THE NATIONAL BENCHMARK TESTS NATIONAL REPORT

2023 INTAKE CYCLE

February 2024

ACKNOWLEDGEMENTS

The National Benchmark Tests (NBTs) are conducted annually by the Centre for Educational Assessments (CEA) at the University of Cape Town (UCT).

This report is the combined effort of the National Benchmark Tests Project (NBTP) team at the Centre for Educational Assessments:

Contact us:

+27 (21) 650 3523

www.nbt.ac.za || www.cea.uct.ac.za

nbt@uct.ac.za || https://www.facebook.com/NationalBenchmarkTestSA

ABBREVIATIONS

AL	Academic Literacy
ALL	Adult Literacy and Life skills
AQL	Academic and Quantitative Literacy
CAPS	Curriculum and Assessment Policy Statement
CEA	Centre for Educational Assessments
DBE	Department of Basic Education
DHET	Department of Higher Education and Training
ENFN	English First Additional Language
ENHN	English Home Language
HESA	Higher Education South Africa
IRT	Item Response Theory
MAT	Mathematics (NBT)
MTHN	Mathematics (NSC)
MTLN	Mathematical Literacy
NBT	National Benchmark Test
NBT AL	National Benchmark Test in Academic Literacy
NSC	National Senior Certificate
NSC ENFN	National Senior Certificate English First Additional Language
NSC ENHN	National Senior Certificate English Home Language
NSC MTHN	National Senior Certificate Mathematics
NSC MTLN	National Senior Certificate Mathematical Literacy
NSC PSCN	National Senior Certificate Physical Sciences
QL	Quantitative Literacy
UCT	University of Cape Town
USAf	Universities South Africa

Table of Contents

Figures

Tables

EXECUTIVE SUMMARY

The National Benchmark Tests (NBTs) provide a service to higher education institutions requiring additional information to assist in the selection and placement of prospective students in appropriate curricular routes. This report aims to provide an initial analysis of the NBTs written by candidates for entry into higher education institutions in the 2023 academic year. Candidates considered in this report wrote the NBTs from May 2022 to February 2023. The report provides information on test performance and benchmarking. This information forms an essential part of assessing the entry level of a candidate's academic skills in the three domains of Academic Literacy (AL), Quantitative Literacy (QL) and Mathematics (MAT). In the 2023 NBT intake cycle, 52,091 Academic Literacy (AL) test scores, 52,086 Quantitative Literacy (QL) test scores and 39,856 Mathematics (MAT) test scores were obtained. All these scores are provided in the body of the report.

Included in this report are comparisons between the performance of this cohort (2023 Intake) and the previous cohort (2022 Intake). This comparison aims to provide valuable insights into any significant variations or trends that may emerge, enabling the identification of areas that may require additional support or intervention for the incoming 2023 intake.

The report also investigates the relationships between the NBT domains AL, QL and MAT and the cognate National Senior Certificate (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. Section 8 of the report shows the complementarity of the information provided by the NBTs to that provided by the NSC.

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 the 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.

2.   PURPOSE OF THE REPORT

2.1 OBJECTIVE

The objective of this report is to provide an initial analysis of the NBTs written by candidates for entry into higher education institutions in the 2023 academic year. Candidates considered in this report will have written the NBTs between May 2022 and February 2023.

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

2.2 DESCRIPTION OF THE SAMPLE

The sample considered for the 2023 report consists of all NBT candidates who wrote the tests by February 2023. Section 8 considers a subsample of the 2023 NBT intake cohort relating specifically to candidates who have NSC results as well. More detailed notes on this sample are provided in that section.

2.3 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.

o   Data are not collected by the NBTP on the actual placement of all the candidates in faculties or institutions. Caution should therefore be used when drawing conclusions based on the results from the intended faculty of study.

2.4 PLANNED RESEARCH

The Centre for Educational Assessments (CEA) does research on the NBTs and the general preparedness of students beyond what is 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

3.1 PURPOSES OF THE TESTS

The NBTs are designed specifically:

o   To perform a function that is complementary to that of the NSC. They act as a provider of augmented independent and objective information against which the performance of students in the NSC 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.

o   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 in 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.

o   The tests are designed to assess the entry-level preparedness of students in terms of the key areas of AL, QL and MAT. 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.

3.2 AIMS OF THE TESTS

The NBTs are aimed at assessing the pool of school-leaving higher education applicants, 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 AL, QL and MAT levels of proficiency 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 the focus.

3.3 TEST DOMAINS

3.3.1 ACADEMIC LITERACY (AL)

The NBT in AL aims to assess candidates' ability to:

o   read carefully and make meaning from texts that are typical of the kinds that they will encounter in their studies;

o   understand vocabulary, including vocabulary related to academic study, in their contexts;

o   identify and track points and claims being made in texts;

o   understand and evaluate the evidence that is used to support claims made by writers of texts;

o   extrapolate and draw inferences and conclusions from what is stated or given in texts;

o   identify main from supporting ideas in the overall and specific organisation of a text;

o   identify and understand the different types and purposes of communication in texts;

o   be aware of and identify text differences that relate to writers' different purposes, audiences and kinds of communication.

3.3.2 QUANTITATIVE LITERACY (QL)

The NBT in QL aims to assess candidates' ability to:

o   select and use a range of quantitative terms and phrases;

o   apply quantitative procedures in various situations;

o   formulate and apply simple formulae;

o   read and interpret tables, graphs, charts and text and integrate information from different sources, and accurately do simple calculations involving multiple steps;

o   identify trends and patterns in various situations;

o   reason logically;

o   understand and interpret information that is presented visually (e.g., in graphs, tables, flow-charts);

o   understand basic numerical concepts and information used in text, and do basic numerical manipulations;

o   competently interpret quantitative information.

3.3.3 MATHEMATICS (MAT)

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

o   problem solving and modelling, requiring the use of algebraic processes, as well as understanding and using functions represented in different ways;

o   basic trigonometry, including graphs of trigonometric functions, problems requiring solution of trigonometric equations and application of trigonometric concepts;

o   spatial perception (angles, symmetries, measurements, etc.), including representation and interpretation of two- and three-dimensional objects;

o   analytic geometry and circle geometry;

o   data handling and probability;

o   competent use of logical skills.

The MAT tests are not intended 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 (DBE) 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.

3.4 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. Moreover, the tests can provide diagnostic data that could inform student support curriculum intervention. While the two literacy tests are recommended for use for all prospective higher education students, the MAT test should typically be administered to students who wish to study courses that have a 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.

3.5 INFERENCES TO BE MADE FROM TEST SCORES

As the NBTs 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. Curriculum provision will be able to support students who are deemed not to be ready for the demands of mainstream higher education provision without appropriate levels of support, as indicated in Table 1. It is appropriate to interpret certain (lower) levels of performance on the tests as meaning that students will require extensive levels of academic support if they are going to cope with the demands of higher education.

Table 1 Description of NBT tests

Academic and Quantitative Literacy test (3 hours and 5 minutes) The results of the two sections of the AL and QL test are reported separately as percentages and benchmark levels.	The test targets students' o capacity to engage successfully with the reading and reasoning demands of academic study in the medium of instruction; and o 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 the NSC subjects Mathematics and Mathematical Literacy
Mathematics test (3 hours) The results of the test are reported as a percentage and in terms of benchmark levels.	The test targets candidates' ability related to mathematical concepts formally regarded as part of the secondary school Mathematics curriculum

3.6 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 and 5 minutes and 3 hours duration respectively, written on the same day. All applicants write the Academic and Quantitative Literacy (AQL) test. The proportions of items in each domain of this test are as follows: Academic Literacy – 60 to 70%; Quantitative Literacy – 30 to 40%. The AL component of the AQL test currently consists of 75 items and the QL component of the test currently consists of 50 items. The time allocation for the AL and QL sections of the test is two hours and five minutes 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 write only the AL or the QL test. However, as stated

above, the tests have been designed to be written as a set.

3.7 LANGUAGE OF THE TESTS

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

3.8 TEST ITEM-TYPES

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

3.9 TEST SCORING

Writers' responses are recorded on mark-reading sheets that are scanned using Optical Scanner technology. Responses are scored using the unidimensional three parameter (a, b, c[1]) 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.

3.10 TEST REPORTING

Institutions and candidates receive test results for each domain as a percentage score along with the relevant performance benchmark category. As Table 3(found later in this document) indicates, they are also informed about the level of institutional response deemed appropriate to meet educational needs.

3.11 TEST ADMINISTRATION

The NBT AQL and NBT MAT were administered in 25 national sessions, and these consist of 5 online sessions across the cycle and 20 paper-based sessions. The online tests were administered under standardised conditions, as set out in a Test Administration Manual, and the procedures are available from the CEA at UCT. The CEA team has published some research on the transition into offering these two modes of administration (Sango *et al.*, 2022) and continue to conduct analyses and put measures in place to ensure comparability across the various test sessions. Approximately 28% of the candidates for the NBT AL, NBT QL and NBT MAT (Table 2) wrote in the online sessions in this cycle (Intake 2023).

Table 2 NBT Intake 2023: Test administration

Test Administration	Wrote AL		Wrote QL		Wrote MAT	
	n	%	n	%	n	%
Online	14 658	28.14	14 658	28.14	11 508	28.87
Pencil & Paper	37 433	71.86	37 428	71.86	28 348	71.13
Total	52 091	100	52 086	100	39 856	100

---

[1] Where a = discrimination, b = difficulty, and c = guessing/pseudo-chance.

3.12 ITEM AND TEST DEVELOPMENT

Item and test development teams comprise academics from all higher education institutions in South Africa as well as practising teachers. In addition to calls on academics to make themselves available 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 that the teams are representative of all higher education institution types and disciplinary areas. To date, more than 550 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 comprising 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 carried out in November 2022 The NBTP organised and hosted consolidated item and test review workshops for AL, QL and MAT for the 2023 intake cycle tests.

Standard setting for the NBTs is done approximately every three years. The purpose of standard setting study for the NBTs is to establish minimum scores that classify test takers into distinct performance levels. The minimum scores are also described as threshold scores because they specify the minimum score required to breach the threshold of a performance level. Standard setting is a judgment-based process with no empirically correct passing scores (O'Neill, Buckendahl, Plake, & Taylor, 2007). The concept of how much knowledge or skill must be demonstrated on a test, and embodied by a test score, to reach a level of proficiency or performance is a function of the values and expectations of those involved in setting the standard (O'Neill et al., 2007; Tannenbaum & Katz, 2013). In this value-based context, an evaluation of the credibility and meaningfulness of the passing score—the reasonableness of the passing score—is based on the appropriateness of the standard-setting design and the quality of the implementation of the standard-setting process (Papageorgiou & Tannenbaum, 2016).

On behalf of the Centre for Educational Testing for Access and Placement and the National Benchmark Tests Project, a standard-setting study was conducted for the NBTs during the week of October 14th – 19th 2019 by Dr. Wanda D. Swiggett, Ph.D., Educational Testing Service, Princeton, New Jersey, U.S.A. A total of six panels of qualified faculty from universities across South Africa participated in workshops for each of the domains measured by the NBTs (Academic Literacy, Quantitative Literacy, and Mathematics) in order to establish two threshold scores for each of the three domains.

3.13 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 to the NBT Stakeholders' Consultative Forum;

o   Dissemination of information about the NBTP to the higher education sector, the Department of Higher Education and Training (DHET) and the DBE;

o   Revision and resetting of benchmarks for Degree and Diploma study every three years.

3.14 THE NBT BENCHMARKS

The NBTP aims to deliver information against benchmarked categories of performance for formal study at institutions of higher learning. Table 3 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 CEA Test Development Coordinator.

Table 3 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 which suggest 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 are unlikely to cope with mainstream university study.

The score range at which the benchmarks are defined was 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. More detailed description of benchmark levels for each of the NBT domains set is available on request from the CEA Test Development Coordinator. Table 4 shows the benchmarks for Degree study as well as those for Diploma/Higher Certificate study which were set in 2019 and were used to determine the proficiency of the 2023 intake candidates.

Table 4 NBT benchmarks set in 2019 for Degree and Diploma/Higher Certificate study

Proficient	100%	Test performance suggests that future academic performance will not be adversely affected (students may pass or fail at university, but this is highly unlikely to be attributable to strengths or weaknesses in the domains tested). If admitted, students may be placed into regular programmes of study. Degree: AL [69%]; QL [70%]; MAT [69%] Diploma/Certificate: AL [61%]; QL [66%]; MAT [63%]
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 [35%]; QL [40%]; MAT [37%] Diploma/Certificate: AL [33%]; QL [34%]; MAT [33%]
Basic	0%	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.

In addition, the Intermediate performance band is divided into Intermediate Upper and Intermediate Lower, as shown in Table 5. 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 5 NBT Intermediate benchmarks and how they should be interpreted

	Intermediate Upper	Assessment of need	Intermediate Lower	Assessment of need
AL	Degree: [52-68] Diploma/Certificate: [47-60]	Students are likely to need complementary support (additional tutorials, workshops, augmented courses, language intensive work).	Degree: [35-51] 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: [53-68] Diploma/Certificate: [48-62]		Degree: [37-52] Diploma/Certificate: [33-47]	

3.15 INSTITUTIONS AND ORGANIZATIONS USING THE NBTS

48 institutions requested and received scores from the NBTP during the 2023 intake cycle by February 2023. The NBTs were used for a variety of purposes 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.

3.16 ACCESSIBILITY OF THE NBT PROJECT

In the 2023 intake cycle, the test sessions were offered pencil and paper and online. In the national sessions, the NBT tests were offered to 91,947 writers. AQL tests were written by 52,091 candidates for AL and 52,086 candidates for QL, and MAT tests were written by 39,856 candidates (different tests are written to maintain the security and integrity of the tests).

The CEA is dedicated to ensuring that the NBT tests are accessible to all prospective NBT writers. In addition to ensuring physical access to test venues through its extensive footprint across Southern Africa, the team collaborates with disability units nationally to review and optimise our offerings. The CEA is proud to report that in the 2023 Intake, 194 writers requiring special accommodations were catered to. These include accommodations for tests written in braille, large print tests, special venues to accommodate students with mobility challenges, and a host of other special accommodations.

4. DEMOGRAPHIC CHARACTERISTICS OF THE 2023 INTAKE NBT CANDIDATES

Candidates writing the NBTs for the 2023 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 65.81% females, and 65.73% indicated their population group as black. The NBT candidates appear to be representative of the demographic characteristics of the national cohort of higher education applicants.

Table 6 Frequency tables for selected self-reported demographic characteristics for the 2023 Intake

	Wrote AL		Wrote QL		Wrote MAT	
	n	%	n	%	n	%
GENDER						
Male	15 934	31.41	15 933	31.41	12 651	32.6
Female	33 381	65.81	33 377	65.81	25 080	64.62
Unspecified	1 409	2.78	1 409	2.78	1 078	2.78
Total	50 724	100	50 719	100	38 809	100
POPULATION GROUP						
Black	33 343	65.73	33 340	65.73	25 882	66.69
Coloured	5 951	11.73	5 949	11.73	3 564	9.18
Indian/Asian	3 478	6.86	3 478	6.86	3 146	8.11
White	5 104	10.06	5 104	10.06	4 050	10.44
Other	188	0.37	188	0.37	135	0.35
Unspecified	2 660	5.24	2 660	5.24	2 032	5.24
Total	50 724	100	50 719	100	38 809	100
CITIZENSHIP						
South African	45 574	89.85	45 570	89.85	34 889	89.9
SADC county	1 455	2.87	1 454	2.87	1 066	2.75
Other African country	681	1.34	681	1.34	531	1.37
Other	392	0.77	392	0.77	320	0.82
Unspecified	2 622	5.17	2 622	5.17	2 003	5.16
Total	50 724	100	50 719	100	38 809	100
GR 12 LANGUAGE						
Afrikaans	2 857	5.63	2 857	5.63	1 959	5.05
English	43 910	86.57	43 905	86.57	33 753	86.97
Other	1 316	2.59	1 316	2.59	1 073	2.76
Unspecified	2 641	5.21	2 641	5.21	2 024	5.22
Total	50 724	100	50 719	100	38 809	100
HOME LANGUAGE						
Afrikaans	3 019	5.95	3 019	5.95	2 060	5.31
English	15 954	31.45	15 950	31.45	11 856	30.55
isiNdebele	392	0.77	392	0.77	323	0.83
isiXhosa	8 276	16.32	8 275	16.32	5 853	15.08
isiZulu	5 959	11.75	5 959	11.75	4 797	12.36
Sesotho	3 647	7.19	3 647	7.19	2 971	7.66
Sesotho sa Leboa	2 781	5.48	2 781	5.48	2 488	6.41
Setswana	2 898	5.71	2 898	5.71	1 971	5.08
siSwati	1 170	2.31	1 170	2.31	978	2.52
Tshivenda	1 470	2.9	1 470	2.9	1 366	3.52
Xitsonga	1 635	3.22	1 635	3.22	1 400	3.61
Other Language	860	1.7	860	1.7	710	1.83
Unspecified	2 663	5.25	2 663	5.25	2 036	5.25
Total	50 724	100	50 719	100	38 809	100

5. PERFORMANCE OF THE 2023 INTAKE

5.1 TEST PERFORMANCE OF THE 2023 INTAKE NBTP CANDIDATES

For the 2023 intake cycle, registration opened on 1 April 2022. The NBT tests were made available in both English and Afrikaans, the two official languages of instruction at South African higher education institutions for the 2023 intake cycle.

The scores indicated below are those of candidates who wrote the NBTs for the 2023 intake cycle. The NBT candidates represent the demographic characteristics of the national cohort of higher education applicants.

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 77 shows the descriptive statistics for the cohort as a whole. The distributions on both the QL and the MAT tests were positively skewed (see the histograms in Figure 1 and box-and-whisker plots in Figure 2).

5.1.1 DESCRIPTIVE STATISTICS

Table 7 Descriptive statistics for AL, QL and MAT for the 2023 Intake

NBT Test	n	Mean	SD	Minimum	1st Quartile	Median	3rd Quartile	Maximum
AL	52 091	55.99	14.43	10.00	44.00	55.00	68.00	97.00
QL	52 086	46.26	14.99	9.00	35.00	41.00	55.00	99.00
MAT	39 856	43.07	16.76	16.00	30.00	37.00	52.00	98.00
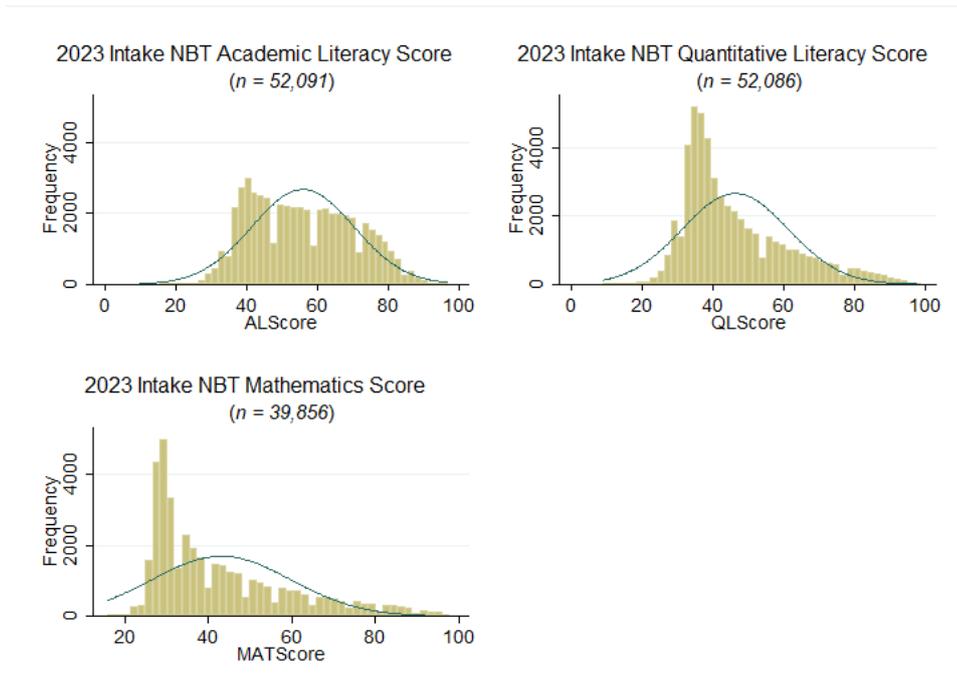
Figure 1 NBT test scores distribution for 2023 intake
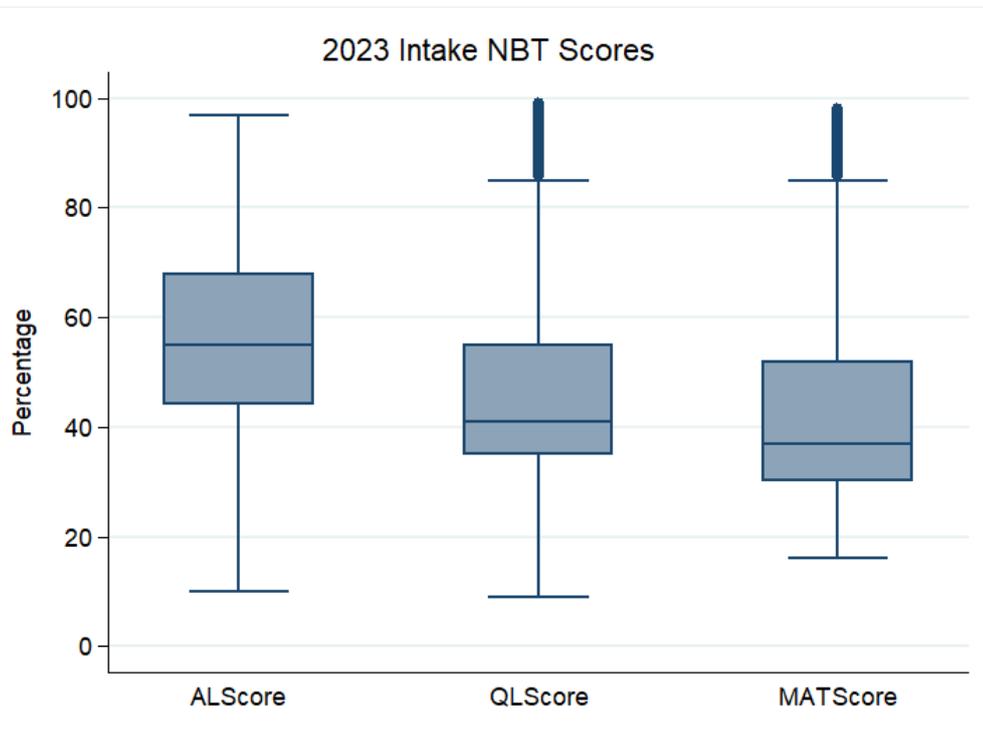
Figure 2 NBT test scores for 2023 intake

5.2 2023 NBT COHORT BY PERFORMANCE LEVELS

Table 8 represents the performance within criterion-referenced degree benchmark levels for the 2023 intake cycle as a whole. These candidates were placed into four benchmark levels: Basic, Intermediate Lower, Intermediate Upper and Proficient (see Figure 3). The interpretation of benchmark levels was discussed in the section relating to the NBT benchmarks earlier in this document.

The performance of the 2023 intake cohort strongly suggests that the higher education sector needs to be prepared to provide extensive support in QL and MAT, since as many as 90% of their prospective students are likely to have scores that fall within the Basic and Intermediate benchmark bands.

Table 8 Frequency table for the degree benchmark levels of the 2023 Intake

NBT tests	Basic	Intermediate Lower	Intermediate Upper	Proficient	Total (n)
Academic Literacy	1 786 (3.43%)	20 554 (39.46%)	17 691 (33.96%)	12 060 (23.15%)	52 091
Quantitative Literacy	23 254 (44.65%)	15 809 (30.35%)	7 869 (15.11%)	5 154 (9.90%)	52 086
Mathematics	19 364 (48.58%)	10 731 (26.92%)	5 544 (13.91%)	4 217 (10.58%)	39 856
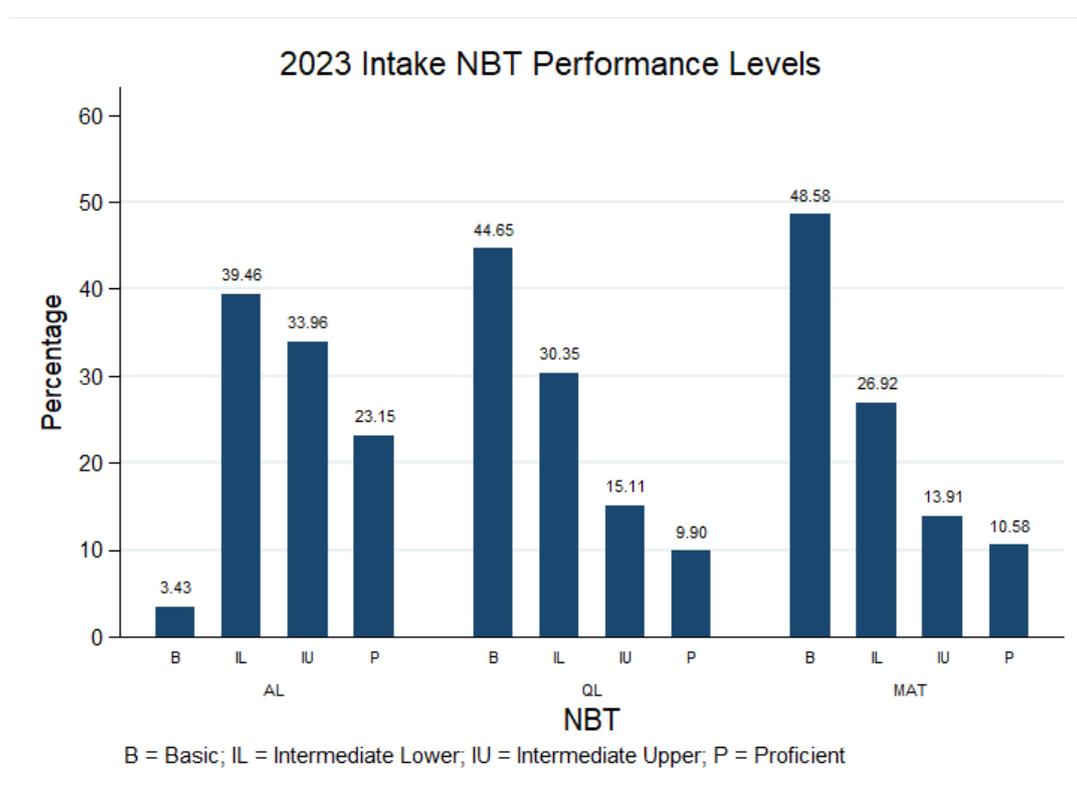
Figure 3 2023 Intake - NBT performance levels for AL, QL and MAT

Basic band

The number of candidates with scores in the Basic band is significant for QL and MAT (see Table 88 and Figure 3). Approximately 49% of the candidates had MAT scores in the Basic band and about 45% of the QL candidates had scores in the Basic band. The prediction is that these candidates will require extensive support if they are to have a chance of succeeding in higher education study.

Intermediate band

Table 88 and Figure 3 above show that roughly 41% of candidates had MAT scores in the Intermediate benchmark level (both Intermediate Lower and Upper) and about 46% of candidates had QL scores in the

Intermediate benchmark level, while about 73% of the candidates had AL scores in the Intermediate category.

Proficient band

The Proficient band can be interpreted to mean that academic progress in higher education should not be limited or negatively affected by ability in this domain. As can be seen from both Table 8 and Figure 3 above, the percentage of candidates with Proficient scores in QL and MAT is quite low – about 10% for QL and 11% for MAT. Although the percentage of candidates with Proficient scores in AL was approximately 23%, this still does not represent the majority of the candidates.

5.3 PERFORMANCE ON NBTS 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 who intend to apply to Health Sciences faculties are required to write the NBTs as part of the admission process. The use of NBTs 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.

5.3.1 AL PERFORMANCE BY INTENDED FACULTY

The AL performance of candidates across all the faculties is presented in Figure 4.

