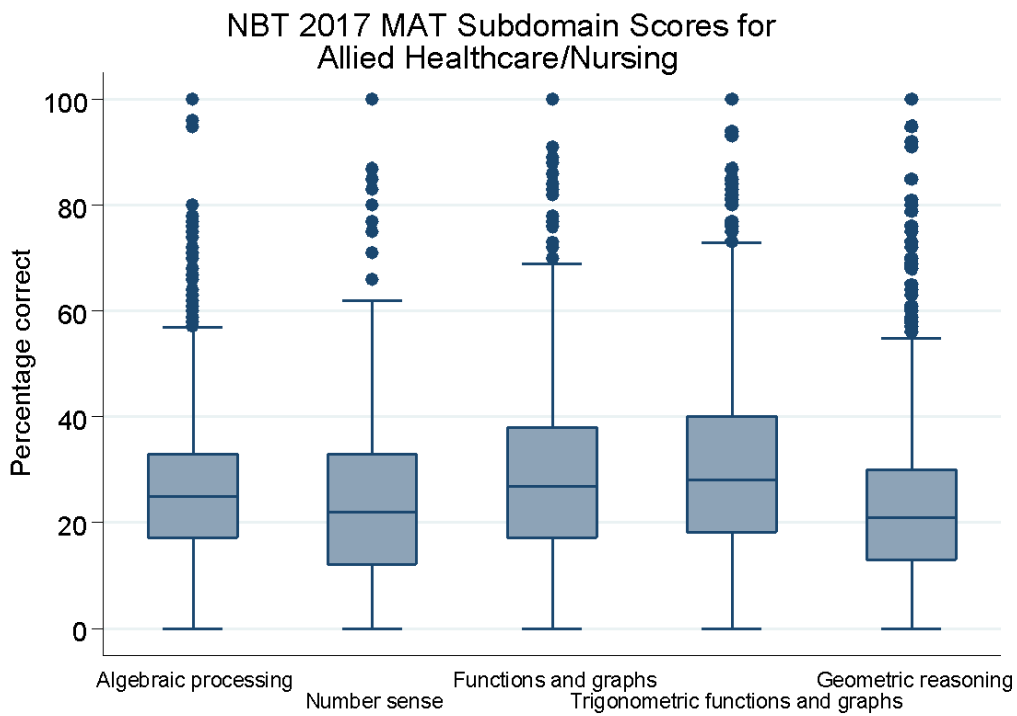


Figure 53 Allied Healthcare/Nursing MAT subdomain performance, NBT 2017

Applicants indicating the area of Art and Design as their first choice may well not have taken NSC Mathematics; many may have taken Mathematical Literacy and would therefore not have been equipped to write the NBT MAT test. Low scores in all subdomains represented in the boxplots should be interpreted with caution. It is however interesting that scores for this group are actually higher than those for applicants to the Allied Healthcare/Nursing group.

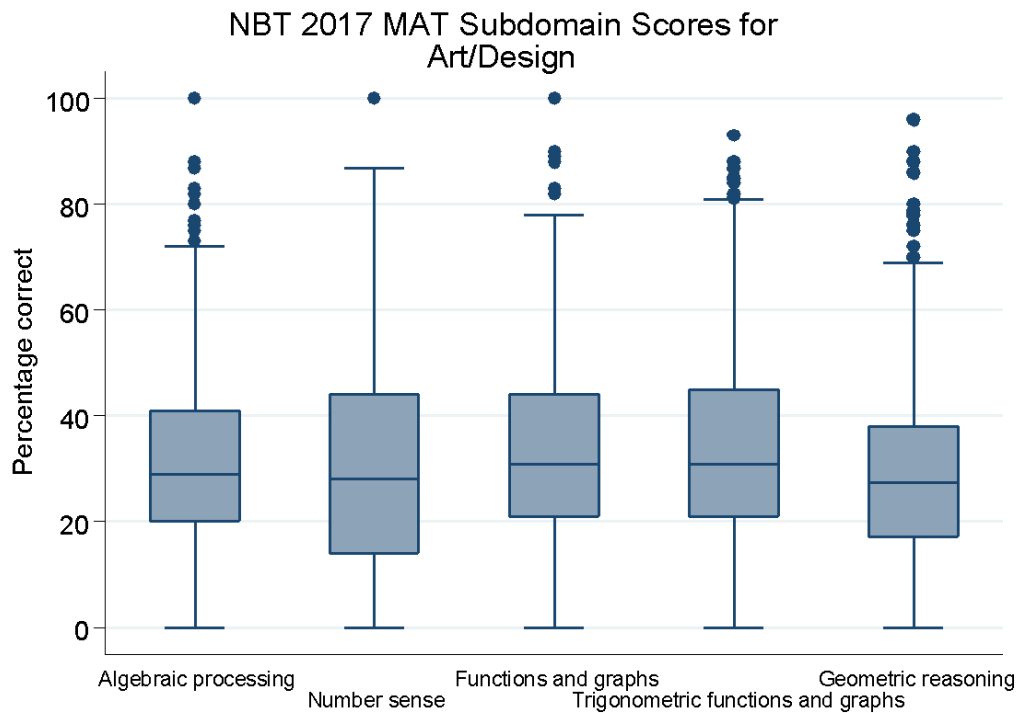


Figure 54 Art/Design MAT subdomain performance, NBT 2017



The median scores of candidates who applied to study courses in Business, Commerce and Management were less than 40% in all subdomains, i.e. in the Lower Intermediate band. Economics, in particular, is heavily dependent on the subdomains Algebraic processing, Number sense and Functions and graphs. Once registered in these courses, students will need considerable support in order to cope with the mathematical component of their studies.

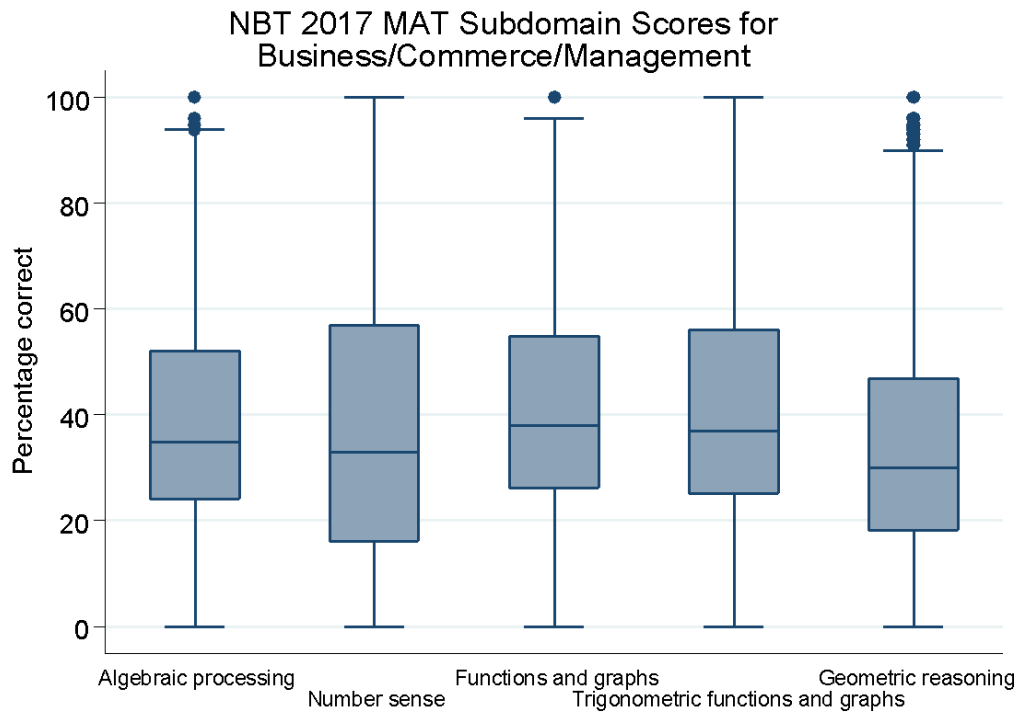


Figure 55 Business/Commerce/Management MAT subdomain performance, NBT 2017

The boxplots in Figure 56 below show the subdomain performance of those intending to study Education. These scores are generally low, with medians in the Basic band. These candidates' content knowledge will therefore need extensive remediation.

One of the reasons that so-called Euclidean Geometry was removed from the NSC curriculum was that there were too few educators able to teach it. The CAPS now includes this topic, and the 2016 NBT MAT tests assessed this new work, which was examined for the first time in Grade 12 in 2014 and in the NBT MAT tests in 2015. The Geometric reasoning subdomain includes aspects such as analytical geometry, and properties of geometric objects, that were in the old curriculum and are still in the CAPS; it also includes circle geometry, since this is now in the CAPS. Poor performance in this area may be attributed to lack of teacher exposure to the topics that are new to the curriculum. Much thought and planning needs to be given to addressing the poor performance in this subdomain. Education students (especially those planning to teach the Sciences and/or Mathematics) will need much support to develop comprehension and skill in all these subdomain areas before they will be able to fully comprehend the topics they will be studying and one day teaching.

