THE NATIONAL BENCHMARK TESTS NATIONAL REPORT

2022 INTAKE CYCLE

June 2023

NBT
National Benchmark Tests Project

CEA
Centre for Educational Assessments

ACKNOWLEDGEMENTS

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

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ABBREVIATIONS

AL	Academic Literacy
ALL	Adult Literacy and Lifeskills
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

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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 2022 academic year. Candidates considered in this report wrote the NBTs from March 2021 to February 2022. 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 2022 NBT intake cycle, 48,763 Academic Literacy (AL) test scores, 48,762 Quantitative Literacy (QL) test scores and 35,463 Mathematics (MAT) test scores were obtained. All these scores are provided in the body of the report.

Considering the unique circumstances and challenges faced during the 2021 test administration, a decision was made to compare the intake of 2022 with the 2020 Intake. This approach allows for an assessment of the potential impact of the disruptions caused by the pandemic on student performance and admission outcomes. 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 2022 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 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 2022 academic year. Candidates considered in this report will have written the NBTs between May 2021 and February 2022.

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 2022 Intake report consists of all NBT candidates who wrote the tests in the period March 2021 to February 2022. These are referred to as the "2022 Intake Cohort", or "2022 NBT Cohort" for brevity in text and figures. Section 8 considers a subsample of the 2022 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:

- 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.
- Candidates are asked to indicate their first, second and third choice of faculty to which they have applied or will apply. Only the first choice of intended faculty was used in this analysis.
- Data are not collected by the 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:

- 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.
- 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.
- 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:

- read carefully and make meaning from texts that are typical of the kinds that they will encounter in their studies;
- understand vocabulary, including vocabulary related to academic study, in their contexts;
- identify and track points and claims being made in texts;
- understand and evaluate the evidence that is used to support claims made by writers of texts;
- extrapolate and draw inferences and conclusions from what is stated or given in texts;
- identify main from supporting ideas in the overall and specific organisation of a text;
- identify and understand the different types and purposes of communication in texts;

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

3.3.2 Quantitative Literacy (QL)

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

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

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:

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

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 five minutes and three 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 uni-dimensional 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

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

3.11 TEST ADMINISTRATION

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.

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 500 academics have participated in one or more ways in the NBTP.

The teams are constructed on the basis of the expertise of the participants in what constitutes proficiency of test-writers at the school-leaving stage wishing to enter higher education. Language and disciplinary experts drawn from outside the test development teams function as reviewers of the tests in terms of their language, content and format appropriateness, construct representation, and bias and fairness. Items are assessed by review panels 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 largely carried out from October to November 2019. The NBTP organised and hosted item and test review workshops for AL, QL and MAT for the 2020 and 2021 intake cycle tests. Item and test review reports are available on request from the CEA Test Development Coordinator.

Standard-setting for the NBTs is done approximately every three years. The purpose of standard-setting 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

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

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 NBTP, a standard-setting study was conducted for the NBTs during the week of 14 to 19 October 2019 by Wanda D Swiggett (PhD, Educational Testing Service, Princeton, New Jersey, USA). 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 (AL, QL and MAT) in order to establish two threshold scores for each of the three domains for 2020 – 2023 testing cycles.

3.13 NBTP ANNUAL CYCLE

The NBTP follows an annual cycle of:

- Item development and item review workshops;
- Populating the item banks;
- Test assembly and preparation of tests in each domain for each testing session;
- Test administration, scoring and score reporting to writers and institutions;
- Data analysis as part of continual item and test development and improvement;
- Contribution to the NBT Stakeholders' Consultative Forum;
- Dissemination of information about the NBTP to the higher education sector, the Department of Higher Education and Training (DHET) and the DBE;
- 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 2 provides a description of benchmark levels and what institutional response to candidates performing at these levels should be. More detailed description of benchmark levels for each of the NBT domain tests is available on request from the CEA Test Development Coordinator.

Table 2 NBT overall benchmark descriptors

Proficient	Performance in domain areas suggests that academic performance will not be adversely affected in cognate domains. If admitted, students should be placed on regular programmes of study
Intermediate	Challenges in domain areas identified 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 3 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 2022 intake candidates.

Table 3 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 4. The Intermediate band represented the majority of the applicant pool, and this is the pool for which educational institutions should be prepared to address educational needs with extended or augmented support programmes to enable students to succeed in their Degree studies.

Table 4 NBT Intermediate benchmarks and how they should be interpreted

	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

63 institutions (13 Universities) requested and received scores from the NBTP during the 2022 intake cycle by February 2022. 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 2022 intake cycle, the test sessions were offered pencil and paper and online. The NBT test sessions were offered to 84,225 writers. AQL tests were written by 48,762 candidates for AL and 48,762 candidates for QL, and MAT tests were written by 35,463 candidates (different tests are written to maintain the security and integrity of the tests).

4. DEMOGRAPHIC CHARACTERISTICS OF THE 2022 INTAKE NBT CANDIDATES

Candidates writing the NBTs for the 2022 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 5. The table reflects the frequencies based on writers of each test. For example, the subsample of AL writers consisted of 54.37% females, and 52.28% 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 5 Frequency tables for selected self-reported demographic characteristics for the 2022 intake

	Wrote AL		Wrote QL		Wrote MAT	
	Count	**%**	**Count**	**%**	**Count**	**%**
GENDER						
Female	26,512	54.37	26,511	54.37	18,611	52.48
Male	13,599	27.89	13,598	27.89	9,861	27.81
Unspecified	8,652	17.74	8,651	17.74	6,990	19.71
Total	48,763	100	48,762	100	35,462	100
POPULATION GROUP						
Black	25,495	52.28	25,494	52.28	17,368	48.98
Coloured	4,813	9.87	4,813	9.87	2,937	8.28
Indian/Asian	2,290	4.70	2,290	4.70	2,032	5.73
White	4,363	8.95	4,362	8.95	3,427	9.66
Other	111	0.23	111	0.23	81	0.23
Unspecified	11,691	23.98	11,691	23.98	9,617	27.12
Total	48,763	100	48,761	100	35,462	100
CITIZENSHIP						
South African	35,121	72.02	35,119	72.02	24,446	68.94
SADC county	1,261	2.59	1,261	2.59	904	2.55
Other African country	491	1.01	491	1.01	374	1.05
Other	236	0.48	236	0.48	192	0.54
Unspecified	11,654	23.90	11,654	23.90	9,546	26.92
Total	48,763	100	48,761	100	35,462	100
GR 12 LANGUAGE						
Afrikaans	2,355	4.83	2,354	4.83	1,576	4.44
English	33,683	69.07	33,682	69.08	23,525	66.34
Other/ Unspecified	12,725	26.10	12,725	26.10	10,361	29.22
Total	48,763	100	48,761	100	35,462	100
HOME LANGUAGE						
Afrikaans	2,504	5.14	2,503	5.13	1,703	4.80
English	12,760	26.17	12,760	26.17	9,303	26.23
isiNdebele	369	0.76	369	0.76	248	0.70
isiXhosa	5,165	10.59	5,165	10.59	3,456	9.75
isiZulu	5,776	11.85	5,775	11.84	3,446	9.72
Sesotho	3,125	6.41	3,125	6.41	2,365	6.67
Sesotho sa Leboa	1,637	3.36	1,637	3.36	1,268	3.58
Setswana	1,991	4.08	1,991	4.08	1,194	3.37
siSwati	921	1.89	921	1.89	645	1.82
Tshivenda	959	1.97	959	1.97	793	2.24
Xitsonga	1,136	2.33	1,136	2.33	851	2.40
Other Language	661	1.36	661	1.36	521	1.47
Unspecified	11,759	24.11	11,759	24.12	9,669	27.27
Total	**48,763**	**100**	**48,761**	**100**	**35,462**	**100**

5. PERFORMANCE OF THE 2022 INTAKE

5.1 TEST PERFORMANCE OF THE 2022 INTAKE NBTP CANDIDATES

For the 2022 intake cycle, registration opened on 1 April 2021. 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 2022 intake cycle.

The scores indicated below are those of candidates who wrote the NBTs for the 2022 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 6 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 Figure 2).

5.1.1 DESCRIPTIVE STATISTICS

Table 6 Descriptive statistics for NBT AL, QL and MAT for the 2022 intake

NBT Test	n	Mean	SD	Minimum	1st Quartile	Median	3rd Quartile	Maximum
AL	48,763	57.32	14.61	17.00	42.00	57.00	69.00	96.00
QL	48,761	47.43	16.55	14.00	40.00	42.00	57.00	99.00
MAT	35,462	41.64	17.48	15.00	30.00	35.00	51.00	97.00

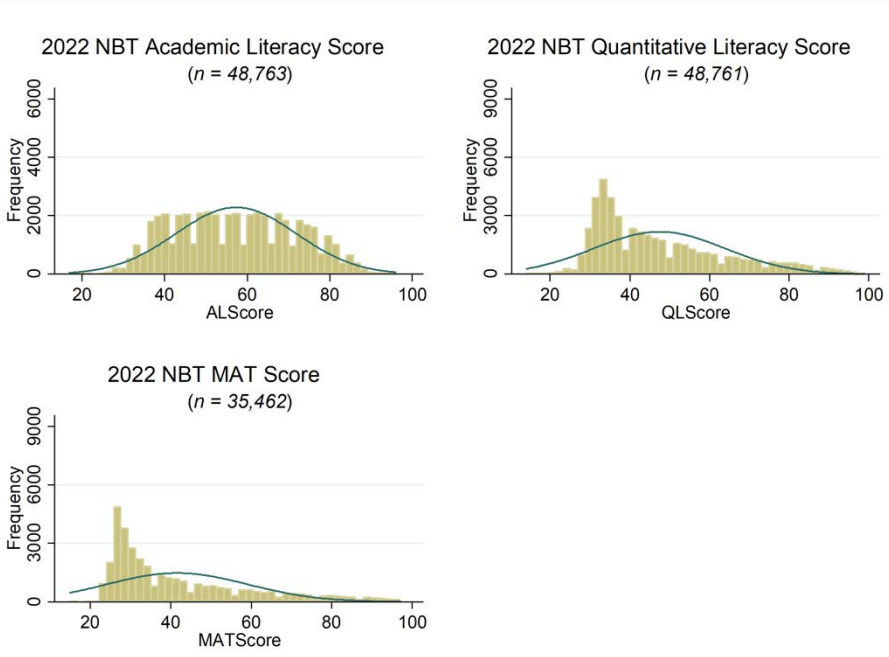

Figure 1 NBT test scores for 2022 intake

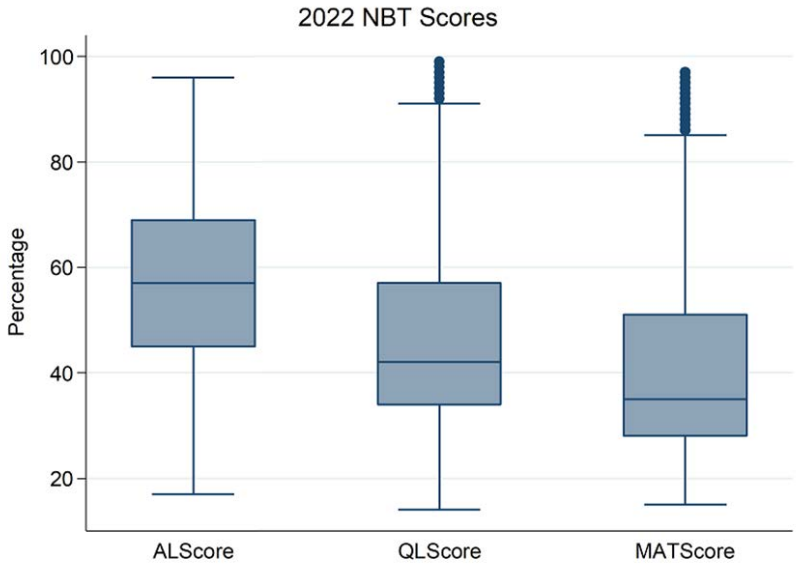

Figure 2 NBT test scores for 2022 intake

5.2 2022 INTAKE - NBT RESULTS BY PERFORMANCE LEVELS

Table 7 represents the performance within criterion-referenced degree benchmark levels for the 2022 Intake as a whole. These candidates were placed into four degree 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.

Table 7 Frequency tables for the degree benchmark levels of the 2022 intake

NBT tests	Basic	Intermediate Lower	Intermediate Upper	Proficient	Total (N)
Academic Literacy	2,021 (4.14%)	16,784 (34.42%)	17,329 (35.54%)	12,629 (25.90%)	48,763
Quantitative Literacy	20,971 (43.01%)	13,934 (28.58%)	7,532 (15.45%)	6,324 (12.97%)	48,761
Mathematics	19,097 (53.85%)	8,120 (22.90%)	4,489 (12.66%)	3,756 (10.59%)	35,462

The performance of the 2022 intake strongly suggests that the higher education sector needs to be prepared to provide extensive support in QL and MAT, since as many as 80% of their prospective students are likely to have scores that fall within the Basic and Intermediate benchmark bands.

Basic band

The number of candidates with scores in the Basic band is significant for QL and MAT. Fifty-four percent of the candidates had MAT scores in the Basic band and 43% 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 7 above shows that 36% of candidates had scores in the Intermediate benchmark level for MAT and 44% of candidates had scores in the Intermediate benchmark level for QL, while 70% of the AL candidates had 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 Table 7 above, the percentage of candidates with Proficient scores in QL and MAT is quite low, namely 13% for QL, and 11% for MAT. Although the percentage of candidates with Proficient scores in AL was approximately 26%, this still does not represent the majority of the candidates.