Proficient band

Overall, the proportion of candidates with scores in the Proficient band for faculties such as Science/Mathematics (38%), Humanities (27%), Engineering/Built Environment (29%), Information and Communication Technology (ICT) (25%), and Business/Commerce/Management (30%) were relatively high, all 25% or more of their respective cohorts. The cohorts with the lowest proportions of candidates in the Proficient band were Education (4%) and Allied Healthcare/Nursing (9%). The small proportion of candidates with scores in this 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 AL support.

Intermediate band

A high proportion of candidates fell in the Intermediate band – both Intermediate Lower and Upper. The proportion of candidates in the Intermediate Lower performance band ranges from 25% to 67%. The high number of candidates with scores in the Intermediate Lower performance bands Allied Healthcare/Nursing (64%) and Education (67%) is an indication of the high proportion of candidates who would require additional AL support while undertaking their academic studies at universities.

Basic band

The faculty with the highest proportion of candidates in the Basic band was Education (11%) and these candidates would require considerable AL support in order to cope with the academic demands of tertiary level study.

2023 Intake NBT Academic Literacy Performance Levels By Intended FACULTY of Study
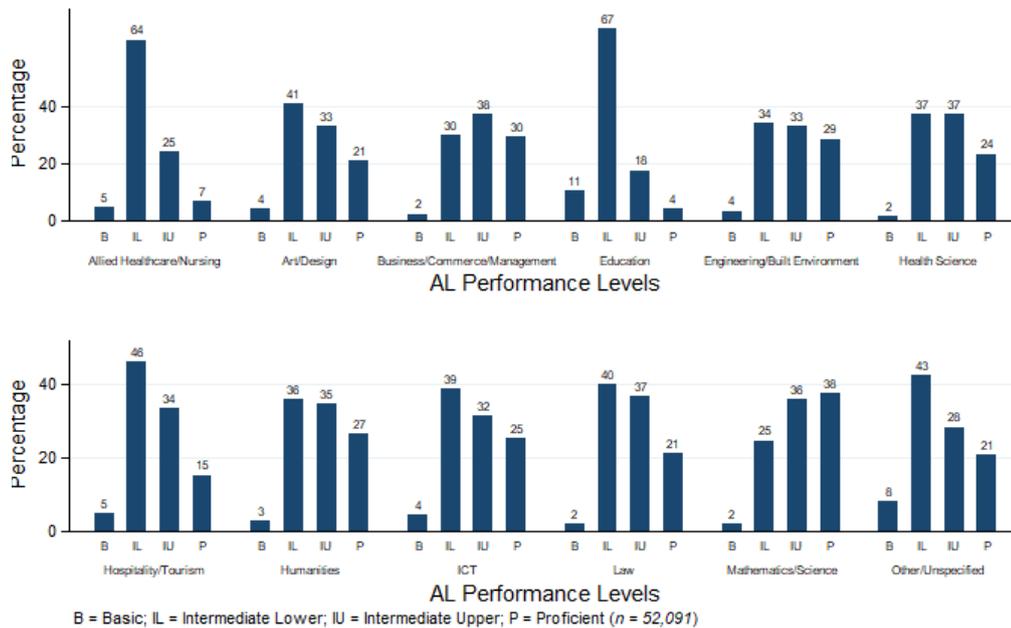
Figure 4 NBT Academic Literacy performance levels by intended faculty of study

5.3.2 QL PERFORMANCE BY INTENDED FACULTY

The QL performance of candidates across all the faculties is presented in Figure 5.

Proficient band

Overall, the proportion of candidates with scores in the Proficient band for the faculties were relatively low, with all apart from Engineering/Built Environment (17%) and Mathematics/Science (21%) being 15% and below. 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 can be expected to cope with academic study at university without additional QL support.

Intermediate band

Overall, for each faculty the proportion of candidates with scores in the Intermediate Lower band were between 25% and 35%. The proportion of candidates with scores in the Intermediate Upper band were between 4% and 22%. Faculties such as Health Sciences (52%), Business/Commerce/Management (51%) Engineering/Built Environment (49%) and Mathematics/Science (50%) have higher proportions of candidates in the Intermediate band (Intermediate Lower and Upper combined). These results are an indication of the relatively high proportion of candidates who would require additional QL support while undertaking their academic studies at universities. These courses are reliant on QL and candidates will need support. Not all candidates may require QL support to the same extent, as this depends on the courses they undertake, and some courses have minimal or no QL content.

25

Basic band

The proportion of candidates with QL scores in the Basic band was very high: Education (75%), Allied Healthcare/Nursing (68%), Hospitality/Tourism (54%), Law (53%), Art/Design (53%), and Humanities (51%). These candidates would require considerable QL support in order to cope with the academic demands of tertiary-level study. Quantitative faculties such as Health Sciences (38%), Business/Commerce/Management (35%), Engineering/Built Environment (33%) and Mathematics/Sciences (25%) had the smallest proportions of candidates with scores in the Basic band.
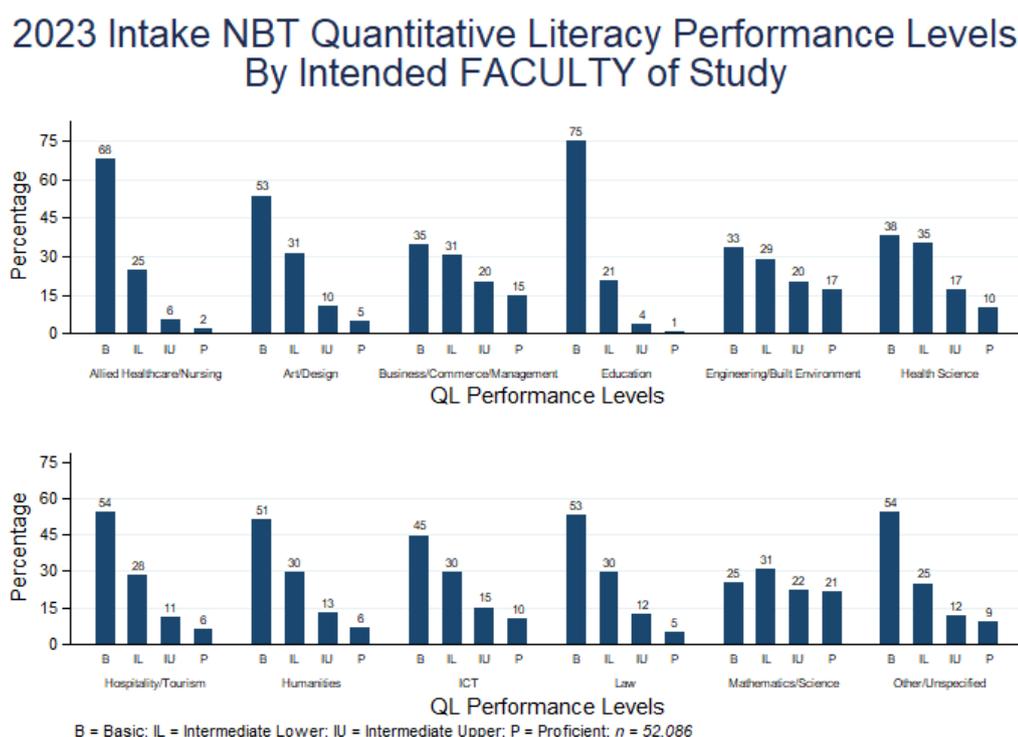
Figure 5 NBT Quantitative Literacy performance levels by intended faculty of study

5.3.3 MAT PERFORMANCE BY INTENDED FACULTY

The performance levels in MAT are indicated in Figure 6.

Proficient band

The highest numbers of Proficient scores in MAT reflect candidates who intend to study in the following faculties: Mathematics/Science (20%), Engineering/Built Environment (16%), Business/Commerce/ Management (13%), and Health Sciences (11%). This is a matter of concern since these programmes include Mathematics courses. The percentage of scores in the Proficient band for Allied Healthcare/Nursing (2%) is a problem if a sizeable proportion of these candidates are intending to become healthcare professionals.

Intermediate band

A high proportion of candidates' MAT scores fell in the Intermediate band, both Intermediate Lower and Upper. The faculties of Mathematics/Sciences (50%), Engineering/Built Environment (45%), Health Sciences (45%), Business/Commerce/Management (43%), and Hospitality/Tourism (43%) have higher

proportions of candidates in the Intermediate band (Intermediate Lower and Upper combined). These candidates will all require additional curriculum-integrated support if they are to succeed in the Mathematics (or Mathematics-related) courses that they undertake. In some faculties (e.g., Law, Hospitality/Tourism) the programmes do not have a Mathematics component, but those faculties that do (e.g., Science/Mathematics and Engineering/Built Environment) will need to carefully consider the type of support that they need to provide, and the extent thereof.

Basic band

Across all the faculties, the proportion of candidates with scores in the Basic band was the largest. The faculties with the highest proportions of candidates in this band were Education (85%), Allied Healthcare/Nursing (77%), Law (69%), Art/Design (68%) and Humanities (67%). It is unlikely that these candidates will cope with the Mathematics component of their courses should it be a requirement for their chosen discipline.
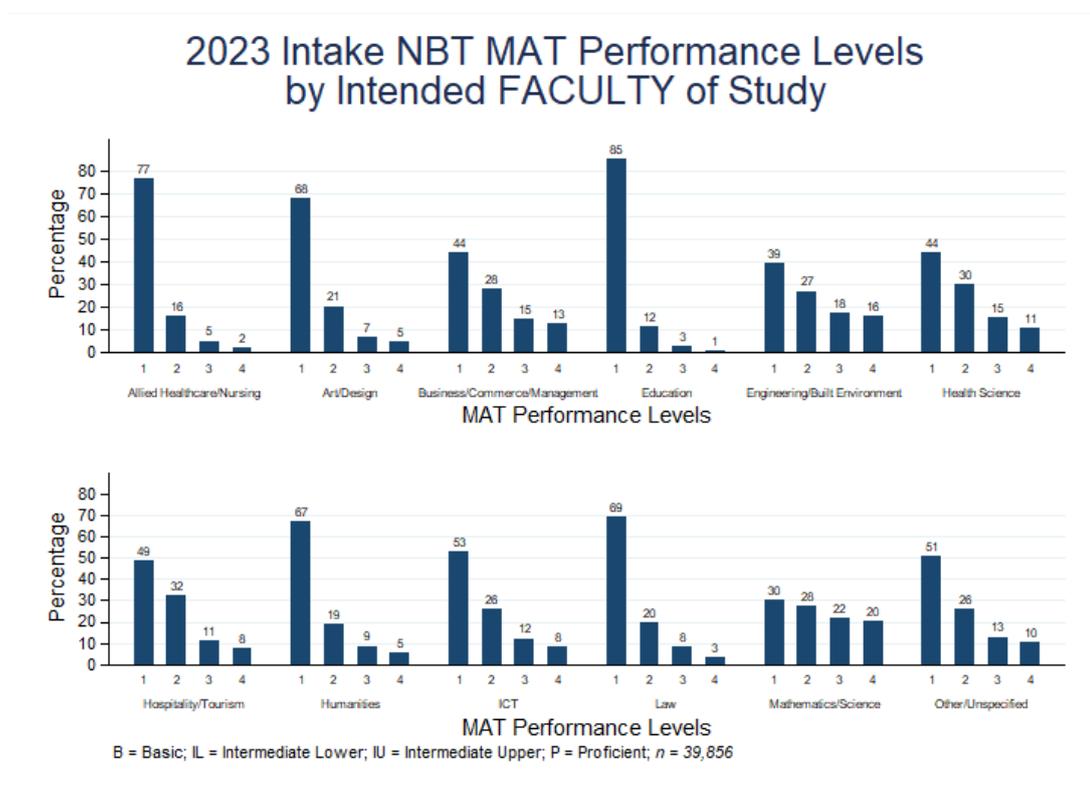
Figure 6 MAT performance levels by intended programme of study, 2023 intake cycle

5.4 PERFORMANCE ON THE NBTs BY TEST LANGUAGE

This section reports a comparison in performance by candidates who wrote the NBTs in English and Afrikaans. A total of 49 829 (95.67%) candidates wrote the NBT AQL in English and 38 212 (95.88%) candidates wrote the NBT MAT in English. The number of candidates who wrote NBTs in Afrikaans is substantially lower, as expected: 2 257 (4.33%) for NBT AQL and 1 644 (4.12%) for NBT MAT. This information is summarised in Table 9 below.

AQL/MAT test language	Wrote AL		Wrote QL		Wrote MAT	
	n	%	n	%	n	%
Afrikaans	2 257	4.33	2 257	4.33	1 644	4.12
English	49 834	95.67	49 829	95.67	38 212	95.88
Total	52 091	100.00	52 086	100.00	39 856	100.00

Table 10 reports the descriptive statistics for the Afrikaans and English NBT cohorts of the 2023 intake cycle. 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. However, further research and analysis is required (including testing the significance of the difference).

Table 10 Descriptive statistics for AL, QL, and MAT of the 2023 Intake by test language

NBT Test	Test language	n	Mean, %	SD, %	Min., %	1st Quartile, %	Median, %	3rd Quartile, %	Max., %
AL	Afrikaans	2 257	58.82	12.94	28	49	60	69	89
	English	49 834	55.87	14.48	10	43	55	67	97
QL	Afrikaans	2 257	52.29	16.55	12	38	50	65	96
	English	49 829	45.98	14.86	9	35	41	54	99
MAT	Afrikaans	1 644	48.32	18.13	22	33	44	61	98
	English	38 212	42.84	16.66	16	30	37	52	98

5.4.1 AL PERFORMANCE ON TESTS WRITTEN IN AFRIKAANS AND ENGLISH

The proportion of candidates who had scores in the Intermediate band (Intermediate Upper and Lower) was slightly higher in the subgroup of candidates who wrote the NBT AL in English (73.51%) than their peers who wrote the test in Afrikaans (71.33%), while a higher proportion of those writing in English (3.49%) had scores in the Basic band compared to those writing in Afrikaans (2.13%). In terms of the Proficient band, the proportion of candidates with scores in this band was 26.54% of those who wrote in Afrikaans and 23% of the candidates who wrote in English respectively (see Figure 7). Although there is not a marked difference between the two groups in terms of the combined Proficient scores, it is important to note the difference in the distribution of candidates between these two categories.
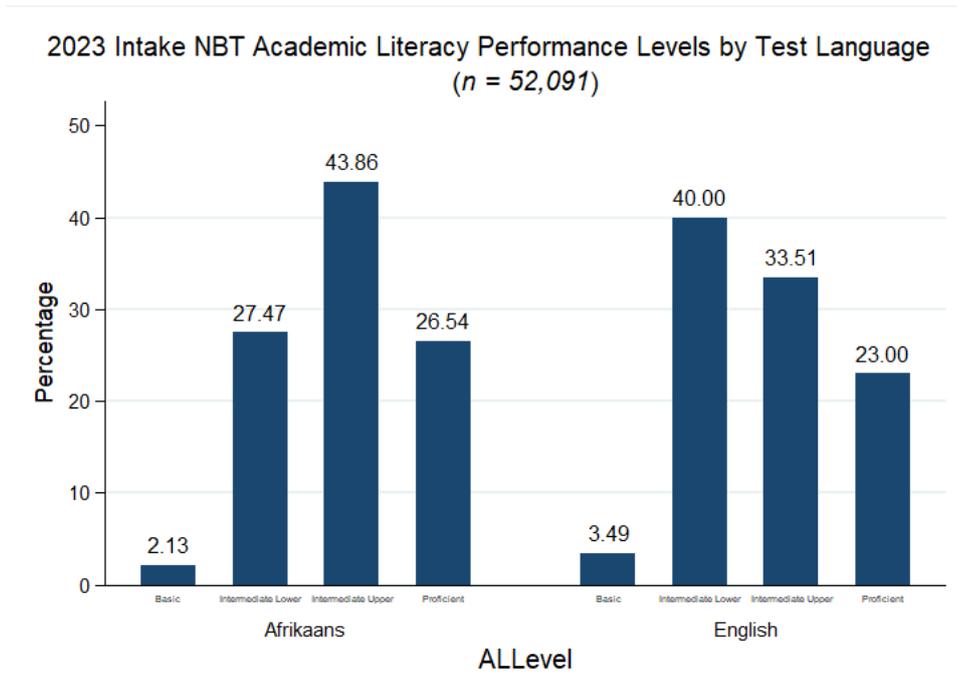
Figure 7 2023 Intake: NBT AL performance levels by test language

5.4.2 QL PERFORMANCE ON TESTS WRITTEN IN AFRIKAANS AND ENGLISH

Of the Afrikaans candidates who wrote the QL tests in this cycle, 18.43% of the scores fell in the Proficient band and 29.11% of the scores were in the Basic band (Figure 8). The English writers, on the other hand, showed a slightly different performance picture: 9.51% of the scores fell within the Proficient band, while 45.35% of the scores fell within the Basic band. The Afrikaans writers are a smaller group of candidates, but it is still important to note these differences in the performance distribution, as shown in Figure 8.
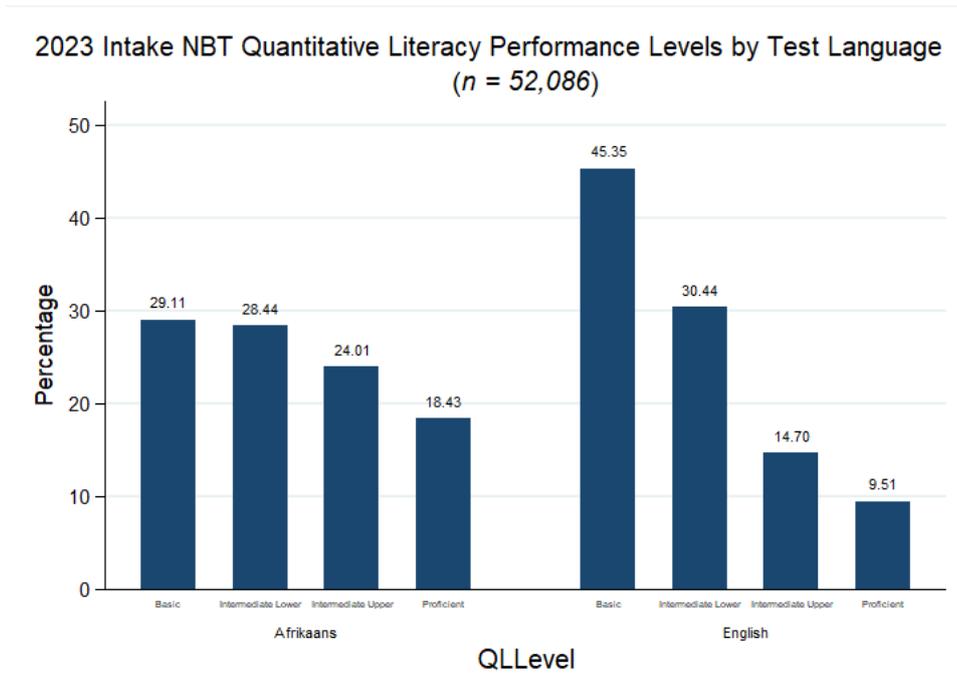
Figure 8 2023 Intake: NBT QL performance levels by test language

5.4.3 MAT PERFORMANCE ON TESTS WRITTEN IN AFRIKAANS AND ENGLISH

The graph in Figure 9 shows that 16.18% of those who wrote the MAT test in Afrikaans had scores in the Proficient category, compared to 10.34% of the English group. Of those who wrote the MAT test in Afrikaans, 34.67% had scores in the Basic category, compared to 49.18% of the candidates in the English group.
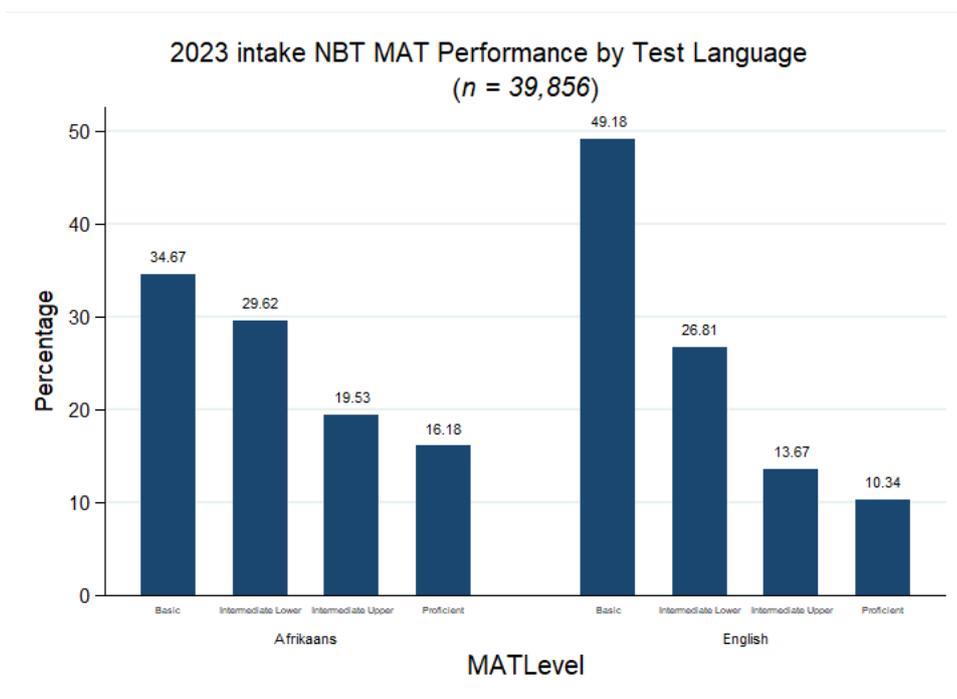
Figure 9 2023 Intake: NBT MAT performance levels by test language

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

This section reports the comparisons between South African candidates and non-South African candidates. The 2023 intake NBT cohort included candidates who reported themselves as non-South African citizens (Table 11 and Table 12). These candidates reported themselves as being SADC citizens, citizens of other African countries, or citizens elsewhere.

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

	Wrote AL		Wrote QL		Wrote MAT	
	n	%	n	%	n	%
South African	46 808	89.86	46 804	89.86	35 835	89.91
Non-South African	2 621	5.03	2 620	5.03	1 988	4.99
Unspecified	2 662	5.11	2 662	5.11	2 033	5.10
Total	52 091	100	52 086	100	39 856	100

Table 12 Scores: SA citizens vs non-SA candidates

	n	Mean	sd	min	p25	p50	p75	max
AL SCORE								
South African	46 808	55.73	14.35	10	43	54	67	96
Non-South African	2 621	60.53	13.70	21	50	62	71	97
Total	52 091	55.99	14.43	10	44	55	68	97
QL SCORE								
South African	46 804	46.11	14.89	9	35	41	54	99
Non-South African	2 620	49.74	15.61	17	37	46	60	98
Total	52 086	46.26	14.99	9	35	41	55	99
MAT SCORE								
South African	35 835	42.90	16.68	16	30	37	52	98
Non-South African	1 988	46.24	17.78	19	31	41	57,5	98
Total	39 856	43.07	16.76	16	30	37	52	98

5.5.1 AL PERFORMANCE BY CITIZENSHIP

A higher proportion of the non-South African candidates (31.86%) had scores that fell into the Proficient band compared to the South African candidates (22.47%) and the unspecified group (26.63%). Also, a higher proportion of the South African candidates (3.24%) had scores in the Basic band compared to the non-South African candidates (2.17%) but the group with unspecified citizenship had the highest proportion in the Basic band with 8.04%. In terms of the Intermediate bands (Intermediate Upper and Lower), 74.3% of South African candidates' scores, 65.97% of the non-South African candidates' scores, and 65.33% of the unspecified candidates' scores fell into these bands, respectively (Figure 10).
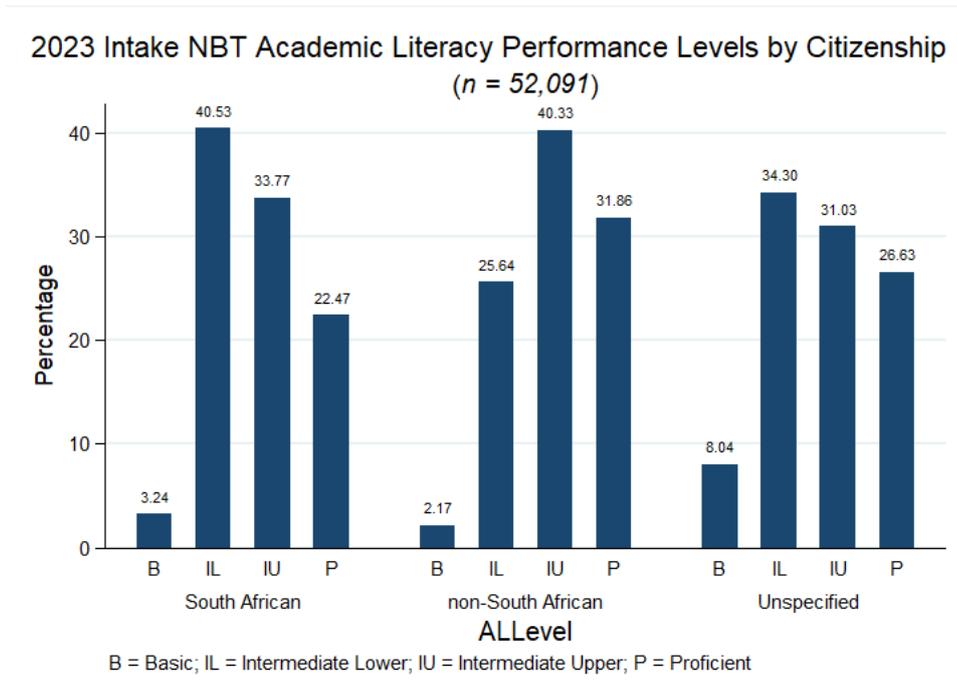
Figure 10 2023 Intake: NBT AL performance levels by citizenship

5.5.2 QL PERFORMANCE BY CITIZENSHIP

Non-South African and South African candidates for QL who wrote the tests are represented in Figure 11. The results show that 12.67% of non-South Africans had scores that were in the Proficient band compared to 9.71% of the South African group. The proportion of candidates with scores in the Basic band for the South African group was 44.94%, the non-South African group was 32.29%, and the group with unspecified citizenship, 51.58%. It appears that both groups of candidates would require QL support.
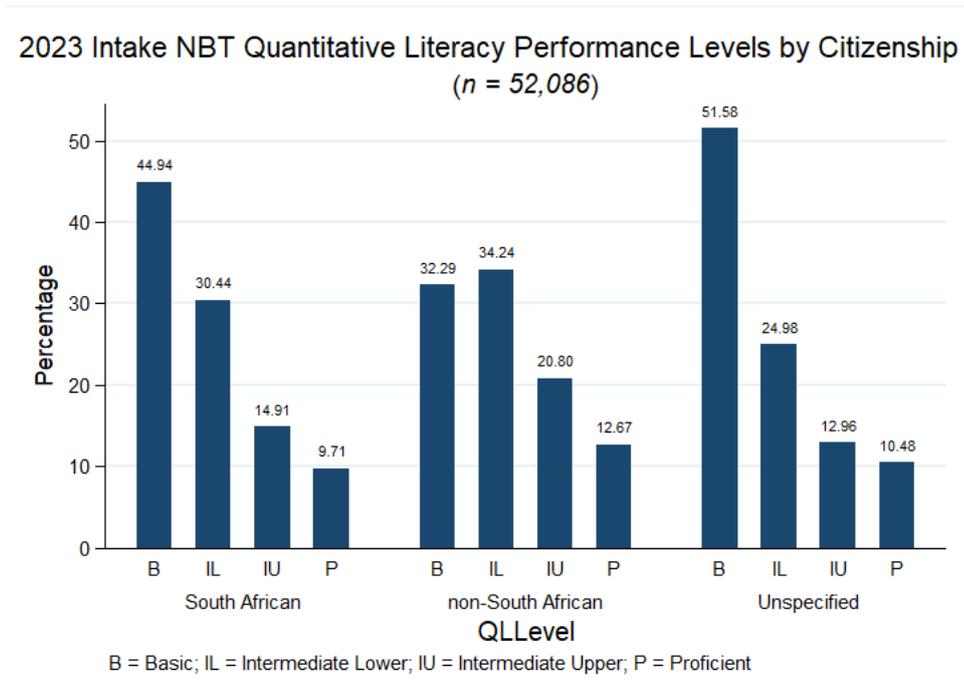
Figure 11 2023 Intake: NBT QL performance levels by citizenship

5.5.3 MAT PERFORMANCE BY CITIZENSHIP

Of the non-South African candidates, 14.49% had scores in the Proficient band, compared to 10.38% of the South African candidates (10.28% of candidates with unspecified citizenship fell in this band); 40.44% of the non-South African candidates had scores in the Basic band, compared to 49.06% of the South African candidates whose scores were in the Basic band (48.25% of candidates with unspecified citizenship fell in this band). The difference in the Basic band is somewhat offset by the difference in the Intermediate Lower band (26.73% of the South African group; 28.87% of the non-South African candidates). The non-South African candidates appeared to have performed slightly better in MAT than the South African candidates.
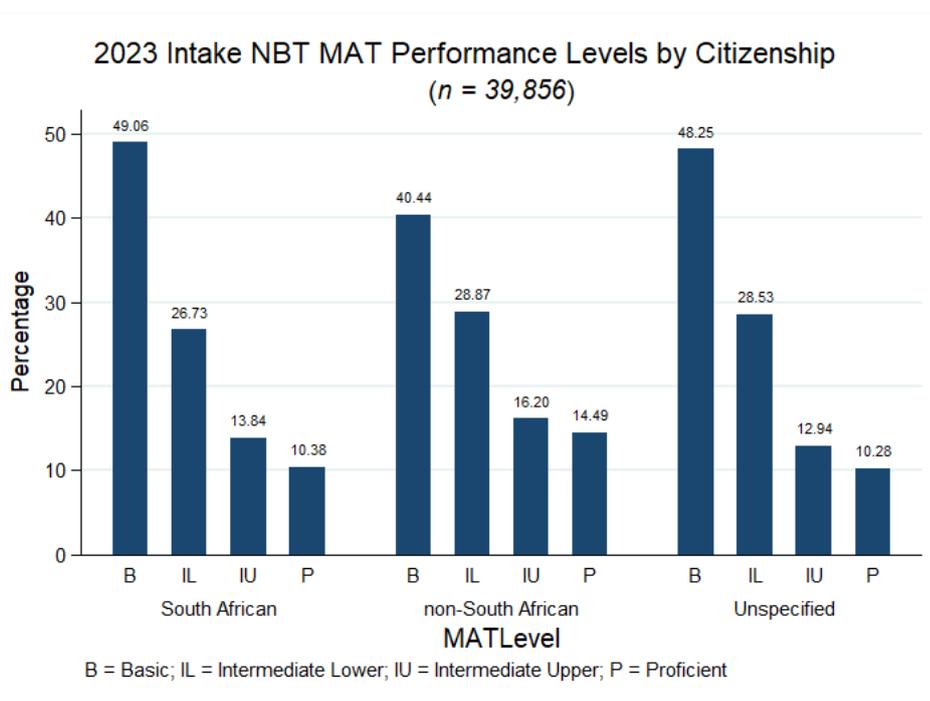
Figure 12 2023 Intake: NBT MAT performance levels by citizenship

5.6 PERFORMANCE ON NBTS AT SUBDOMAIN LEVEL

The main uses of NBT data by institutions are for the admission (selection and appropriate placement) of students and for curriculum development (to inform teaching and learning). Once these students are accepted at institutions, the NBTs can be used for providing information about the academic needs of these 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 that they actually have. The subdomain analysis for the various faculties, programmes and courses 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 analysis also highlights 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 or 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 2023 intake NBT cohort. This analysis can meaningfully contribute to making institutional teaching and learning initiatives more responsive to the actual needs of students.