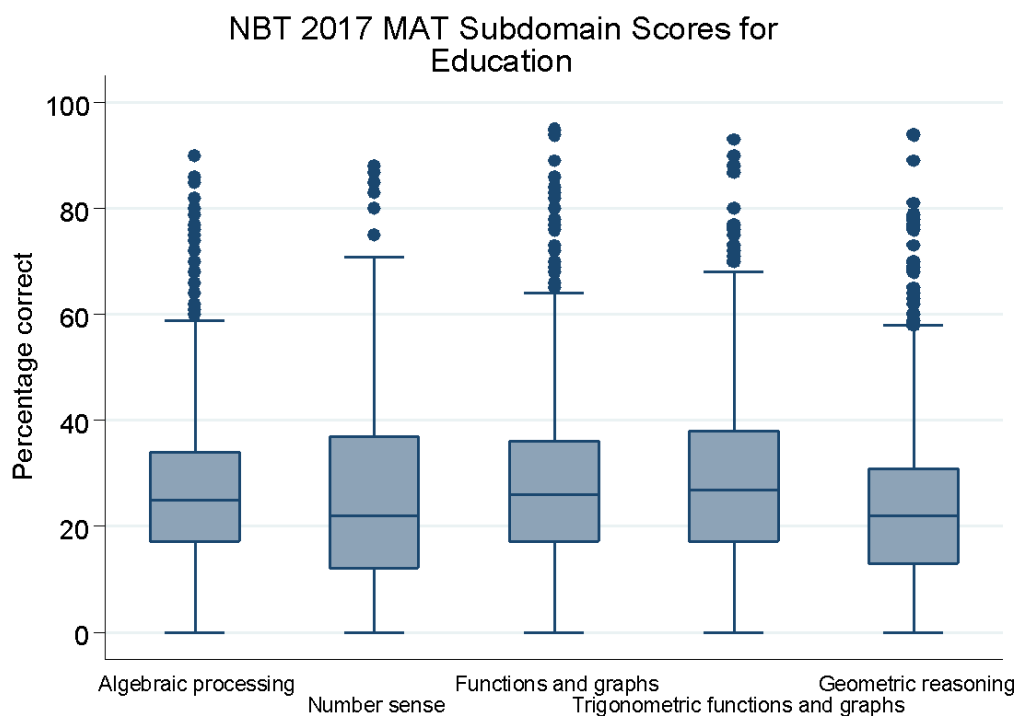


Figure 56 Education MAT subdomain performance, NBT 2017

The lack of outliers in the boxplots for all subdomains in the next figure shows that there was a greater spread of scores for those candidates who intended applying to the Faculty of Engineering and the Built Environment. Median scores in all subdomains were however low (in the region of 43% or less, i.e. in the Lower Intermediate band). A third quartile score of roughly between 50% and 60% in all subdomains is a matter of concern: 75% of candidates applying to study courses which are heavily dependent on mathematics have NBT MAT subdomain scores that are below 62%. Mathematics is central to this area of study. Many of these candidates, if admitted to this area of study, will need extensive support in all subdomains. Considering the QL scores and MAT scores together, it seems that certain essential but missing building blocks in QL may be undermining mathematical performance; simultaneous and targeted support in both QL and MAT may be needed to address the problem.

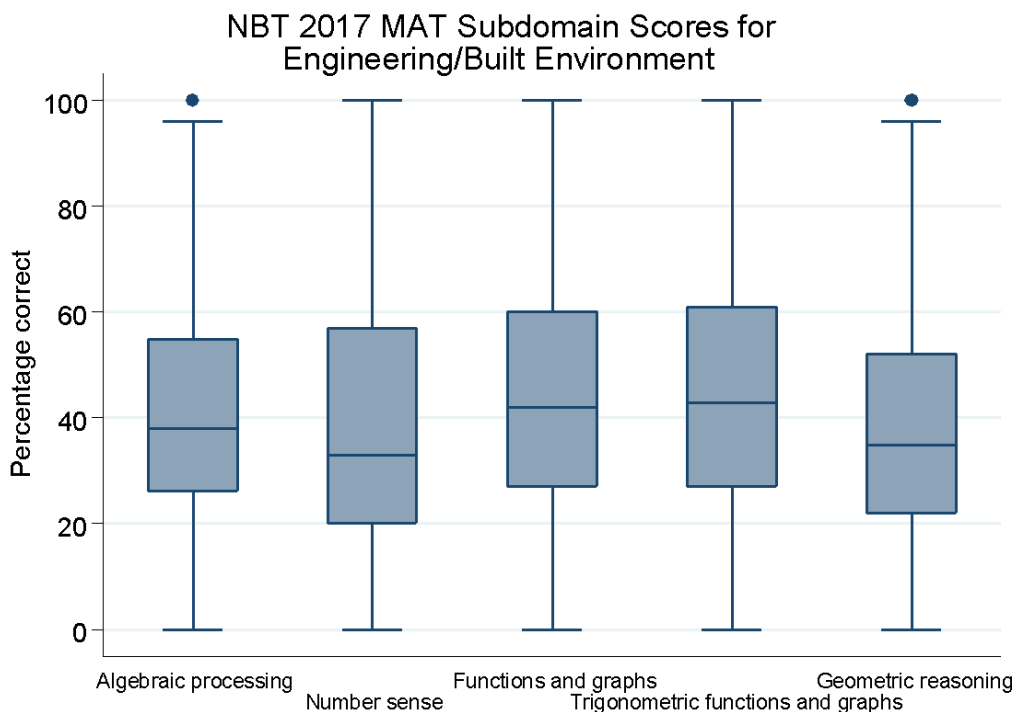


Figure 57 Engineering/Built Environment MAT subdomain performance, NBT 2017

The Health Sciences Consortium makes use of the NBTs in its selection programme. However, there are many more applicants than can be accommodated, and only the top performing candidates can be selected. Those candidates who do not end up in their intended field of study will enrol in other areas. If they enrol for Science degrees, or for any other programmes where mathematics is a requirement, they will need support in all subdomains. The boxplots below show that in all subdomains the medians are in the Lower Intermediate band, indicative of substantial support requirements.

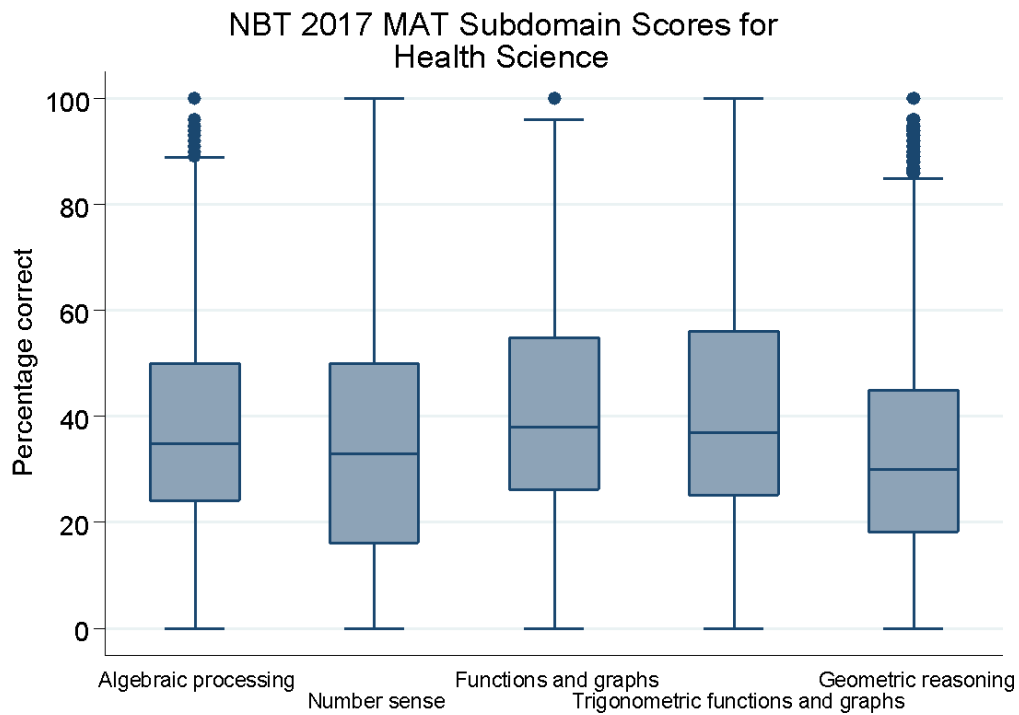


Figure 58 Health Science MAT subdomain performance, NBT 2017

It is possible that candidates intending to study in the area of Hospitality and Tourism did not take Mathematics at school, and may have taken Mathematical Literacy, which would not have equipped them to write the MAT test. It is difficult to interpret the scores below; however it is unlikely that these candidates will study mathematics courses.

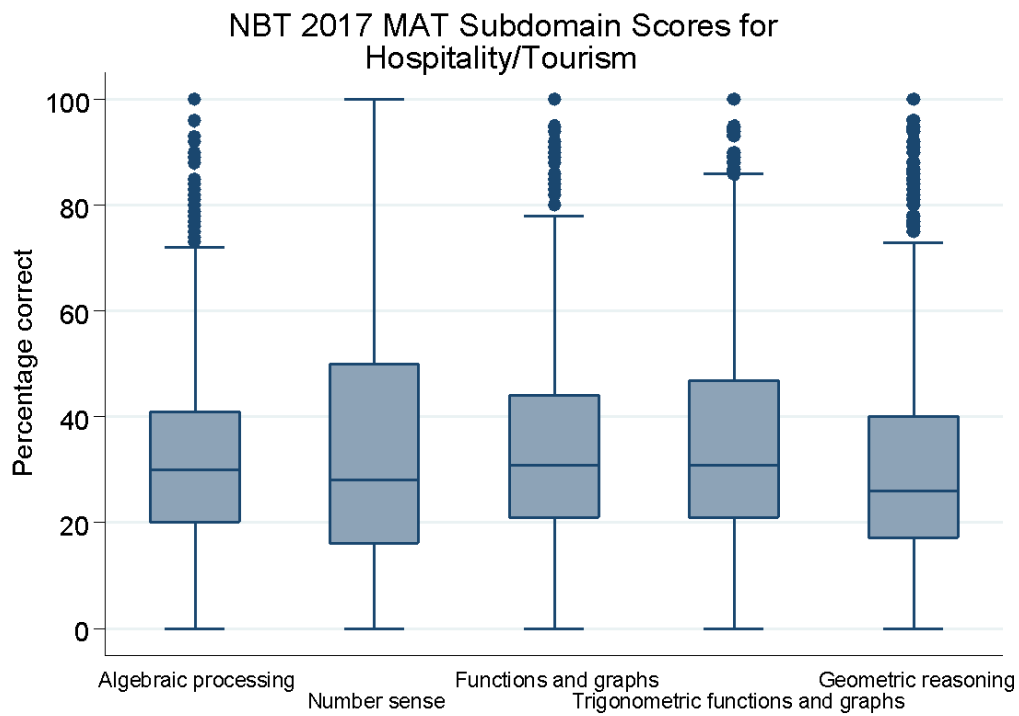


Figure 59 Hospitality/Tourism MAT subdomain performance, NBT 2017

Mathematics is not in general a requirement for Humanities. Since the majority of the candidates whose scores are reflected in the boxplots below are unlikely to be studying mathematics courses, it is not necessary to comment further on these scores.