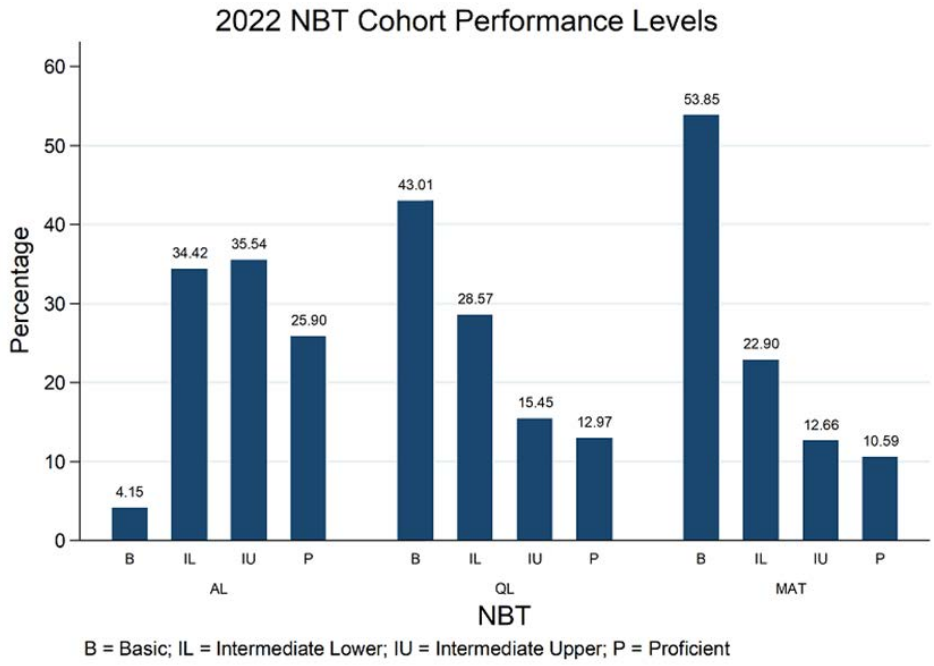

Figure 3 2022 Intake - NBT performance levels for AL, QL and MAT

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 (45%), Humanities (37%), Law (35%), Engineering/Built Environment (32%), and Business/Commerce/Management (31%) were relatively high, all exceeding 30% of their respective cohorts. The candidates who indicated that their intended faculties were Health Sciences, Art/Design, Education and Hospitality/Tourism had lower proportions of students in the Proficient band, ranging between 23% and 28% of these cohorts. However, the cohorts with the lowest proportions of candidates in the Proficient band were Information and Communication Technology (ICT) (16%) and Allied Healthcare/Nursing (11%). 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 high number of candidates with scores in the Intermediate Lower performance bands in Allied Healthcare/Nursing (49%), ICT (43%) and Health Sciences (39%) 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 high proportion of candidates in ICT (12%) and Hospitality/Tourism (17%) whose scores fall within the Basic performance band is a cause for concern as these candidates would require considerable AL support in order to cope with the academic demands of tertiary level study.

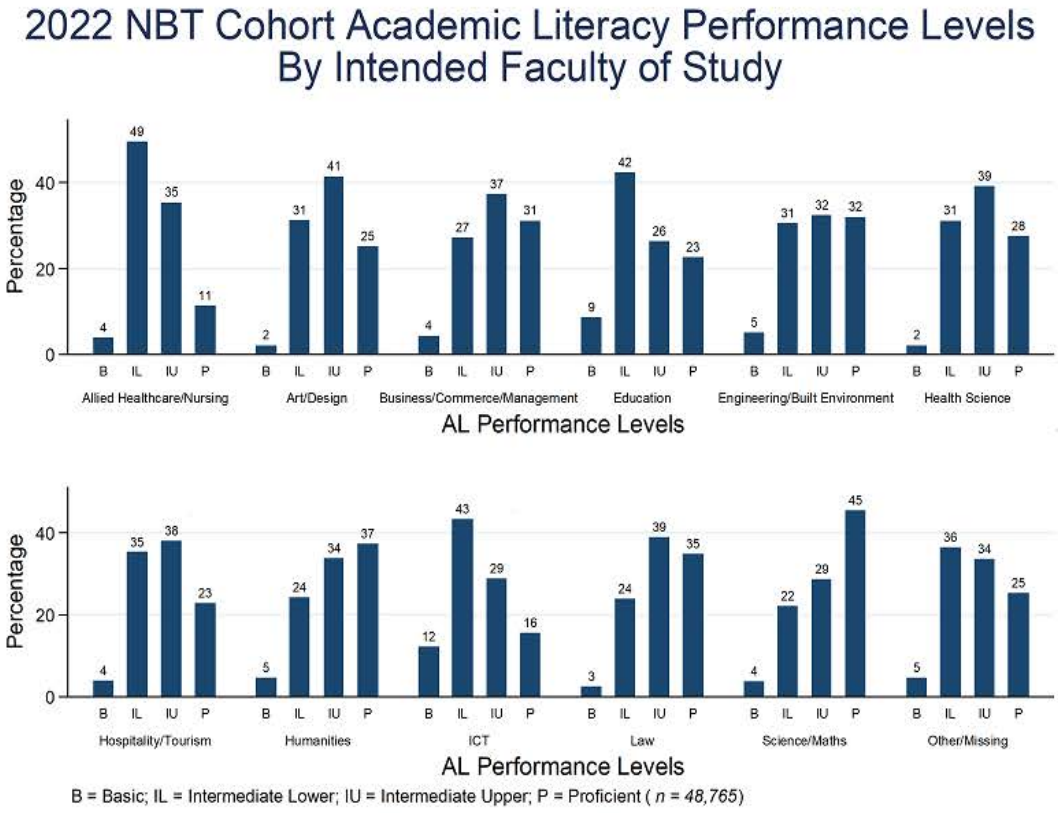

Figure 4 NBT Academic Literacy performance levels by intended faculty of study

5.3.2 QL PERFORMANCE BY INTENDED FACULTY

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

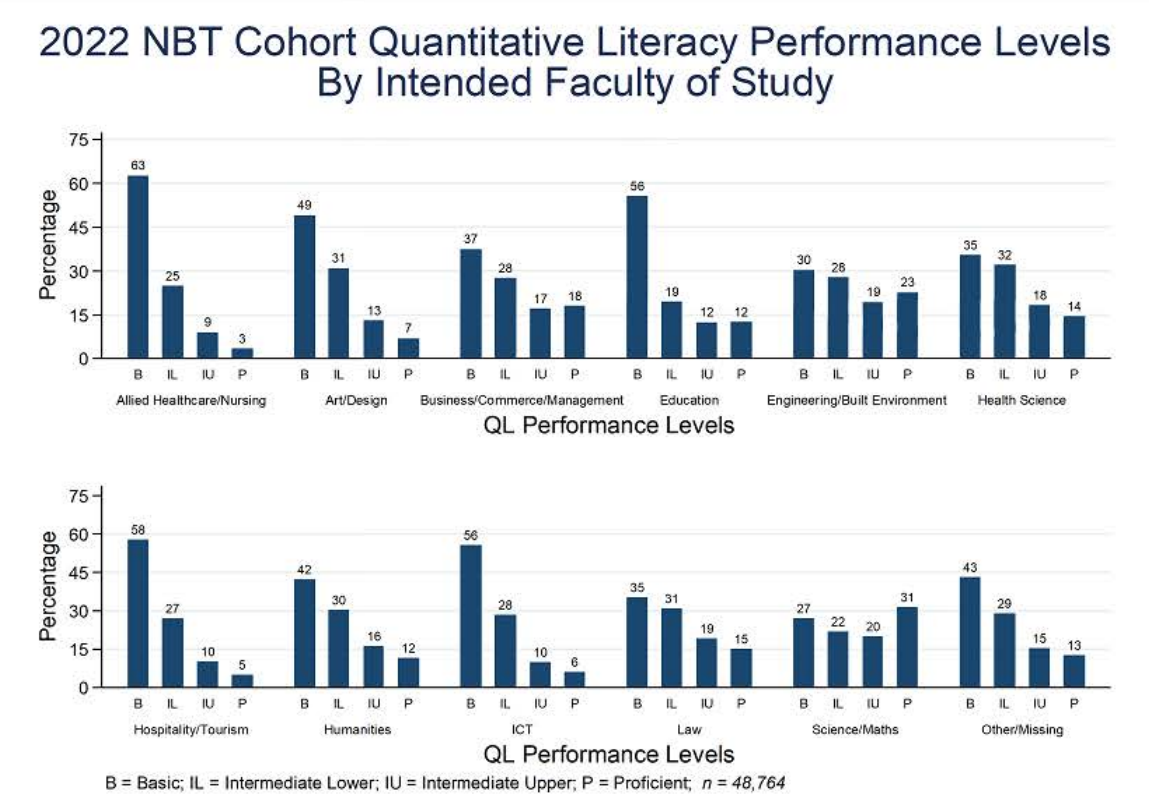

Figure 5 NBT Quantitative Literacy performance levels by intended faculty of study

Proficient band

Overall, the proportion of candidates with scores in the Proficient band for the faculties was below 20%. Of the proportion of candidates applying to Health Sciences, 14% of the scores were in the Proficient band. The small proportion of candidates with scores in the Proficient band in the various faculties is an indication of the low number of candidates who 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 22% and 32%: Health Sciences (32%), Business/Commerce/Management (28%), Engineering/Built Environment (28%), Law (31%) and Humanities (30%). The proportion of candidates with scores in the Intermediate Upper band were between 9% and 20%. Faculties such as Health Sciences (50%), Law (50%), Humanities (46%), Art/Design (55%), Allied Health/Nursing (44%), and other (44%) 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.

Basic band

The proportion of candidates with QL scores in the Basic band was very high: Allied Healthcare/Nursing (58%), Education (56%), ICT (56%), Hospitality/Tourism (58%) and Humanities (42%). 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 (35%), Business/Commerce/Management (37%), Engineering/Built Environment (30%) and Mathematics/Sciences (27%) had the smallest proportions of candidates with scores in the Basic band.

5.3.3 MAT PERFORMANCE BY INTENDED FACULTY

The performance levels in MAT are indicated in Figure 6.

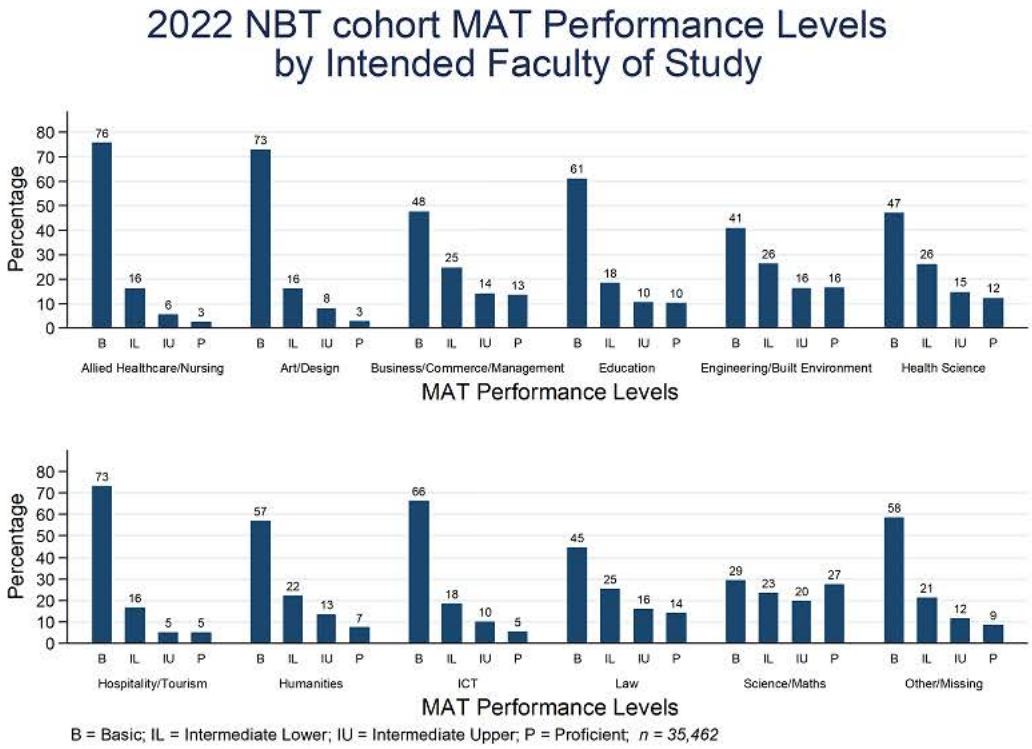

Figure 6 MAT performance levels by intended programme of study

Proficient band

The highest numbers of Proficient scores in MAT reflect candidates who intend to study in the following faculties: Mathematics/Science (27%), Engineering/Built Environment (16%), Law (14%), Health Sciences (12%) and Education (10%). This is a matter of concern if any of these programmes include Mathematics courses. The percentage of scores in the Proficient band for Allied Healthcare/Nursing (3%) 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 (43%), Engineering/Built Environment (42%), Law (41%), Health Sciences (41%), Business/Commerce/Management (39%), Humanities (35%) and Education (28%) 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

The highest percentages of scores between 60% and 80% in the Basic band in MAT represent candidates intending to study Allied Healthcare/Nursing, Art, Education, Law, Hospitality/Tourism and ICT. It is unlikely that these candidates will cope with the Mathematics component of their courses.

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 46,254 (95.15%) candidates wrote the NBT AQL in English and 33,645 (95.49%) candidates wrote the NBT MAT in English. The number of candidates who wrote NBTs in Afrikaans is substantially lower, as expected: 2,356 (4.85%) for NBT AQL and 1,572 (4.51%) for NBT MAT. This information is summarised in Table 8 below.