The analysis by subdomain is based on the intended faculty of study indicated by the candidates when they write the NBTs. 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 NBTP on the actual placement of all the candidates in faculties or institutions. Caution should therefore be used when decisions are made based on the results from the intended faculty of study.

5.6.1 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 AL on which the test is based has a well-theorised history (see, for example, Bachman & Palmer, 1996; Cummins, 2000; Yeld, 2001; Cliff, Yeld & Hanslo, 2003; Cliff & 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 & Pearce, 2007; Cliff & Hanslo, 2009). The construct of the test is summarised in Table 13 below.

Table 13 Descriptions of the AL Subdomains

Subdomain assessed	Description
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 are 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, based on either what is stated in texts or what 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 *genre*	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 2023 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 (with a twelfth graphic for applicants who indicated "Other" as their faculty choice) and show the distributions of student scores on the different subdomains of the NBT AL. In addition, Table 14 provides a summary of the performance distribution per AL subdomain for the entire 2023 intake cohort and Table 15 consists of the AL subdomains median (p50) performance indicator per faculty.

Table 14 The performance distribution on the NBT AL subdomains

	N	mean	sd	min	p25	p50	p75	max
Cohesion	52 091	63.77	19.35	0.00	50.00	62.00	75.00	100.00
Communicative function	52 091	50.40	21.71	0.00	28.00	50.00	71.00	114.00
Discourse relations	52 091	53.50	25.12	0.00	33.00	57.00	80.00	100.00
Essential/ non-essential	52 091	61.33	20.70	0.00	44.00	66.00	77.00	108.00
Grammar/ syntax	52 091	60.89	26.90	0.00	40.00	60.00	80.00	100.00
Inferencing	52 091	51.89	20.26	0.00	36.00	55.00	68.00	100.00
Metaphorical expression	52 091	48.44	19.86	0.00	33.00	44.00	66.00	100.00
Text genre	52 091	45.59	27.48	0.00	33.00	50.00	66.00	100.00
Vocabulary	52 091	51.67	22.24	0.00	33.00	50.00	66.00	100.00

Table 15 AL subdomains median (p50) performance indicator per faculty

	Cohesion	Communicative function	Discourse relations	Essential/ non-essential	Grammar/ syntax	Inferencing	Metaphorical expression	Text genre	Vocabulary
Allied Healthcare/Nursing	50	42	40	55	60	42	37	33	50
Art/Design	62	44	50	64	60	52	44	50	50
Business/Commerce/ Management	75	57	66	66	60	57	44	50	50
Education	50	42	40	44	40	36	33	33	43
Engineering/Built Environment	75	56	66	66	60	57	44	50	50
Health Science	67	50	60	66	60	57	44	50	50
Hospitality/Tourism	71	42	50	58	60	47	44	33	50
Humanities	71	57	66	66	60	57	44	50	50
ICT	71	55	57	64	60	55	44	43	50
Law	62	50	57	66	60	57	44	50	50
Mathematics/Science	75	57	66	66	75	63	55	50	50
Other/Unspecified	62	43	50	55	60	47	44	40	50
Total	62	50	57	66	60	55	44	50	50

The performance on the NBT AL subdomains by candidates who had indicated their intention to enrol for courses in various faculties has been examined. These faculties included the following: Allied Healthcare/Nursing, Art/Design, Business/Commerce/Management, Education, Engineering/Built Environment, Health Sciences, Hospitality/Tourism, Humanities, Information and Communication Technology, Law, and Mathematics/Science. The general picture of performance by candidates planning to study in all these faculties is that Discourse relations, Metaphorical expression, Text genre, and Vocabulary seemed the most challenging for them and that performance on the remaining subdomains was relatively better, although Inferencing also appears to a difficult subdomain for certain groups. However, it is also clear that students in all these faculties would benefit from AL support in all the subdomains that are assessed in the NBT AL.

In addition to looking at the medians in each subdomain for each of these faculty cohorts (presented in the box-and-whisker plots below but also summarised in Table 15), it is useful to also notice where the range of scores for a particular subdomain was the widest as this suggests that there is great variance in the levels of ability of students in that cohort in that particular subdomain.
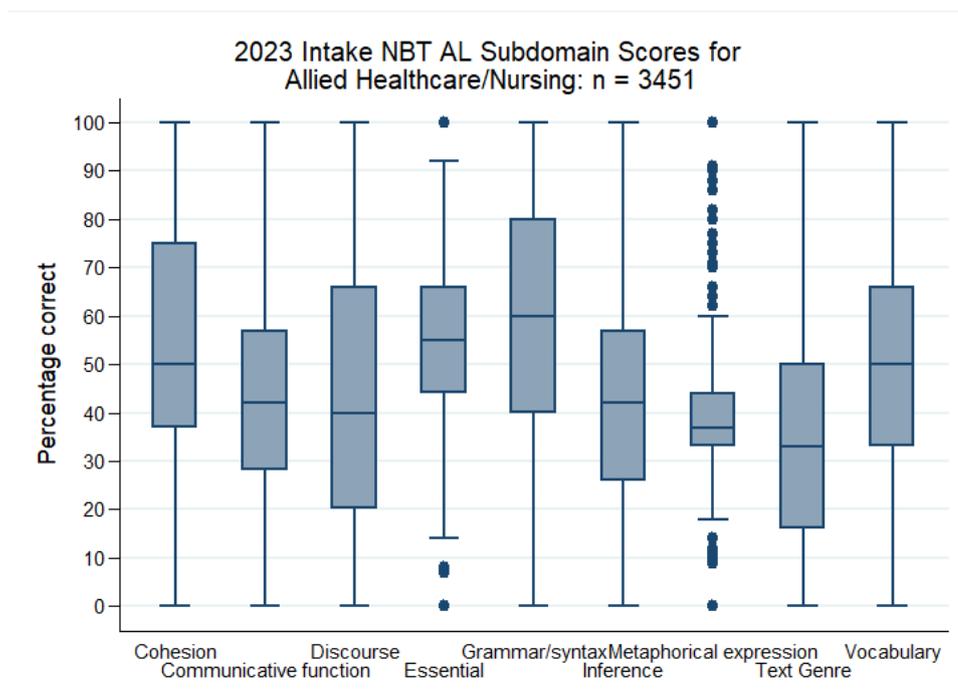
Figure 13 Allied Healthcare/Nursing AL subdomain performance, 2023 Intake

36
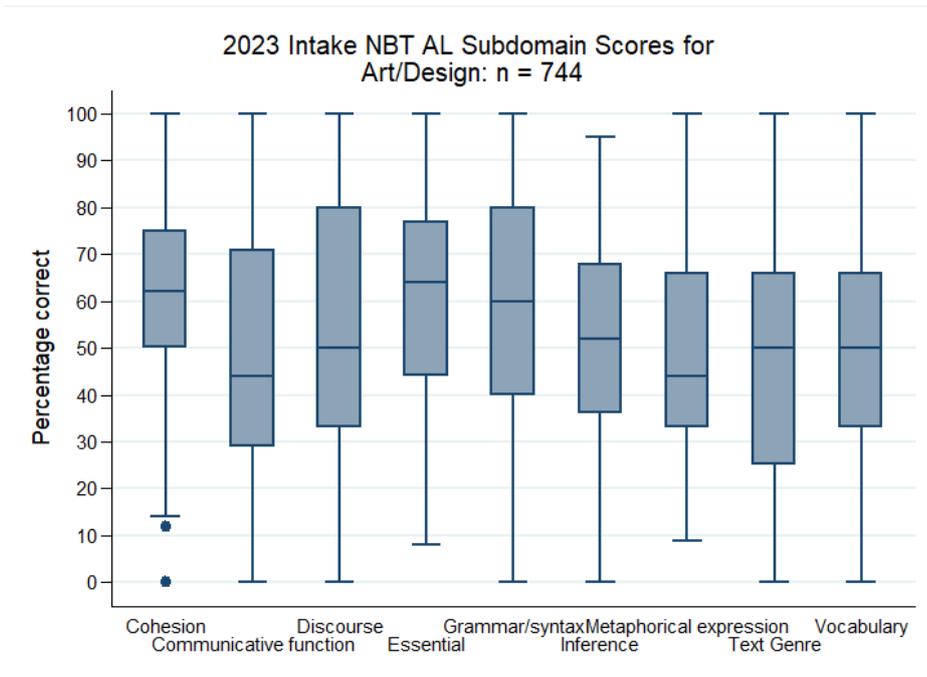
Figure 14 Art and Design AL subdomain performance, 2023 Intake
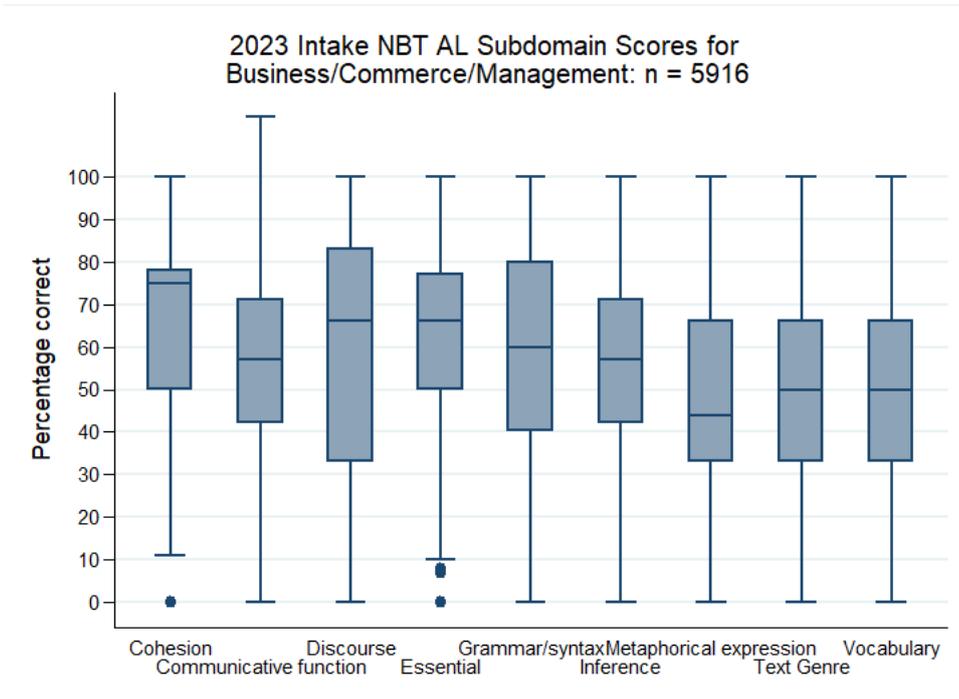
Figure 15 Business/Commerce/Management AL subdomain performance, 2023 Intake
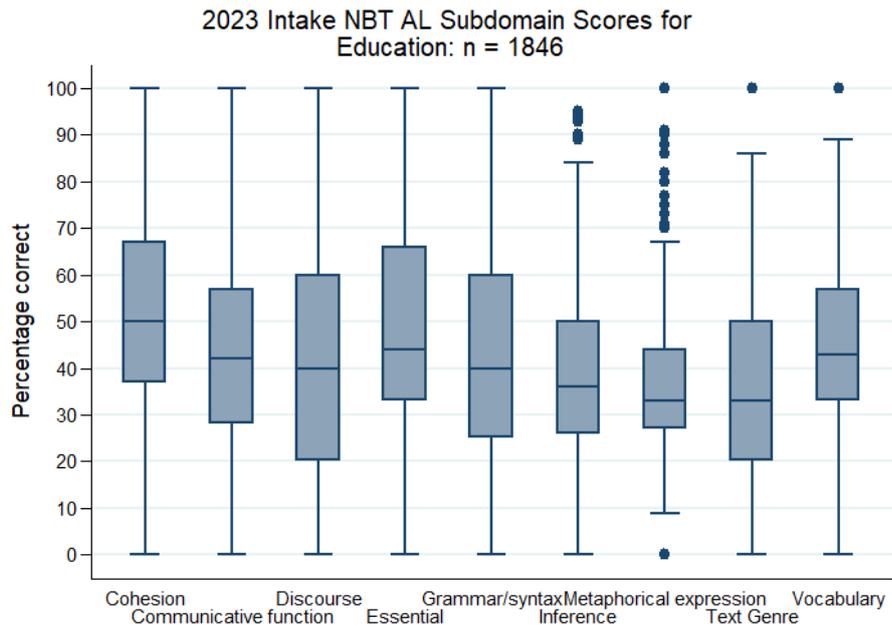
Figure 16 Education AL subdomain performance, 2023 Intake
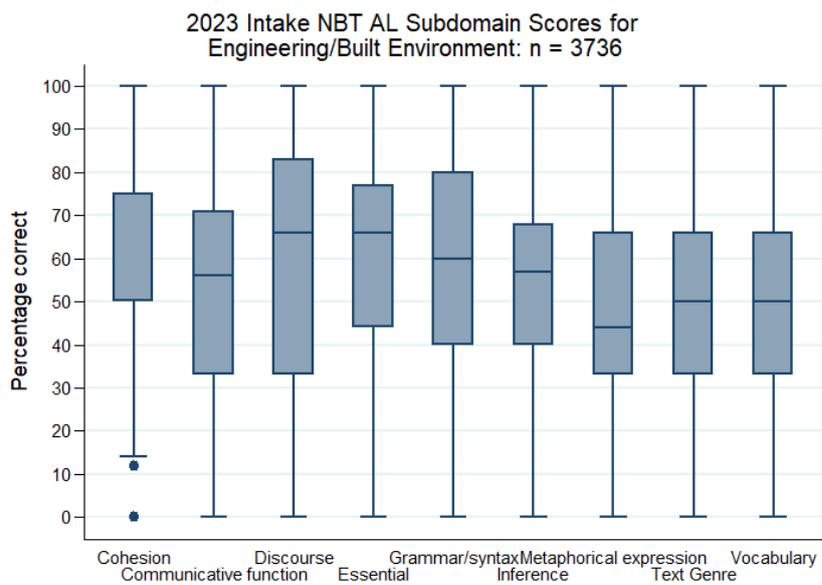
Figure 17 Engineering/Built Environment AL subdomain performance, 2023 Intake
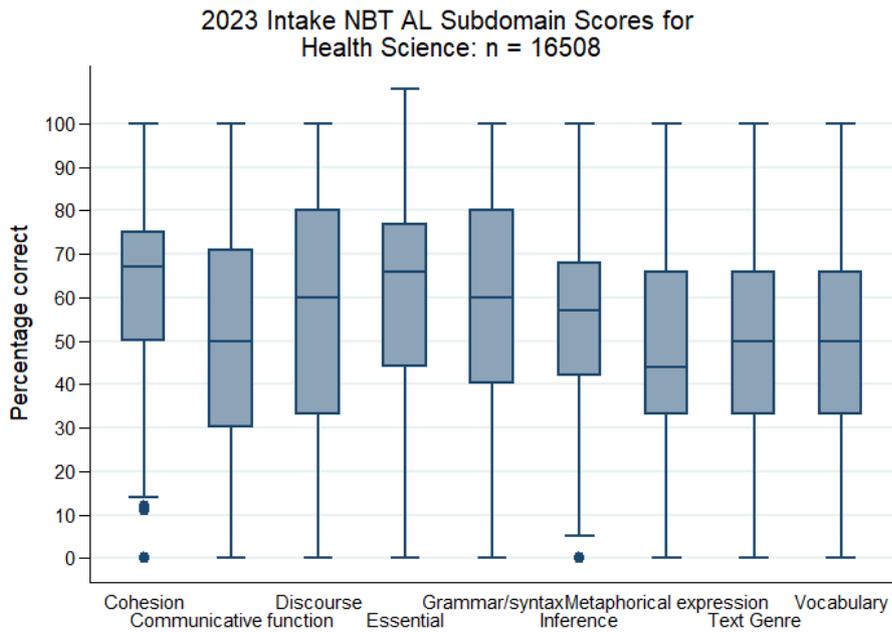
Figure 18 Health Sciences AL subdomain performance, 2023 Intake

Figure 19 Hospitality/Tourism AL subdomain performance, 2023 Intake

Figure 20 Humanities AL subdomain performance, 2023 Intake

Figure 21 Information and Communication Technology AL subdomain performance, 2023 Intake

Figure 22 Law AL subdomain performance, 2023 Intake

Figure 23 Science/Mathematics AL subdomain performance, 2023 Intake

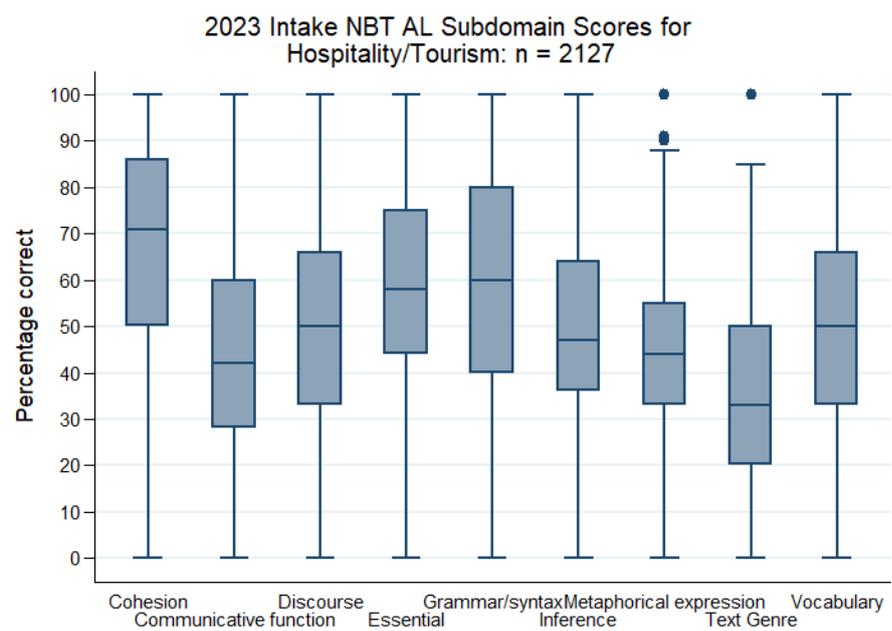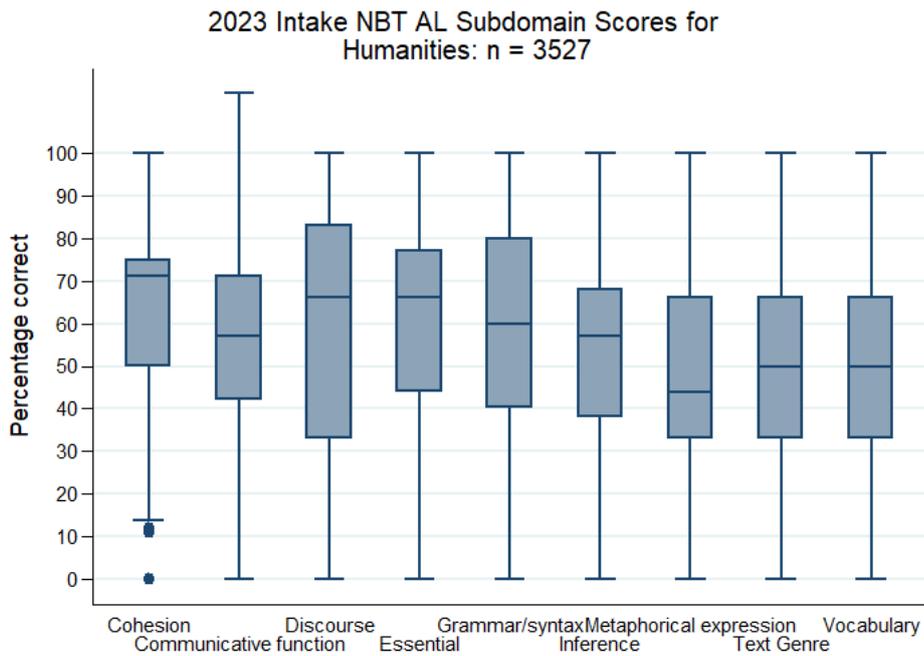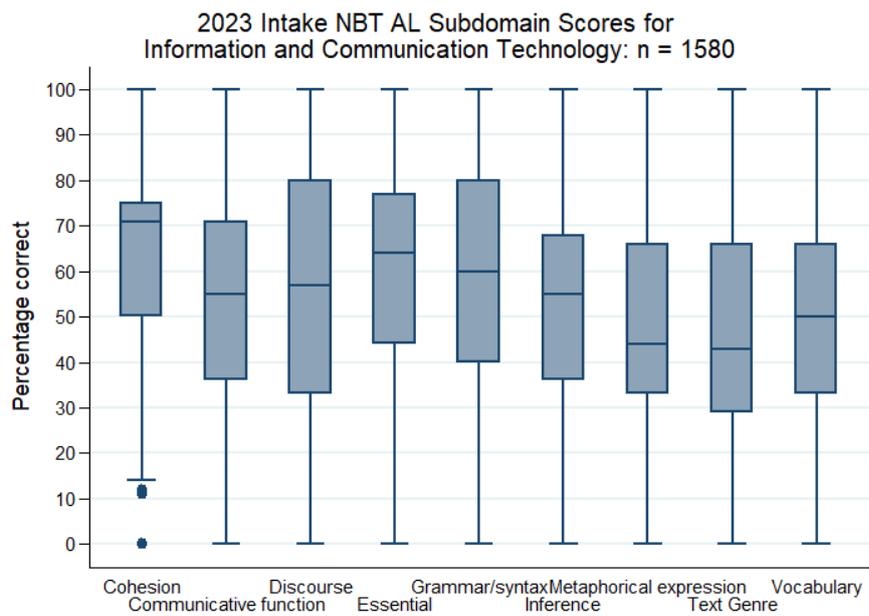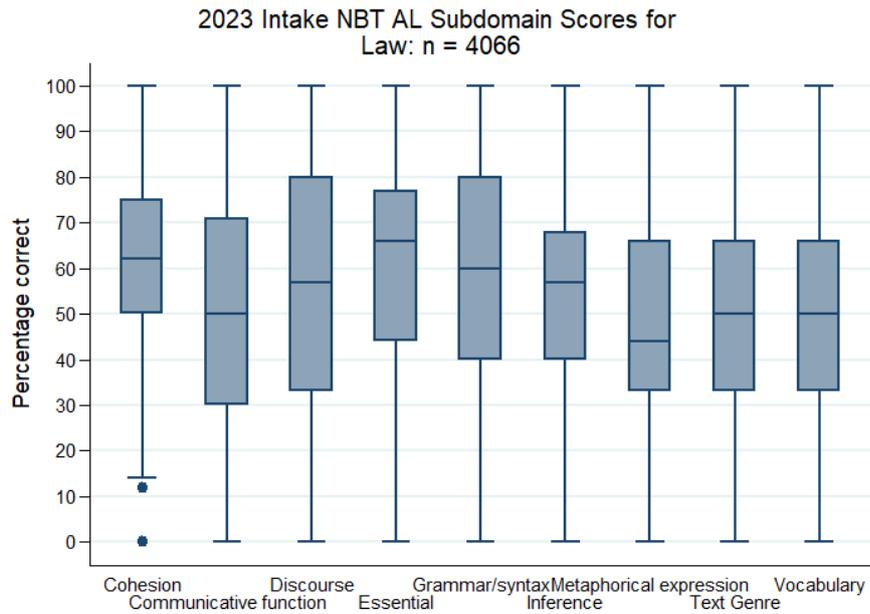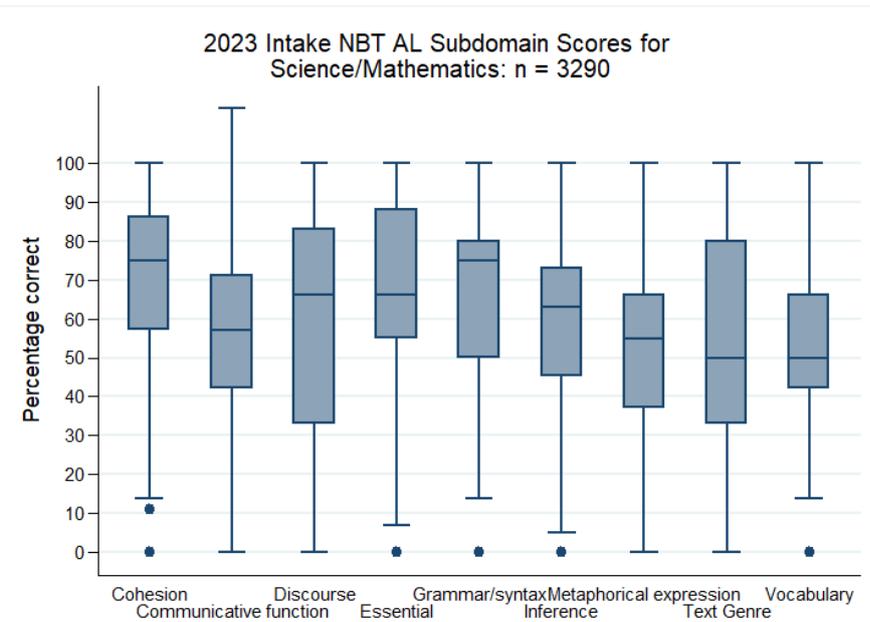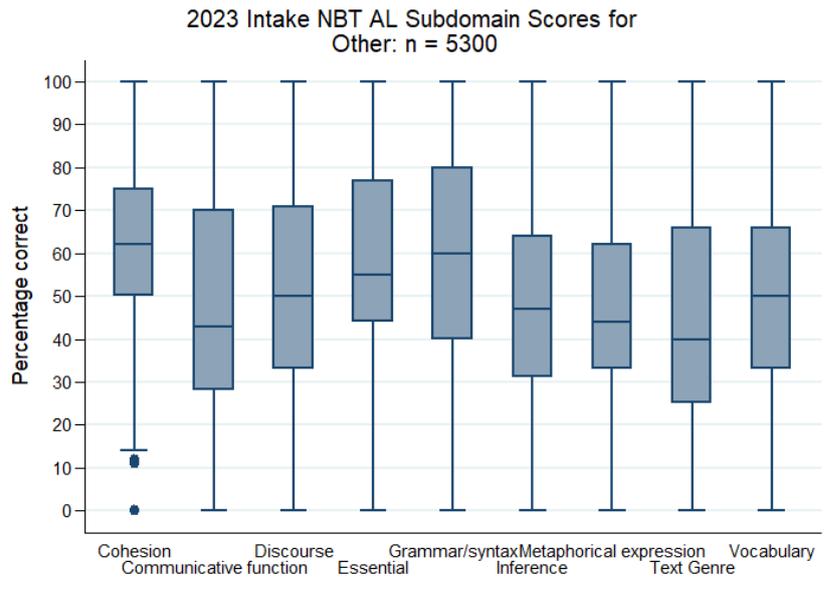*Figure 24 Other AL subdomain performance, 2023 Intake*

5.6.2 THE CONSTRUCT OF THE QL TEST

The following definition of QL underpins the NBT QL test:

> "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, and 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 & 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 QL as "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 QL test are grouped into sub-domains according to the six main mathematical and statistical ideas tested by the questions. Table 16 gives a description and specification of the mathematical and statistical ideas dimension of the construct tested by the QL test.