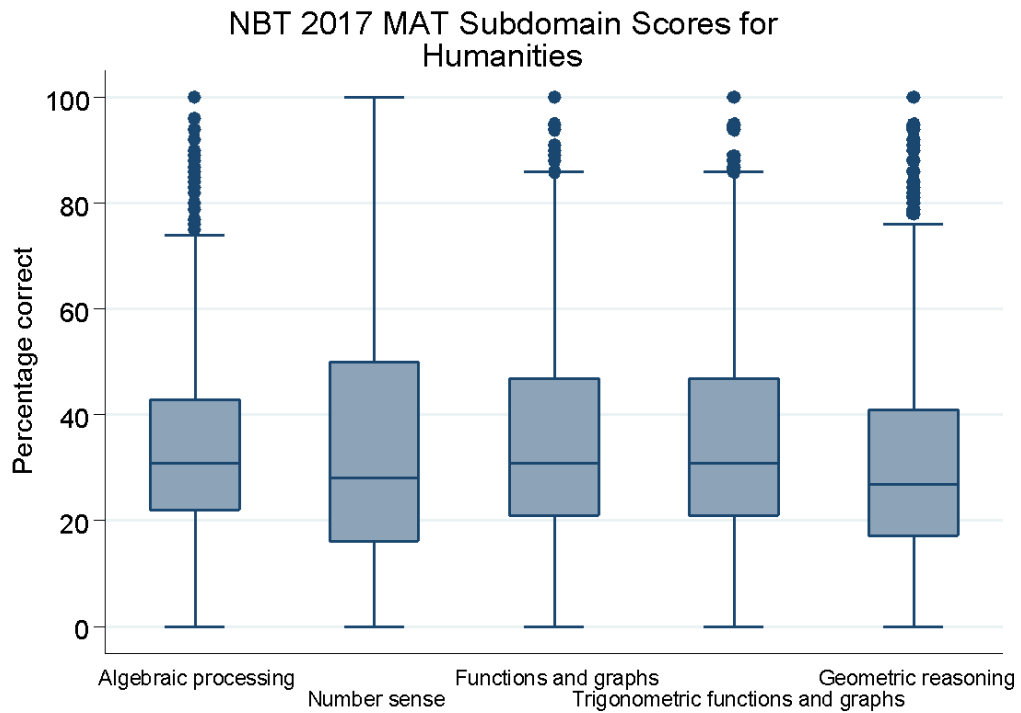


Figure 60 Humanities MAT subdomain performance, NBT 2017

In many institutions, Mathematics is a requirement for degrees in Information and Communication Technology. The high-scoring outliers in this group are unlikely to need support in mathematics. The median scores in all subdomains reflected in the boxplots below are 30% or lower and thus fall in the Basic band. The low scores are indicative of the extensive mathematical support that will be needed by the candidates in this group in all subdomains, except possibly Geometric reasoning. The components of this subdomain (analytic geometry, angles and shape, area and volume, circle geometry) may not be important for ICT courses.

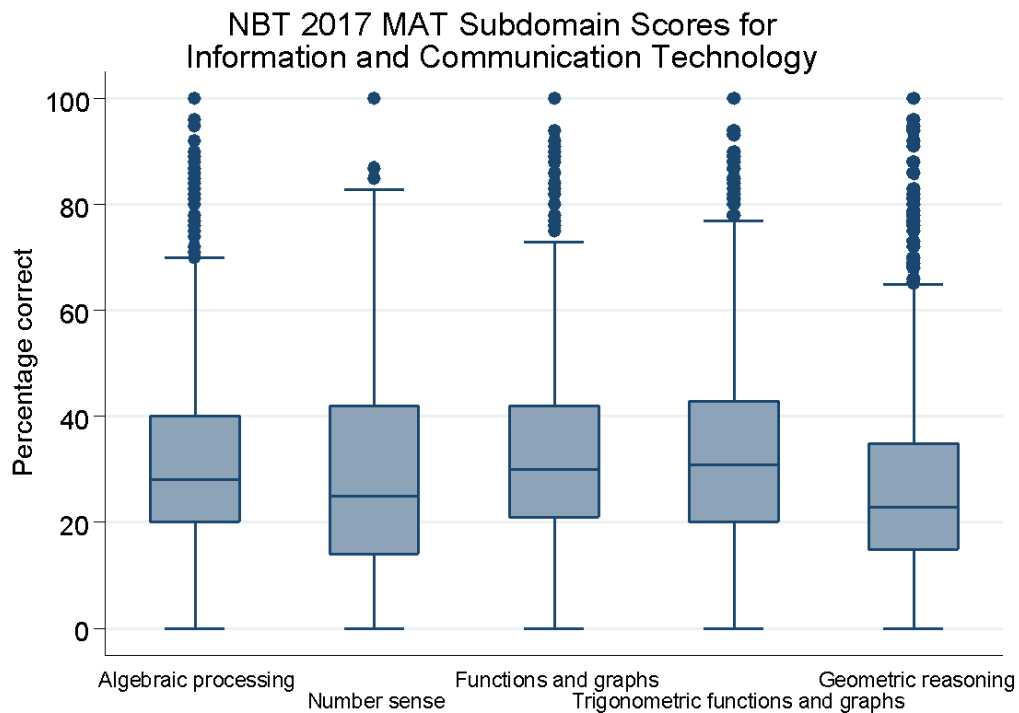


Figure 61 Information and Communication Technology MAT subdomain performance, NBT 2017

Mathematics is generally not a requirement for Law. Since the majority of the candidates whose scores are reflected in the boxplots below are likely to enrol for Law, and are unlikely to be studying mathematics courses, it is not necessary to comment further on these scores, apart from raising one specific concern: students in the Law faculty will need support (even if it is provided via QL support courses) in the MAT subdomain Number sense (median score in the Lower Intermediate band) if they are to be able to make logical decisions with regard to number relationships, orders of magnitude, etc.

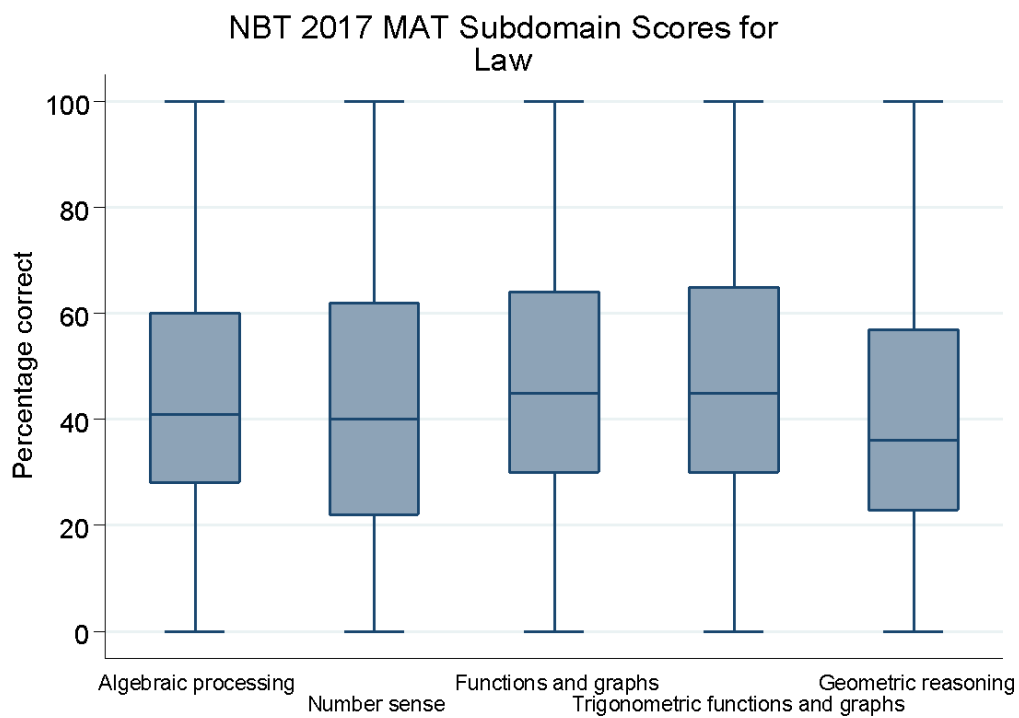


Figure 62 Law MAT subdomain performance, NBT 2017



Mathematics is a core course for Science and Mathematics courses. It is a matter of concern that for candidates intending to register for Science and Mathematics courses, the means in all subdomains are close to the Basic benchmark (35%). Clearly there are some high-performing candidates, but on the whole extensive mathematical support will need to be provided for those who enrol in these courses. Performance in Number sense and Geometric reasoning (medians below 30%) is particularly low, and this will have to be addressed if candidates are to cope with their mathematical studies. We point out again that low performance in the latter subdomain may be attributed to the change in curriculum and a possible lag in teaching expertise.