Table 8 NBT Test language, 2022 intake cycle

	Wrote AL		Wrote QL		Wrote MAT	
AQL/MAT test language	**Count**	**%**	**Count**	**%**	**Count**	**%**
Afrikaans	2,356	4.85	2,355	4.84	1,572	4.46
English	46,254	95.15	46,253	95.16	33,645	95.54
Total	48,610	100	48,608	100	35,217	100

Table 9 reports the descriptive statistics for the Afrikaans and English NBT cohorts of the 2022 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 9 Descriptive statistics for AL, QL, and MAT of the 2022 intake - NBT cohort by test language

NBT Test	Test language	n	Mean	SD	Min.	1st Quartile	Median	3rd Quartile	Max.
AL	Afrikaans	2,356	59.74	13.37	27.00	49.00	61.00	70.00	91.00
	English	46,254	57.19	14.67	17.00	45.00	57.00	69.00	96.00
QL	Afrikaans	2,355	51.39	17.97	16.00	36.00	47.00	65.00	99.00
	English	46,253	47.23	16.45	14.00	34.00	42.00	57.00	99.00
MAT	Afrikaans	1,572	46.60	20.35	23.00	29.00	40.00	61.00	97.00
	English	33,645	41.42	17.30	15.00	28.00	35.00	50.00	97.00

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 Afrikaans (70.68%) than their peers who wrote the test in English (70.06%), while a higher proportion of those writing in English (4.23%) had scores in the Basic band compared to those writing in Afrikaans (2.59%). The proportion of candidates with scores in the Proficient band was 29.73% of those candidates who wrote in Afrikaans and 25.71% of those 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.

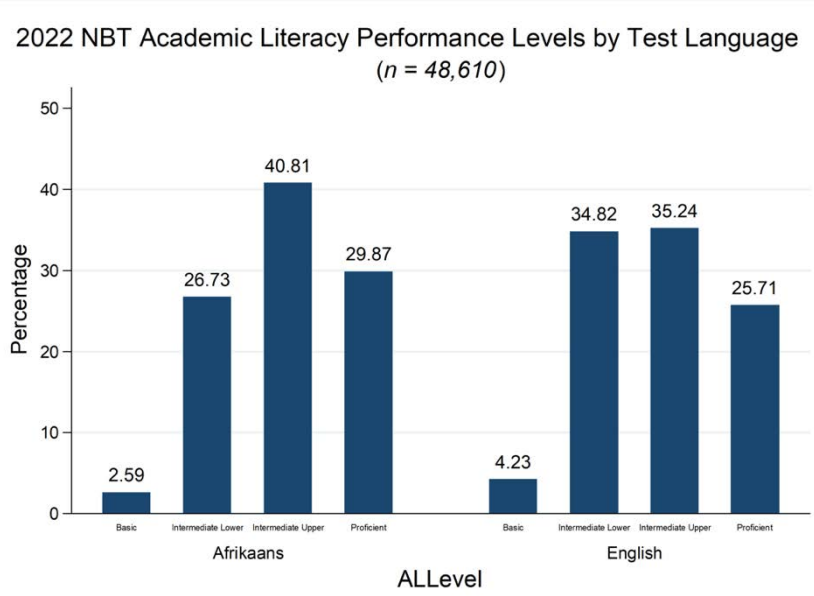

Figure 7 2022 Intake - NBT AL performance levels by test language

5.4.2 QL PERFORMANCE ON TESTS WRITTEN IN AFRIKAANS AND ENGLISH

Of the Afrikaans candidates who wrote the QL tests for the 2022 intake cycle, 20.03% of the scores fell in the Proficient band and 35.13% of the scores were in the Basic band (Figure 8). The English writers, on the other hand, showed a slightly different performance picture: 12.62% of the scores fell within the Proficient band, while

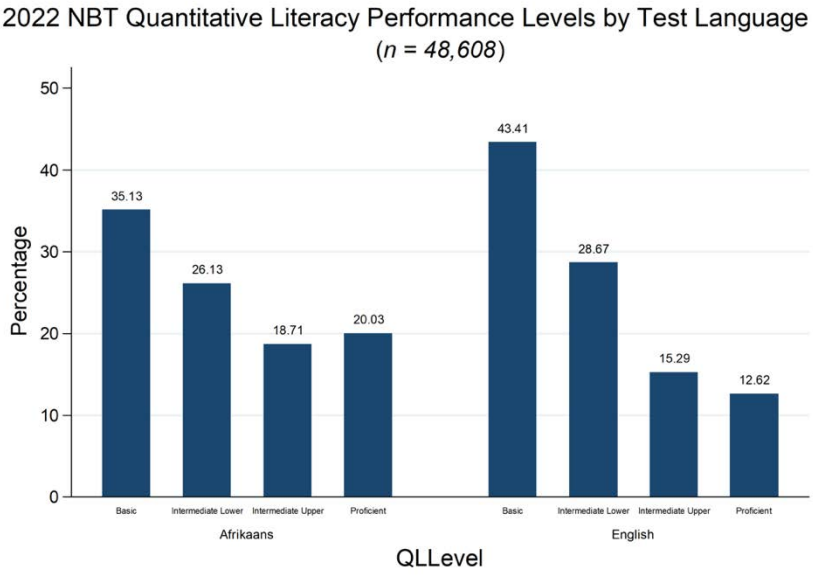

Figure 8 2022 Intake - NBT QL performance levels by test language

43.41% of the scores fell within the Basic band. Despite the Afrikaans writers being a smaller proportion of all candidates, their overall performance was better than that of the English writers across the four performance categories, as shown in Figure 8.

5.4.3 MAT PERFORMANCE ON TESTS WRITTEN IN AFRIKAANS AND ENGLISH

The graph in Figure 9 shows that 18.38% of those who wrote the MAT test in Afrikaans had scores in the Proficient category, compared to 10.24% of the English group. Of those who wrote the MAT test in Afrikaans, 44.02% had scores in the Basic category, compared to 54.29% of the candidates in the English group.

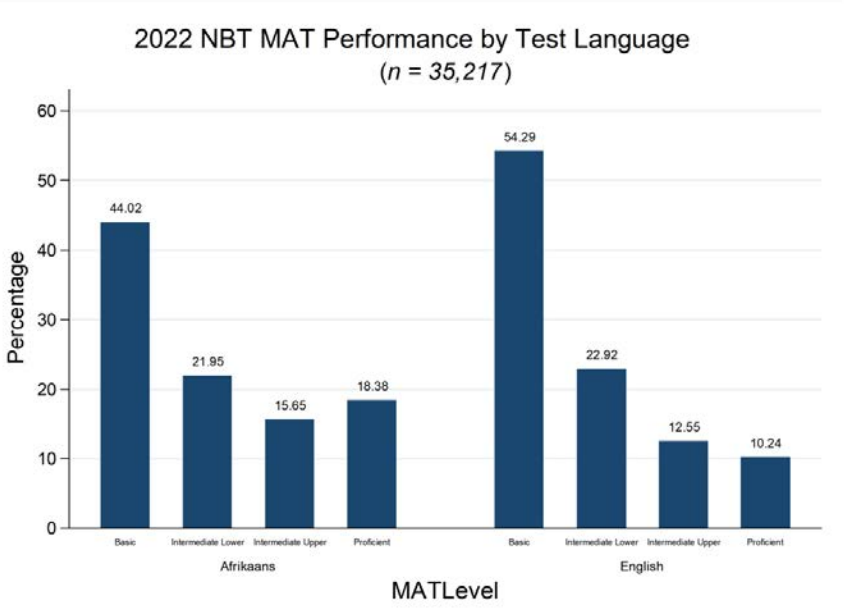

Figure 9 2022 Intake - NBT MAT performance levels by test language

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 2022 intake NBT cohort included candidates who reported themselves as non-South African citizens (Tables 10 and 11). These candidates reported themselves as being SADC citizens, citizens of other African countries, or citizens elsewhere.

Table 10 Number of test writers: SA citizens vs non-SA candidates

	Wrote AL		Wrote QL		Wrote MAT	
	n	%	n	%	n	%
South African	35,121	94.64	35,119	94.64	24,446	94.33
Non-South African	1,988	5.36	1,988	5.36	1,470	5.67
Total	37,109	100	37,107	100	25,916	100

Table 11 Scores: SA citizens vs non-SA candidates

	n	Mean	sd	min	p25	p50	p75	max
AL SCORE								
South African	35,121	55.91	14.56	17.00	44.00	55.00	67.00	95.00

non-South African	1,988	61.66	13.30	24.00	52.00	62.00	72.00	94.00
Total	37,109	56.22	14.56	17.00	44.00	56.00	68.00	95.00
QL SCORE								
South African	35,119	45.85	16.15	14.00	33.00	41.00	55.00	99.00
non-South African	1,988	50.71	16.23	14.00	33.00	41.00	62.00	97.00
Total	37,107	46.11	16.23	14.00	33.00	41.00	55.00	99.00
MAT SCORE								
South African	24,446	41.23	17.30	15.00	28.00	34.00	50.00	97.00
non-South African	1,470	44.78	18.27	16.00	29.00	39.00	57.00	97.00
Total	25,916	41.43	17.38	15.00	28.00	35.00	51.00	97.00

5.5.1 AL PERFORMANCE BY CITIZENSHIP

A higher proportion of the non-South African candidates (33.60%) had scores in the Proficient band compared to the South African candidates (22.83%), while a lower proportion of the South African candidates (1.51%) had scores in the Basic band compared to the non-South African candidates (5.23%). In terms of the Intermediate bands (Intermediate Upper and Lower), 71.94% of South African candidates' scores and 64.89% of the non-South African candidates' scores fell into these bands, respectively (Figure 10).

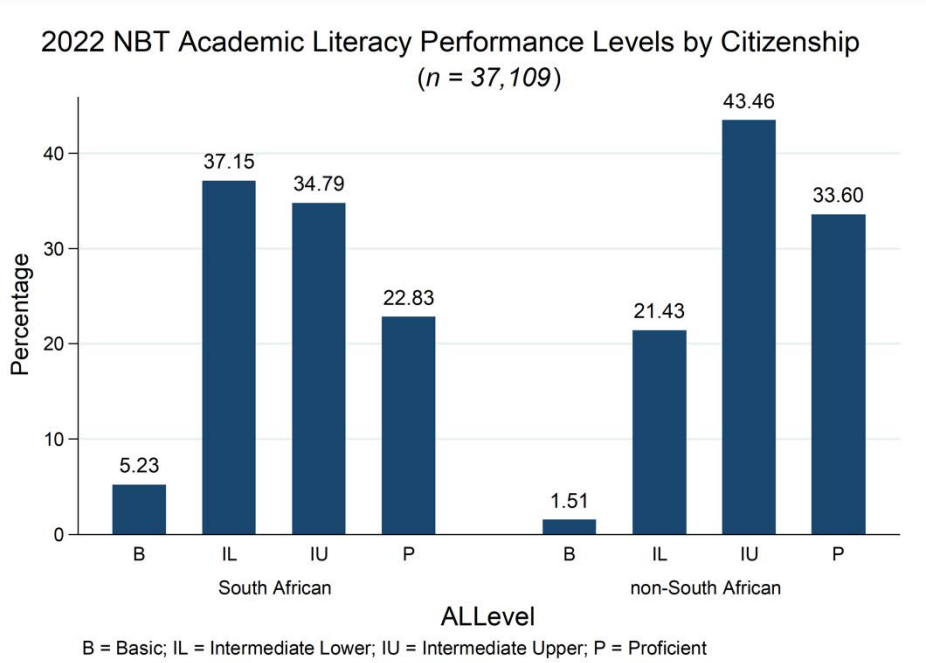

Figure 10 2022 Intake - NBT AL performance levels by citizenship

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 16.35% of non-South Africans had scores that were in the Proficient band compared to 11.18% of the South African group. The proportion of candidates with scores in the Basic band for the South African group was 46.90%, compared to the non-South African group with 32.90%. The South African candidates in the Intermediate Upper group represented 13.99% of the total number of candidates, compared with 20.37% for the

non-South African candidates. It appears that both groups of candidates would require QL support.

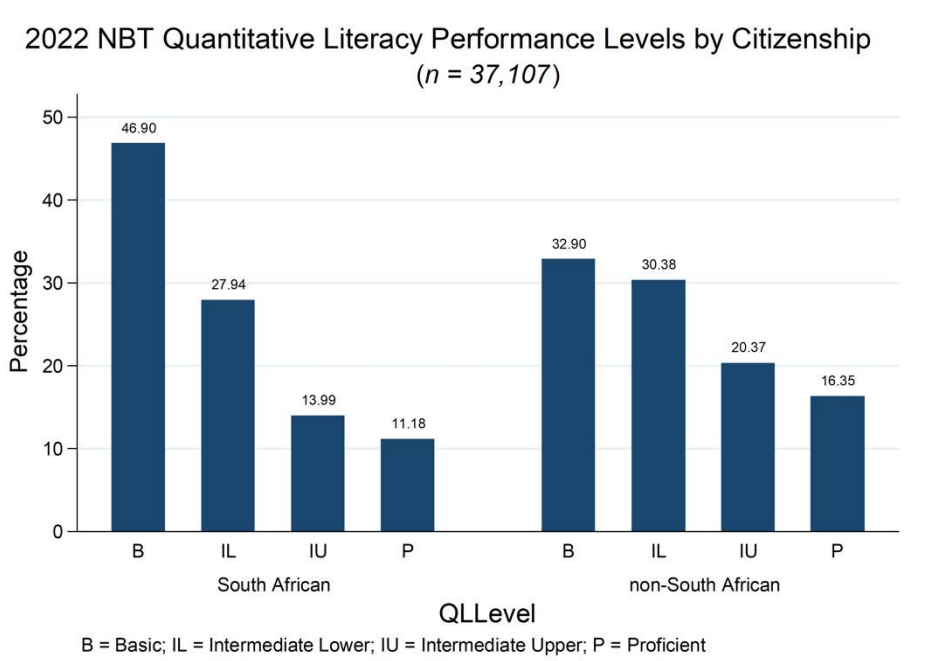

Figure 11 2022 Intake - NBT QL performance levels by citizenship

5.5.3 MAT PERFORMANCE BY CITIZENSHIP

Of the non-South African candidates, 13.87% had scores in the Proficient band, compared to 10.19% of the South African candidates; 45.34% of the non-South African candidates had scores in the Basic band, compared to 54.58% of the South African candidates whose scores were in the Basic band. The difference in the Basic band is somewhat offset by the difference in the Intermediate Lower band (23.07% of the South African group; 24.27% of the non-South African candidates). The non-South African candidates appeared to have performed slightly better in MAT than the South African candidates.