Table 16 Competency specification for the QL test by mathematical and statistical ideas

QL subdomain	Description of skills
Quantity, number and operations	• 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 • 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) • 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
Shape, dimension and space	• The ability to understand the conventions for the measurement and description (representation) of 2- and 3-dimensional objects, angles and direction • The ability to perform simple calculations involving areas, perimeters and volumes of simple shapes such as rectangles and cuboids
Relationships, pattern, permutation	• The ability to recognise, interpret and represent relationships and patterns in a variety of ways (graphs, tables, words and symbols) • The ability to manipulate simple algebraic expressions using simple arithmetic operations
Change and rates	• 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) • The ability to quantify and reason about changes or differences • 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 • The ability to interpret curvature of graphs in terms of changes in rate

Data representation and analysis	•	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
	•	The ability to represent data in simple tables and charts, such as bar or line charts
Chance and uncertainty	•	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
	•	The ability to represent a probability as a number between 0 and 1, with 0 representing impossibility and 1 representing certainty

The performance on the NBT QL subdomains by candidates who had indicated their intention to enrol for courses in various faculties has been examined. These faculties included the following: Allied Healthcare/Nursing, Art/Design, Business/Commerce/Management, Education, Engineering/Built Environment, Health Sciences, Hospitality/Tourism, Humanities, Information and Communication Technology, Law, and Mathematics/Science. The candidates were asked to indicate their first choice of field of study and the associated faculty at the institution to which they wished to study. The general picture of performance by candidates (see Table 17) planning to study in all these faculties is that 75% of the candidates' scores are below 50% in two of the six subdomains (Change and rates, Shape dimension and space), and below 60% in three subdomains (Data representation and analysis; Quantity, number and operations; and Relationships, pattern and permutation). In the Change and rates subdomain, the 25th percentile (p25) and the median (p50) were both 36, implying that 25% and 50% of the test-takers scored at or below this value, respectively. Looking at these performance indicators together with the assessed QL skills descriptions in Table 16, it could be observed, for example, that the candidates are likely to experience difficulties where the abilities to distinguish between changes (or differences in magnitudes) expressed in absolute terms and those expressed in relative terms (for example, as percentage change), or the abilities to calculate average rates of change and to recognise that the properties of a graph might be required.

Table 17 Performance on the NBT QL subdomains

	N	mean	sd	min	p25	p50	p75	max
Change and rates	52 086	40.21	18.35	0	36.00	36.00	50.00	100.00
Data representation and analysis	52 086	45.23	16.30	0	36.00	44.00	56.00	100.00
Chance and uncertainty	52 086	64.80	33.40	0	33.00	66.00	100.00	100.00
Quantity, number and operations	52 086	41.73	18.83	0	26.00	36.00	53.00	100.00
Relationships, pattern and permutation	52 086	41.48	21.93	0	22.00	43.00	55.00	100.00
Shape, dimension and space	52 086	42.42	17.43	0	30.00	38.00	50.00	100.00

Table 18 QL subdomains median (p50) performance indicator per faculty

Faculty	Change and rates	Data representation and analysis	Chance and uncertainty	Quantity, number and operations	Relationships, pattern and permutation	Shape, dimension and space
Allied Healthcare/Nursing	36	40	66	33	22	38
Art/Design	36	40	66	33	33	38
Business/Commerce/Management	45	44	66	43	44	46
Education	36	38	50	30	22	38
Engineering/Built Environment	45	44	66	43	44	46
Health Science	36	44	66	36	44	38
Hospitality/Tourism	36	40	66	36	33	46
Humanities	36	40	66	36	33	38
ICT	36	44	66	40	43	38
Law	36	40	66	33	33	38
Mathematics/Science	45	48	66	50	55	46
Other/Unspecified	36	40	66	33	33	38
Total	36	44	66	36	43	38

The boxplots that follow reflect information about candidates writing the NBT QL test in the 2023 intake year. The boxplots are for the eleven faculties (with a twelfth graphic for applicants who indicated "Other" as their faculty of choice) and show the distributions of candidates' scores on different subdomains of questions in the QL test. In addition to looking at the medians in each subdomain for each of these faculty cohorts (presented in the box-and-whisker plots below but also summarised in Table 18), it is useful to also notice where the range of scores for a particular subdomain was the widest as this suggests that there is great variance in the levels of ability of students in that cohort in that particular subdomain.
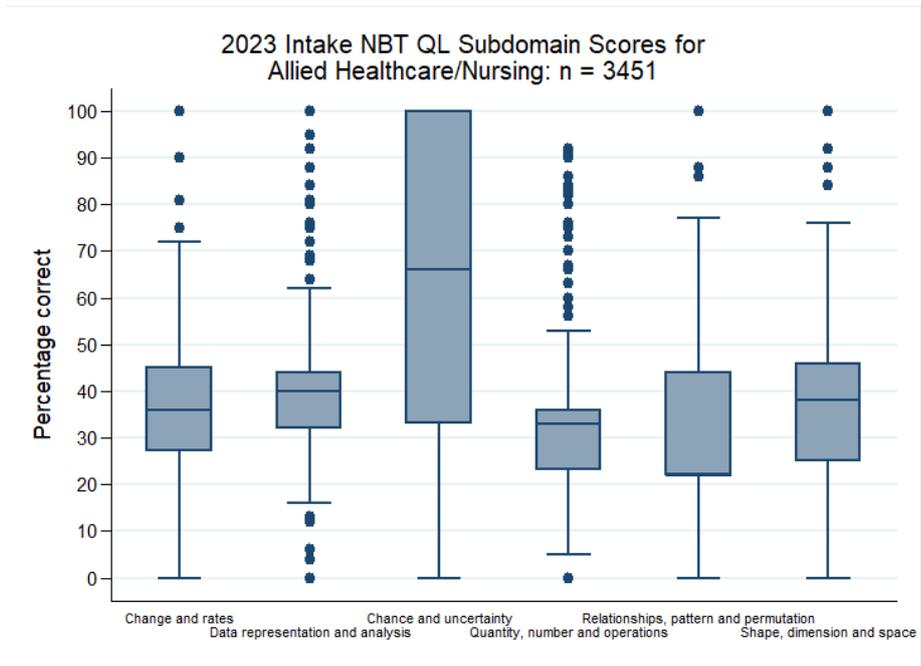
Figure 25 Allied Healthcare/Nursing subdomain QL performance, 2023 Intake
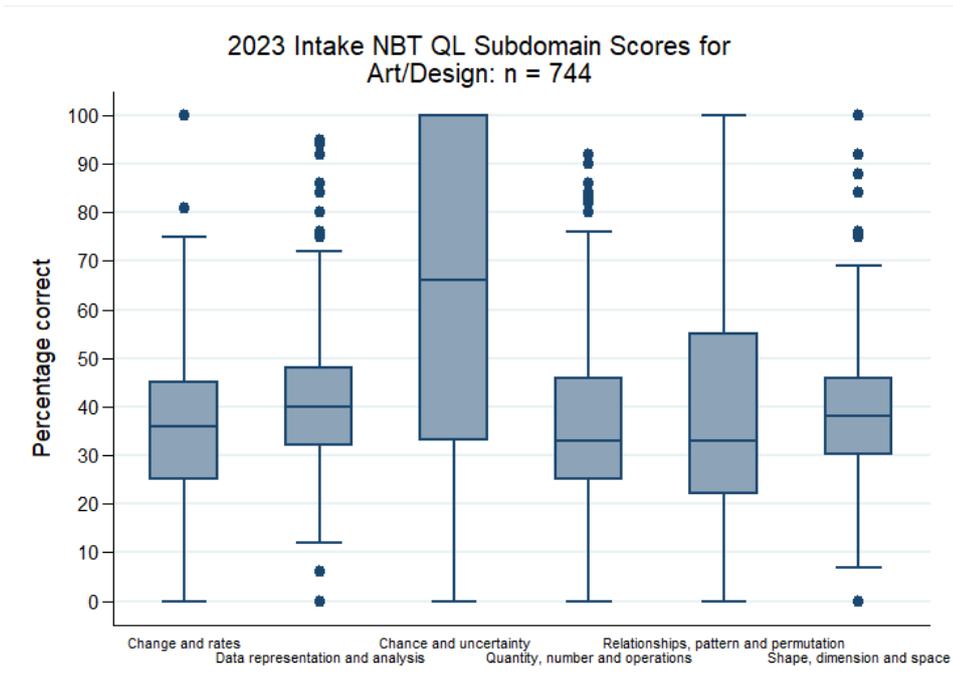
Figure 26 Art/Design subdomain QL performance, 2023 Intake
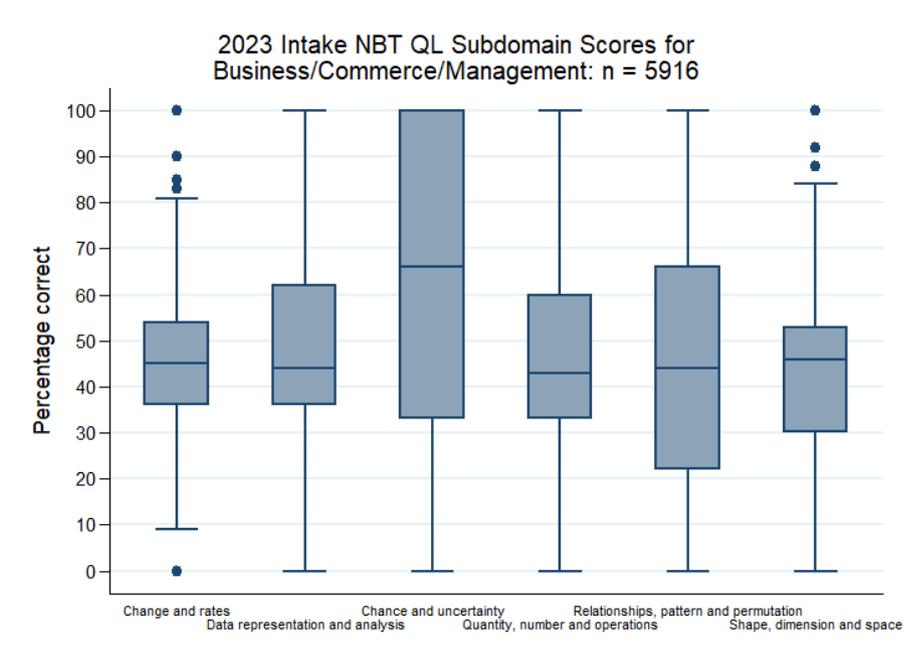
Figure 27 Business/Commerce/Management QL performance, 2023 Intake
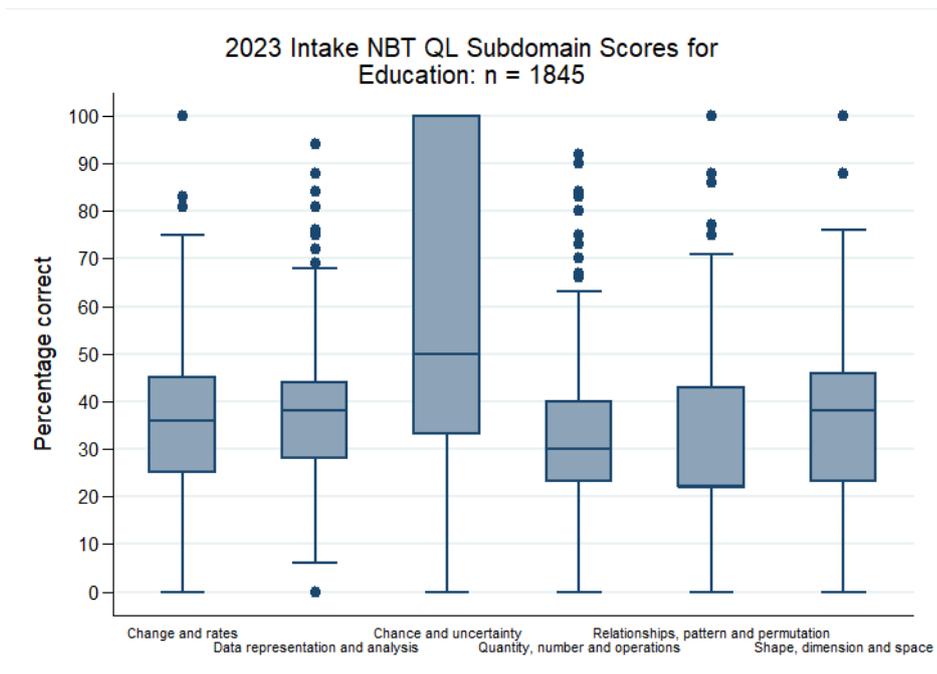
Figure 28 Education subdomain QL performance, 2023 Intake
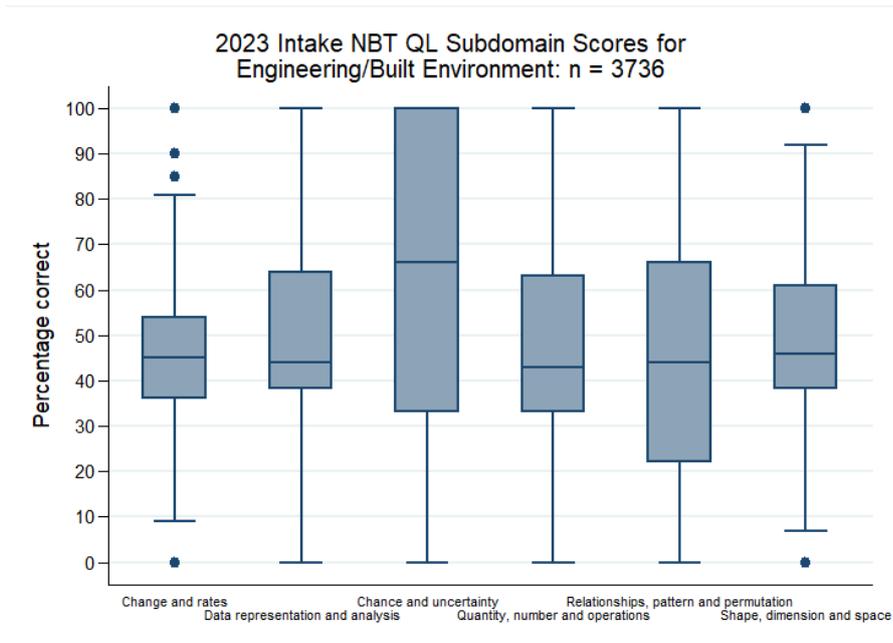
Figure 29 Engineering/Built Environment QL subdomain performance, 2023 Intake
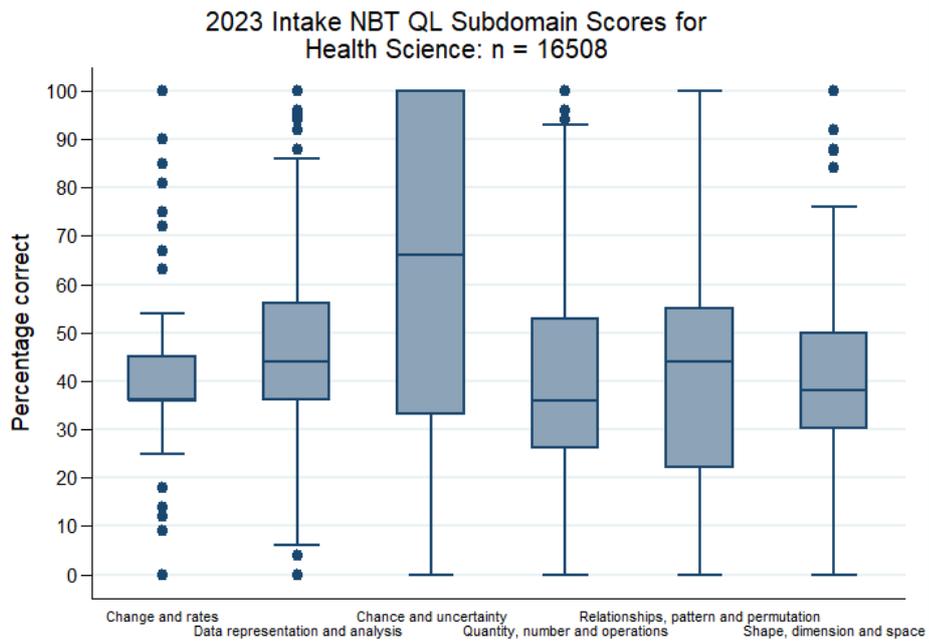
Figure 30 Health Sciences QL subdomain performance, 2023 Intake

Figure 31 Hospitality/Tourism QL subdomain performance, 2023 Intake

Figure 32 Humanities QL subdomain performance, 2023 Intake

49

Figure 33 Information and Communication Technology QL subdomain performance, 2023 Intake

Figure 34 Law QL subdomain performance, 2023 Intake

Figure 35 Science/Mathematics QL subdomain performance, 2023 Intake
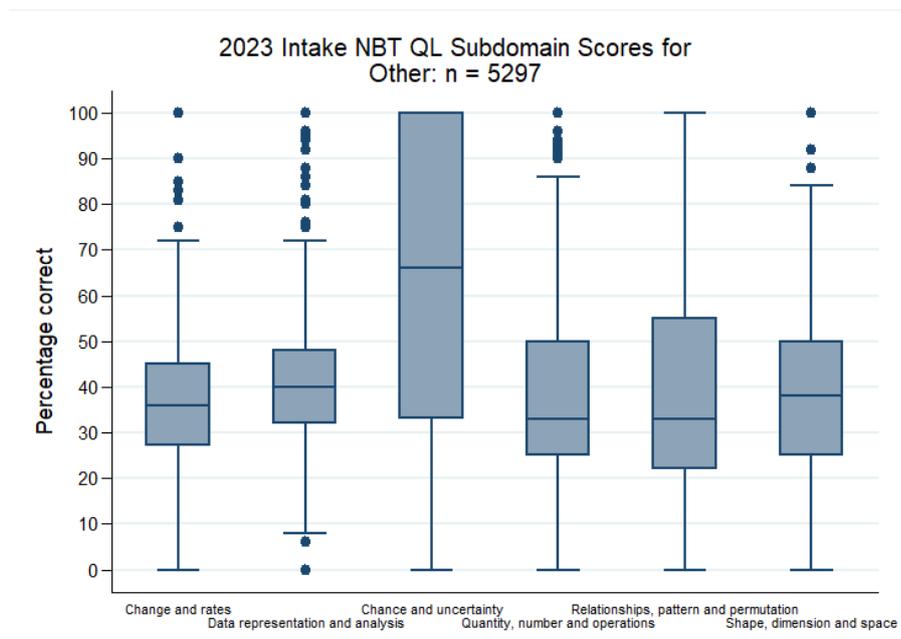
Figure 36 "Other" QL subdomain performance, 2023 Intake

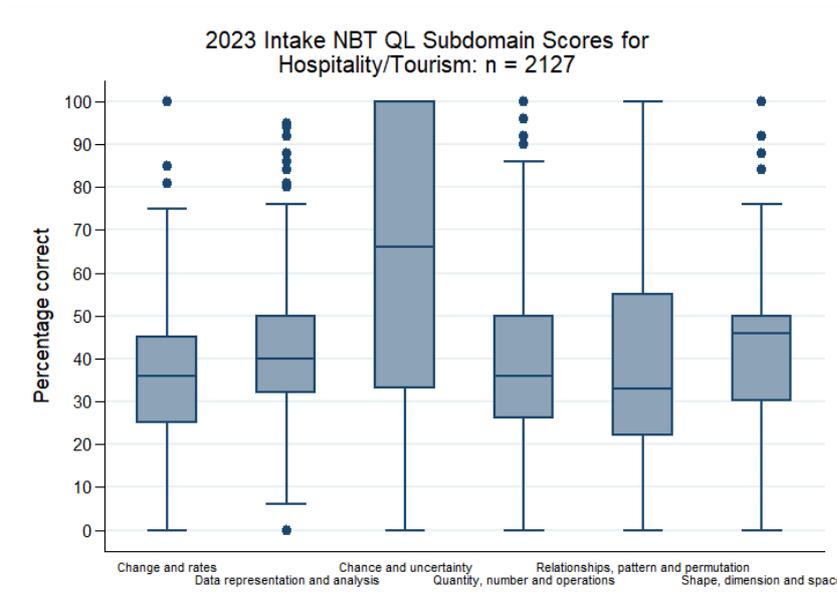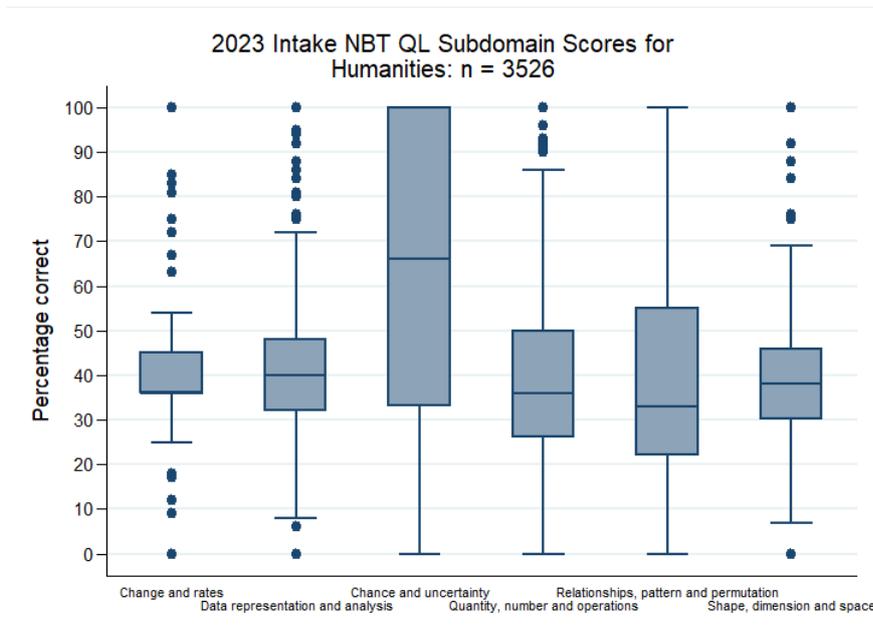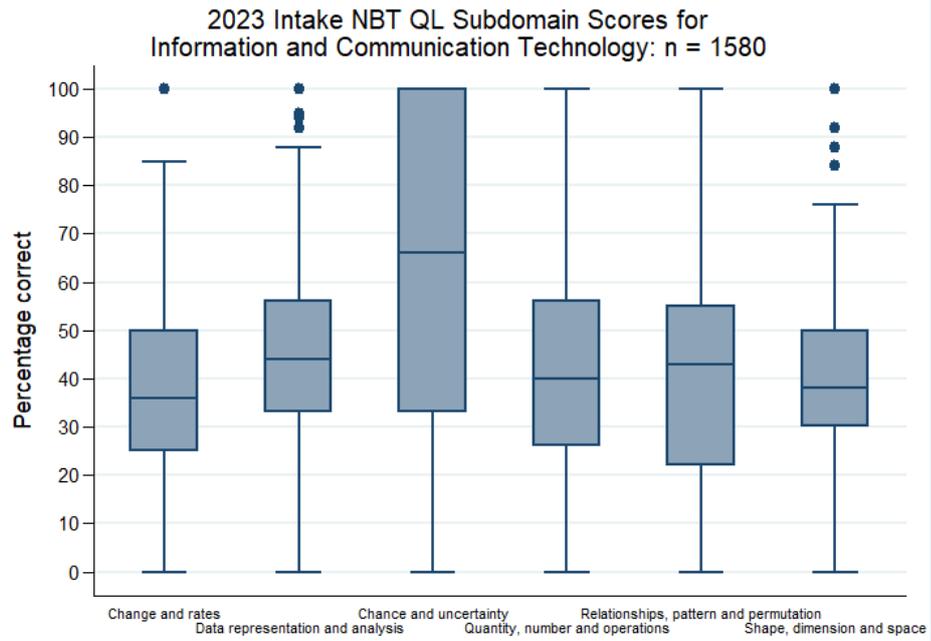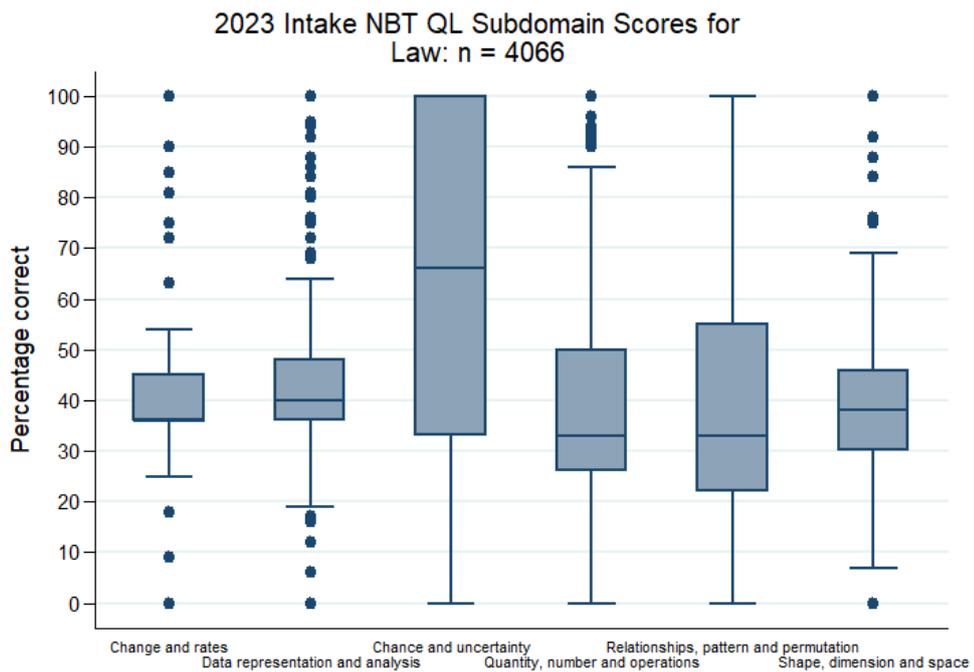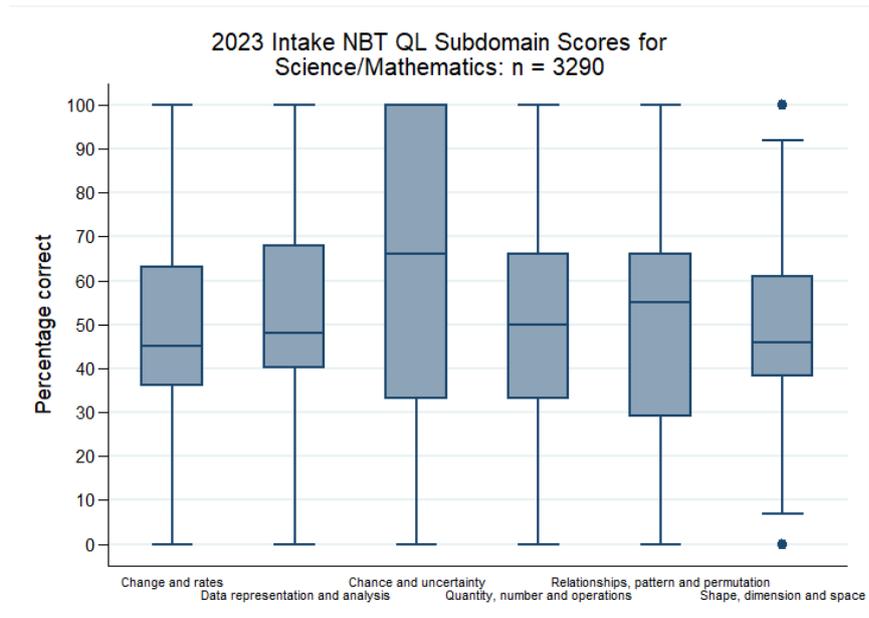### 5.6.3 THE CONSTRUCT OF THE MAT TEST

The boxplots that follow later in this section reflect information from the candidates who wrote the NBT MAT test in the 2023 intake cycle. The candidates were asked to indicate their first choice for field of study and the associated faculty at the institution at which they wish to study. Eleven faculties are reflected. The boxplots show the distributions of student scores on different subdomains of questions in the MAT test.