These results are illustrated in Figure 63 below.

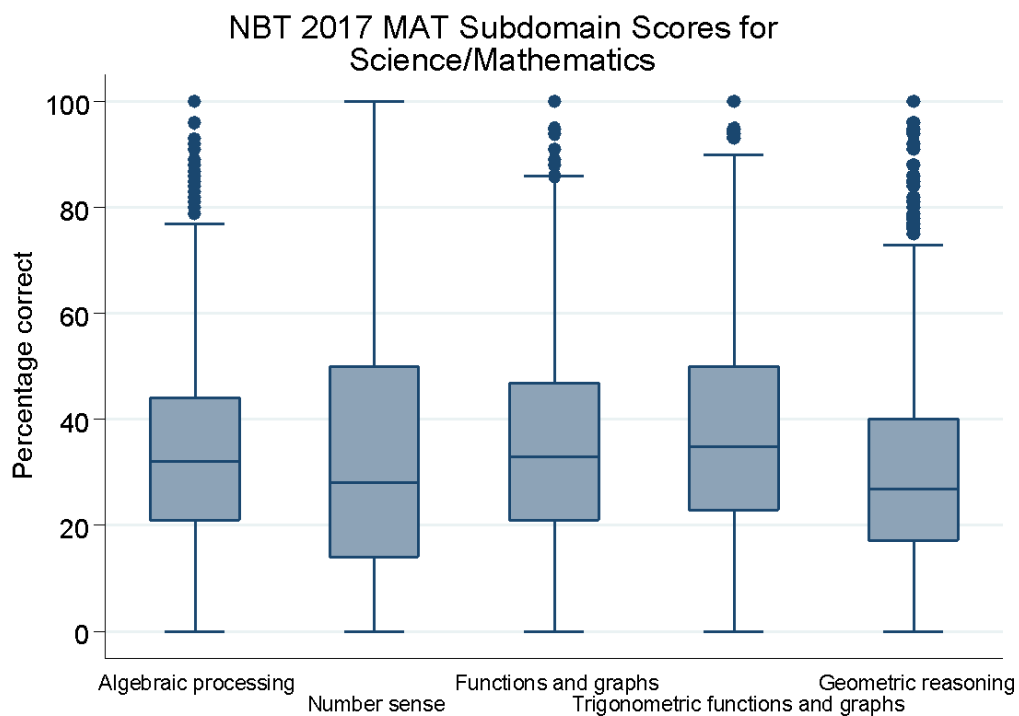


Figure 63 Science/Mathematics MAT subdomain performance, NBT 2017

## 8. PERFORMANCE ON THE 2017 NBTP HIGHER EDUCATION INTAKE CYCLE TESTING AND PERFORMANCE IN COGNATE NSC SUBJECTS IN 2016

This report now turns to the presentation and discussion of associations between the National Senior Certificate examination and the NBTs. This is done principally to examine the extent to which the NBTs might be said to provide complementary information to that provided by the NSC about the school-leaving cohort wishing to enter higher education.

The National Senior Certificate (NSC) is structured according to specific categories of subjects and rules of combination.

For a learner/candidate to obtain a National Senior Certificate, the learner must offer seven approved subjects and provide full evidence of School Based Assessment for each subject and he/she must:

- (a) Complete the programme requirements for Grades 10, 11 and 12 separately and obtain the distinct outcomes and associated assessment standards of all three years;
- (b) Comply with the internal assessment requirements for Grades 10, 11 and 12 and the external assessment requirements of Grade 12; and

The minimum requirements to obtain a National Senior Certificate are:

- (a) Achievement of 40% in three subjects, one of which is an official language at Home Language Level;
- (a) b) Achievement of 30% in three subjects; and
- (b) Full evidence in the school-based assessment component in the subject failed.

*Table 16 Scale of achievement/level descriptors*

<b>Achievement Level</b>	<b>Achievement Description</b>	<b>Marks %</b>
7	Outstanding achievement	80 – 100
6	Meritorious achievement	70 – 79
5	Substantial achievement	60 – 69
4	Adequate achievement	50 – 59
3	Moderate achievement	40 – 49
2	Elementary achievement	30 – 39
1	Not achieved	0 – 29

MINIMUM REQUIREMENTS FOR ADMISSION TO THE HIGHER CERTIFICATE, DIPLOMA AND BACHELOR’S DEGREE

Minimum Higher Education Admission requirements in accordance with the three levels of undergraduate programmes are as follows:

(a) Higher Certificate

The minimum admission requirement is a National Senior Certificate with a minimum of 30% in the language of learning and teaching of the Higher Education Institution as certified by Umalusi, the Quality Assurance Council. Institutional and programme needs may require additional combinations of recognised NSC subjects and levels of achievement.

(b) Diploma

The minimum admission requirement is a National Senior Certificate with a minimum of 30% in the language of learning and teaching of the Higher Education Institution as certified by Umalusi, the Quality Assurance Council, coupled with an achievement rating of 3 (Moderate Achievement, 40% – 49%) or better in four recognised NSC 20-credit subjects. Institutional and programme needs may require additional combinations of recognised NSC subjects and levels of achievement.

(c) Bachelor’s Degree

The minimum admission requirement is a National Senior Certificate with a minimum of 30% in the language of learning and teaching of the Higher Education Institution as certified by Umalusi, the Quality Assurance Body, coupled with an achievement rating of 4 (Adequate achievement, 50% – 59%) or better in four subjects chosen from the following recognised 20-credit NSC subjects (which will be known as the designated subject list):

Table 17 The Higher Education Designated Subject List

Accounting	Information Technology
Agricultural Science	Languages
Business Studies	Life Sciences
Consumer Studies	Mathematics
Dramatic Arts	Mathematical Literacy
Economics	Music
Engineering Graphics and Design	Physical Sciences
Geography	Religion Studies
History	Visual Arts

NOTES ON THE SAMPLE USED FOR THE ANALYSIS IN THIS SECTION

Since it is not clear which result to keep if a candidate wrote the NBT multiple times, the scores of all candidates who wrote the NBT more than once were excluded from this subsample. Calculation of a correlation coefficient is based on the assumption that the data satisfy the assumption of independence of observations, i.e., observations are not influenced by each other. Repeat occurrences of one individual would be an example of observations that influence each other. NSC results were then matched. The resulting subsample came to 71,376 candidates. Nearly 83% (59,345) of these candidates achieved the NSC with a Bachelor’s pass while the remaining 12,031 (17%) achieved the NSC with a Diploma or Higher Certificate pass.

Please note, list wise deletion was utilised when correlation coefficients were calculated and scatterplots were constructed. List wise deletion means that candidates were excluded from analysis if any single value for a particular calculation was missing. The sample was further analysed separately by Higher Education (HE) Admission type (Degree; Diploma/Higher Certificate).

NSC Subject codes:

MTHN = Mathematics

MTLN = Mathematical Literacy

ENHN = English Home Language

ENFN = English First Additional Language

PSCN = Physical Sciences

Caution should be used when interpreting the correlation coefficients. The scatterplots for the NSC ENFN against NBT AL, NSC MTHN against NBT QL, NSC MTLN against NBT QL, NSC MTHN against NBT MAT, NSC PSCN against NBT MAT show heterogenous variance. The point cloud of the scatterplot for NSC MTLN against NBT QL also show some non-linear trend.

## SELF-REPORTED DEMOGRAPHICS

The 2017 NBT – 2016 NSC cohort self-classified their biographical details. The cohort consisted of approximately 59% female and 41% male; approximately 61% were black and 20% white; approximately 97% were South African citizens and approximately 31% reported English as their home language while the vast majority had an African language as home language. 83% of the cohort achieved the NSC at a Bachelor's degree level and the remainder at Higher Certificate or Diploma level.

Table 18 Self-reported demographics

	Full Sample		Bachelors		Diploma or Higher Certificate	
	N	%	n	%	n	%
<b>GENDER</b>						
Male	28,954	40.57	24,443	41.19	4,511	37.49
Female	42,422	59.43	34,902	58.81	7,520	62.51
<b>Other</b>						
<b>Total</b>	71,376	100	59,345	100	12,031	100
<b>POPULATION GROUP</b>						
Black	43,393	60.79	33,457	56.38	9,936	82.59
Coloured	8,368	11.72	7,102	11.97	1,266	10.52
Indian/Asian	4,788	6.710	4,393	7.400	395	3.280
White	14,559	20.40	14,146	23.84	413	3.430
Other	268	0.380	247	0.420	21	0.170
<b>Total</b>	71,376	100	59,345	100	12,031	100
<b>CITIZENSHIP</b>						
South African	69,540	97.43	57,797	97.39	11,743	97.61
SADC country	927	1.300	773	1.300	154	1.280
Other African country	519	0.730	428	0.720	91	0.760
Other	390	0.550	347	0.580	43	0.360
<b>Total</b>	71,376	100	59,345	100	12,031	100
<b>HOME LANGUAGE</b>						
Afrikaans	8,430	11.81	7,763	13.08	667	5.540
English	22,064	30.91	20,071	33.82	1,993	16.57
isiNdebele	673	0.940	544	0.920	129	1.070
isiXhosa	9,907	13.88	7,173	12.09	2,734	22.72
isiZulu	8,036	11.26	6,709	11.31	1,327	11.03
Sesotho	5,655	7.920	4,200	7.080	1,455	12.09
Sesotho sa Leboa	5,309	7.440	3,998	6.740	1,311	10.90
Setswana	3,691	5.170	2,952	4.970	739	6.140
siSwati	1,585	2.220	1,254	2.110	331	2.750
Tshivenda	2,420	3.390	1,853	3.120	567	4.710
Xitsonga	2,575	3.610	1,968	3.320	607	5.050
Other Language	1,031	1.440	860	1.450	171	1.420
<b>Total</b>	71,376	100	59,345	100	12,031	100
<b>GR12 LANGUAGE</b>						
Afrikaans	7,957	11.15	7,257	12.23	700	5.820
English	61,900	86.72	50,976	85.90	10,924	90.80
Other	1,519	2.130	1,112	1.870	407	3.380
<b>Total</b>	71,376	100	59,345	100	12,031	100
*The sample includes 499 candidates that had results on both MTHN and MTLN						
<b>HE ADMISSION</b>						
Bachelor's degree	59,345	83.14				
Diploma/Higher Certificate	12,031	16.86				
<b>Total</b>	71,376	100				