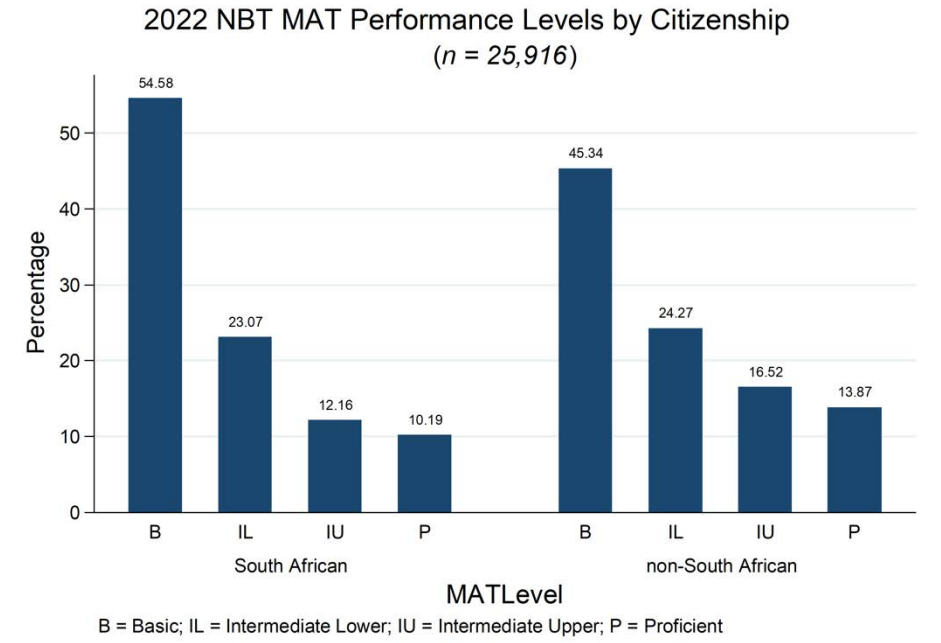

Figure 12 2022 Intake - NBT MAT performance levels by citizenship

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 2022 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 sub-domain 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 12 below.

Table 12 NBT 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	Readers' abilities to understand and analyse the extent to which grammatical

academic meaning and interpretation	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 2022 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.

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, as can be seen from Table 13 below.

Table 13: AL Subdomains performance data

Subdomain	N	mean	sd	min	p25	p50	p75	max
Cohesion	48,763	64	19	0	50	75	75	100
Communicative function	48,763	51	22	0	28	42	71	100
Discourse relations	48,763	54	26	0	33	60	80	100
Essential/non-essential	48,763	64	20	0	44	66	77	100
Grammar/syntax	48,763	63	26	0	40	60	80	100
Inferencing	48,763	53	20	4	42	57	68	100
Metaphorical expression	48,763	50	19	0	33	44	66	100
Text genre	48,763	48	28	0	33	50	66	100
Vocabulary	48,763	52	23	0	33	50	66	100

The NBT AL subdomain performance by candidates who intended to apply for courses in the Allied Healthcare/Nursing faculty is graphically presented in the boxplots in Figure 13. Overall, the medians of all subdomains fell within the Intermediate band. The subdomains Cohesion and Grammar/syntax had the highest medians, with medians of 62% and 60% respectively. The subdomains with the lowest median scores were Text genre (33%), Communicative function (42%), Metaphorical expression (44%), and Inferencing (47%). According

to the graph, performance in these subdomains seems to be the most problematic. Text genre appears to be a particular weakness, with the full cohort (excluding some outliers) scoring below the Proficient band. The subdomains Discourse relations and Vocabulary both have medians of 50%, which suggests that many of the students in this cohort would also find tasks that rely on skills and knowledge related to these subdomains (with medians of 50% or lower) very challenging. These results suggest that a substantial proportion of this cohort would face AL difficulties in their studies and that they would need assistance in this regard.

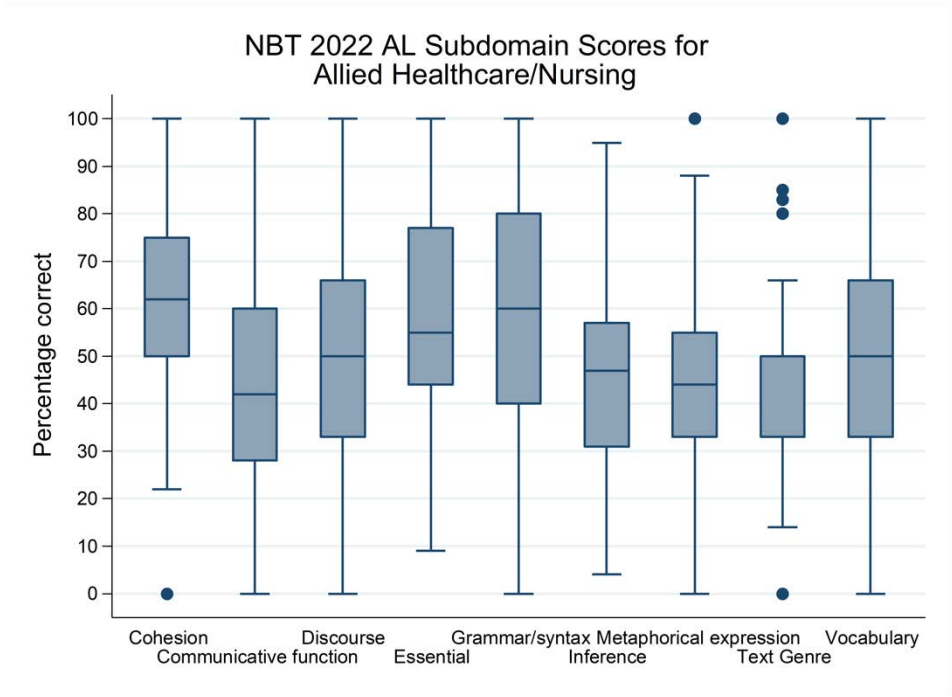

Figure 13 Allied Healthcare/Nursing NBT AL subdomain performance, 2022 Intake

The NBT AL subdomain performance by candidates who intended to apply for courses in the Art/Design faculty is graphically presented in the boxplots in Figure 14. Overall, the medians of all subdomains fell within the Intermediate band. The subdomains Discourse relations and Essential/non-essential had the highest medians, both with medians of 66%, and Grammar/syntax had a median of 60%. The subdomains with the lowest median scores were Metaphorical expression (44%), Text genre (50%) and Vocabulary (50%), and performance in these subdomains suggests that some of the candidates in this cohort may find tasks that rely on skills and knowledge related to these subdomains very challenging. Overall, these results suggest that many of these candidates would struggle with some of the demands of AL that are typical of higher education and that many of them would need relevant intervention to increase their chances of success at academic study.

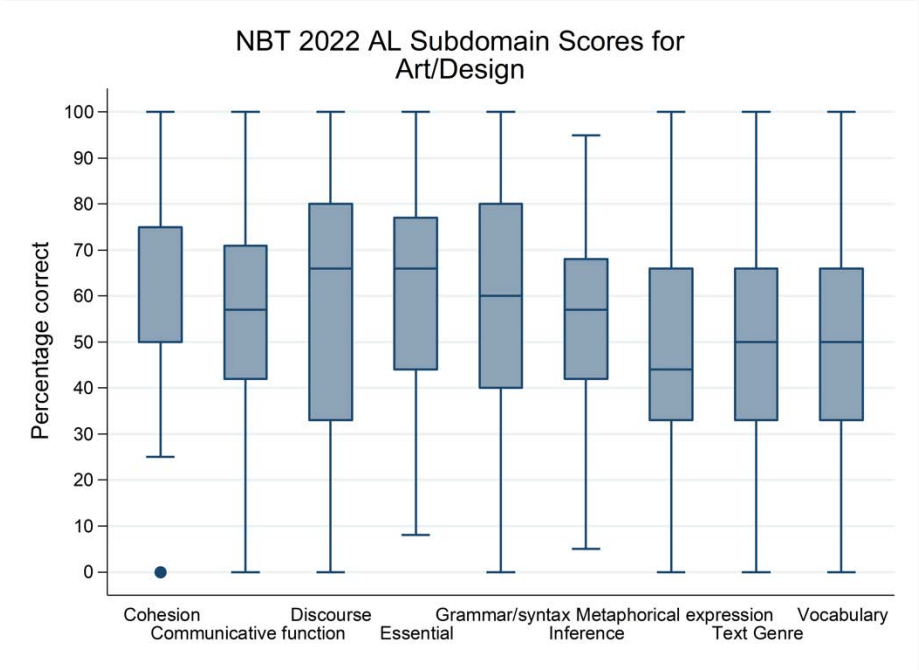

Figure 14 Art and Design NBT AL subdomain performance, 2022 intake

The NBT AL subdomain performance by candidates who intended to apply for courses in the Business/Commerce/Management faculty is graphically presented in the boxplots in Figure 15. Overall, the medians of all subdomains fell within the Intermediate band. The subdomains Discourse relations and

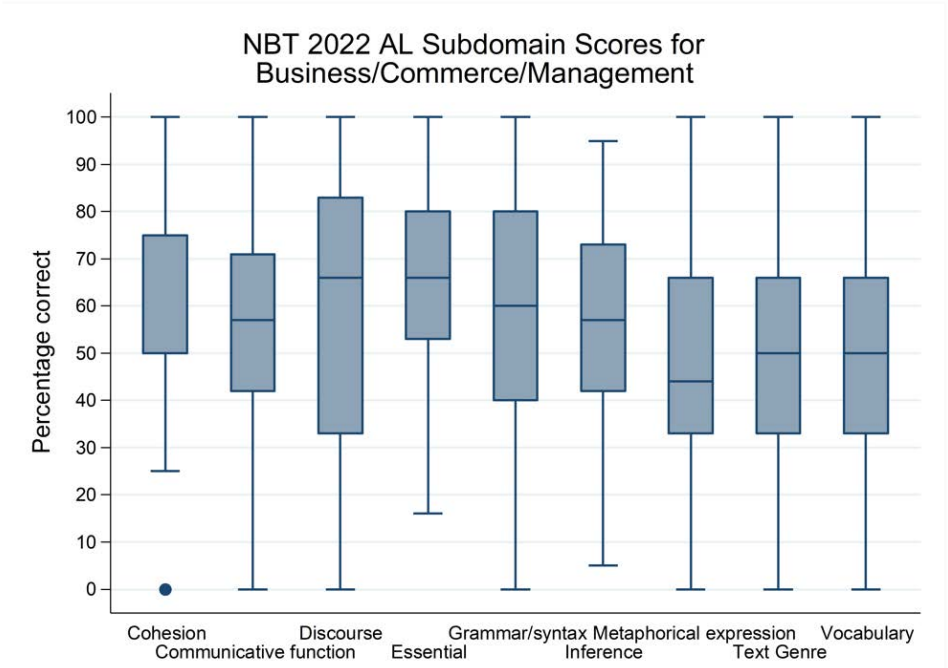

Figure 15 Business/Commerce/Management NBT AL subdomain performance, 2022 intake

Essential/non-essential had the highest medians, both with medians of 66%, and Grammar/syntax had a median of 60%. The subdomains with the lowest median scores were Metaphorical expression (44%), Text genre (50%) and Vocabulary (50%), and performance in these subdomains suggests that some of the candidates in this cohort may find tasks that rely on skills and knowledge related to these subdomains very challenging. Overall, these results suggest that many of these candidates would struggle with some of the demands of academic literacy that are typical of higher education and that many of them would need relevant intervention to increase their chances of success at academic study.

The NBT AL subdomain performance by candidates who intended to apply for courses in the Education faculty is graphically presented in the boxplots in Figure 16. Overall, the medians of all subdomains fell within the Intermediate band. The subdomains Cohesion and Essential/non-essential had the highest medians, with medians of 62% and 66% respectively, and Grammar/syntax had a median of 60%. The subdomains with the lowest median scores were Text genre (33%), Communicative function (42%), Metaphorical expression (44%) and Inferencing

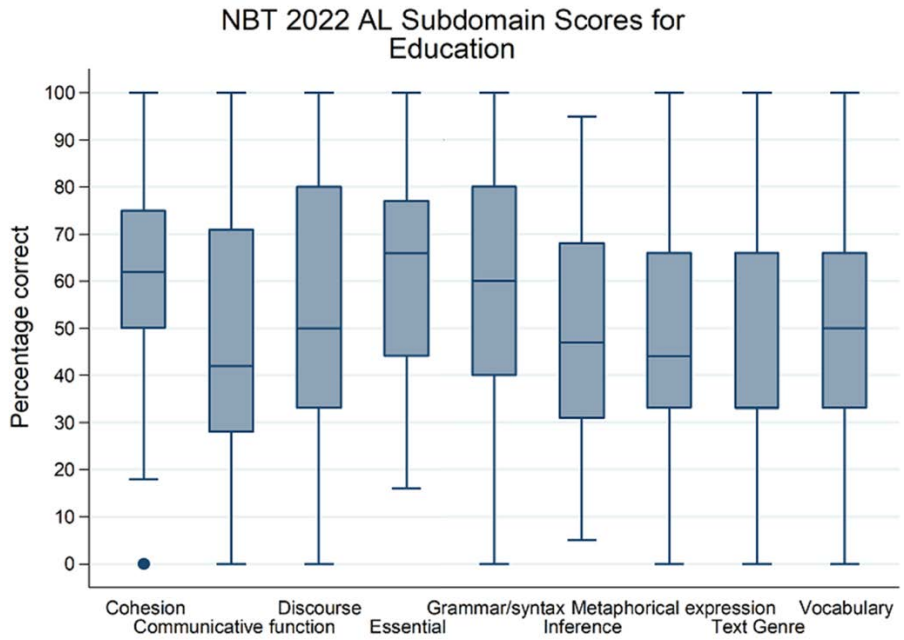

Figure 16 Education NBT AL subdomain performance, 2022 intake

(47%). According to the graph, performance in these subdomains seem to be the most problematic and Text genre appears to be a particular weakness for this cohort. The subdomains Discourse relations and Vocabulary had medians of 50%, which suggests that many of the students in this cohort would also find tasks that rely on skills and knowledge related to these subdomains (with the medians of 50% or lower) very challenging. These results suggest that a substantial proportion of this cohort would face AL difficulties in their studies and that they would need assistance in this regard.