The content of the MAT test is embedded in the NSC Mathematics curriculum (CAPS, taking into account the pace-setter guidelines for teaching), but aligned with first-year mainstream needs (content selected in consultation with academics who are 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 (see Table 19). 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 CAPS.

The NSC exams (school exit, norm-referenced) and NBTs (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 the most significance for first-year Mathematics courses.

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

> "[t]he 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 must be learnt through active engagement (Mason, 2002). The sub-domain information facilitates both prospective students' and lecturers' active engagement with the mathematical content that they will need to deal with.

Table 19 NBT Mathematics (MAT) subdomains assessed

MAT Subdomain	Skills assessed
Algebraic processing	Modelling situations by making use of mathematical process skills (translation from language to algebra, solution of problem); Operations (incl. surds, logarithms and exponents, including solution of exponential equations); Algebraic manipulation; Applying a given definition (algebraic context), determining the validity of a given assertion (algebraic context); Measurement problems
Number sense	Operations (numerical and/or algebraic) including relationships such as ratios and percentages; Financial calculations; Probability

Functions and graphs	Understanding function notation, properties and interpretation of graphs; Applications of principles of differential calculus and related problems; Applying a given definition (graphical context), determining the validity of a given assertion (graphical context)	
Trigonometric functions and graphs	Trigonometric functions, their properties and graphs; Problems involving the solution of trigonometric equations and the use of identities, including simplification of trigonometric expressions; Application of area, sine and cosine rules, including two- or three-dimensional problems; Application of trigonometric concepts such as definitions of trigonometric ratios in solving two- or three-dimensional problems	
Geometric reasoning	Properties of shapes (2D and 3D); Analytic geometry (linking geometric and algebraic properties); Circle Geometry	

The performance on the NBT MAT subdomains by candidates who had indicated their intention to enrol for courses in various faculties has been examined. These faculties included the following: Allied Healthcare/Nursing, Art/Design, Business/Commerce/Management, Education, Engineering/Built Environment, Health Sciences, Hospitality/Tourism, Humanities, Information and Communication Technology, Law, and Mathematics/Science. The general picture of performance by candidates planning to study in all these faculties is that, depending on the programme of study or course, it is possible that these candidates will experience varied levels of difficulties with mathematically demanding curricula. The skills assessed by the MAT subdomains as described in Table 19 above should be analysed in relation to the performance trends shown in Table 20 below. It is concerning that 75% of all candidates' scores are below the 60% mark across all the subdomains, and 50% of all candidates' scores are below 41%, with the lowest performance in the Number sense subdomain.

Table 20 The performance of the NBT MAT subdomains

	N	mean	sd	min	p25	p50	p75	max
Algebraic processing	39 856	45.86	18.53	0	33.00	36.00	56.00	100.00
Number sense	39 856	36.92	27.89	0	14.00	28.00	57.00	100.00
Functions and graphs	39 856	46.62	21.44	0	30.00	39.00	60.00	100.00
Trigonometric functions and graphs	39 856	41.33	22.94	0	23.00	38.00	57.00	100.00
Geometric reasoning	39 856	40.67	18.71	0	25.00	41.00	50.00	100.00

The patterns of performance in the subdomains differ across faculties, with slightly better performance in the faculties of Engineering/Built Environment and Science/Mathematics. In all other cases, the median values lie in the Intermediate Lower band or the Basic band, indicating a need for support in all mathematical subdomain areas for most students.

Table 21 MAT subdomains median (p50) performance indicator per faculty

Faculty	Algebraic processing	Number sense	Functions and graphs	Trigonometric functions and graphs	Geometric reasoning
Allied Healthcare/Nursing	36	14	39	28	33
Art/Design	36	14	39	29	33
Business/Commerce/Management	43	28	39	38	41
Education	33	14	34	23	33
Engineering/Built Environment	46	42	43	42	41
Health Science	40	28	39	38	41
Hospitality/Tourism	40	25	39	38	38
Humanities	36	25	39	29	33
ICT	36	28	39	33	33
Law	36	14	39	28	33
Mathematics/Science	50	57	52	47	41
Other/Unspecified	36	28	39	33	38
Total	36	28	39	38	41

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 or 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 addition to looking at the medians in each subdomain for each of these faculty cohorts (presented in the box-and-whisker plots below but also summarised in Table 21), it is useful to also notice where the range of scores for a particular subdomain was the widest as this suggests that there is great variance in the levels of ability of students in that cohort in that particular subdomain.
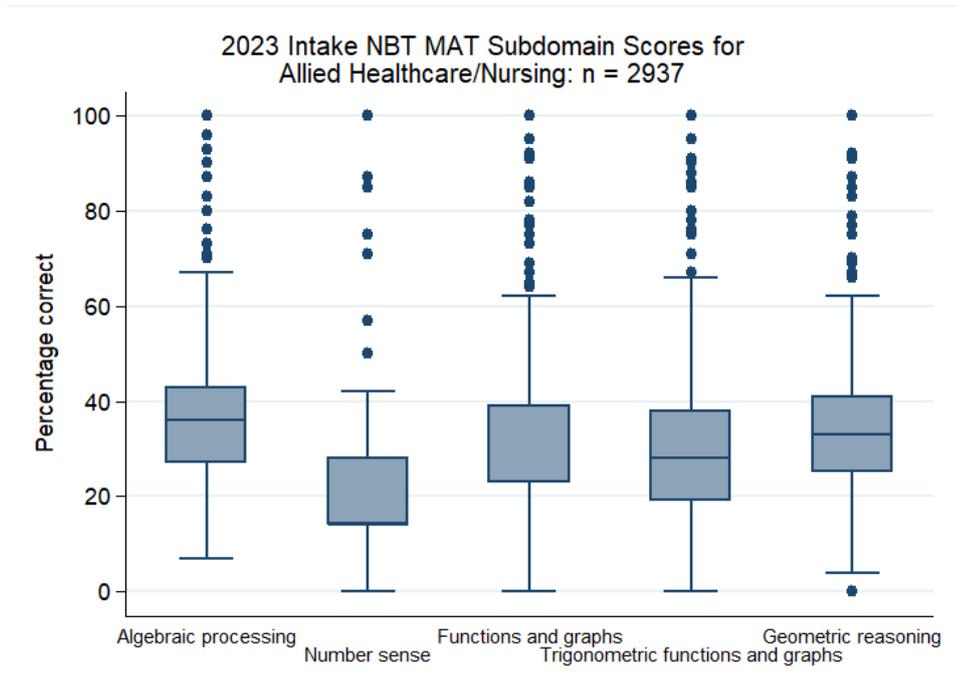
Figure 37 Allied Healthcare/Nursing MAT subdomain performance, 2023 Intake
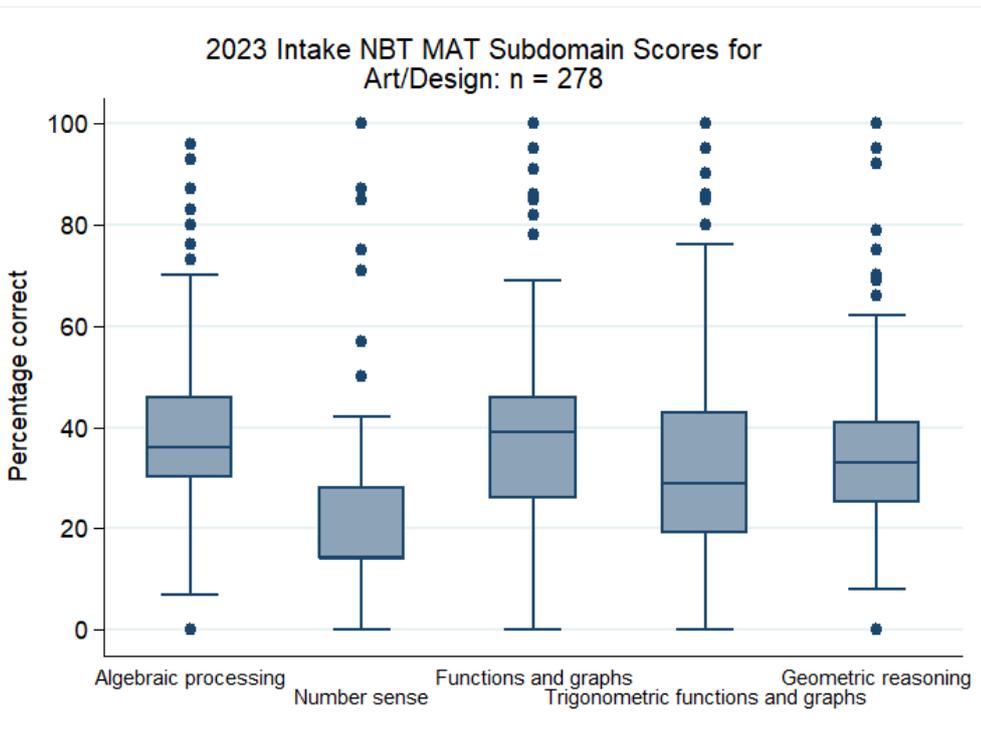
Figure 38 Art/Design MAT subdomain performance, 2023 Intake
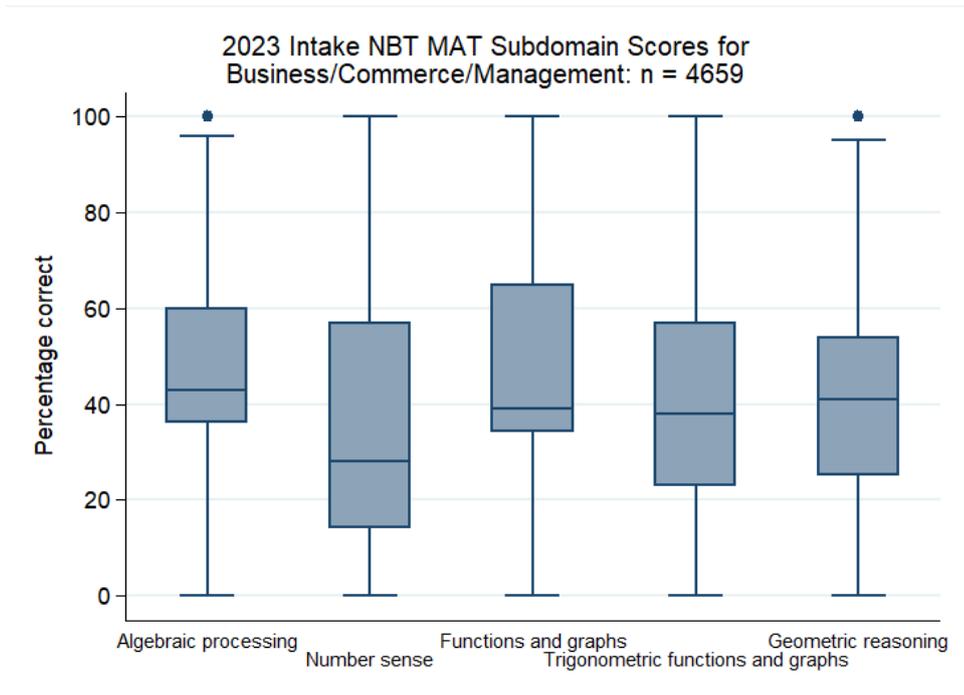
Figure 39 Business/Commerce/Management MAT subdomain performance, 2023 Intake
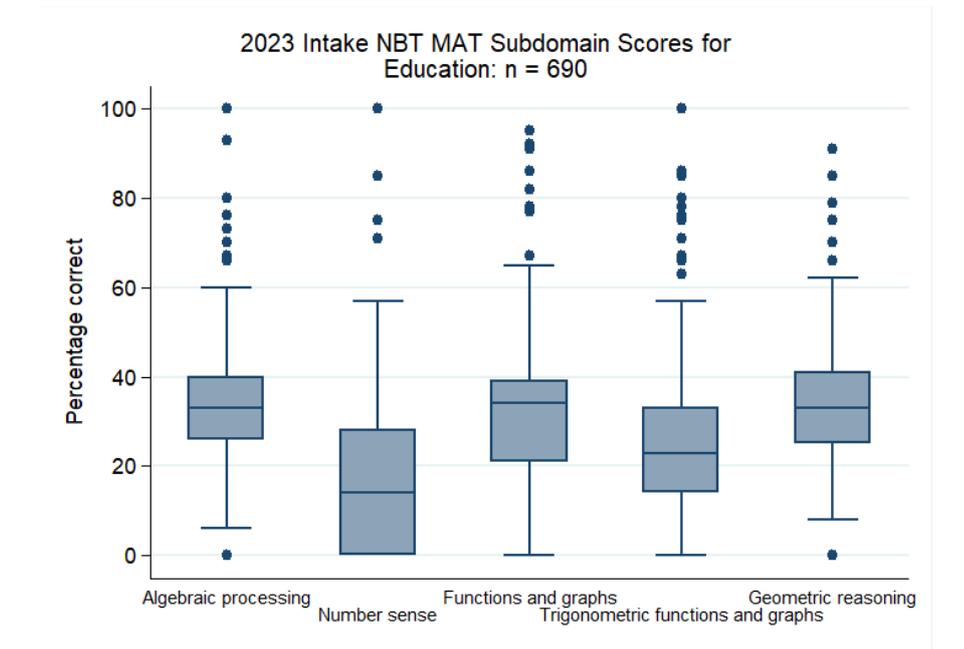
Figure 40 Education MAT subdomain performance, 2023 Intake
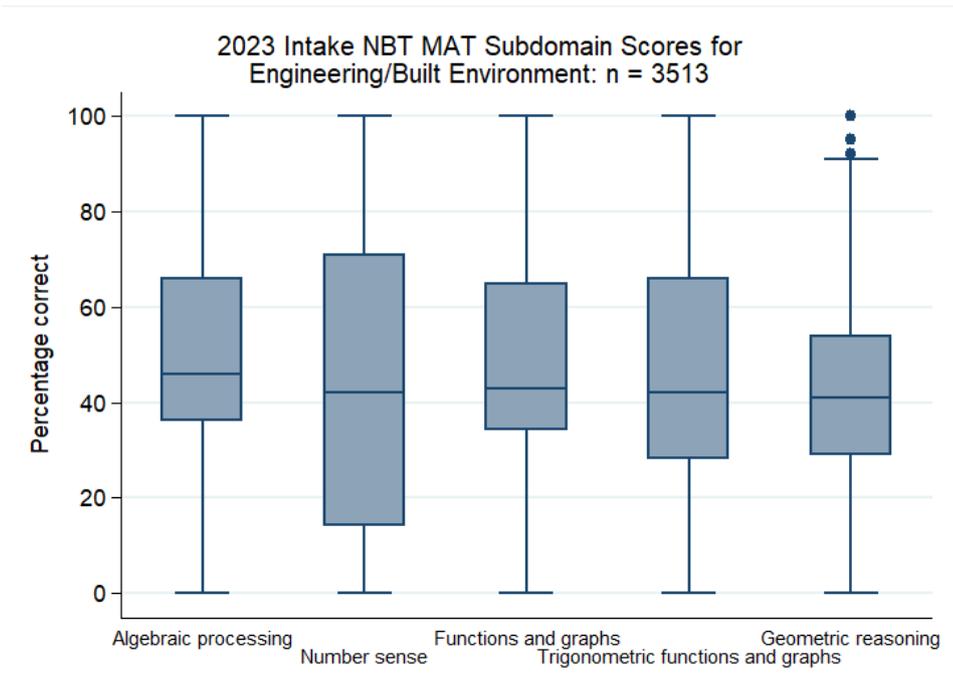
Figure 41 Engineering/Built Environment MAT subdomain performance, 2023 Intake
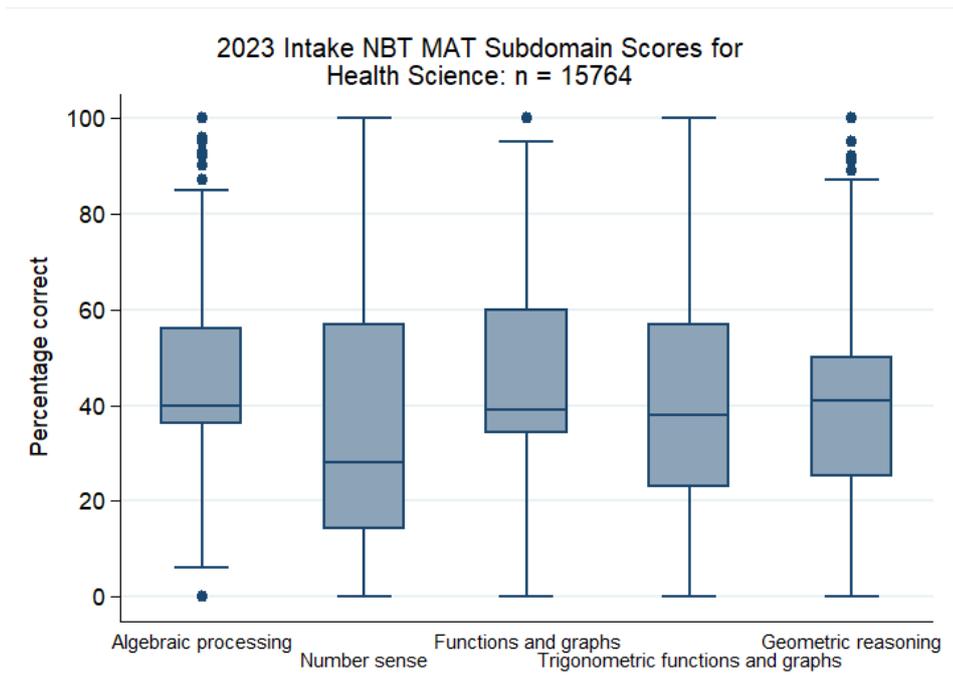
Figure 42 Health Sciences MAT subdomain performance, 2023 Intake
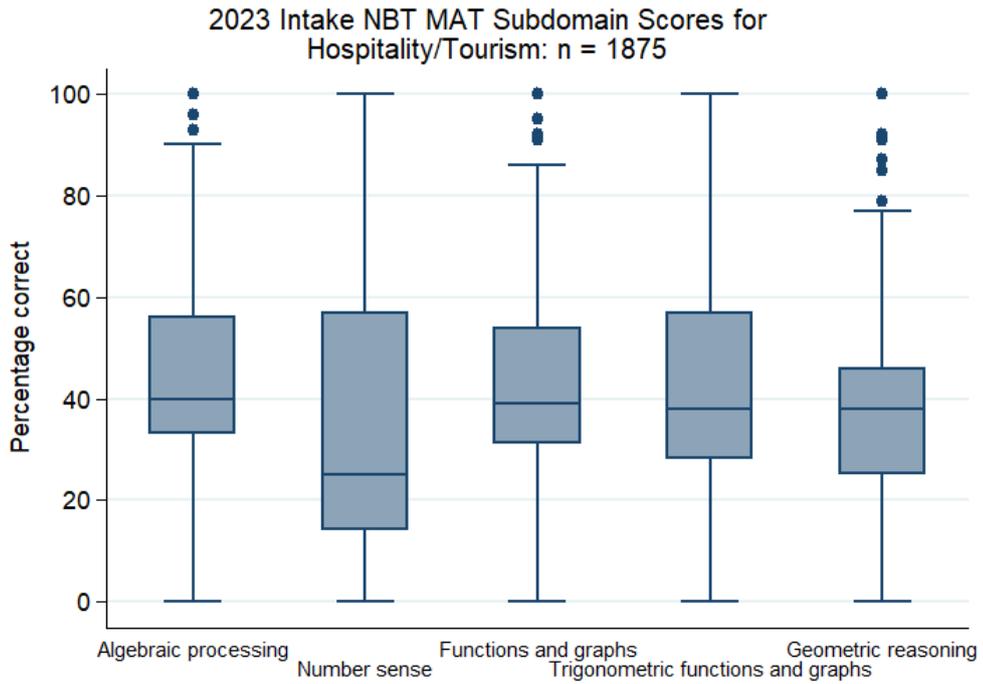
Figure 43 Hospitality/Tourism MAT subdomain performance, 2023 Intake
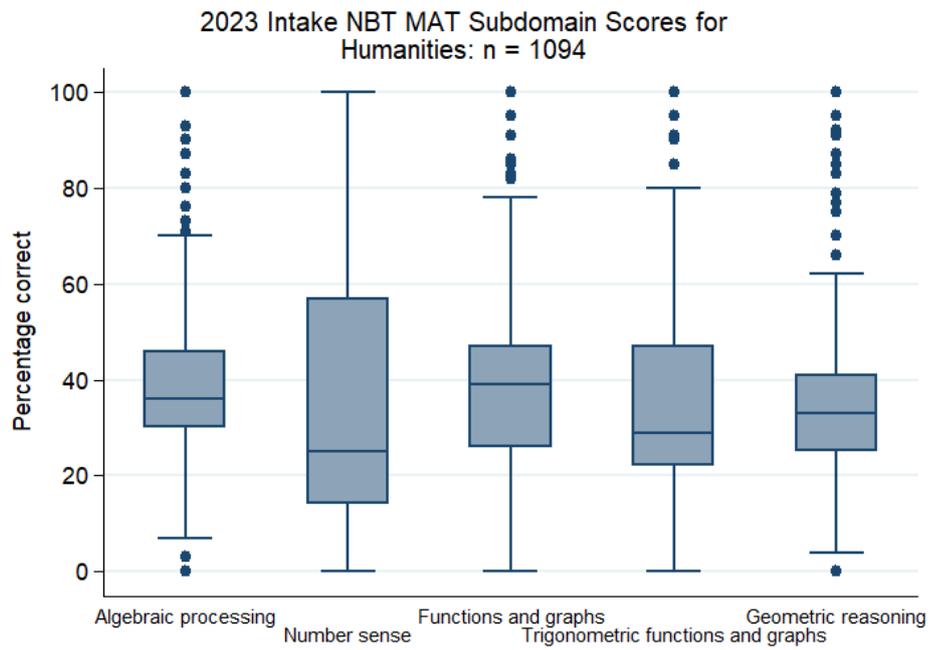
Figure 44 Humanities MAT subdomain performance, 2023 Intake
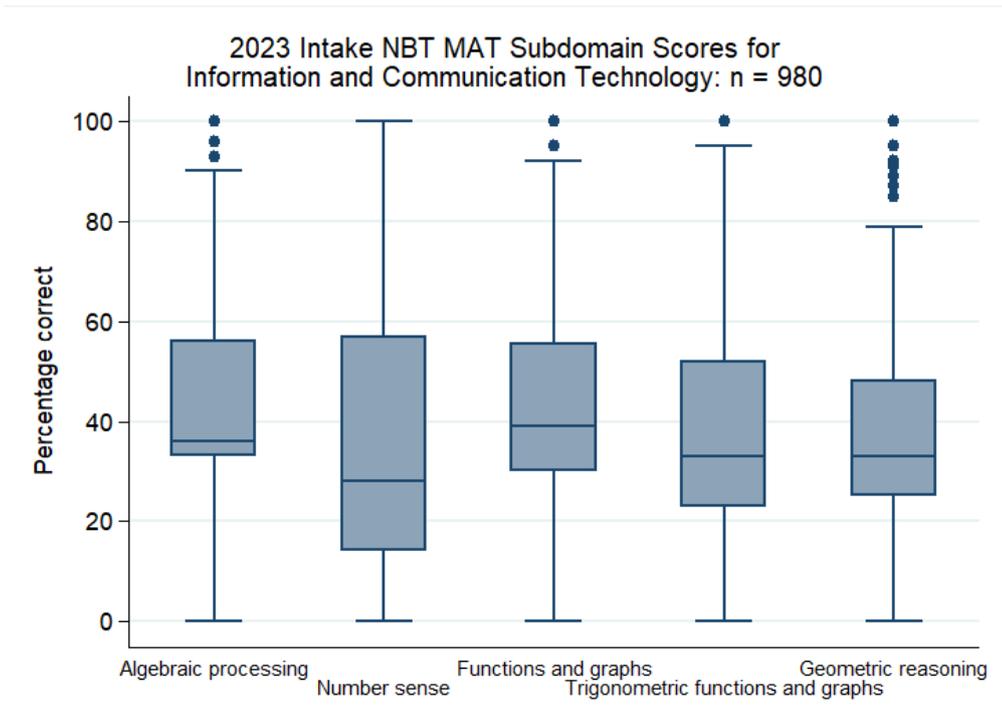
Figure 45 Information and Communication Technology MAT subdomain performance, 2023 Intake
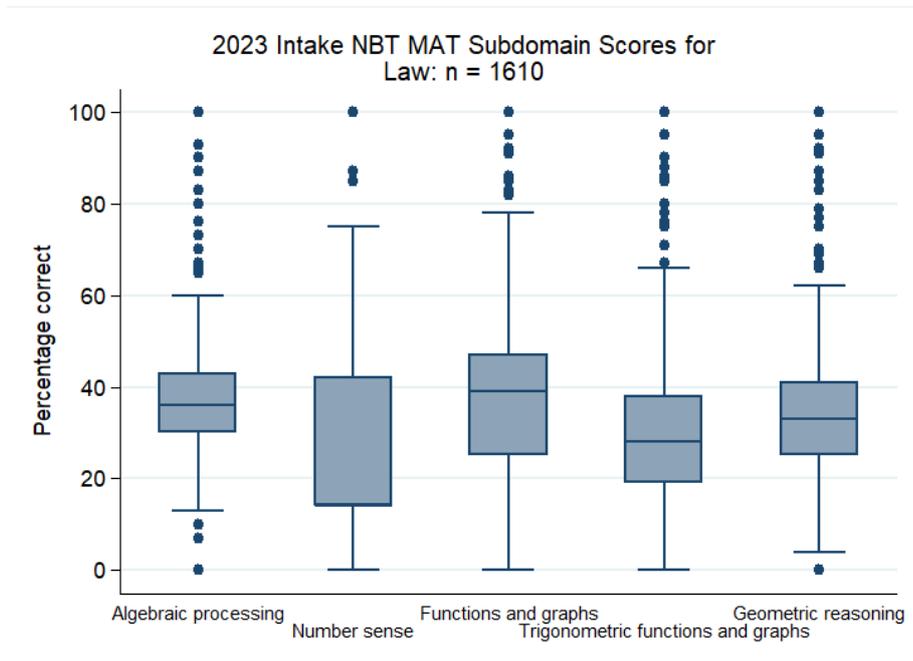
Figure 46 Law MAT subdomain performance, 2023 Intake
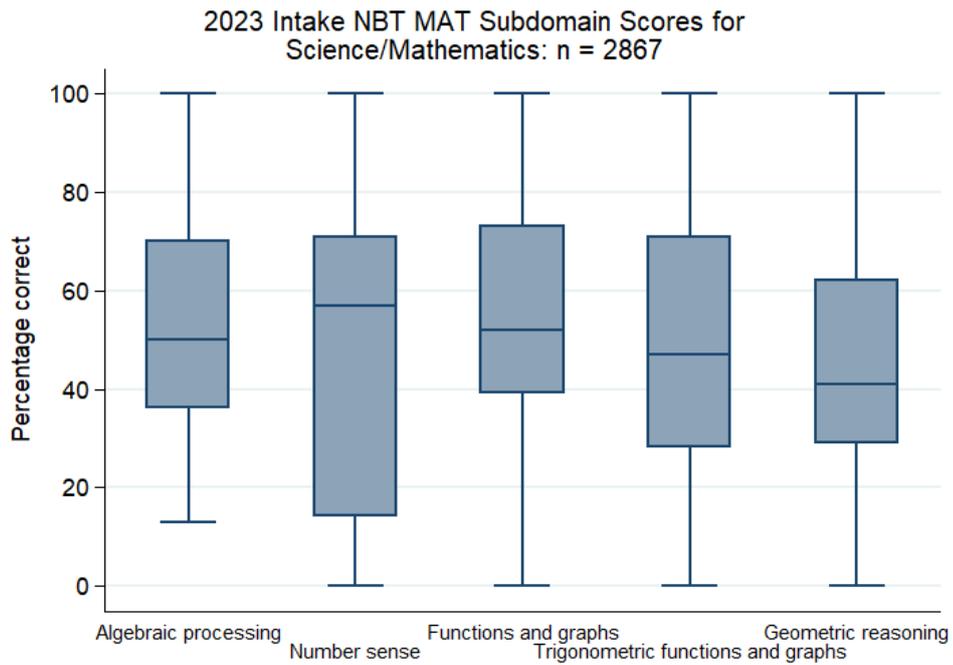
Figure 47 Science/Mathematics MAT subdomain performance, 2023 Intake
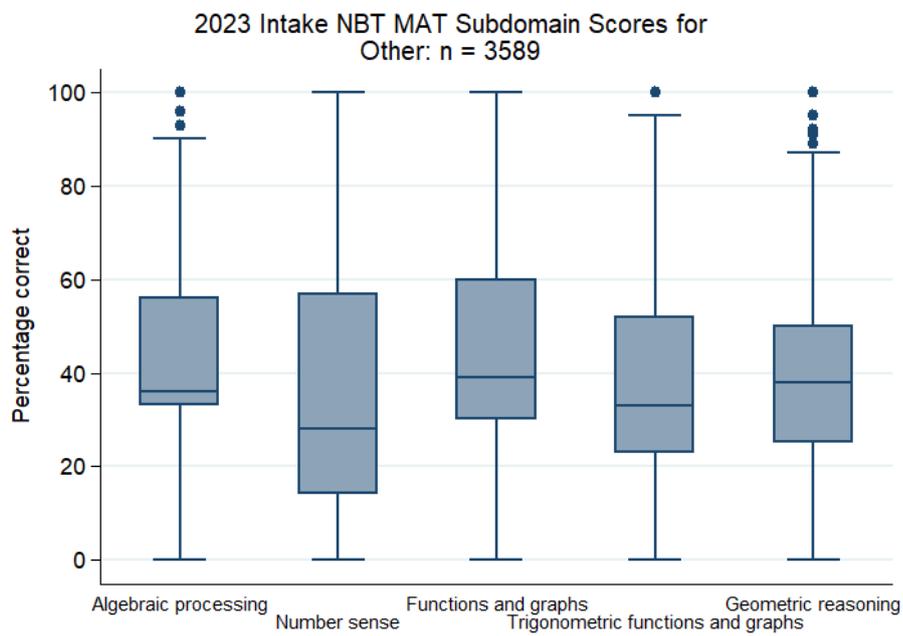
Figure 48 Other MAT subdomain performance, 2023 Intake