## DESCRIPTIVE STATISTICS

Table 19 Descriptive statistics

	N	mean	Sd	min	p25	p50	p75	Max
<b>TOTAL COHORT</b>								
NBT AL	71376	54.67	14.10	18	42	53	66	94
NBT QL	71372	47.31	15.53	10	35	43	57	98
NBT MAT	52414	40.46	16.09	1	28	35	48	97
NSC MTHN	55932	58.63	18.75	3	45	59	73	100
NSC MTLN	16027	64.58	14.36	11	55	65	75	99
NSC ENHN	37992	67.86	10.71	36	60	68	76	99
NSC ENFN	33383	67.17	10.25	32	60	67	75	97
NSC PSCN	44304	59.41	17.65	9	46	59	73	100
<b>BACHELOR'S DEGREE</b>								
NBT AL	59345	57.06	13.72	18	45	57	68	94
NBT QL	59343	49.57	15.76	10	37	46	60	98
NBT MAT	44492	42.61	16.46	1	29	37	52	97
NSC MTHN	47533	62.56	17.06	3	51	63	75	100
NSC MTLN	12345	68.68	12.28	22	60	69	78	99
NSC ENHN	32885	69.85	9.650	40	63	70	77	99
NSC ENFN	26459	69.62	9.180	35	63	70	76	97
NSC PSCN	37701	63.39	15.75	12	52	63	75	100
<b>DIPLOMA/CERTIFICATE</b>								
NBT AL	12031	42.89	9.190	20	36	40	47	84
NBT QL	12029	36.13	7.440	12	32	34	38	90
NBT MAT	7922	28.41	4.520	1	26	27	29	89
NSC MTHN	8399	36.35	10.54	4	30	37	44	79
NSC MTLN	3682	50.84	12.15	11	42	49	59	93
NSC ENHN	5107	55.02	7.970	36	49	55	60	87
NSC ENFN	6924	57.83	8.620	32	51	58	64	88
NSC PSCN	6603	36.71	8.300	9	31	36	42	80
*The sample includes 499 candidates that had results on both MTHN and MTLN								

Figure 64 below highlights the differences in the purposes of the NSC and NBT. In measuring school exit levels, MTHN, MTLN and PSCN scores are markedly higher than NBT MAT and QL scores; ENHN and ENFN scores are markedly higher than NBT AL scores. Half the MTLN candidates score above 65%. This is in no way reflected in the QL, where the median is 43%.

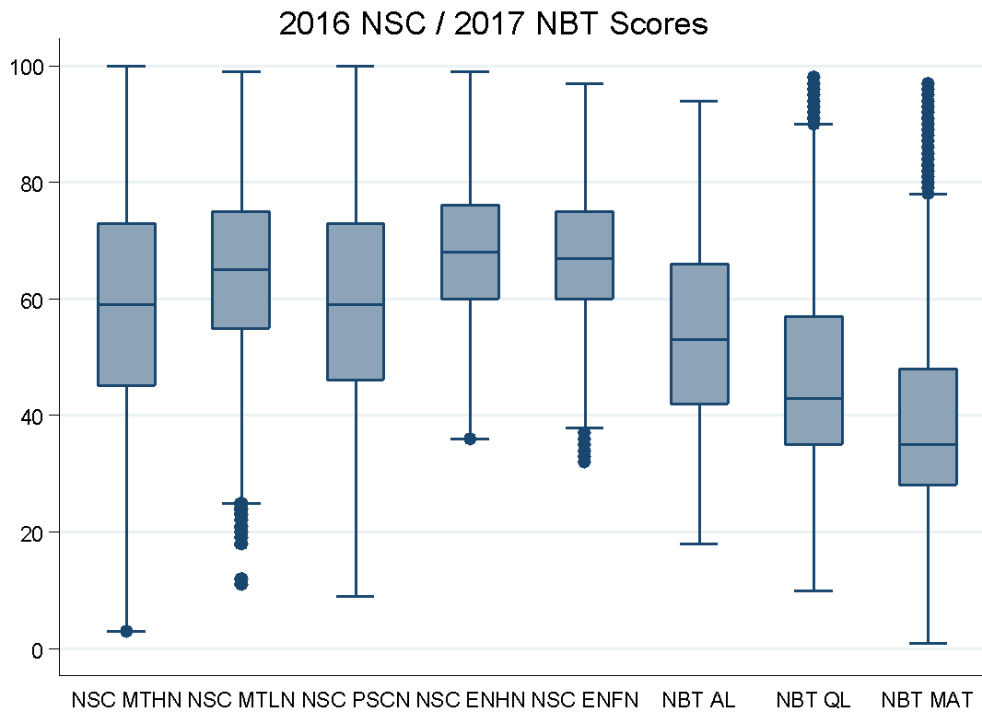


Figure 64 2016 NSC/2017 NBT scores

## 2016 NSC / 2017 NBT Scores

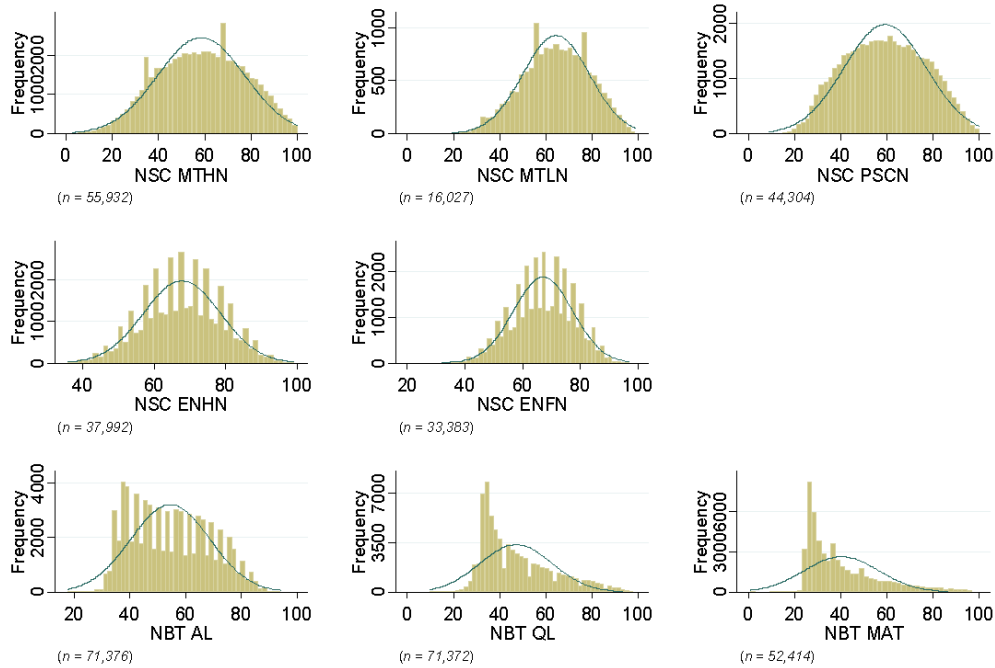


Figure 65 2016 NSC/2017 NBT scores

### NBT BENCHMARKS

There are very noticeable differences in the NBT performance of candidates who passed the NSC at the Bachelor’s degree level (classified using NBT degree benchmarks) and those who passed the NSC at the diploma/higher certificate level (classified using NBT diploma/higher certificate benchmarks).

For **AL**, while just over a quarter of Bachelor’s degree candidates had scores in the Proficient band just 6% of the diploma/higher certificate candidates had scores in the Proficient band. More than two thirds of diploma/higher certificate candidates had scores in the Intermediate Lower band.

In **QL** the pattern is slightly different, with proportionally more diploma/higher certificate than degree candidates in the Basic and Intermediate Lower categories, and proportionally fewer in the Intermediate Upper and Proficient bands.

For **MAT**, about 10% of the Bachelor’s degree candidates had scores in the Proficient band; just over 89% of the diploma/higher certificate candidates had scores in the Basic band.

These results are shown in Table 20 and Figure 66 below.