The NBT AL subdomain performance by candidates who intended to apply for courses in the Engineering/Built Environment faculty is graphically presented in the boxplots in Figure 17. Overall, the medians of all subdomains fell within the Intermediate band. The subdomains Discourse relations and Essential/non-essential had the highest medians, both with medians of 66%, and Grammar/syntax had a median of 60%. The subdomains with the lowest median scores were Metaphorical expression (44%), Text genre (50%) and Vocabulary (50%), and performance in these subdomains suggests that some of the candidates in this cohort may find tasks that rely on skills and knowledge related to these subdomains very challenging. Overall, these results suggest that many of these candidates would struggle with some of the demands of AL that are typical of higher education and that many of

them would need relevant intervention to increase their chances of success at academic study.

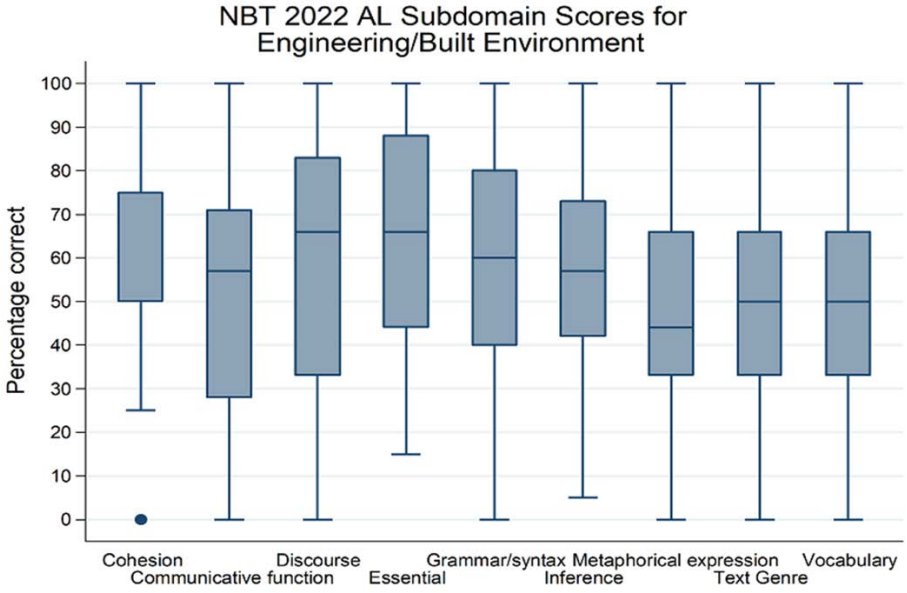

Figure 17 Engineering/Built Environment NBT AL subdomain performance, 2022 intake

The NBT AL subdomain performance by candidates who intended to apply for courses in the Health Sciences faculty is graphically presented in the boxplots in Figure 18. Overall, the medians of all subdomains fell within the Intermediate band. The subdomains Discourse relations and Essential/non-essential had the highest medians, both with medians of 66%, and Grammar/syntax had a median of 60%. The subdomains with the lowest median scores were Metaphorical expression (44%), Text genre (50%) and Vocabulary (50%), and performance in these subdomains suggests that some of the candidates in this cohort may find tasks that rely on skills and knowledge related to these subdomains very challenging. Overall, these results suggest that many of these candidates would struggle with some of the demands of AL that are typical of higher education and that many of them would need relevant intervention to increase their chances of success at academic study.

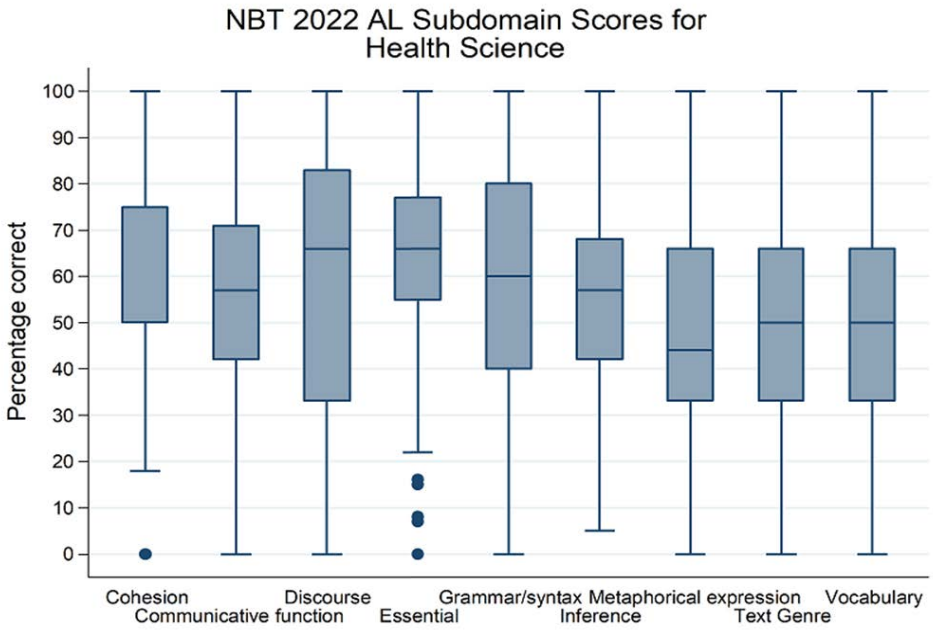

Figure 18 Health Sciences NBT AL subdomain performance, 2022 intake

The NBT AL subdomain performance by candidates who intended to apply for courses in the Hospitality/Tourism faculty is graphically presented in the boxplots in Figure 19. Overall, the medians of all subdomains fell within the Intermediate band. The subdomains Cohesion and Essential/non-essential had the highest medians, with medians of 62% and 66% respectively, and Grammar/syntax had a median of 60%. The subdomains with the lowest median scores were Text genre (40%), Communicative function (42%) and Metaphorical expression (44%). According to the graph, performance in these subdomains seems to be the most problematic and Text genre appears to be a particular weakness for this cohort. The subdomain Vocabulary had a median of 50%, which suggests that many of the students in this cohort would also find tasks that rely on skills and knowledge related to these subdomains (with the medians of 50% or lower) very challenging. These results suggest that a substantial proportion of this cohort would face AL difficulties in their studies and that they would need assistance in this regard.

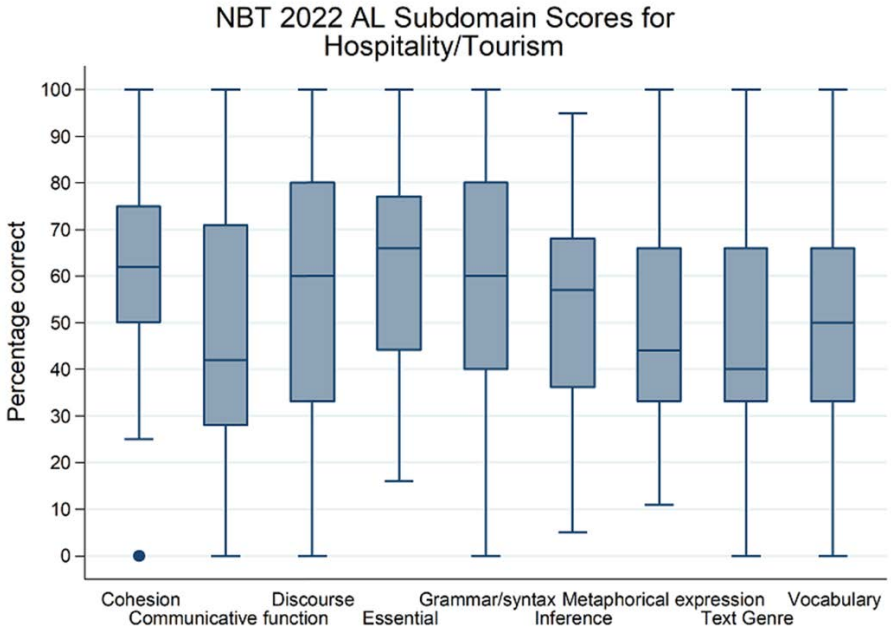

Figure 19 Hospitality/Tourism NBT AL subdomain performance, 2022 intake

The NBT AL subdomain performance by candidates who intended to apply for courses in the Humanities faculty is graphically presented in the boxplots in Figure 20. Overall, the majority of the medians of the AL subdomains fell within the Intermediate band. The subdomains Grammar/syntax (80%), Cohesion (75%), Discourse relations (66%) and Essential/non-essential (66%) had the highest medians. The subdomains with the lowest median scores were Metaphorical expression (50%), Text genre (50%) and Vocabulary (50%), and performance in these subdomains suggests that some of the candidates in this cohort may find tasks that rely on skills and knowledge related to these subdomains very challenging. Overall, these results suggest that a number of these candidates would struggle with some of the demands of AL that are typical of higher education and that many of them would need relevant intervention to increase their chances of success at academic study.

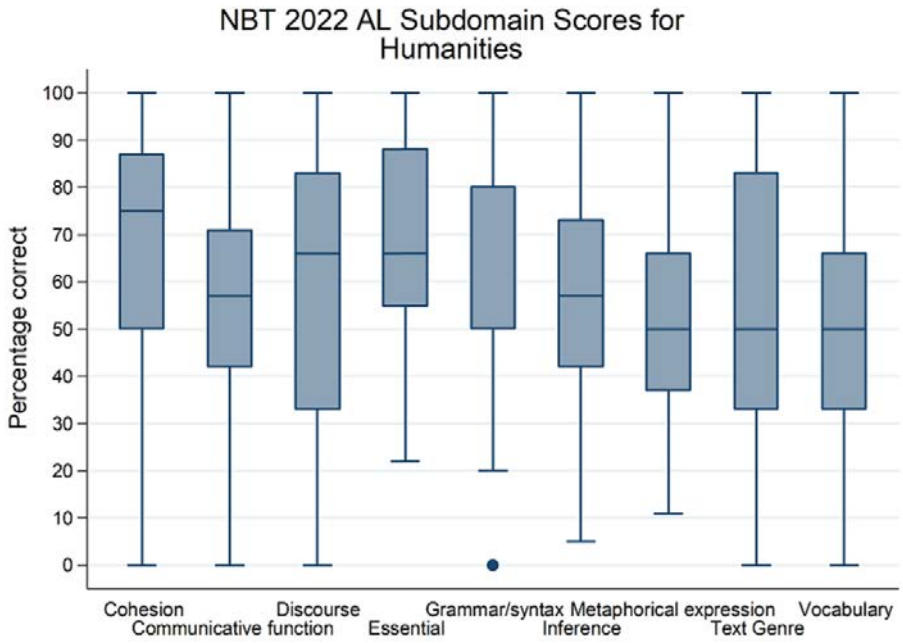

Figure 20 Humanities NBT AL subdomain performance, 2022 intake

The NBT AL subdomain performance by candidates who intended to apply for courses in the Information and Communication Technology faculty is graphically presented in the boxplots in Figure 21. Overall, the medians of all subdomains fell within the Intermediate band. The subdomains Grammar/syntax (60%), Cohesion (55%) and Essential/non-essential (55%) had the highest medians. The subdomains with the lowest median scores were Text genre (33%), Discourse relations (40%), Communicative function (42%), Metaphorical expression (44%) and Inferencing (47%). According to the graph, performance in these subdomains seem to be the most problematic and, once again, Text genre appears to be a particular weakness for this cohort. The subdomain Vocabulary had a median of 50%, which suggests that many of the students in this cohort would also find tasks that rely on skills and knowledge related to these subdomains (with the medians of 50% or lower) very challenging. These results suggest that a substantial proportion of this cohort would face AL difficulties in their studies and that they would need assistance in this regard.

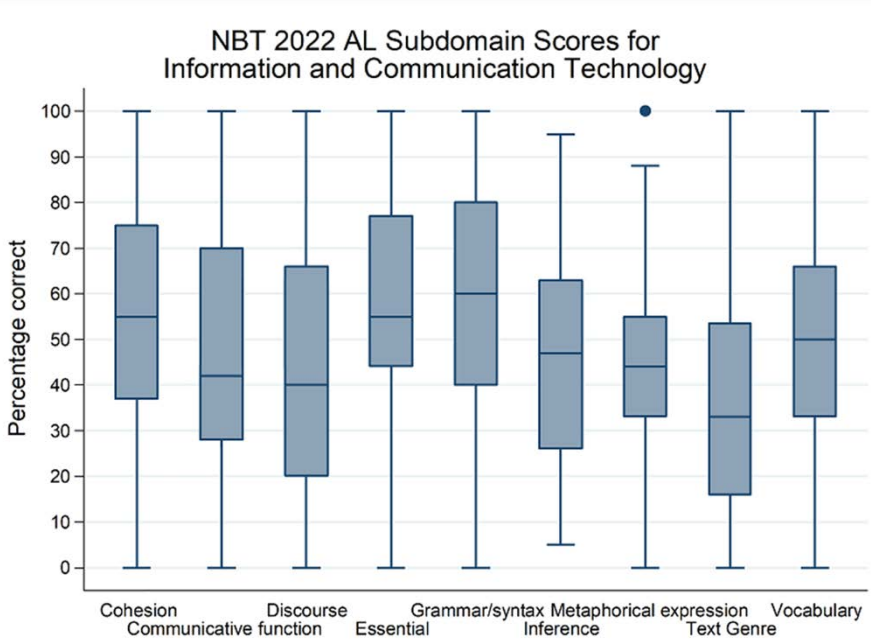

Figure 21 Information and Communication Technology NBT AL subdomain performance, 2022 intake

The NBT AL subdomain performance by candidates who intended to apply for courses in the Law faculty is graphically presented in the boxplots in Figure 22. Overall, the majority of the medians of the AL subdomains fell within the Intermediate band. The subdomains Cohesion (75%), Discourse relations (66%) and Essential/non-essential (66%) had the highest medians, and Grammar/syntax had a median of 60%. The subdomains with the lowest median scores were Metaphorical expression (50%), Text genre (50%) and Vocabulary (50 %), and performance in these subdomains suggests that some of the candidates in this cohort may find tasks that rely on skills and knowledge related to these subdomains very challenging. Overall, these results suggest that a number of these candidates would struggle with some of the demands of AL that are typical of higher education and that many of them would need relevant intervention to increase their chances of success at academic study.