6. PERFORMANCE ON THE NBT HIGHER EDUCATION 2023 INTAKE CYCLE TESTING AND PERFORMANCE IN COGNATE NSC SUBJECTS IN 2022

This section of the report presents and discusses associations between the NSC examination and the NBTs. The aim is to examine the extent to which the NBTs might provide complementary information to that provided by the NSC about the school-leaving cohort wishing to enter higher education.

The NSC is structured according to specific categories of subjects and rules of combination.

For a learner to obtain an NSC, the learner must offer seven approved subjects and provide full evidence of school-based assessments for each subject, and he or she must also:

(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.

The minimum requirements to obtain an NSC are:

(a) Achievement of 40% in three subjects, one of which is an official language at Home Language level;

(b) Achievement of 30% in three other subjects; and

(c) Full evidence in the school-based assessment component in the subject field.

Table 22 Scale of achievement/level descriptors

Achievement level	Achievement description	Marks %
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

6.1 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 an NSC 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 an NSC 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 an NSC 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 4 (Adequate achievement, 50% – 59%) or better in four subjects chosen from the 20 credit-bearing NSC subjects. Some of these subjects are listed in Table 23.

Table 23 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

6.2 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 NBTs multiple times, the scores of all candidates who wrote the NBTs 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, and NSC results were then matched.

It should be noted that 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 admission type (Degree; Diploma/Higher Certificate).

The NSC subject codes are as follows:

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 (Figure 67), NSC MTHN against NBT QL (Figure 69), NSC MTLN against NBT QL (Figure 70), NSC MTHN against NBT MAT (Figure 71), and NSC PSCN against NBT MAT (Figure 72) show heterogenous variance. The point cloud of the scatterplot for NSC MTLN against NBT QL also shows some non-linear trend (Figure 70).

6.3 SELF-REPORTED DEMOGRAPHICS

The NBT for 2023 HE intake cycle / 2022 NSC cohort self-classified their biographical details. The cohort consisted of approximately 31% males and 66% females (3% unspecified). Approximately 65% were black, 12% were coloured, 11% white, and 8% Indian/Asian. The majority were South African citizens. The candidates spoke a total of eleven official languages. Approximately 32% reported English as their home language, 6% reported Afrikaans as their home language, while the vast majority had an indigenous African language as a home language. Of the NSC cohort, 88% were at a Bachelor's Degree level and the remainder were at a Higher Certificate or Diploma level (Table 24).

Table 24 Self-reported demographics

	Full Cohort		Bachelor's degree pass		Diploma or Higher Certificate pass	
	n	**%**	**n**	**%**	**n**	**%**
GENDER						
Male	11 371	31.10	10 187	31.52	1 184	27.90
Female	24 274	66.39	21 336	66.01	2 938	69.24
Unspecified	918	2.51	797	2.47	121	2.85
Total	36 563	100.00	32 320	100.00	4 243	100.00
POPULATION GROUP						
Black	23 611	64.58	20 353	62.97	3 258	76.79
Coloured	4 530	12.39	3 932	12.17	598	14.09
Indian/Asian	2 839	7.76	2 671	8.26	168	3.96
White	3 884	10.62	3 832	11.86	52	1.23
Other	114	0.31	107	0.33	7	0.16
Unspecified	1 585	4.33	1 425	4.41	160	3.77
Total	36 563	100.00	32 320	100.00	4 243	100.00

CITIZENSHIP						
South African	34 265	93.71	30 241	93.57	4 024	94.84
SADC country	298	0.82	261	0.81	37	0.87
Other African	253	0.69	230	0.71	23	0.54
Other	166	0.45	163	0.50	3	0.07
Unspecified	1 581	4.32	1 425	4.41	156	3.68
Total	36 563	100.00	32 320	100.00	4 243	100.00
GR 12 LANGUAGE						
Afrikaans	2 257	6.17	2 045	6.33	212	5.00
English	31 656	86.58	27 957	86.50	3 699	87.18
Other	1 047	2.86	874	2.70	173	4.08
Unspecified	1 603	4.38	1 444	4.47	159	3.75
Total	36 563	100.00	32 320	100.00	4 243	100.00
HOME LANGUAGE						
Afrikaans	2 334	6.38	2 136	6.61	198	4.67
English	11 716	32.04	10 725	33.18	991	23.36
isiNdebele	239	0.65	202	0.63	37	0.87
isiXhosa	6 131	16.77	5 145	15.92	986	23.24
isiZulu	4 394	12.02	3 962	12.26	432	10.18
Sesotho	2 519	6.89	2 164	6.70	355	8.37
Sesotho sa Leboa	2 119	5.80	1 813	5.61	306	7.21
Setswana	2 001	5.47	1 750	5.41	251	5.92
siSwati	653	1.79	578	1.79	75	1.77
Tshivenda	1 200	3.28	987	3.05	213	5.02
Xitsonga	1 224	3.35	1 040	3.22	184	4.34
Other	423	1.16	372	1.15	51	1.20
Unspecified	1 610	4.40	1 446	4.47	164	3.87
Total	36 563	100.00	32 320	100.00	4 243	100.00
HE ADMISSION						
Bachelor's degree					32 320	88.40
Diploma/ Higher Certificate					4 243	11.60
Total					36 563	100.00

6.4 DESCRIPTIVE STATISTICS

Table 25 Descriptive statistics: NBTs and NSC

	n	mean	sd	min	p25	p50	p75	max
TOTAL COHORT								
ALScore	36 558	56.14	14.31	10	44	55	68	97
QLScore	36 556	46.70	15.00	13	36	42	55	99
MathsScore	28 839	43.30	17.00	16	30	37	52	98
MTHN	30 218	59.79	19.28	4	46	60	75	100
MTLN	6 430	67.07	13.22	16	58	68	77	97
ENHN	20 993	69.87	9.90	38	63	70	77	98
ENFN	15 570	73.08	9.14	35	67	74	80	98
PSCN	25 266	62.33	16.66	15	50	63	75	100
BACHELOR'S DEGREE								
ALScore	32 316	57.62	14.15	10	46	57	69	97
QLScore	32 314	48.00	15.26	13	36	43	57	99
MathsScore	25 761	44.91	17.20	16	31	40	55	98
MTHN	26 940	63.00	17.60	4	50	63	76	100
MTLN	5 487	69.85	11.38	23	62	71	78	97
ENHN	18 742	71.38	9.02	39	65	71	78	98
ENFN	13 578	74.59	8.23	40	69	75	80	98
PSCN	22 579	65.30	14.88	15	54	65	76	100
DIPLOMA/CERTIFICATE								
ALScore	4 242	44.86	9.77	22	38	42	50	83
QLScore	4 242	36.78	7.32	16	33	35	38	88
MathsScore	3 078	29.81	5.48	19	27	29	31	95
MTHN	3 278	33.47	10.32	5	27	34	41	78
MTLN	943	50.90	11.42	16	43	49	60	86
ENHN	2 251	57.33	7.79	38	52	57	63	82
ENFN	1 992	62.78	8.32	35	57	63	69	87
PSCN	2 687	37.39	7.26	15	32	37	43	69

Figure 49 below highlights the differences in the purposes of the NSC and the NBTs. In measuring school exit levels, the MTHN, MTLN and PSCN scores are markedly higher than the NBT MAT and QL scores; and the ENHN and ENFN scores are markedly higher than the NBT AL scores. More than half of the MTLN candidates scored above 60%, but this is not reflected in the QL scores of where the median is 42%.
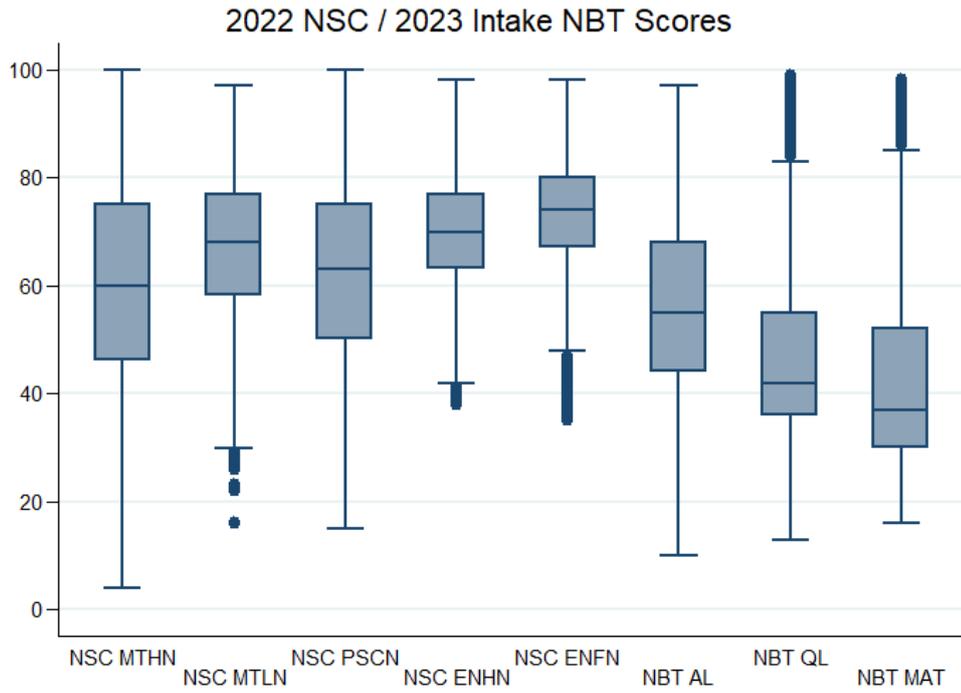
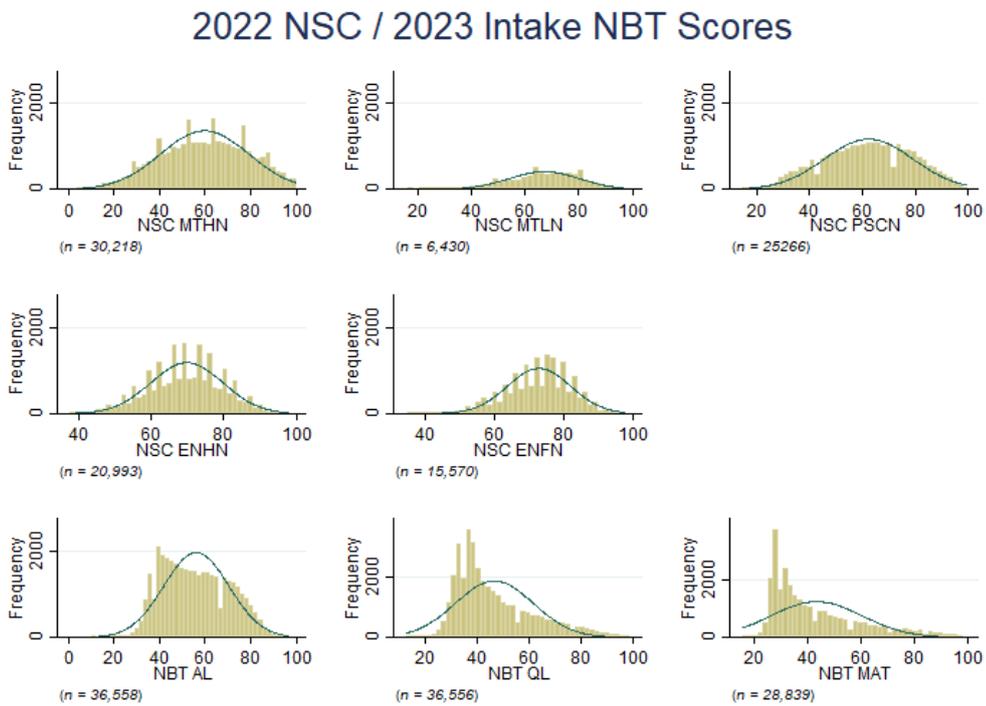*Figure 49 2022 NSC/2023 Intake NBT scores distribution*

Figure 50 2022 NSC/2023 Intake NBT scores frequencies

66

7.   COMPARISON

7.1 COMPARISON: 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.

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

The proportion of candidates who scored in the Proficient band on the NBT AL in English was larger than that of their Afrikaans counterparts when comparing the scores according to intended faculty. Figure 51shows the proportion of students in the Intermediate Lower and Upper bands across all the faculties for the Afrikaans cohort in comparison with the students who wrote the papers in English (Figure 52) for the same faculties. The faculty group with the highest proportion of candidates in the Intermediate Lower band was Education for English cohorts (68%) and, for the cohort that wrote in Afrikaans, the faculty group with the highest proportion of candidates in the Intermediate Lower band, was Education (63%). In terms of the Intermediate Upper band, the faculty groups with the highest proportion of candidates in this band were Allied Healthcare/Nursing (50%) in the Afrikaans cohorts, and Mathematics/Science (38%) in the English cohorts. It is worth mentioning that in all the English and Afrikaans cohorts, the majority of candidates in each faculty group fell in the Intermediate bands. Perhaps most notably, 90% of the candidates in the Afrikaans cohort of Education (see Figure 51) and 88% of the candidates in the English cohort of Allied Healthcare/Nursing (see Figure 52) scored within either the Intermediate Lower or Intermediate Upper bands. This suggests that majority of the candidates in these cohorts would need some type of support to develop their academic literacy skills and handle the demands of academic study in higher education.

Figure 51 2023 Intake: NBT AL performance levels by intended programme of study for Afrikaans writers

2023 Intake NBT Academic Literacy Performance Levels by Intended Faculty of Study, English

Figure 52 2023 Intake: NBT AL performance levels by intended programme of study for English writers

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

The QL performance of candidates who wrote in Afrikaans was higher than that of the candidates who wrote in English (Figure 53and Figure 54). The proportion of candidates who wrote in Afrikaans whose scores fell in the Basic band in QL is lower for most of the faculties compared to the proportions of candidates who wrote in English. A high proportion of candidates who wrote in English fell into the Basic band, and the candidates applying to the Education (76%) and Allied Healthcare/Nursing (69%) faculties showed the largest proportions of candidates in the Basic band (Figure 54).

Figure 53 2023 Intake: NBT QL performance levels by intended faculty of study for Afrikaans writers

Figure 54 2023 Intake: NBT QL performance levels by intended faculty of study for English writers

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

The MAT performance of candidates who wrote in English was better than that of candidates who wrote in Afrikaans (Figure 55 and Figure 56). The proportion of candidates who wrote in Afrikaans and had scores in the Basic band is slightly lower or similar for English counterparts in the same faculties, with the exception of Art/Design where more Afrikaans candidates' had scores in Basic band (100% of the Afrikaans group, 67% of the English cohort).
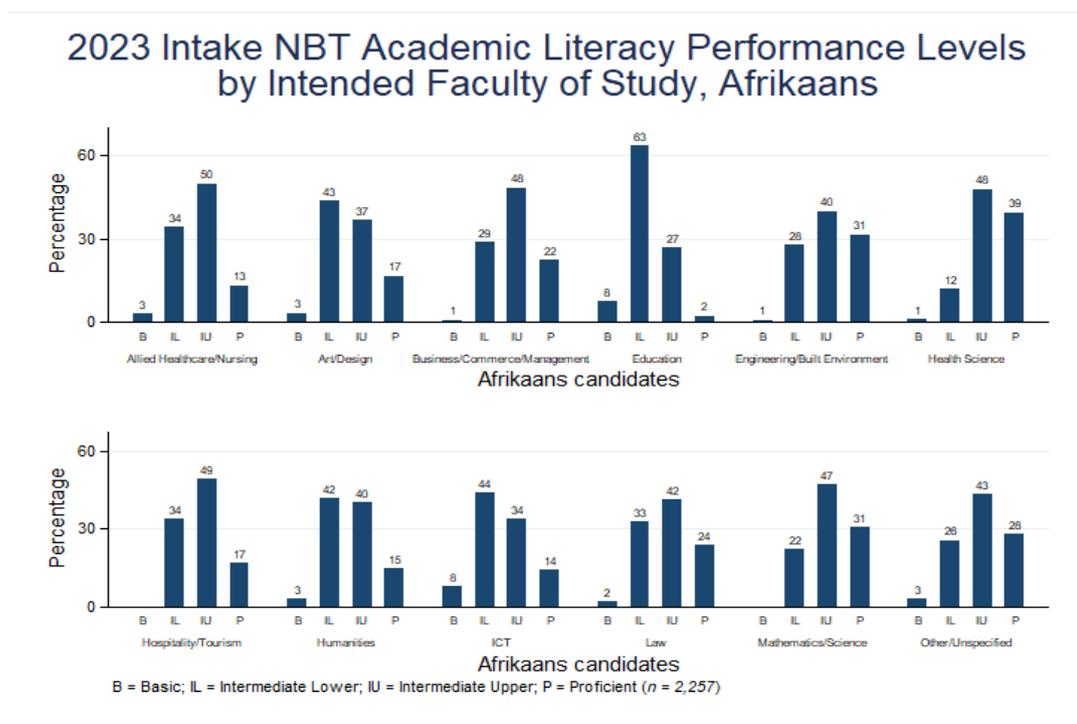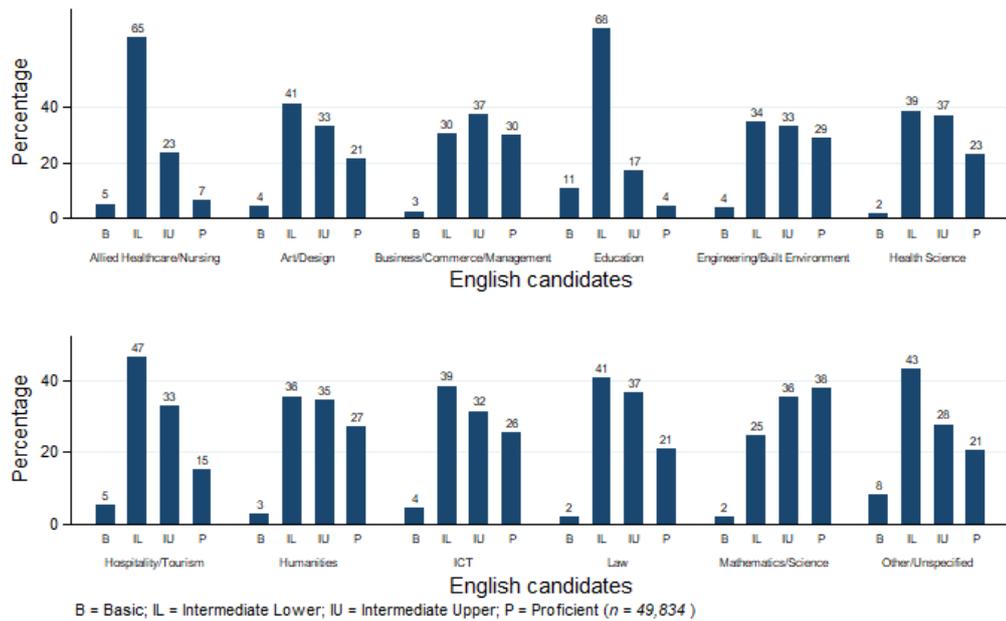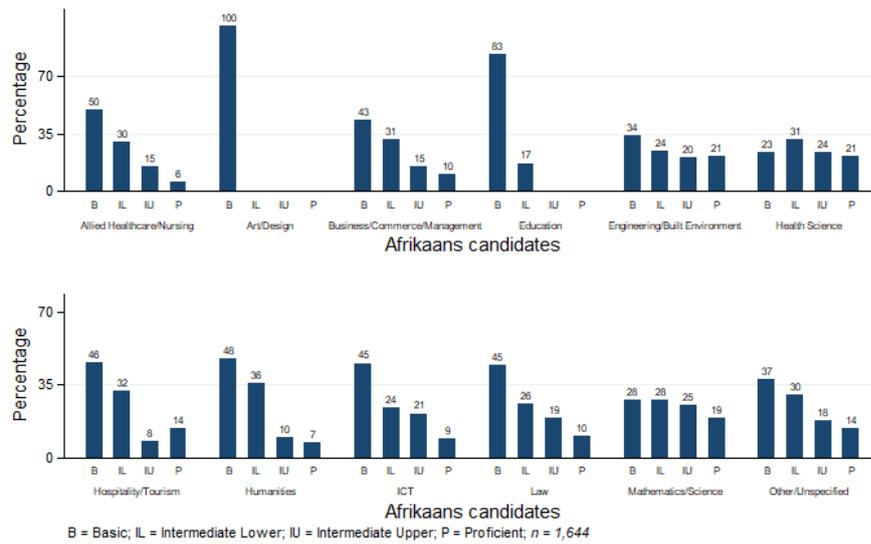
Figure 55 2023 Intake: NBT MAT performance levels by intended programme of study for Afrikaans writers
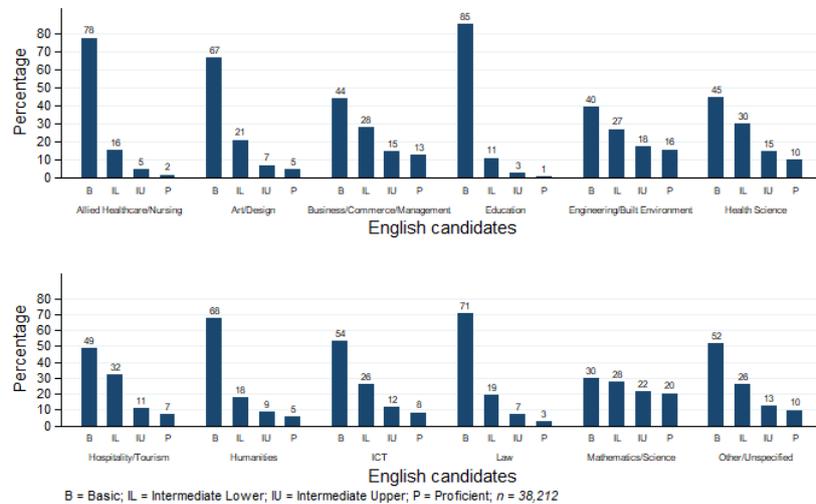
Figure 56 2023 Intake: NBT MAT performance levels by intended programme of study for English writers

7.2 COMPARISON OF THE 2022 INTAKE RESULTS TO THE 2023 INTAKE RESULTS

In this section the AL, QL and MAT performance of the candidates is examined in the 2022 and 2023 intake cycles to investigate broad trends of the NBTs over time. In broad terms, the 2023 intake cohort performed fairly similarly to the 2022 intake cohort in terms of all three domain proficiency categories (AL, QL and MAT).