Table 20 Frequency tables of benchmark bands for the NBT domains

<b>AL</b>	<b>Basic</b>	<b>Intermediate Lower</b>	<b>Intermediate Upper</b>	<b>Proficient</b>	<b>Total</b>
<b>AL</b>					
<b>Bachelors n</b>	5,623	19,724	18,564	15,434	59,345
<b>%</b>	9.480	33.24	31.28	26.01	100
<b>Diploma/Certificate n</b>	513	8,218	2,569	731	12,031
<b>%</b>	4.260	68.31	21.35	6.080	100
<b>QL</b>					
<b>Bachelors n</b>	20,406	19,477	11,356	8,104	59,343
<b>%</b>	34.39	32.82	19.14	13.66	100
<b>Diploma/Certificate n</b>	5,164	6,124	629	112	12,029
<b>%</b>	42.93	50.91	5.230	0.930	100
<b>MAT</b>					
<b>Bachelors n</b>	18,338	14,929	6,850	4,375	44,492
<b>%</b>	41.22	33.55	15.40	9.830	100
<b>Diploma/Certificate n</b>	7,072	814	34	2	7,922
<b>%</b>	89.27	10.28	0.430	0.0300	100

2017 NBT cohort Performance levels  
NSC2016/NBT2017 Subsample

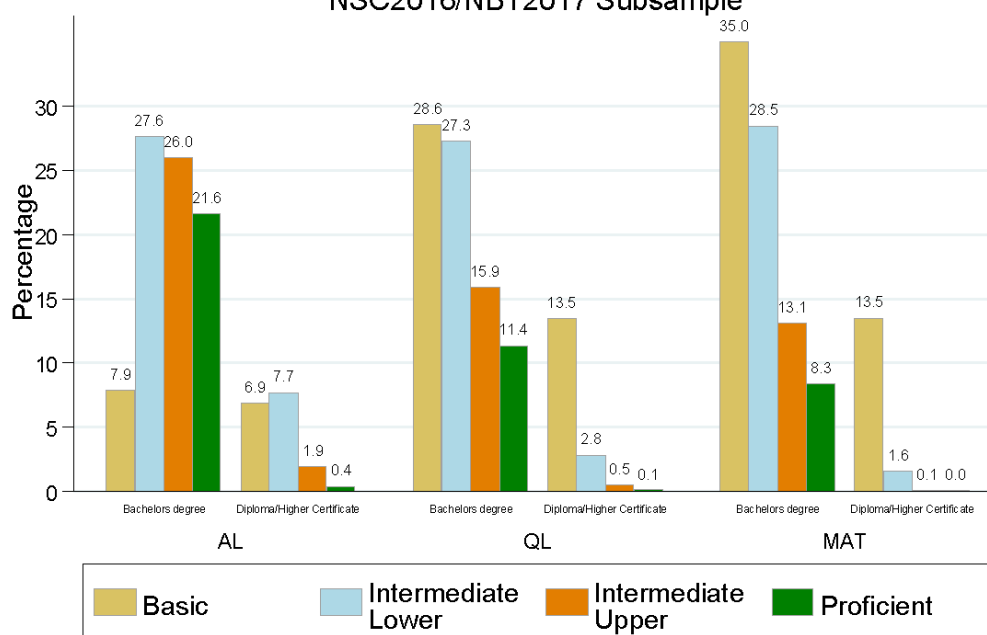


Figure 66 NSC cohort performance levels on NBT

ASSOCIATIONS BETWEEN SCORES ON THE NATIONAL BENCHMARK TEST IN ACADEMIC LITERACY AND THE NATIONAL SENIOR CERTIFICATE EXAMINATION FOR ENGLISH

Figures 67 and 68 (and Tables 21 and 22) depict associations between scores on the National Benchmark Test in Academic Literacy (NBT AL) and scores on the NSC English Home Language (NSC ENHN) and NSC English First Additional Language (ENFN) for two subgroups, those who achieved an NSC with a Bachelor’s degree pass and those who achieved an NSC with a Diploma or Certificate pass, of 2017 intake Higher Education students who wrote the NSC in 2016.

Figure 67 shows the scatterplot of NBT AL scores against NSC English Home Language (ENHN) scores for candidates who achieved the NSC with Degree-level pass as well as those who achieved the NSC with Diploma or Higher Certificate pass. There was a correlation of 0.689 between NSC English Home Language and NBT AL for those with a Bachelor’s degree pass and a correlation of 0.611 between NSC English Home Language and NBT AL for Diploma/Certificate candidates. Candidates who obtained the NSC with a Bachelor’s degree pass and performed well in the NSC English Home Language (80% and above), had varying levels of performance on the NBT AL. Candidates who achieved either a Diploma or Higher Certificate NSC pass performed fairly poorly on both the NSC English Home Language and NBT AL. The figure shows that these candidates, even though they took the NSC English Home Language subject, are largely not prepared to cope with the typical academic literacy demands of academic study.

Table 21 Correlation matrix for the 2016 NSC and 2017 NBT results, Bachelor's degree

Bachelors	NBT AL	NBT QL	NBT MAT	NSC MTHN	NSC MTLN	NSC ENHN	NSC ENFN	NSC PSCN
<b>NBT AL</b>	1							
	59345							
<b>NBT QL</b>	0.717	1						
	59343	59343						
<b>NBT MAT</b>	0.535	0.717	1					
	44492	44492	44492					
<b>NSC MTHN</b>	0.366	0.564	0.771	1				
	47533	47533	43674	47533				
<b>NSC MTLN</b>	0.624	0.696	0.468	0.479	1			
	12345	12343	1238	537	12345			
<b>NSC ENHN</b>	0.689	0.547	0.504	0.501	0.515	1		
	32885	32883	23339	25509	7891	32885		
<b>NSC ENFN</b>	0.695	0.524	0.430	0.356	0.476	.	1	
	26459	26459	21153	22024	4453	0	26459	
<b>NSC PSCN</b>	0.316	0.448	0.671	0.848	0.518	0.537	0.382	1
	37701	37701	35595	37261	660	18892	18809	

Table 22 Correlation matrix for NSC 2016 and NBT 2017 results, Diploma/Higher Certificate

Diploma/ Higher Certificate	NBT AL	NBT QL	NBT MAT	NSC MTHN	NSC MTLN	NSC ENHN	NSC ENFN	NSC PSCN
<b>NBT AL</b>	1							
	12031							
<b>NBT QL</b>	0.607	1						
	12029	12029						
<b>NBT MAT</b>	0.280	0.406	1					
	7922	7922	7922					
<b>NSC MTHN</b>	0.0911	0.230	0.363	1				
	8399	8398	7497	8399				
<b>NSC MTLN</b>	0.511	0.554	0.147	0.431	1			
	3682	3681	466	50	3682			
<b>NSC ENHN</b>	0.611	0.379	0.0992	0.0318	0.308	1		
	5107	5107	2963	3188	1966	5107		
<b>NSC ENFN</b>	0.561	0.280	0.110	-0.0209	0.348	.	1	
	6924	6922	4959	5211	1716	0	6924	
<b>NSC PSCN</b>	0.0375	0.0759	0.199	0.562	0.315	0.0207	-0.0181	1
	6603	6602	6005	6423	209	2270	4333	<b>6603</b>

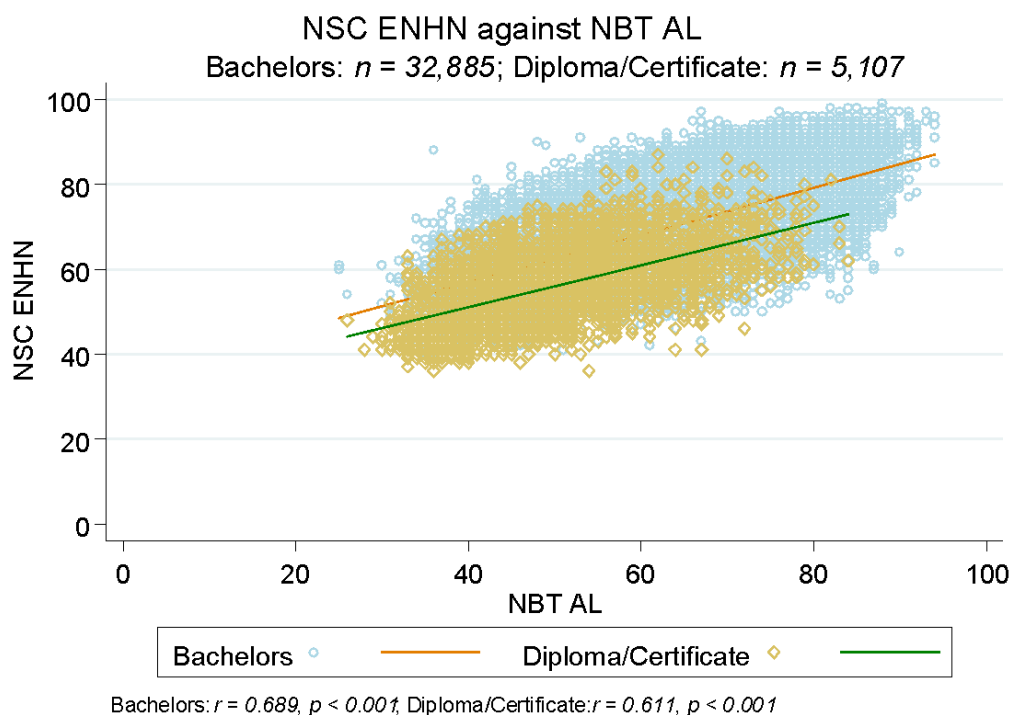


Figure 67 NSC ENHN against NBT AL

Figure 68 shows the scatterplot of NBT AL scores against NSC English First Additional Language (ENFN) scores for candidates who achieved an NSC with either a Bachelor's degree-level pass or Diploma/Certificate level pass who took the NSC English First Additional Language Examination.