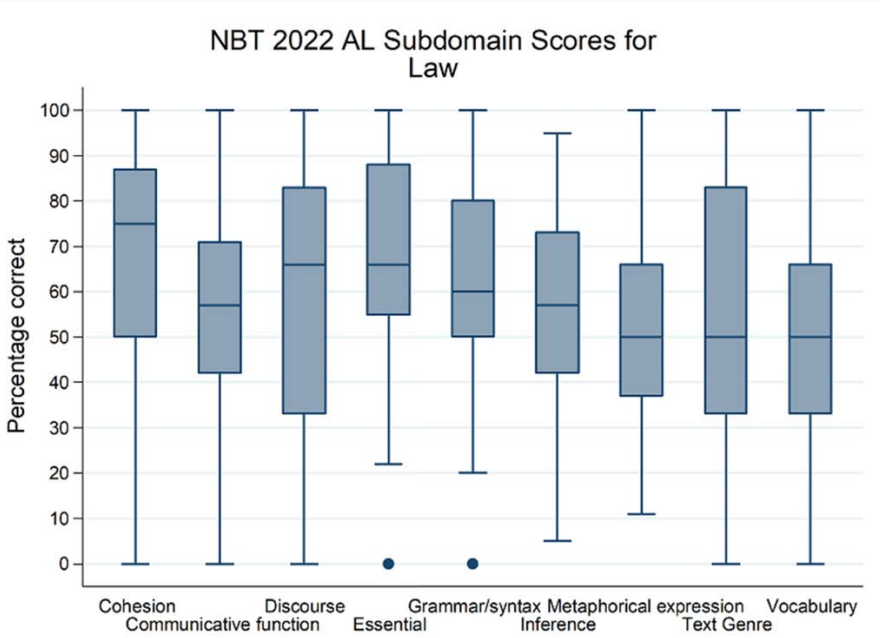

Figure 22 Law NBT AL subdomain performance, 2022 intake

The NBT AL subdomain performance by candidates who intended to apply for courses in the Science/Mathematics faculty is graphically presented in the boxplots in Figure 23. Overall, the majority of the medians of the AL subdomains fell within the Intermediate band. The subdomains Grammar/syntax (80%), Essential/non-essential (77%), Cohesion (76%), Discourse relations (66%) and Inferencing (63%) had the highest medians. The subdomain with the lowest median score was Text genre (50%). Although a relatively large proportion of this cohort would be able to cope with the demands associated with these subdomains, overall, these results still suggest that some of these candidates would struggle with some of the demands of AL that are typical of higher education and that many of them would need relevant intervention to increase their chances of success at academic study.

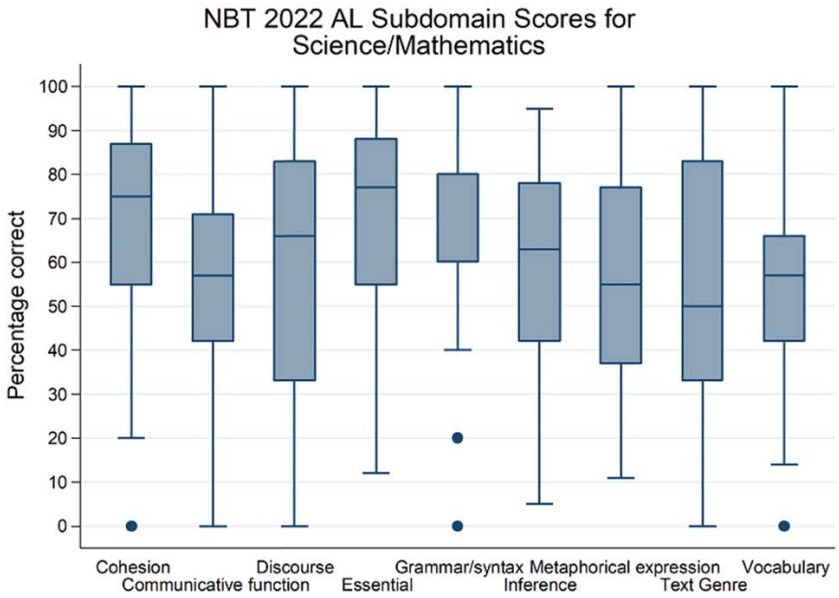

Figure 23 Science/Mathematics NBT AL subdomain performance, 2022 intake

The NBT AL subdomain performance by candidates intending to enrol for programmes in faculties other than those that we have mentioned is visually presented in Figure 24. Overall, the medians of all subdomains fell within the Intermediate band. The subdomains Essential/non-essential (66%), Cohesion (62%), Discourse relations (60%) and Grammar/syntax (60%) had the highest medians. The subdomains with the lowest median scores were Communicative function (42%) and Metaphorical expression (44%), and Text genre and Vocabulary both had medians of 50%. Performance in these subdomains suggests that some of the candidates in this cohort may find tasks that rely on skills and knowledge related to these subdomains very challenging. Overall, these results suggest that many of these candidates would struggle with some of the demands of AL that are typical of higher education and that many of them would need relevant intervention to increase their chances of success at academic study.

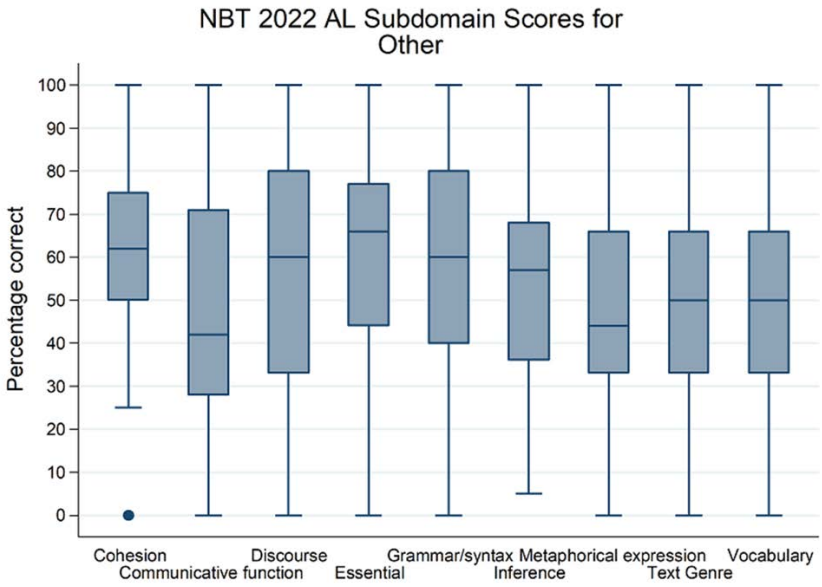

Figure 24 Other NBT AL subdomain performance, 2022 intake

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 14 gives a description and specification of the mathematical and statistical ideas dimension of the construct tested by the QL test.

Table 14 Competency specification for the QL test by mathematical and statistical ideas

Skill assessed	Description of skill
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 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 15, 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 15 Performance on the NBT QL subdomains

Subdomain	N	mean	sd	min	p25	p50	p75	max
Change and rates	48,761	42	17	0	36	36	45	100
Data representation and analysis	48,761	46	17	4	32	44	56	100
Chance and uncertainty	48,761	68	33	0	33	66	100	100
Quantity, number and operations	48,761	43	20	4	26	36	56	100
Relationships, pattern and permutation	48,761	44	23	0	22	44	55	100
Shape, dimension and space	48,761	42	18	0	30	38	46	100

The boxplots that follow reflect information about candidates writing the NBT QL test in the 2022 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.

The candidates who intended to study in the Allied Healthcare/Nursing faculty (n = 6,290) fared consistently poorly across the six subdomains. The boxplots in Figure 25 indicate that 50% of the candidates' scores fell in the range between 25% and 40% across the six competence areas, except for Chance and uncertainty. The lowest median is in the Quantity, number and operations subdomain. The 25th percentile and the median scores of around 25% indicate that a significant portion of the test-takers scored below these values. This suggests that a substantial number of individuals' scores fell into the Basic band in this subdomain, with a quarter of the individuals' scores

being between 43% and 72%. In most academic programmes in the Allied Healthcare/Nursing faculty, the content is dependent on competency in QL and candidates would need to be quantitatively literate. Candidates would benefit from QL interventions that are geared specifically to Allied Healthcare/Nursing courses.

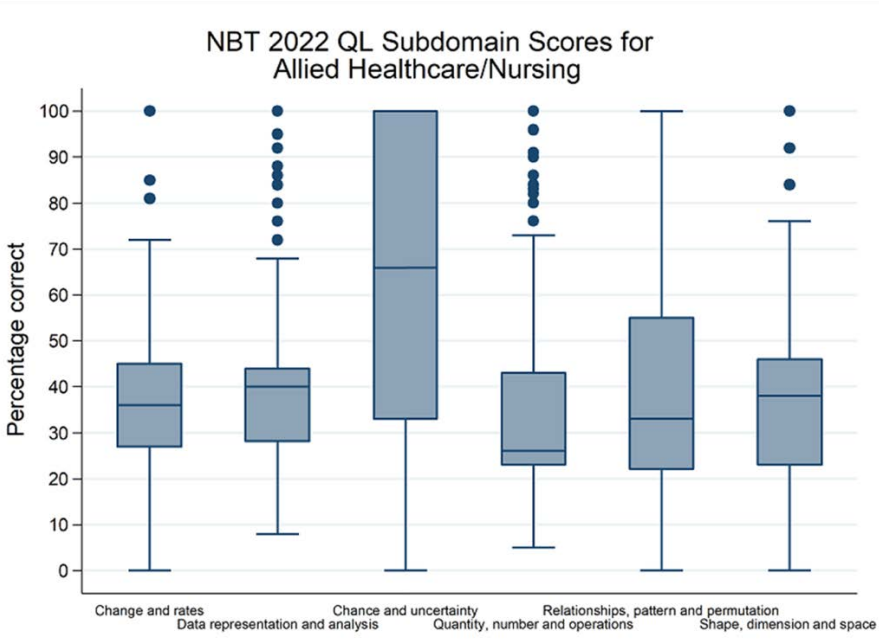

Figure 25 Allied Healthcare/Nursing subdomain NBT QL performance, 2022 intake

For the candidates who indicated that they intended to study Art and Design (n = 1,424), 50% of the candidates' scores in the subdomains ranged between 30% and 45%, except for Chance and uncertainty which has few items in the test (Figure 26). The spread of scores in the box for the Chance and uncertainty subdomain is larger than that in the other boxes, which is suggestive of the highest variability in scores, indicating that 75% of the scores fall within the 35% to 100% range. Shape, dimension and space, and Quantity, number and operations are QL aspects that candidates in this faculty may be required to know. Interventions should take this into account.

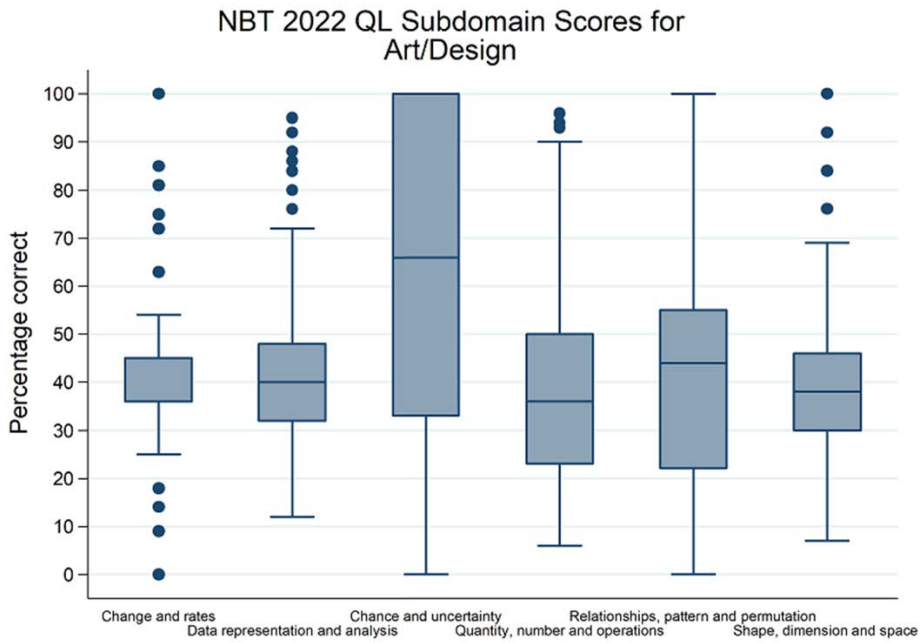

Figure 26 Art/Design subdomain NBT QL performance, 2022 intake

The QL performance for candidates applying to the Business/Commerce/Management faculty (n = 4,695) saw a slight improvement from the subdomain performance in the previous faculties. The medians for the six subdomains range between 35% and 45%, except for Chance and uncertainty, which has few items in the test (Figure 27). In this faculty, a large component of the coursework deals with aspects of Change and rates, Chance and uncertainty, and Quantity, number and operations, and the fact that the medians are in the Intermediate Lower and Upper performance bands suggests that the candidates would benefit from QL support provided as part of their regular curriculum.