Figure 57 shows that there was a slight improvement in AL performance from the 2022 intake cohort to the 2023 intake cohort. The proportion of scores in the Proficient category for this domain decreased slightly from 25.90% of the cohort to 23.15%, while the proportion of the scores in the Basic category decreased from 4.14% to 3.43%.
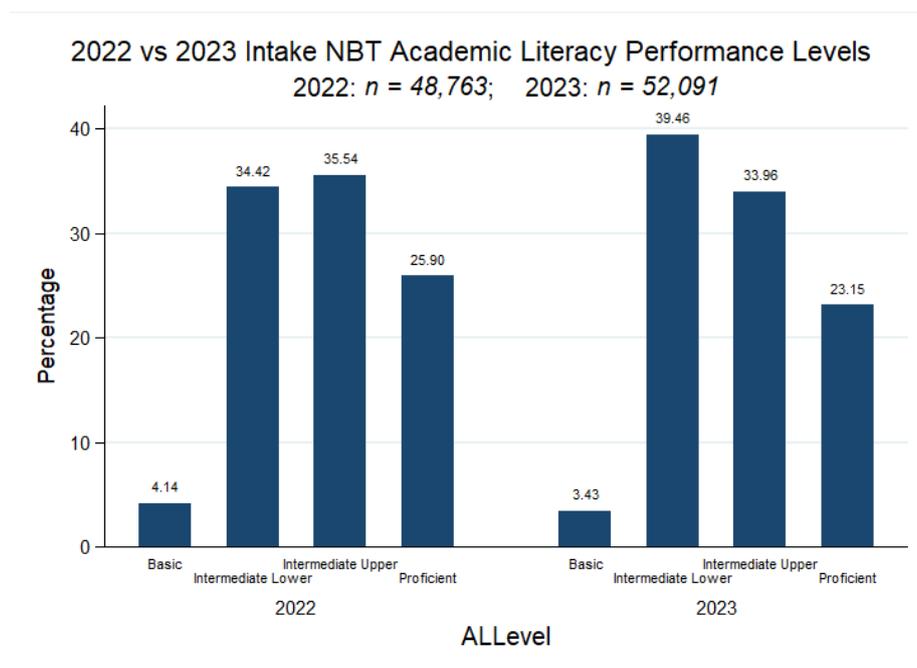
Figure 57 Performance in AL, 2022 and 2023 Intake cycles

For QL performance, the proportions of candidates whose QL scores were in the Proficient band decreased from 12.97% in the 2022 intake to 9.90% in the 2023 intake (Figure 58). There have also been slight changes in the proportions in the Intermediate bands: an increase from 28.57% to 30.35% for the Intermediate Lower band and a slight decrease from 15.45% to 15.11 for the Intermediate Upper band. There was an increase in the proportions of candidates with scores in the Basic band in QL between the 2022 intake and the 2023 intake, from 43.01% to 44.65%. These slight differences may indicate that candidates wishing to enter higher education have comparable levels of preparedness for the demands of academic study from one year to the next.
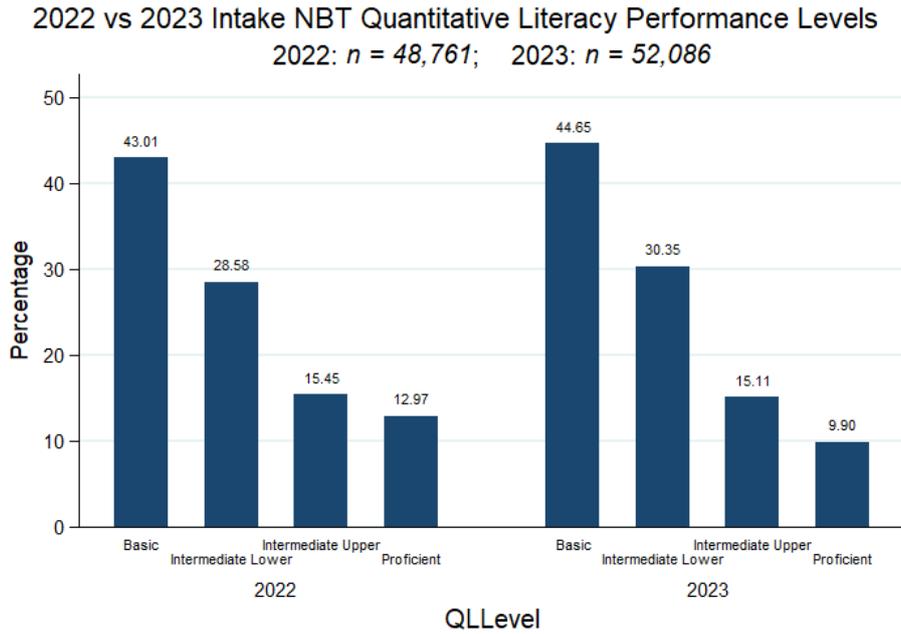
Figure 58 Performance in QL, 2022 and 2023 Intake cycles

Figure 59 shows that performance in MAT has decreased very slightly in the Proficient band, from 10.59% in the 2022 intake to 10.58% in the 2023 intake. The proportions of scores in the Basic band have decreased from 53.85% to 48.58% over the same period. The proportions in the two Intermediate categories (Lower and Upper considered together) increased slightly, from 22.90% and 12.66% in the 2022 intake to 26.92% and 13.91% in the 2023 intake cycle.
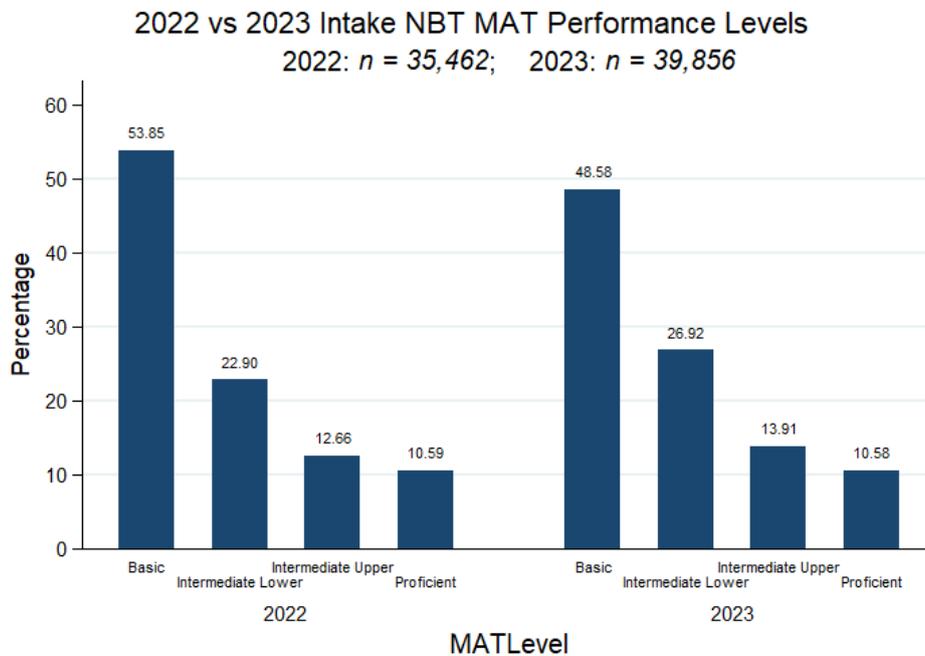
Figure 59 Performance in MAT, 2022 and 2023 Intake cycles

7.2.2 TEST LANGUAGE

Statistical data comparing the performance of candidates who wrote the AL test in Afrikaans and candidates who wrote the AL test in English are presented in Figure 60. The Afrikaans group constituted a lower proportion in the Basic band (2.1%) than their English counterparts (3.5%) in the 2023 intake cycle (both lower than in the previous year). In the Intermediate band the Afrikaans group constituted a lower proportion of the Intermediate Lower category (27.5%) than their English counterparts (40.0%) – both higher in the 2023 intake than in the 2022 intake; the Afrikaans candidates constituted a higher proportion of those in the Intermediate Upper band (43.9%) than their English counterparts (33.5%) in the 2023 intake (in increase in the proportion in Intermediate Lower from the 2022 intake cycle and decrease for Intermediate Upper from the 2022 intake).
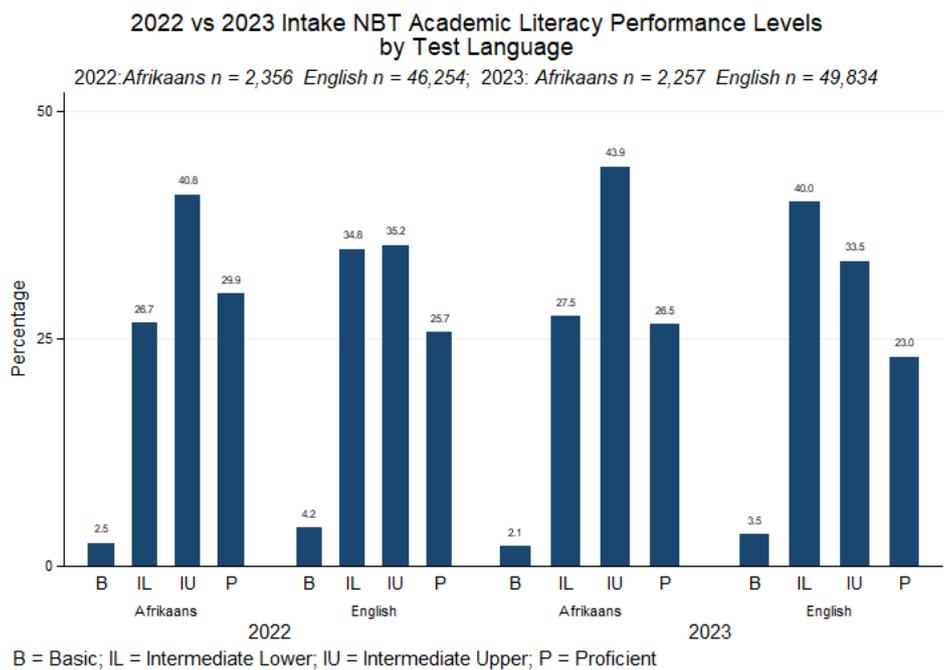
Figure 60 AL performance by test language, 2022 and 2023 Intake cycles

The proportion of candidates who wrote the QL test in Afrikaans is small compared with those who wrote in English. These candidates are most likely first-language speakers of Afrikaans or candidates who intend studying in Afrikaans. The proportion of candidates who wrote the QL test in Afrikaans and whose scores fell into the Proficient band decreased from 20.0% in 2022 to 18.4% in 2023. The proportion of candidates who wrote the test in English in the Proficient band decreased from 12.6% in 2022 to 9.5% in 2023. The proportion of candidates who wrote in Afrikaans and whose scores fell into the Basic band decreased from 35.1% in 2022 to 29.1% in 2023 (Figure 61). For those who wrote in English there was an increase in the proportion in the Basic band from 43.4% in 2022 to 45.3% in 2023. Overall, the pattern of performance for the candidates that wrote in Afrikaans in the 2023 intake cycle was different from the previous cohort, whilst the pattern remained mostly the same for the candidates who wrote the QL test in English.
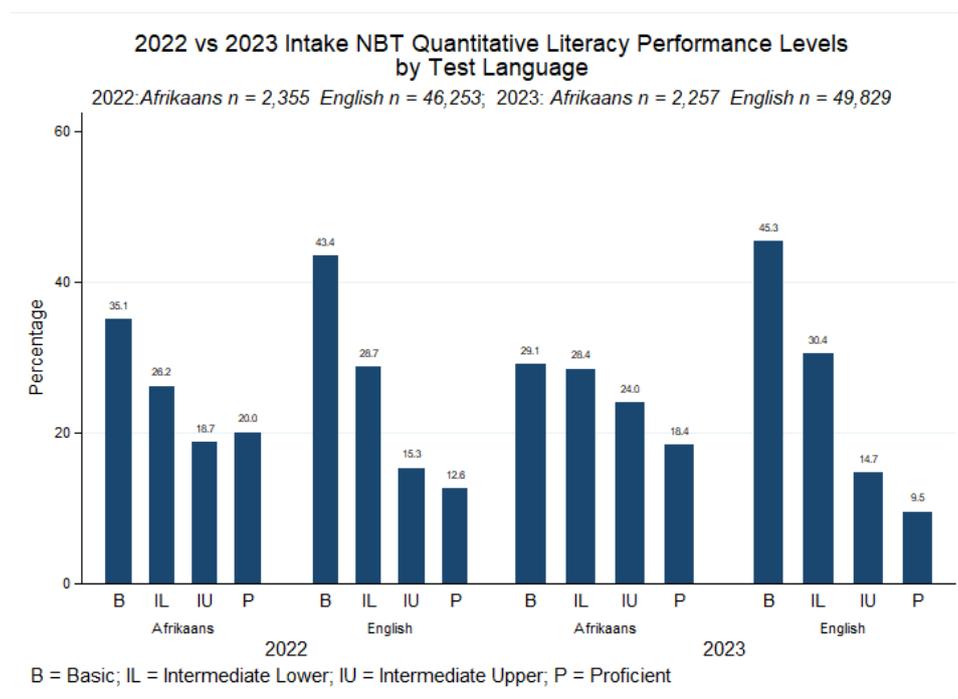
Figure 61 QL performance by test language, 2022 and 2023 Intake cycles

For the candidates who wrote the MAT test in Afrikaans and the candidates who wrote the MAT test in English, there were similar differences to those seen in the QL. In 2022, 18.4% of the Afrikaans candidates had scores in the Proficient band, compared to 16.2% in 2023. Of the English cohorts, 10.3% of the candidates' scores were in the Proficient band in 2023, compared to 10.2% in 2022. In 2023, 34.7% of the Afrikaans candidates (a smaller proportion than the 44.0% in the 2022 intake) and 49.2% of the English candidates had scores in the Basic band (also a smaller proportion than the 54.3% in the 2022 intake). 29.6 % of the Afrikaans cohort in 2023 (an increase from 21.9% in 2022) and 26.8% of the English cohort in 2023 (again an increase from 22.9% in 2022) had scores in the Intermediate Lower band. Those who wrote the test in English are representative of all the other language groups. These results are illustrated in Figure 62 below.
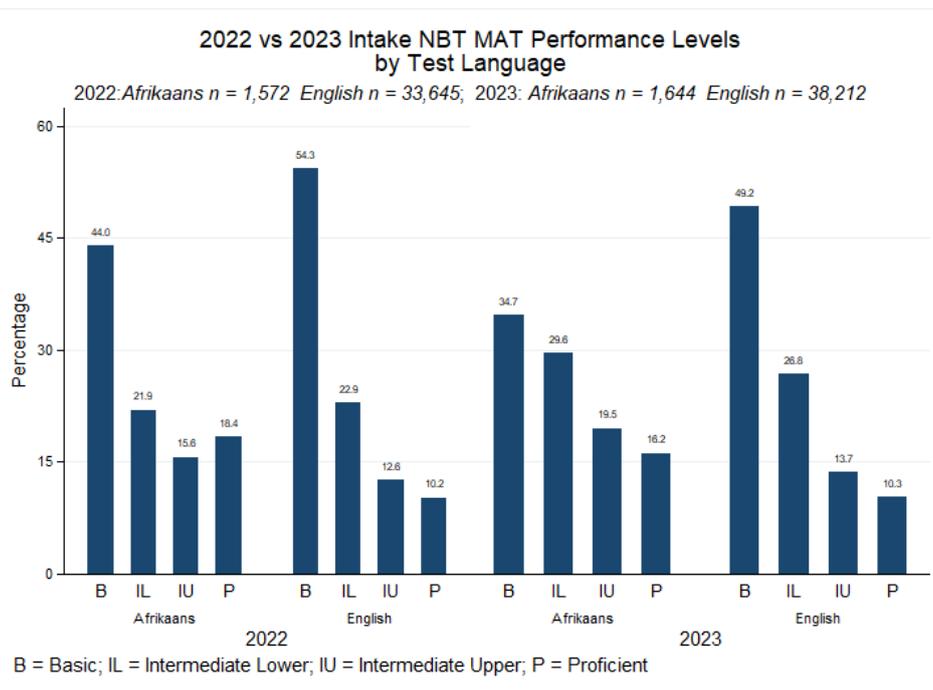
Figure 62 MAT performance by test language, 2022 and 2023 Intake cycles

Citizenship

For the 2023 intake, more non-South Africans were in the Proficient category (31.9%) compared to South Africans (22.5%), more South Africans were in the Intermediate Lower category (40.5%) compared to non-South African writers (25.6%), more non-South Africans were in the Intermediate Upper band (40.3%) compared to South Africans (33.8%), and more South Africans were in the Basic band (3.2%) compared to non-South Africans (2.2%). From the graph, non-South African candidates performed better in the NBT AL Proficient band than did South African candidates, in both the 2022 and the 2023 intake cycles.
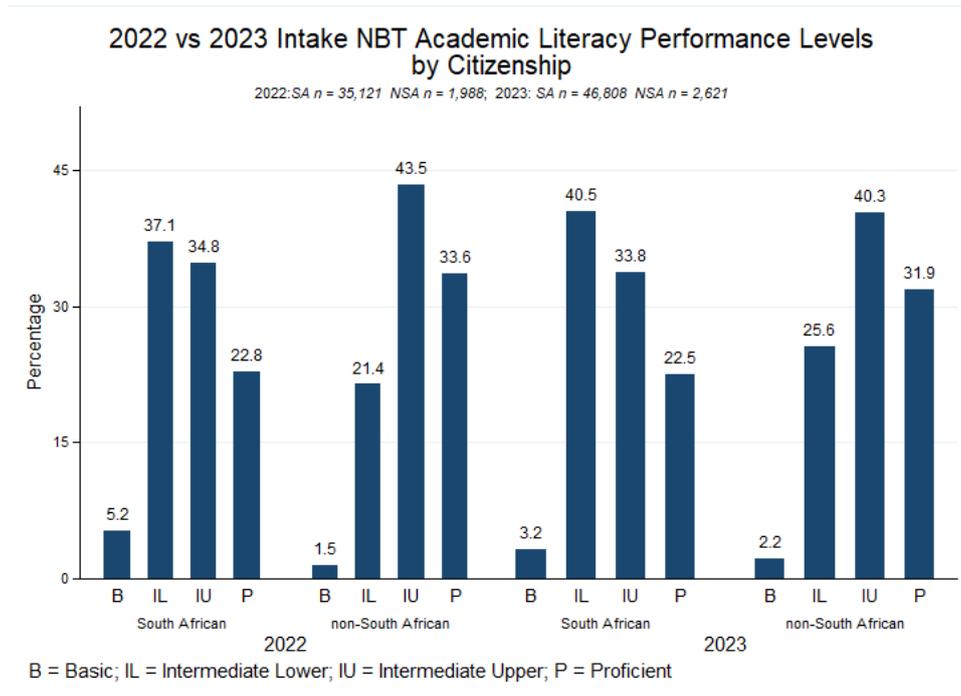
Figure 63 NBT Academic Literacy performance levels by citizenship, 2022 vs 2023 Intake

In terms of QL performance, the non-South African candidates outperformed the South African candidates in the 2023 intake cycle. The proportion of non-South African candidates whose scores were in the Proficient band (12.7%) was higher than the proportion of South African candidates (9.7%) (Figure 64). Overall, the non-South African candidates performed better that the South African cohort. The non-South African cohort had a higher proportion of candidates than in the South African cohort in each of the performance bands apart from the Basic band. The performance could possibly be ascribed to the differences in the schooling systems in the respective countries, although it is most likely an effect of South African universities drawing high-achieving candidates from elsewhere.
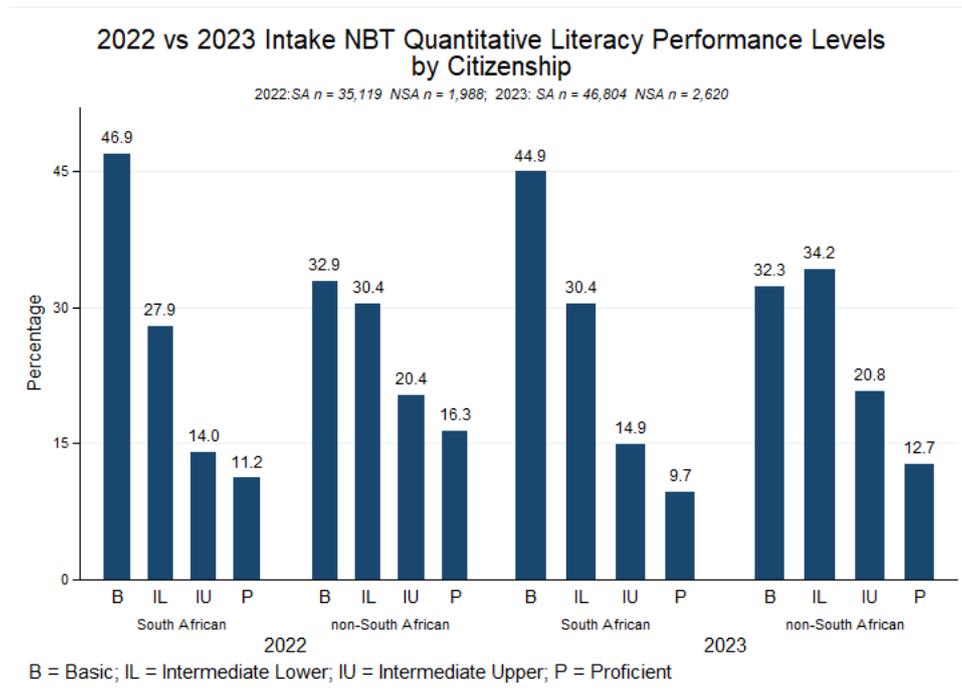
Figure 64 NBT Quantitative Literacy performance levels by citizenship, 2022 vs 2023 Intake

South African candidates performed better in the Proficient band for MAT than the non-South African candidates. In the 2023 intake, 49.1% of the South African candidates were in the Basic band, while 40.4% of the non-South African candidates were in the Basic band (Figure 65). The non-South African writers had the higher proportion of candidates in the Intermediate category (both Intermediate Lower and Upper). In the Proficient category, the two groups performed differently as well: 10.4% of the South African candidates and 14.5% of the non-South African candidates had scores in this band. The slight differences in the Proficient and Basic bands may indicate differences in schooling or institutions attracting high-achieving students from other countries.
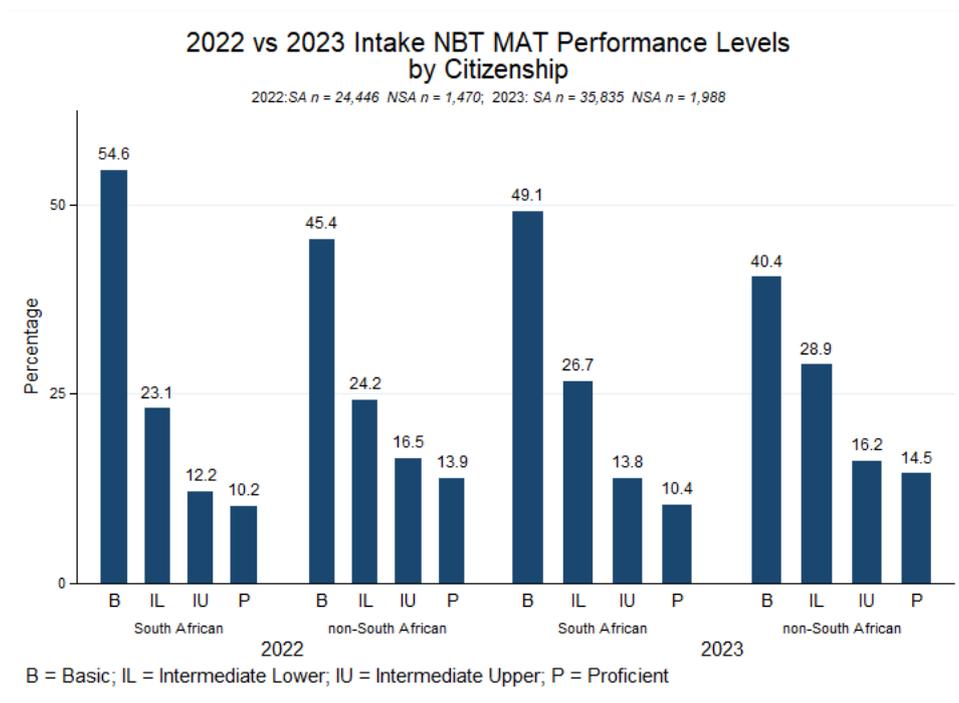
Figure 65 NBT MAT performance levels by citizenship, 2022 vs 2023 Intake

8. 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). The results are shown in Table 26 and Figure 66 below.

For AL, just over a quarter of Bachelor's Degree candidates (26.0%) were in the Proficient band, and approximately 8.9% of the Diploma/Higher Certificate candidates were in the Proficient band. Sixty-three percent of Diploma/Higher Certificate candidates had scores in the Intermediate Lower band and 24.5% had scores in the Intermediate Upper band. Of the Bachelor's Degree candidates, 35.6% of the had scores in the Intermediate Lower band and 36.0 % had scores in the Intermediate Upper band.

For QL, about 11.6% of the Bachelor's Degree candidates had scores in the Proficient band; approximately 60.6% of the Diploma/Higher Certificate candidates had scores in the Intermediate Lower band.

For MAT, about 42.9% of the Bachelor's Degree candidates had scores in the Basic band; approximately 84.9% of the Diploma/Higher Certificate candidates had scores in the Basic band.

Table 26 Frequency tables of benchmark bands for the NBT domains

	Basic		Intermediate Lower		Intermediate Upper		Proficiency		Total
	n	%	n	%	n	%	n	%	n
ACADEMIC LITERACY									
Bachelor's degree pass	778	2.13	11 498	31.45	11 647	31.86	8 393	22.96	32 316
Diploma/Higher Certificate pass	134	0,.37	2 689	7.36	1 040	2.84	379	1.04	4 242
QUANTITATIVE LITERACY									
Bachelor's degree pass	12 408	33,94	10 657	29.15	5 489	15.02	3 760	10.29	32 314
Diploma/Higher Certificate pass	1 389	3,8	2 572	7.04	251	0.69	30	0.08	4 242
MATHEMATICS									
Bachelor's degree pass	11 054	38.33	7 544	26.16	3 980	13.8	3 183	11.04	25 761
Diploma/Higher Certificate pass	2 612	9.06	419	1.45	29	0.1	18	0.06	3 078

Figure 66 NSC cohort performance levels on NBT

8.1 Associations between scores on the NBT in Academic Literacy and the NSC Examination for English
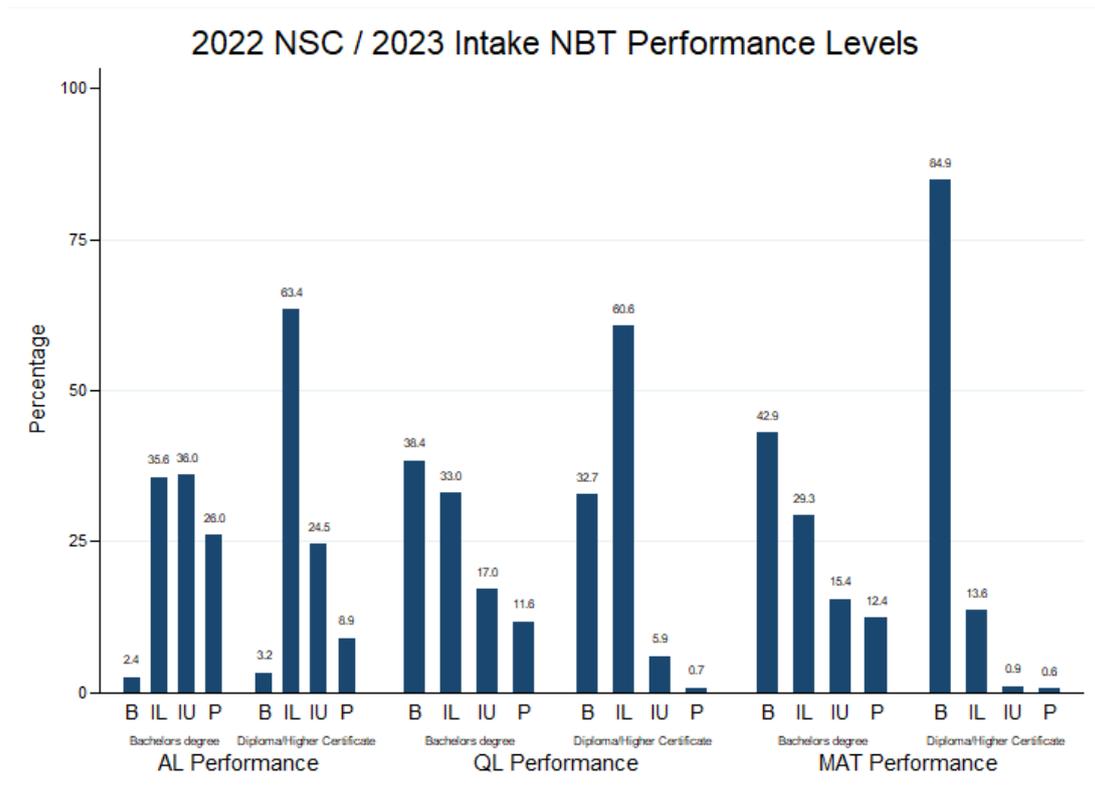
This section depicts the associations between scores on the NBT in AL (NBT AL) and scores on the NSC English Home Language (ENHN) and NSC English First Additional Language (ENFN) for two subgroups: those who achieved an NSC with a Bachelor's Degree pass and those who achieved an NSC with a Diploma or Higher Certificate pass, of the 2023 intake of higher education students who wrote the NSC in 2022.