The candidates who received a Bachelor's pass and performed at a Proficient level in the NBT AL also performed well on the NSC English First Additional Language examination. This is also supported by the reasonably strong correlation of 0.684 between the NSC English First Additional Language scores and NBT AL scores for the candidates who obtained a Bachelor's pass. The candidates who performed exceptionally well on the NSC English First Additional Language examinations with scores of 80% and above had varying scores on the NBT AL test. A large proportion of candidates with a Bachelor's pass fall within the NBT AL Intermediate band. Most of the candidates who obtained a Diploma/Certificate pass performed equally poorly on the NSC English First Additional Language and NBT AL test. This is supported by the correlation coefficient of 0.590. The figure shows that the majority of these candidates, even though they took the NSC English First Additional Language as a subject, are largely not prepared to cope with the typical academic literacy demands of academic study and they will have severe challenges at university.

Figure 68 shows the scatterplot of associations between NBT AL scores and the NSC scores of those students achieving a Bachelor's level pass as well as those who achieved a Diploma/Certificate level pass and who took the NSC with English First Additional Language examination.

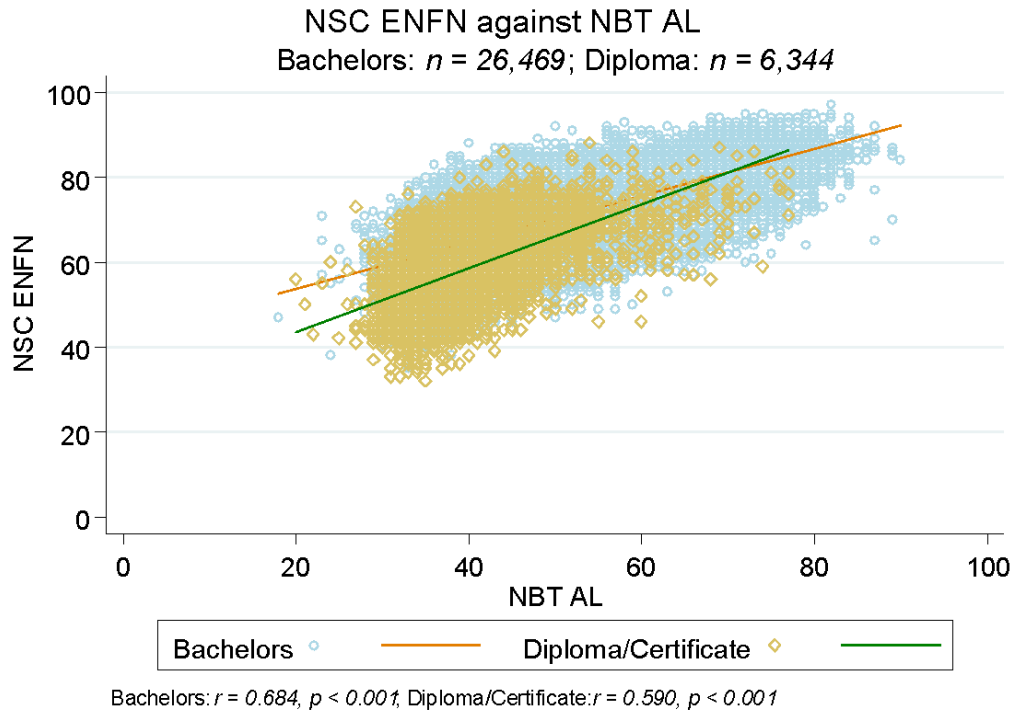


Figure 68 Scatterplot NBT AL vs NSC English First Additional Language

ASSOCIATIONS BETWEEN SCORES ON THE NATIONAL BENCHMARK TEST IN QUANTITATIVE LITERACY AND THE NATIONAL SENIOR CERTIFICATE EXAMINATION FOR MATHEMATICS AND MATHEMATICAL LITERACY

Figures 69 and 70 depict associations between scores on the National Benchmark Test in Quantitative Literacy (NBT QL) and scores on the NSC Mathematics (NSC MTHN) and NSC Mathematical Literacy (MTLN) for two subgroups, those who achieved an NSC with a Bachelor’s degree pass and those who achieved an NSC with a Diploma or Higher Certificate pass, of 2017 intake Higher Education students who wrote the NSC in 2016.

Figure 69 shows the scatterplot of NBT QL scores against NSC Mathematics (MTHN) scores for students who achieved a Degree-level pass as well as those who achieved a Diploma/Certificate-level pass who took the NSC Mathematics examination. There was a correlation of 0.564 between NSC Mathematics and NBT QL for the Bachelor’s degree and a mere 0.230 correlation between NSC Mathematics and NBT QL for Diploma/Certificate candidates. Candidates who obtained the NSC with a Bachelor’s degree pass and performed well on the NSC Mathematics examination, (80% and above), had varying levels of performance on the NBT QL. This was the case for a large portion of these candidates. It can also be clearly seen that even though these candidates performed well on MTHN they will struggle with the quantitative literacy demands of higher education. This figure also clearly shows the complementarity of the information provided by the NBT QL to that provided by the NSC Mathematics (MTHN). Candidates who achieved a Diploma or Higher Certificate NSC pass performed poorly on both the NSC Mathematics and NBT QL. The figure shows that these candidates, even though they did the NSC Mathematics subject, are largely not prepared to cope with the typical quantitative literacy demands of academic study.

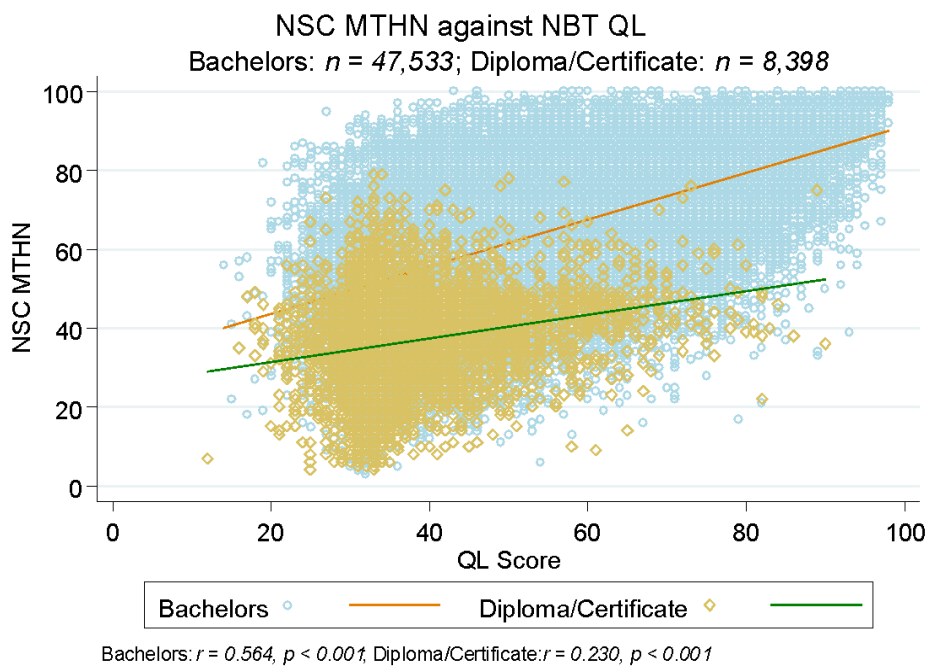


Figure 69 Scatterplot NBT QL vs NSC Mathematics

Figure 70 shows the scatterplot of NBT QL scores against NSC Mathematical Literacy (MTLN) scores for students who achieved an NSC with either a Bachelor’s degree-level pass or a Diploma/Certificate level pass who took the NSC Mathematical Literacy examination.

A very small number of candidates who received a Bachelor’s pass and were Proficient in the NBT QL also performed very well in the NSC Mathematical Literacy test. The relationship between MTLN and QL is clearly not linear and so the correlation between them of 0.696 for the candidates who obtained a Bachelor’s pass must be interpreted with caution. The candidates who performed very well in the NSC Mathematical Literacy examination with scores of 80% and above had varying scores on the NBT QL test. A large proportion of candidates with a Bachelor’s pass falls within the NBT Intermediate band. Most of the candidates who obtained a Diploma/Certificate pass performed equally poorly on the NSC Mathematical Literacy and NBT QL test, which is supported by the correlation coefficient of 0.554. The figure shows that the majority of these candidates, even though they did the NSC Mathematical Literacy as a subject, are largely not prepared to cope with the typical quantitative literacy demands of academic study and they will have severe challenges at university.