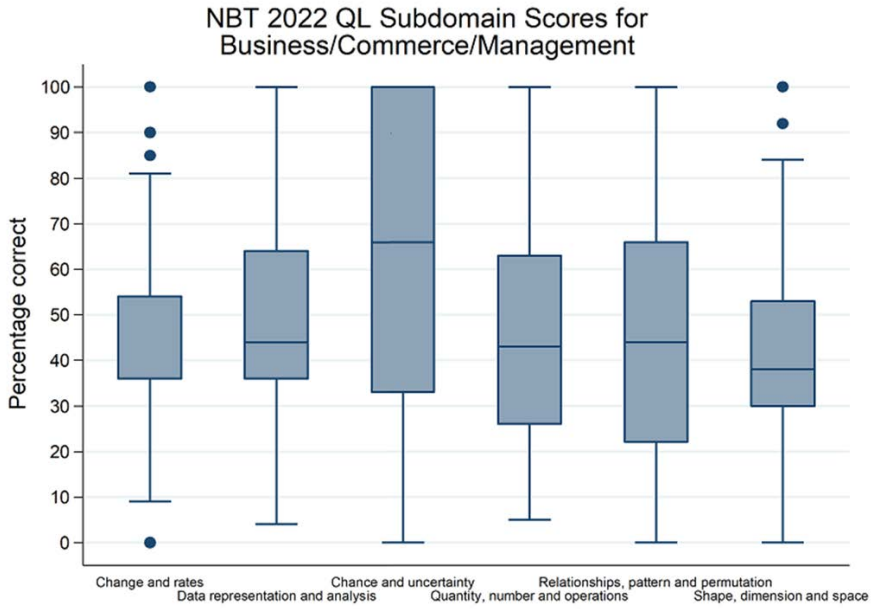

Figure 27 Business/Commerce/Management NBT QL performance, 2022 intake

The QL performance of the Education candidates (n = 1,657) was very poor across the six subdomains and the medians were all in the Basic band. The median scores for candidates applying to this faculty range between 30% and 40% across the six subdomains, except for Chance and uncertainty, which has few items in the test (Figure 28). All subdomains are extremely relevant for all potential educators. The low medians in five of the six subdomains and large proportions scoring within the Basic band are an indication that the majority of the candidates would require extensive support in QL. If candidates teach any aspects of Mathematics, Mathematical Literacy, Geography, Biology or Science they will require targeted QL support relevant to their subjects during their training. Some courses may be less dependent on QL and candidates might be able to cope with the demands of tertiary education in this faculty without additional support.

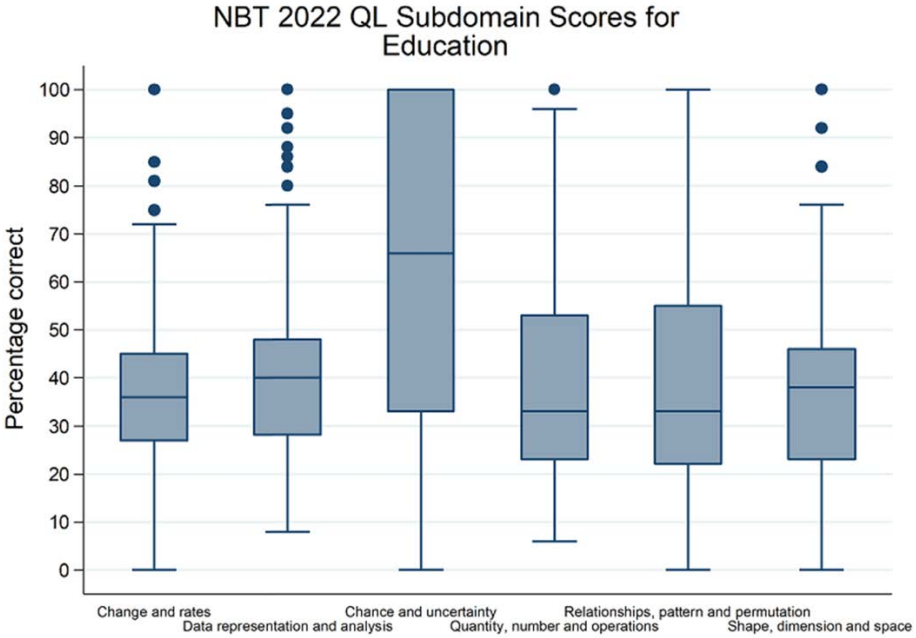

Figure 28 Education subdomain NBT QL performance, 2022 intake

The QL performance of the candidates applying to the Engineering/Built Environment faculty (n = 2,731) was significantly low, considering that all the course content in this faculty is heavily dependent on mathematical and quantitative knowledge and skills (Figure 29). Across the six subdomains, the median scores were between 45% and 55%, except for Chance and uncertainty, which is above 60%. Candidates intending to study in this faculty would need a good understanding of all six subdomains, as a large component of the work in this faculty involves calculations and manipulation of numbers. The performance across the six subdomains indicates that many candidates will require extensive QL support to cope with the heavily mathematical and quantitatively demanding courses that they will study.

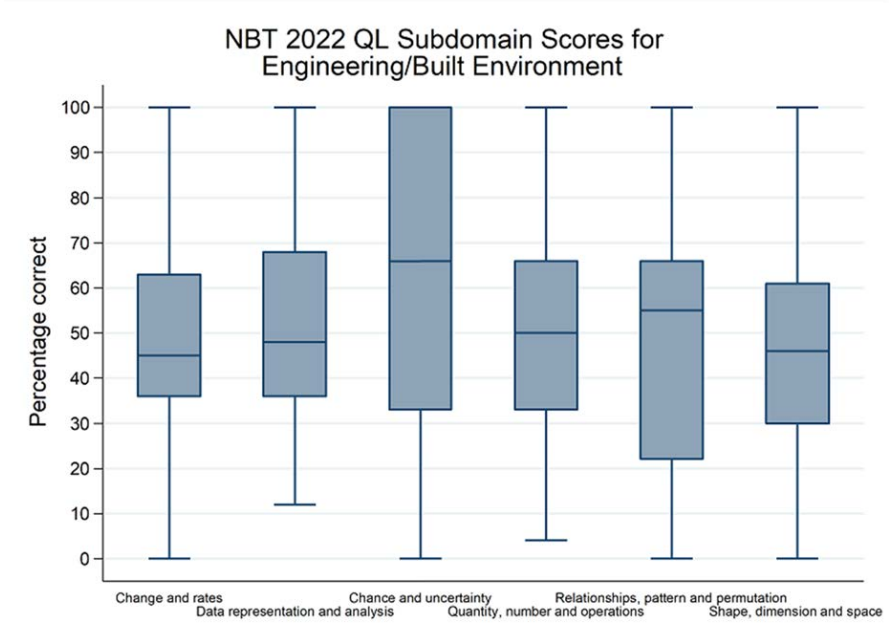

Figure 29 Engineering/Built Environment NBT QL subdomain performance, 2022 intake

For the Health Sciences faculty (n = 12,508), the median scores across the six subdomains ranged between 42% and 55%, except for Chance and uncertainty (66%) (Figure 30). The candidates' performance on the subdomain

of Chance and uncertainty was the best for this group. The results for the six subdomains suggest that the majority of students in the Health Sciences faculty could benefit from QL support. Since this faculty includes inter-disciplinary professions, QL interventions could be aligned with their specific disciplinary needs. However, the results indicate that all Health Sciences students may benefit from generic QL interventions.

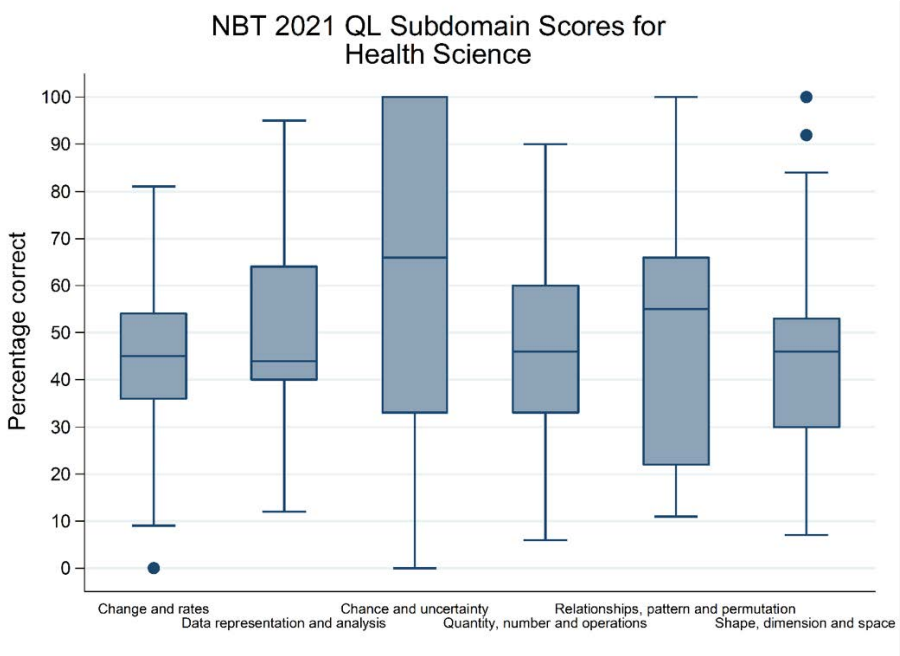

Figure 30 Health Sciences NBT QL subdomain performance, 2022 intake

The median scores of the NBT QL candidates who indicated that they applied to the Hospitality/Tourism faculty (n = 1,103) ranged between 30% and 40% across the five subdomains, except for Chance and uncertainty (66%) (Figure 31). The median scores for Quantity, number and operations and Relationships, pattern and permutation are in the Basic band; the remaining medians fall within the Intermediate performance band. Candidates in this faculty may be required to read graphs, charts and tables and hence the subdomain Data representation and analysis will be relevant for these candidates. While some candidates in this faculty may not need extensive QL support, for those whose courses comprise various aspects of QL, some specifically targeted support will be beneficial.

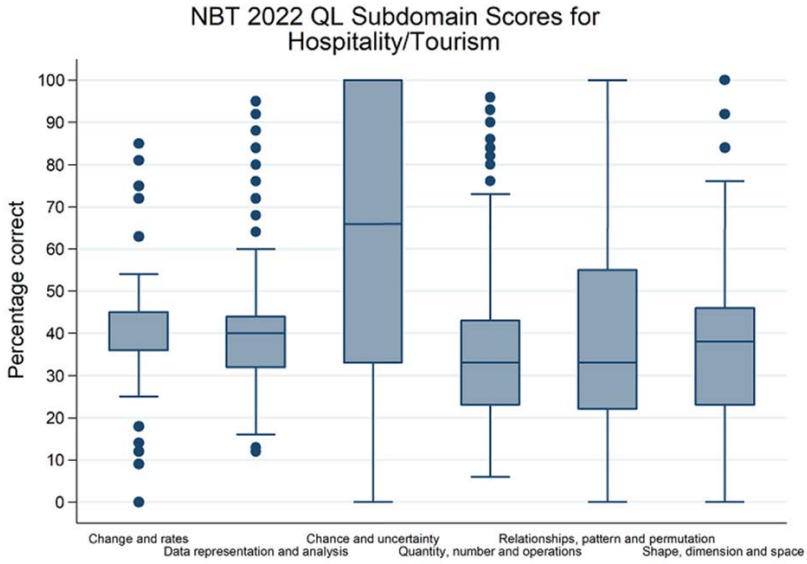

Figure 31 Hospitality/Tourism NBT QL subdomain performance, 2022 intake

The median scores across the subdomains for the Humanities faculty (n = 1,783) range between 35% and 46%, except for Chance and uncertainty (66%) (Figure 32). The median scores for Change and rates, Quantity, number and operations, and Relationship, pattern and permutation fall at or within the Basic band; the medians in the remaining subdomains are all in the Intermediate Lower band. Some departments in this faculty may have a large proportion of work that requires quantitative reasoning and the performance across the six subdomains suggests that, for these candidates, targeted support will be necessary. The candidates performed slightly better on the subdomain Chance and uncertainty with a median score of 66% (still in the Intermediate Lower band).

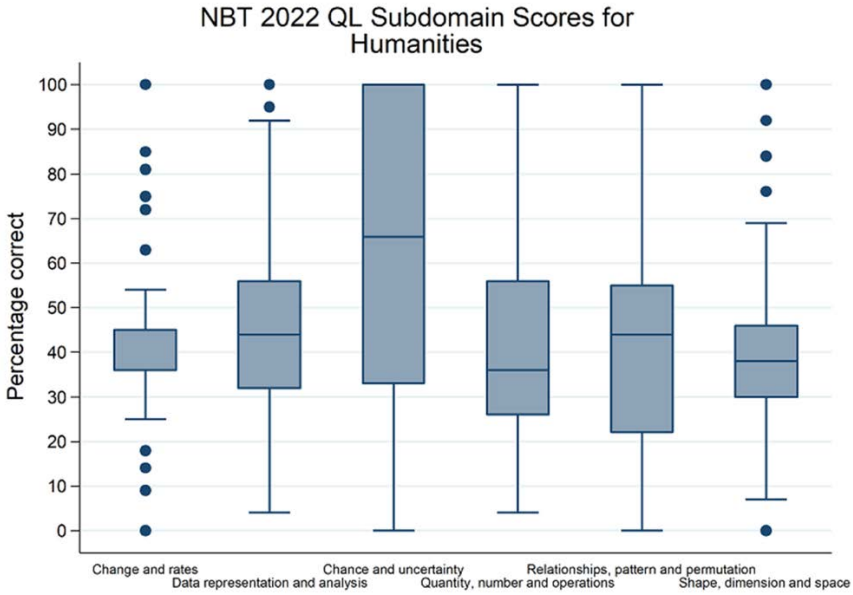

Figure 32 Humanities NBT QL subdomain performance, 2022 intake

The QL performance of the candidates applying to study ICT (n = 2,108) was significantly low, considering that the courses in this faculty are heavily dependent on QL. Candidates in this faculty are expected to have good mathematical and quantitative reasoning skills, as most of the courses require computations and quantitative manipulations. The median scores across the five of the six subdomains ranged between 33% and 40%, with the subdomain Chance and uncertainty being 66%. The subdomain Change and rates had the lowest performance, with a median of 36%, which suggests that half of the individuals performed at or below this value (Figure 33). The 25th percentile score of around 27 indicates that 25% of the test-takers achieved a score of 27% or below. This suggests that a quarter of the individuals performed relatively lower on the test. Many of these candidates would benefit from support or interventions in QL in order to meet the required QL demands of their courses.