Table 27 Correlation matrix for the 2022 NSC and 2023 Intake NBT results, Bachelor's Degree

Bachelor's	NBT AL	NBT QL	NBT MAT	NSC MTHN	NSC MTLN	NSC ENHN	NSC ENFN	NSC PSCN
NBT AL	1							
	32316							
NBT QL	0.6909	1						
	32314	32314						
NBT MAT	0.5539	0.7045	1					
	25757	25757	25761					
NSC MTHN	0.3480	0.5202	0.7452	1				
	26936	26936	25297	26940				
NSC MTLN	0.5836	0.5840	0.3421	0.5595	1			
	5487	5486	552	145	5487			
NSC ENHN	0.6807	0.5420	0.5104	0.5259	0.5785	1		
	18739	18738	14220	14981	3892	18742		
NSC ENFN	0.5945	0.4487	0.4082	0.3922	0.5269	.	1	
	13577	13576	11541	11959	1595	0	13578	
NSC PSCN	0.2825	0.4105	0.6433	0.8627	0.5302	0.5459	0.4016	1
	22576	22576	21773	22565	16	11655	10924	22579

Table 28 Correlation matrix for the 2022 NSC and 2023 Intake NBT results, Diploma/Higher Certificate

Diploma/ Higher Certificate	NBT AL	NBT QL	NBT MAT	NSC MTHN	NSC MTLN	NSC ENHN	NSC ENFN	NSC PSCN
NBT AL	1							
	4242							
NBT QL	0.5928	1						
	4242	4242						
NBT MAT	0.3035	0.3598	1					
	3077	3077	3078					
NSC MTHN	0.1108	0.2134	0.2599	1				
	3277	3277	2926	3278				
NSC MTLN	0.4338	0.4343	0.0767	.	1			
	943	943	144	0	943			
NSC ENHN	0.5655	0.3709	0.0857	0.0907	0.3653	1		
	2251	2251	1507	1606	639	2251		
NSC ENFN	0.4625	0.2209	0.0767	0.0752	0.3569	.	1	
	1991	1991	1571	1672	304	0	1992	
NSC PSCN	0.0111	0.0306	0.1001	0.5086	0.3967	0.0466	0.1014	1
	2686	2686	2448	2681	6	1241	1446	2687

Figure 67 shows the scatterplot of NBT AL scores against NSC ENHN scores for candidates who achieved the NSC with a Bachelor's Degree pass as well as those who achieved the NSC with a Diploma or Higher Certificate pass. There was a correlation of 0.681 between NSC ENHN and NBT AL for those with a Bachelor's Degree pass, and a correlation of 0.566 between NSC ENHN and NBT AL for Diploma/Higher Certificate candidates. Candidates who obtained the NSC with a Bachelor's Degree pass and performed well in the NSC ENHN (75% and above) had varying levels of performance on the NBT AL (Table 27 and Table 288). Candidates who obtained the NSC with either a Diploma or a Higher Certificate pass performed fairly poorly on both the NSC ENHN and the NBT AL. The figure shows that these candidates, even though they took the NSC ENHN as a subject, are largely not prepared for the typical AL demands of academic study.
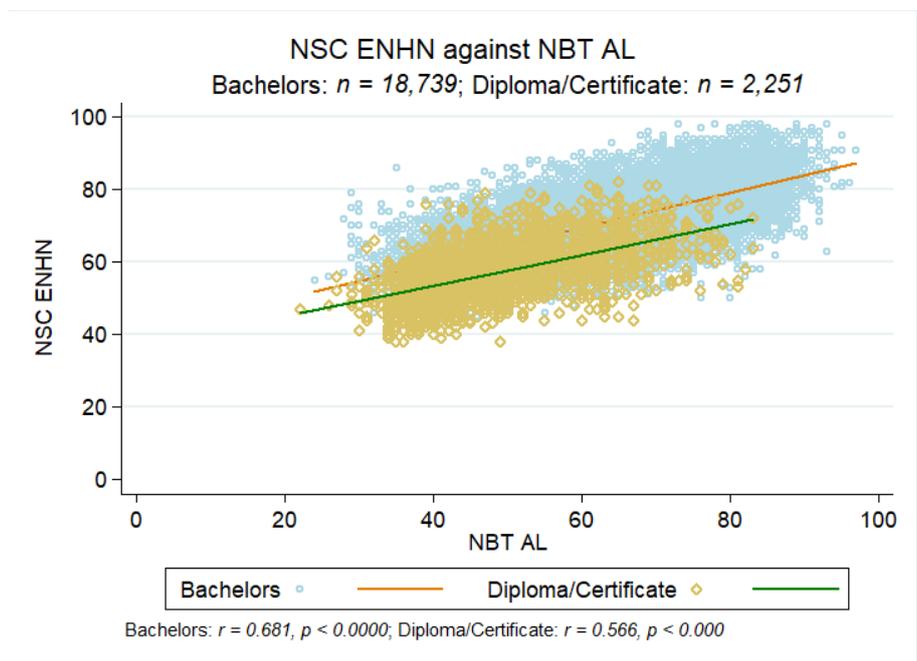

Figure 67 Scatterplot NSC ENHN against NBT AL

Figure 68 shows the scatterplot of NBT AL scores against NSC ENFN scores for candidates who achieved an NSC with either a Bachelor's Degree pass or a Diploma/Higher Certificate pass and who took the NSC ENFN examination.

Candidates who received a Bachelor's Degree pass and performed at the Proficient level in the NBT AL also performed well on the NSC ENFN examination. This is also supported by the reasonably strong correlation of 0.595 between the NSC ENFN scores and the NBT AL scores for the candidates who obtained a Bachelor's Degree pass. The candidates who performed exceptionally well on the NSC ENFN examinations with scores of 80% and above had varying scores on the NBT AL test. A large proportion of candidates with a Bachelor's Degree pass fall within the NBT AL Intermediate band. Most of the candidates who obtained a Diploma/Higher Certificate pass performed equally poorly on the NSC ENFN and the NBT AL test. This is supported by the correlation coefficient of 0.463. The figure shows that the majority of these candidates, even though they took the NSC ENFN as a subject, are largely not prepared to cope with the typical AL demands of academic study and they will have severe challenges at university.
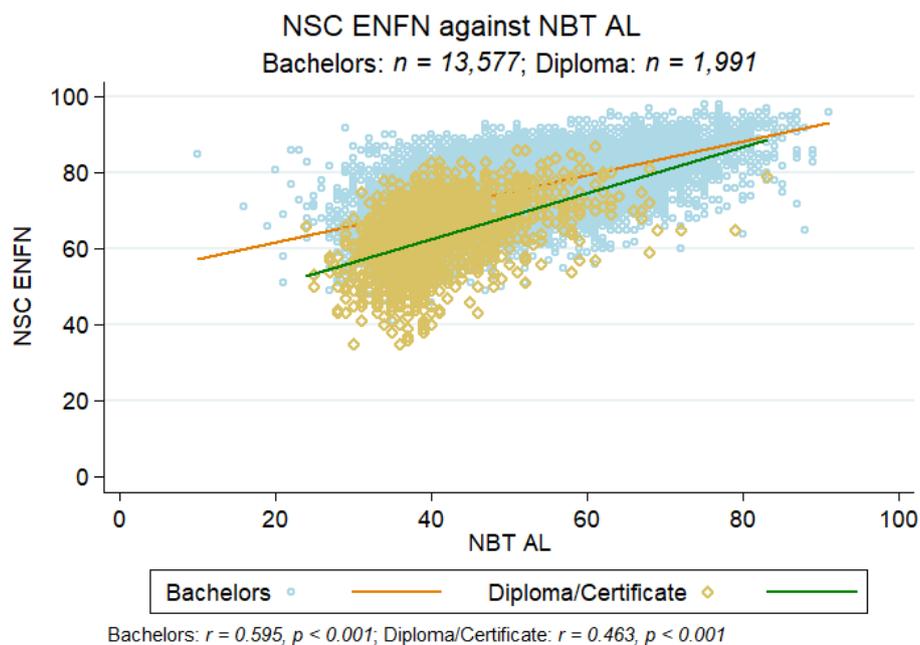
Figure 68 Scatterplot NBT AL vs NSC English First Additional Language

8.2 ASSOCIATIONS BETWEEN SCORES ON THE NBT IN QUANTITATIVE LITERACY AND THE NSC EXAMINATION FOR MATHEMATICS AND MATHEMATICAL LITERACY

This section depicts associations between scores on the NBT in QL (NBT QL) and scores on the NSC Mathematics (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 the 2023 intake of higher education students who wrote the NSC in 2022.

Figure 69 shows the scatterplot of NBT QL scores against NSC MTHN scores for students who achieved a Bachelor's Degree pass as well as those who achieved a Diploma/Higher Certificate pass and who took the NSC MTHN examination. There was a correlation of 0.520 between NSC MTHN and NBT QL for the Bachelor's Degree candidates and a mere 0.213 correlation between NSC MTHN and NBT QL for Diploma/Higher Certificate candidates. Candidates who obtained the NSC with a Bachelor's Degree pass and performed well on the NSC MTHN examination (80% and above) had varying levels of performance on the NBT QL. This was the case for a large number of these candidates. It can also be clearly seen that even though these candidates performed well on the NSC MTHN, they will struggle with the QL 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 MTHN. Candidates who achieved a Diploma/Higher Certificate pass performed poorly on both the NSC MTHN and the NBT QL. The figure shows that these candidates, even though they did the NSC MTHN as a subject, are largely not prepared to cope with the typical QL demands of academic study.
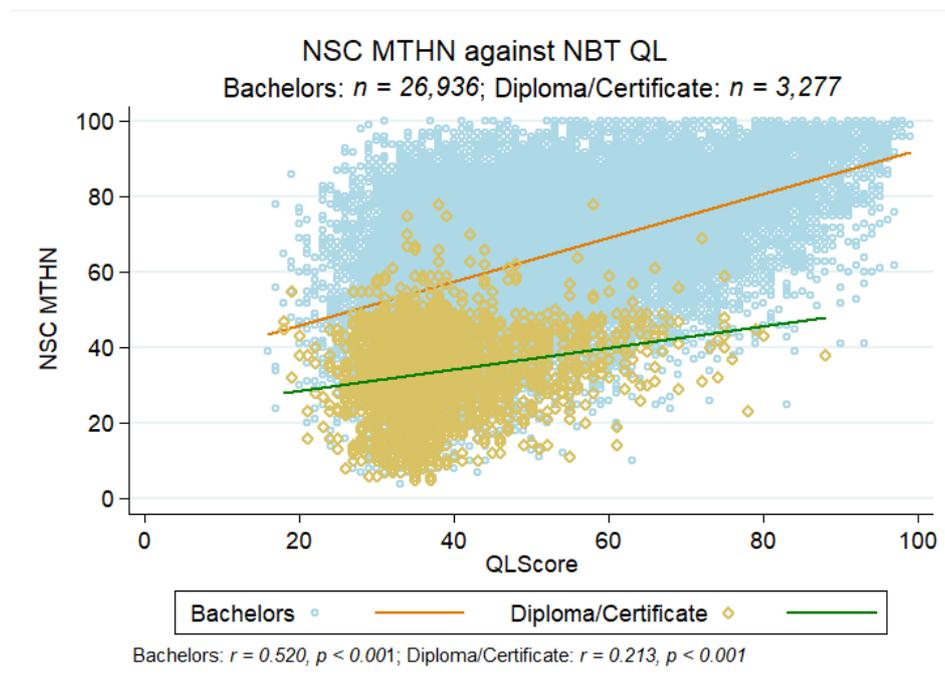

Figure 69 Scatterplot NBT QL vs NSC Mathematics

Figure 70 shows the scatterplot of NBT QL scores against NSC MTLN scores for students who achieved an NSC with either a Bachelor's Degree pass or a Diploma/Higher Certificate pass, and who took the NSC MTLN examination.

A very small number of candidates who received a Bachelor's Degree pass and who were in the Proficient band for NBT QL also performed very well in the NSC MTLN examination. The relationship between NSC MTLN and QL is clearly not linear and so the correlation between them of 0.584 for the candidates who obtained a Bachelor's Degree pass must be interpreted with caution. The candidates who performed very well in the NSC MTLN examination with scores of 80% and above had varying scores on the NBT QL test. A large proportion of candidates with a Bachelor's Degree pass fall within the NBT Intermediate band. Most of the candidates who obtained a Diploma/Higher Certificate pass performed equally poorly on the NSC MTLN examination and the NBT QL test, which is supported by the correlation coefficient of 0.001. The figure shows that the majority of these candidates, even though they did NSC MTLN as a subject, are largely not prepared to cope with the typical QL demands of academic study and they will have severe challenges at university.
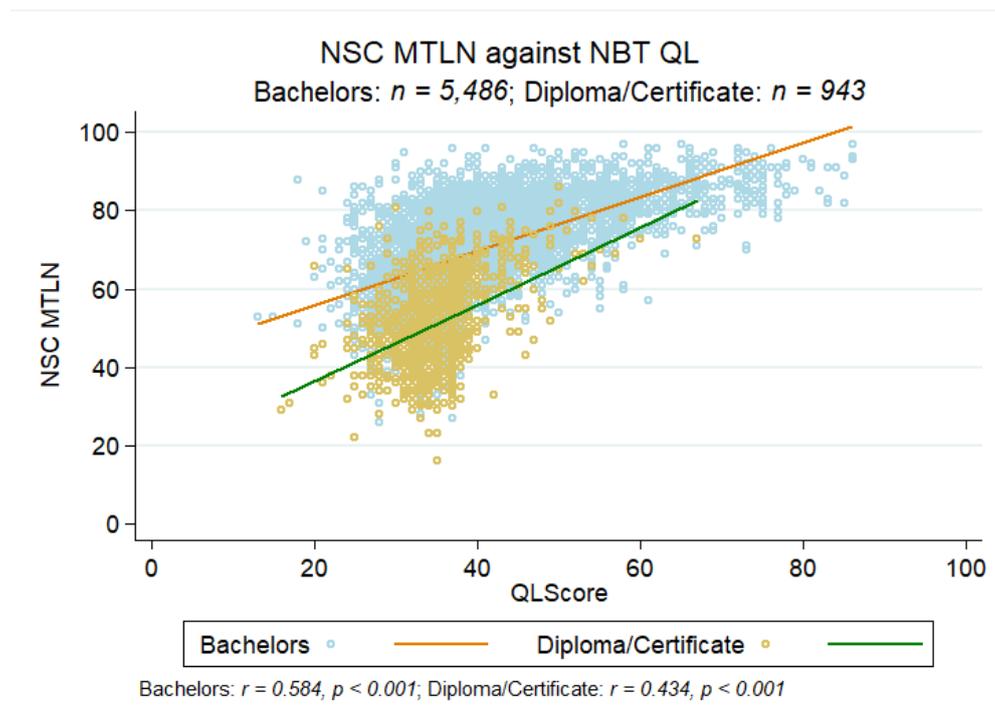

Figure 70 Scatterplot NBT QL vs NSC Mathematical Literacy

8.3 ASSOCIATIONS BETWEEN SCORES ON THE NBT IN MATHEMATICS AND THE NSC EXAMINATION FOR MATHEMATICS AND PHYSICAL SCIENCE

Figure 71 depicts the association between scores on the NBT MAT and scores on the NSC MTHN for those who achieved an NSC with a Bachelor's Degree pass in 2022.

There was a correlation of 0.745 between NSC MTHN 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 MTHN examination (90% and above) had varying levels of performance on the NBT MAT. The figure shows that many candidates did well in the NSC MTHN, but their NBT MAT scores lie in the Intermediate bands, with some scores even 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 MTHN 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.
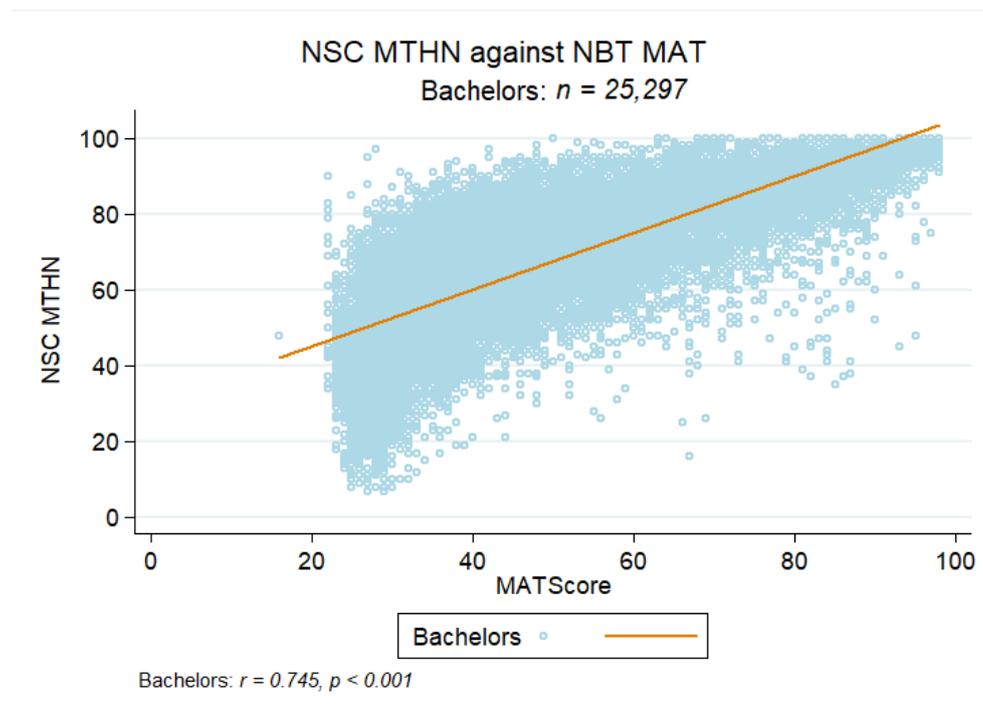

Figure 71 NBT MAT vs NSC MTHN

Figure 72 depicts the association between scores on the NBT MAT and the scores on the NSC Physical Science (PSCN) for those who achieved an NSC with a Bachelor's Degree pass, of the 2023 intake of higher education students who wrote the NSC in 2022.

There was a correlation of 0.643 between NSC PSCN scores and NBT MAT scores for the Bachelor's Degree candidates. Candidates who obtained the NSC with a Bachelor's Degree pass and performed well on the NSC PSCN 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 PSCN (80% and above) fall into the Intermediate and Basic bands of the NBT MAT. 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.
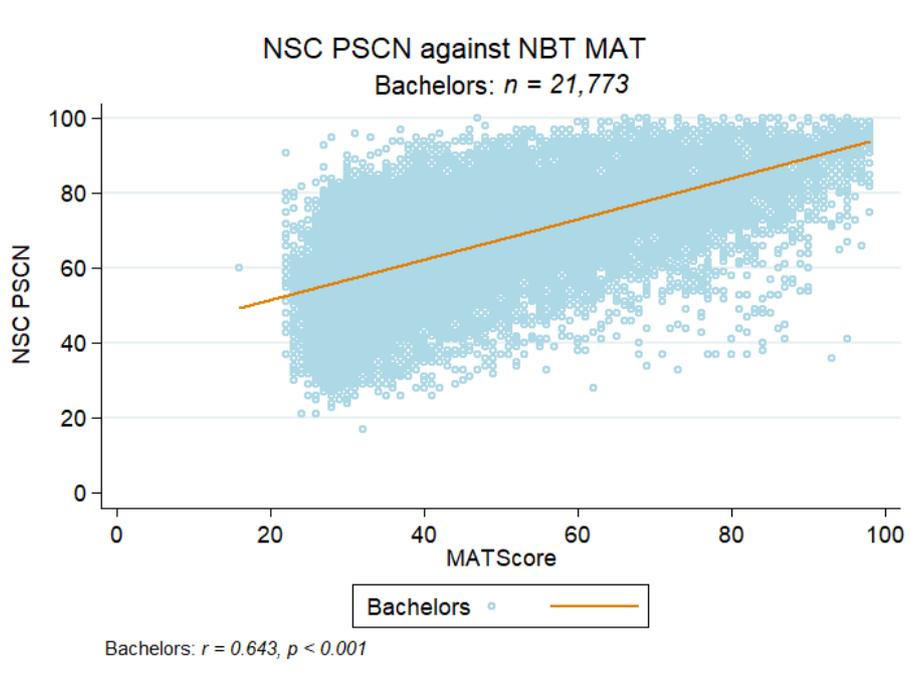
Figure 72 NSC PSCN vs NBT MAT

Many people are firmly of the opinion that a high school exit score is representative of adequate preparation for university study. It is a matter of concern that school-leavers (and parents and educators) do not recognise the different purposes for which the NSC and the NBTs were designed. 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

Given the data on actual students admitted at institutions, NBT diagnostic information, in the form of subdomain analysis, provides useful information for 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 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 2023 intake results show that prospective higher education students performed slightly better in the NBT MAT test with a smaller proportion of students getting scores in the Basic performance band than in the 2022 intake cycle. However, the proficiency in all subdomains is below 50%, which is concerning, given that most of those who wrote the NBTs are students who will be starting first-year studies at university. 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.

The NBTs MAT assessment data together with NSC Mathematics performance statistics indicate that students who come to universities bring in a host of mathematical deficiencies which are likely to affect their performance. Despite the availability of valuable data on student performance, the manual analysis and implementation of support programmes remain a time-consuming and resource-intensive task for first-year lecturers who are already burdened with their teaching responsibilities. Many students commencing higher education encounter a lack of readiness for the demands of university-level study. This unpreparedness can have implications for student retention, attrition rates, and their overall engagement with the learning process. Seeking digital solutions could prove effective in addressing these challenges, the blended approach can better support students at an individual level, without imparting on cost and time commitment.

The digital transformation that schools, colleges, and universities have been slow to adopt, particularly in assessment modes and practices (Richardson & Clesham, 2021), have been accelerated dramatically during the pandemic, with the higher education sector seeking solutions to teaching, learning and assessment. This trend is undoubtedly will drive digital innovation in education and capitalise on lessons learnt during the pandemic. In 2023, the NBT project embarked on an initiative to support this transition by utilising the NBT data and relative importance analyses to inform course specific parallel intervention programme that doesn't require additional time for lecturers, integrates with the course and supports students' concept development by closing the gaps in their prior learning as identified by the NBT diagnostics, while having most impact in the courses they are enrolled in. The project investigates the potential of using an adaptive learning system to facilitate a smoother transition for students entering tertiary education.

REFERENCES

Bachman, LF & Palmer, AS. 1996. *Language Testing in Practice*. Hong Kong: Oxford University Press.

Cliff, AF, Yeld, N & Hanslo, M. 2003. Assessing the academic literacy skills of entry-level students, using the Placement Test in English for Educational Purposes (PTEEP). Paper presented at the European Association for Research in Learning and Instruction (EARLI) conference, Padova, Italy.

Cliff, A & Yeld, N. 2006. Domain 1-Academic Literacy. In: H Griesel (ed) *Access and Entry-Level Benchmarks: The National Benchmark Tests Project*, pp. 19–27. Pretoria: HESA.

Cliff, A, Ramaboa, K & Pearce, C. 2007. The assessment of entry-level students' academic literacy: Does it matter? *Ensovoort* 11(2): 33–48.

Cliff, AF & Hanslo, M. 2009. The design and use of "alternate" assessments of academic literacy as selection mechanisms in higher education. *Southern African Linguistics and Applied Languages Studies* 27(3): 265–276.

Cummins, J. 2000. *Language, Power and Pedagogy: Bilingual Children in the Crossfire*. Clevedon: Multilingual Matters Ltd.

Frith, V & Prince, R. 2006. Quantitative literacy. In: H Griesel (ed) *Access and Entry-Level Benchmarks: The National Benchmark Tests Project*, pp. 19–27. Pretoria: HESA. 28-34; 47-54 Retrieved on 5 September 2019 from: http://www.cetap.uct.ac.za/sites/default/files/image_tool/images/216/2006_HESA_Access%20and%20Entry%20Level%20Benchmarks.pdf

Frith, V & Prince, R. 2016. Quantitative literacy of school leavers aspiring to higher education in South Africa. S*outh African Journal of Higher Education*, 30(1): 138–161.

Gal, I, Van Groenestijn, M, Manly, M, Schmitt, MJ & Tout, D. 2005. Adult numeracy and its assessment in the ALL Survey: A conceptual framework and pilot results. In: T Scott Murray, Y Clermont & M Binkley (eds), *International Adult Literacy Survey. Measuring Adult Literacy and Life Skills: New Frameworks for Assessment*. Ottawa: Statistics Canada. Retrieved on 5 September 2019 from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.120.4652&rep=rep1&type=pdf

Kelly, S, Johnston, B & Baynham, M. 2007. The concept of numeracy as social practice. In: S Kelly, B Johnston & K Yasukawa (eds), *The Adult Numeracy Handbook: Reframing Adult Numeracy in Australia*. Sydney: NSW Adult Literacy and Numeracy Australian Research Consortium, Sydney University of Technology.

Mamona-Downs, J & Downs, M. 2002. Advanced mathematical thinking with a special reference to reflection on mathematical structure. In: L. English (ed) *Handbook of International Research in Mathematics Education*, pp. 165–195. Lawrence Erlbaum Associates, Inc.

Mason, J H. 2002. *Mathematics Teaching Practice: A Guide for University and College Lecturers*. Horwood Publishing Limited, England.

O'Neill, T. R., Buckendahl, C. W., Plake, B. S., & Taylor, L. 2007. Recommending a nursing specific passing standard for the IELTS examination. *Language Assessment Quarterly*, *4*(4), 295–317.

Papageorgiou, S., & Tannenbaum, R. J. 2016. Situating standard setting within argument-based validity. *Language Assessment Quarterly*, *13*, 109–123. http://dx.doi.org/10.1080/15434303.2016.1149857

Prince, R. 2016. Predicting success in higher education: The value of criterion and norm-referenced assessments. *Practitioner Research in Higher Education: Assessment Special Edition*, 10(1): 22–38.

Prince, R & Simpson, Z. 2016. Quantitative literacy practices in civil engineering study: Designs for teaching and learning. *Proceedings of the 5th International Conference on Designs for Learning.* May 18–20, Copenhagen, Denmark.

Richardson, M. & Clesham, R. 2021. Rise of the machines? The evolving role of AI technologies in high stakes assessment. *London Review of Education*, 19(1): 1–13.

Sebolai, K. 2014. Do the Academic and Quantitative Literacy tests of the National Benchmark Tests have discriminant validity? *Journal for Language Teaching*, 48(1).

Sebolai, K. 2016. Distinguishing between English proficiency and academic literacy in English. *Language Matters*, 47(1): 45–60.

Steen, LA. 2004. *Achieving quantitative literacy: An urgent challenge for higher education*. Washington D.C.: The Mathematical Association of America.

Street, B & Baker, D 2006. So, what about multimodal numeracies? In: K Pahl & J Rowsell (eds), *Travel Notes from the New Literacy Studies*. Clevedon: Multilingual Matters Ltd.

Street, B. 2005. Applying new literacy studies to numeracy as social practice. In: A Rogers (ed), *Urban Literacy: Communication, Identity and Learning in Development Contexts*. Hamburg: UNESCO Institute for Education.

Tannenbaum, R. J., & Katz, I. R. 2013. Standard setting. In K. F. Geisinger (Ed.), *APA handbook of testing and assessment in psychology: Vol. 3. Testing and assessment in school psychology and education* (pp. 455–477). Washington, DC: American Psychological Association.

Yeld, N. 2001. *Equity, Assessment and Language of Learning: Key Issues for Higher Education Selection and Access in South Africa*. Unpublished PhD thesis, University of Cape Town.