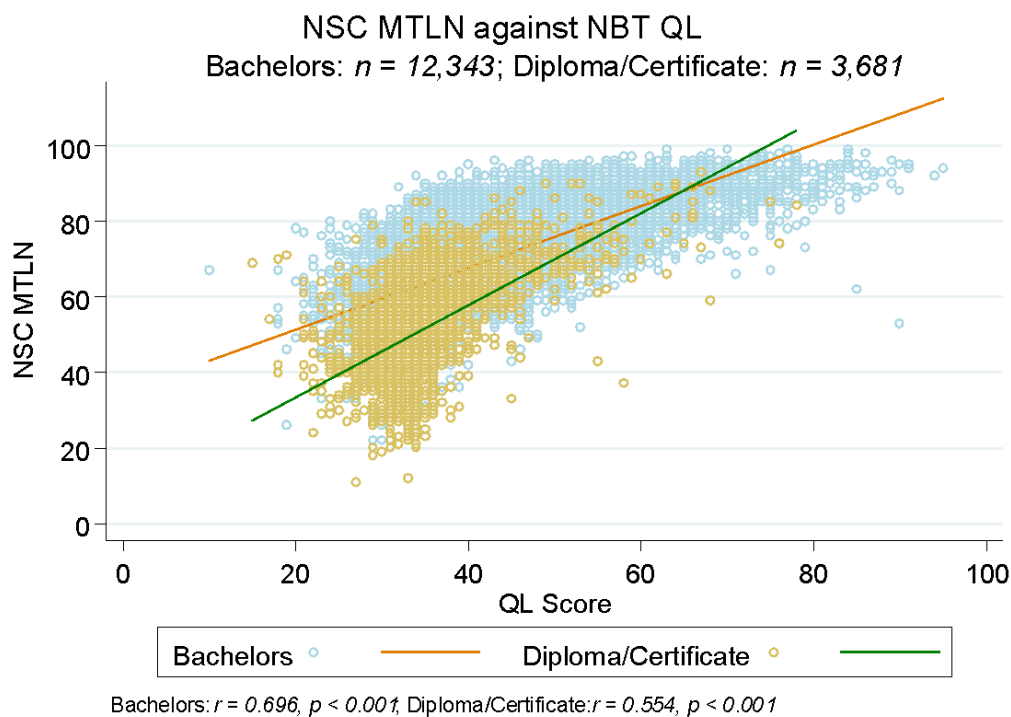


Figure 70 Scatterplot NBT QL vs NSC mathematical Literacy

## ASSOCIATIONS BETWEEN SCORES ON THE NATIONAL BENCHMARK TEST IN MATHEMATICS AND THE NATIONAL SENIOR CERTIFICATE EXAMINATION FOR MATHEMATICS AND PHYSICAL SCIENCE

Figure 71 depicts the association between scores on the NBT MAT and scores on the NSC Mathematics (NSC MTHN) for those who achieved an NSC at a Bachelor's degree level in 2015.

There was a correlation of 0.771 between NSC Mathematics and NBT MAT for the Bachelor's degree candidates. Candidates who obtained the NSC with a Bachelor's degree pass and performed well on the NSC Mathematics examination, (80% and above), had varying levels of performance on the NBT MAT. The figure shows that there are many candidates who did well in the NSC Mathematics but whose scores lie in the Intermediate bands, and even some with scores in the Basic band. This could be indicative of the fact that repeated exposure to past NSC MTHN examination papers may help candidates to be successful in passing an examination, but less successful in acquiring the skills and competencies needed for higher education. Many NSC Mathematics high achievers may in fact be unprepared for the typical mathematical demands of higher education. This figure clearly shows that the NBT MAT provides complementary information to that provided by the NSC MTHN.

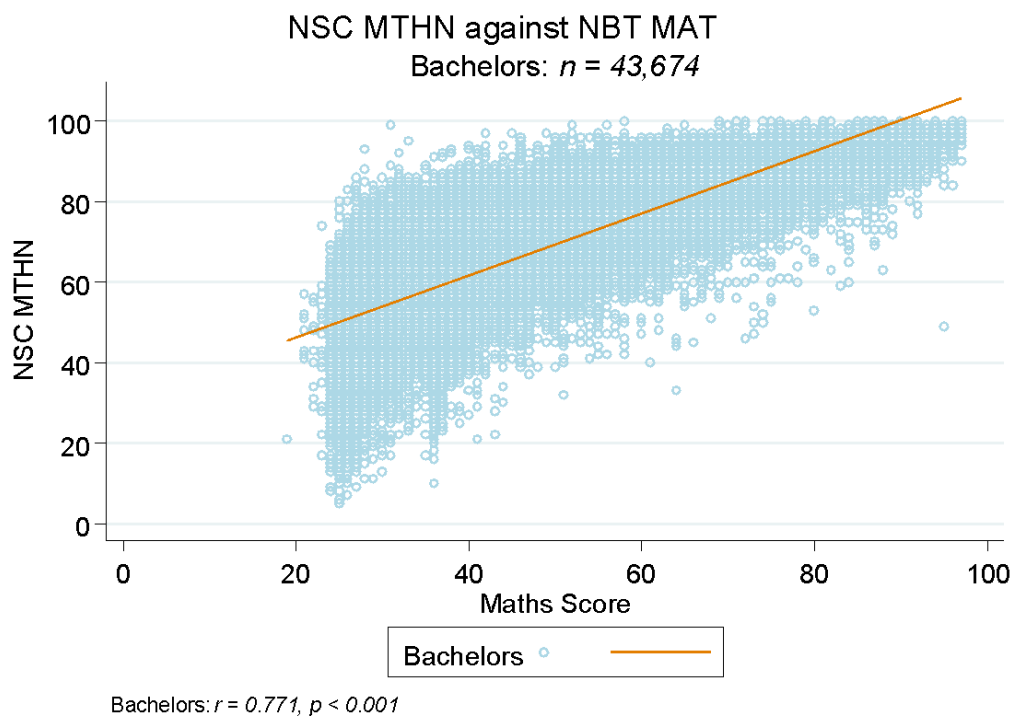


Figure 71 NBT MAT vs NSC MTHN



Figure 72 depicts the association between scores on the National Benchmark Test in Mathematics (NBT MAT) and the scores on the NSC Physical Science (NSC PSCN) for those who achieved an NSC with a Bachelor degree pass, of 2017 intake Higher Education students who wrote the NSC in 2016.

There was a correlation of 0.671 between NSC Physical Science scores and NBT MAT scores for the Bachelor's degree level candidates. Candidates who obtained the NSC with a Bachelor's degree level pass and performed well on the NSC Physical Science examination, (80% and above), again had varying levels of performance on the NBT MAT. The figure shows that even candidates who did well in the NSC Physical Science (80% and above) are in the Intermediate and Basic NBT MAT categories. One of the strengths of the NBT MAT is its ability to spread the scores of the high-achieving students into bands that are more closely aligned with first year performance patterns. A large number of these students will need substantial support if they are to cope with the typical mathematical demands of science courses in higher education.

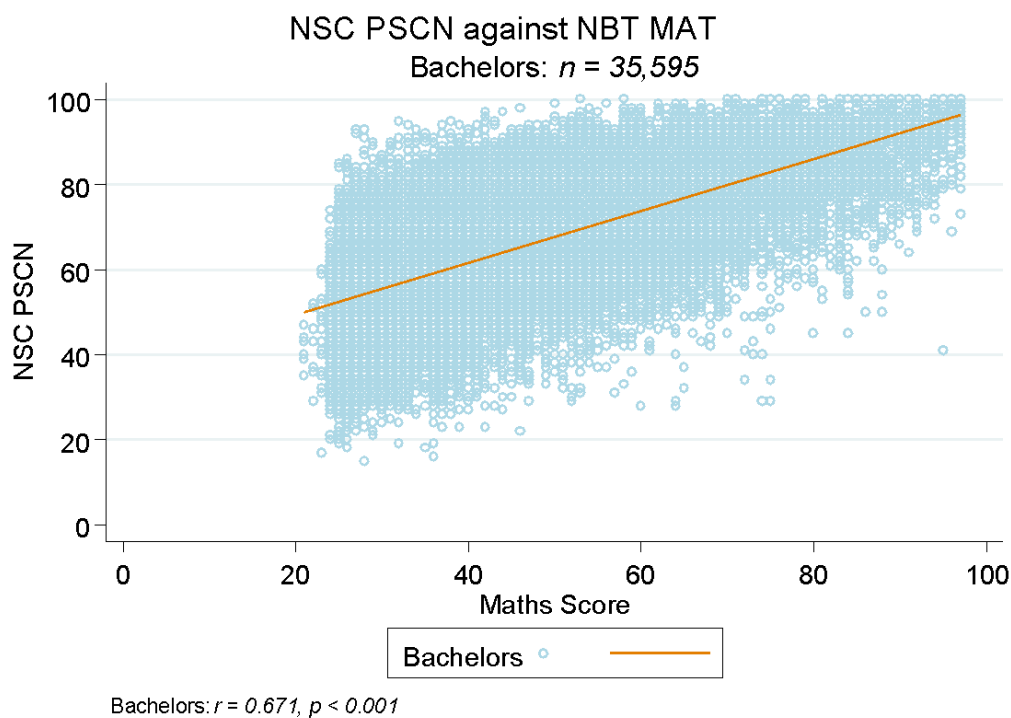


Figure 72 NSC PSCN vs NBT MAT

It is a matter of concern that school leavers (and the same applies to parents and educators) do not recognise the different purposes for which the NSC and NBT were designed. Many people are firmly of the opinion that a high school exit score is representative of adequate preparation for university study. The NBT MAT results resonate more with the experience of lecturers in first year mainstream mathematics (and cognate disciplines) in that they more closely reflect the trends with regard to pass rates at that level.

## 9. CONCLUSION

There is evidence that the NBT is increasing its footprint in South African schools, as indicated by the increase in test sites and test scores between 2016 and 2017. Given data on actual students admitted at institutions, NBT diagnostic information, in the form of subdomain analysis, can provide useful information on teaching and learning. The NBTP team has, since 2015, been running institutional teaching and learning workshops with the purpose of ensuring that the diagnostic information obtained from the tests translates into curriculum development.

This shows that the NBTs are becoming increasingly important not only for informing student preparedness for university entry but also for guiding teaching and learning, particularly in the first year at university.

The national test score results for the 2016 and 2017 intakes are quite consistent and do not deviate much, thus providing supporting information in the reliability of the tests.

The 2017 intake results show that MAT performance is still poor. This remains a major concern. In general proficiency in all subdomains is below 50%, which is worrying, since most of those who wrote the NBTs represent the cream of the students who will ultimately enter university study. Another concern is the extent to which institutions are able to provide the necessary support for the large number of students being admitted who are below the Proficient level in AL, QL or MAT.

More in-depth reports and discussion pieces using NBT data are available as CETAP working papers and can be requested from the Test Development Coordinator.

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