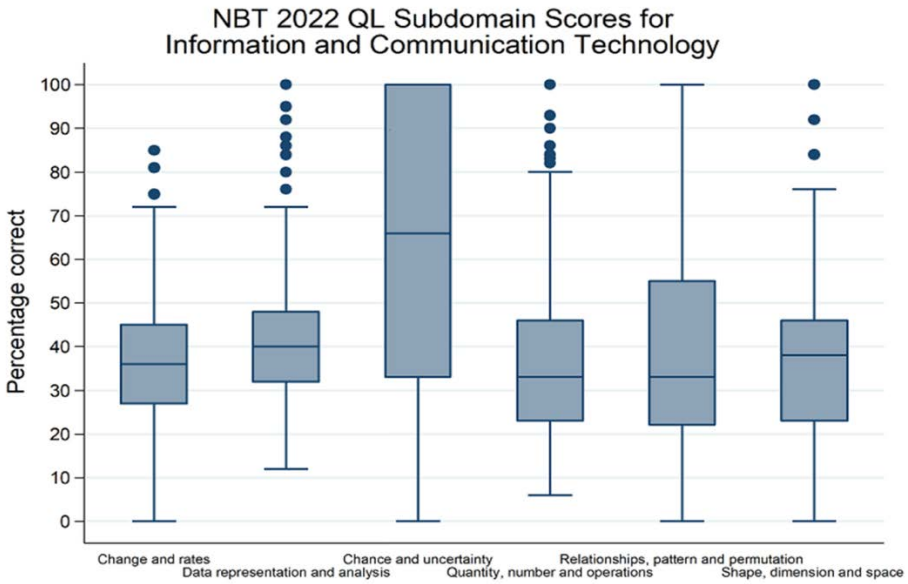

Figure 33 Information and Communication Technology NBT QL subdomain performance, 2022 intake

The median scores across the subdomains for the Law faculty (n = 2,192) range between 38% and 45%, except for Chance and uncertainty (66%) which has few items in the test (Figure 34). Students studying in this faculty may have a large proportion of work that requires quantitative reasoning and the performance across the six subdomains suggests that, for these candidates, targeted support will be necessary.

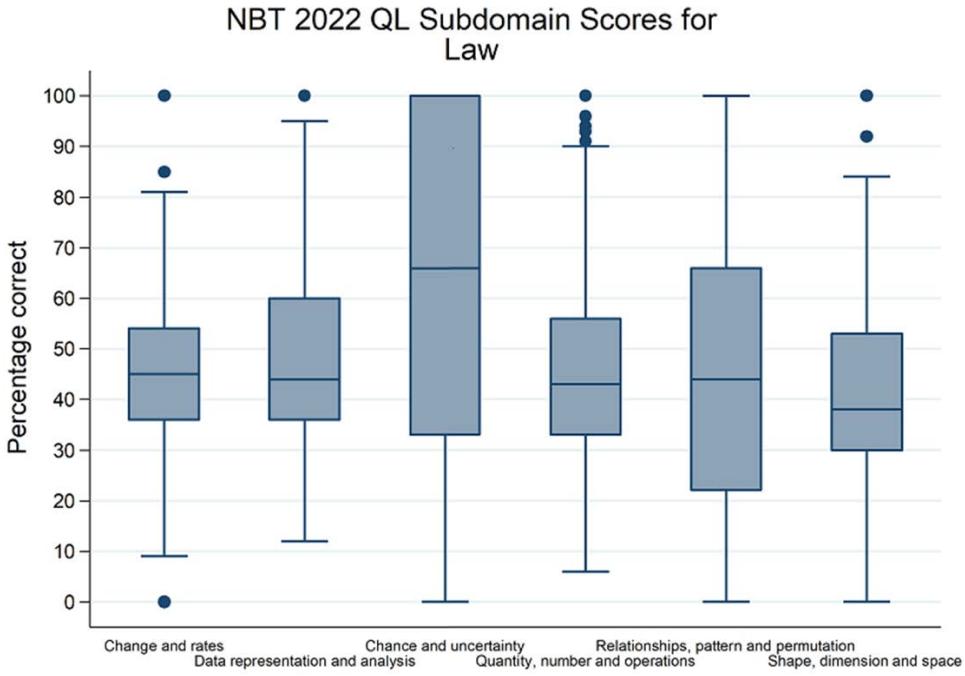

Figure 34 Law NBT QL subdomain performance, 2022 intake

The performance of candidates in the Science/Mathematics faculty (n = 1,433) is of concern. The course content in these faculties is heavily dependent on quantitative reasoning, mathematical knowledge and skills. Candidates will be doing mathematical computations and manipulations and basic foundational competence in Mathematics is required, as well as a thorough grasp of all aspects of QL. The median scores ranged between 44% and 54%, except for Chance and uncertainty (66%) which has few items in the test. The medians for the subdomains Change

and rates (45%), and Shape, dimension and space (45%) are significantly low, indicating that 50% of the candidates' scores in these subdomains appear to be below 45% (Figure 35). These candidates will need a good grounding in quantitative skills, knowledge and understanding in order to meet the demands of tertiary Science or Mathematics courses. These candidates are likely to require extensive QL support relevant to their academic studies.

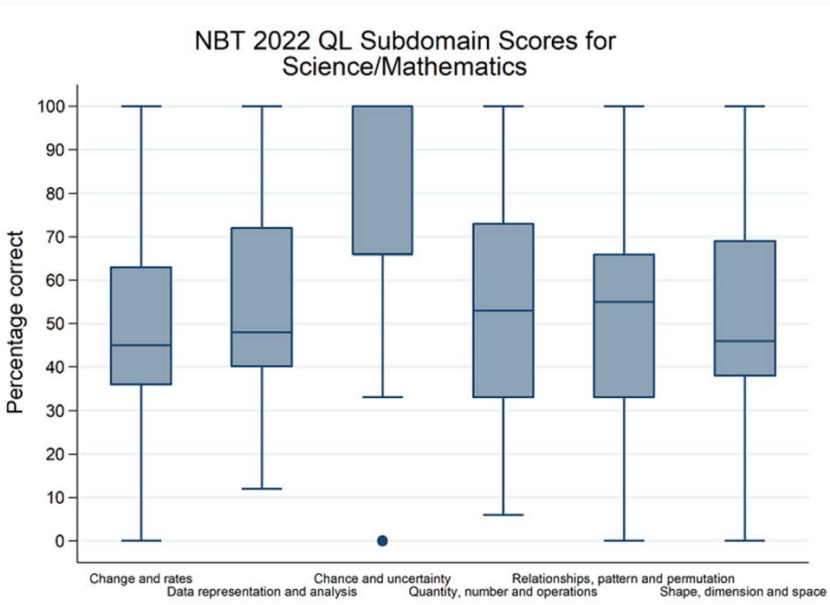

Figure 35 Science/Mathematics NBT QL subdomain performance, 2022 intake

The QL subdomain performance of the "Other" candidates (n = 10,840), meaning those candidates who did not indicate the faculty in which they will study, is summarised in Figure 36 below. The median scores for these candidates range between 35% and 45% across the subdomains, except for Chance and uncertainty (66%) which has few items in the test (Figure 36). The relatively low median scores indicate that the majority of the candidates would require extensive support in QL if quantitative skills are needed in their courses. Some courses may be less dependent on QL and candidates might be able to cope with the demands of tertiary education in those courses without additional support.

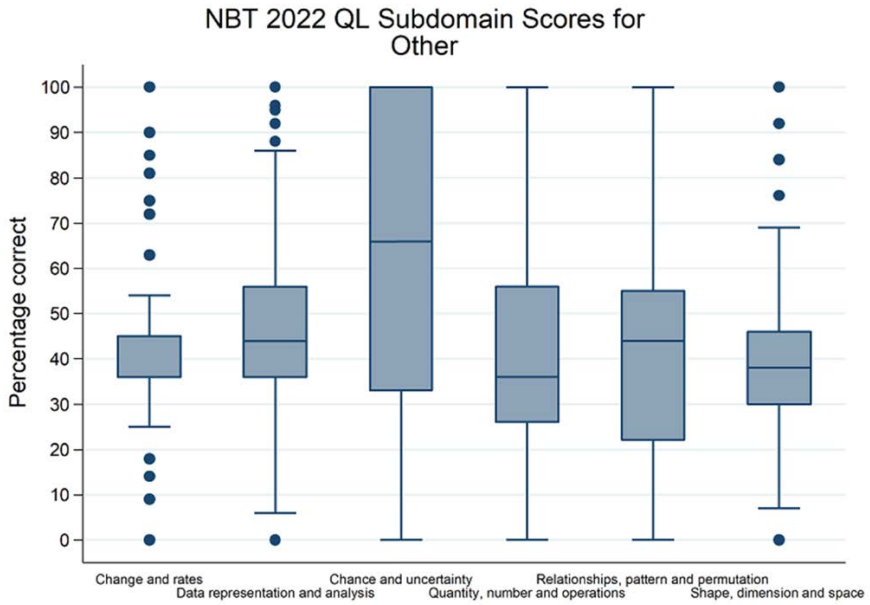

Figure 36 "Other" NBT QL subdomain performance, 2022 intake

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 2022 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. 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 16 Mathematics subdomains assessed, NBT 2022

Skill assessed	Explanation of skill area
Algebraic processes	• Pattern recognition, sequences and series, use of sigma notation • Operations involving relationships such as ratios and percentages • Modelling situations by making use of mathematical process skills (translation from language to algebra, solution of problems) • Operations involving surds, logarithms and exponents, including solution of exponential equations • Financial calculations (compound interest, appreciation, future value, etc.) • Number sense – manipulations/simple calculations involving integers, rational and irrational numbers • Algebraic manipulation (includes expressions, equations, inequalities, simplification, factorisation, completing the square)
Functions represented by graphs and equations; 'functions' to include linear, quadratic, hyperbola, cubic, exponential and logarithmic. Other graphs such as circles are also included	• Comprehension of function notation, substitution, domain, range • Function representation (algebraic and graphic); properties of functions and graphs (such as intercepts, turning points, asymptotes); relationship between graphs and their equations; interpretation of graphical information • Transformations of graphs of the functions noted above; solution of related problems; inverses of functions • Applications of principles of differential calculus and related problems involving simple linear, non-linear functions (i.e., critical points, increasing/decreasing functions, tangents); interpretation of behaviour of function from derivative and vice versa
Basic trigonometry, including graphs of trigonometric functions, problems requiring solutions of trigonometric equations and application of trigonometric concepts	• Definitions of trigonometric ratios (sine, cosine, tangent) • Characteristics and interpretations of trigonometric functions and their graphs (e.g., domain, range, period, amplitude), including transformations of trigonometric functions • Solving of trigonometric equations and using identities; simplification of trigonometric expressions using identities and reduction formulae where necessary; special angles; compound and double angles • Application of area, sine and cosine rules • Application of trigonometric concepts in solving problems, including two- and three-dimensional problems
Spatial perception including angles, symmetries, measurements, representations and interpretation of two-dimensional and three-dimensional shapes	• Geometric objects • Properties of 2D figures and 3D objects (such as the circle, rectangle, trapezium, sphere, cone, pyramid) • Scale factor • Perimeter, area, volume (also of composite figures and objects) • Analytic geometry (linking geometric and algebraic properties in the Cartesian plane) • Circle geometry • Cyclic quadrilaterals • Relationships between tangents, and chords, and angles in a circle
Data handling and probability	• Measurement (and related interpretations) • Representation (such as histograms, line graphs, pie charts, ogives, box-and-whisker plots) and related interpretations • Probability
Competent use of logical skills in making deductions and determining the validity of given assertions	

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 16 above should be analysed in relation to the performance trends shown in Table 17 below. It is concerning that 75% of all candidates' scores are below the 60% mark, and 50% of all candidates' scores are below 41%, with the lowest performance in the Number sense subdomain.

Table 17 The performance of the NBT MAT subdomains

Subdomain	N	mean	sd	min	p25	p50	p75	max
Algebraic processing	35,462	44	18	8	33	36	56	100
Number sense	35,462	38	28	0	14	28	57	100
Functions and graphs	35,462	44	23	0	30	39	60	100
Trigonometric functions and graphs	35,462	39	23	9	23	33	52	100
Geometric reasoning	35,462	41	18	0	25	41	50	100

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 18 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	34	23	33
Art/Design	36	28	34	23	33
Business/Commerce/Management	36	28	39	33	41
Education	36	28	39	33	41
Engineering/Built Environment	40	42	43	38	41
Health Sciences	36	28	39	33	41
Hospitality/Tourism	36	28	30	23	33
Humanities	36	28	39	33	33
ICT	36	28	39	28	33
Law	36	28	39	33	41
Science/Maths	53	57	56	47	41
Other	36	28	39	33	33

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.

Candidates who intend to study in the area of Allied Healthcare/Nursing (n = 4,616) may need to take Mathematics courses in order to study other subjects such as Physics, Chemistry and Biology. The boxplots show median scores between 20% and 40% in all subdomains. Maximum scores range between 40% and 75%, with outliers in all five subdomains (Figure 37). Apart from quite a large number of outliers in all subdomains other than Number sense, the scores are a matter of concern, and these applicants will need fairly extensive support in all subdomains.

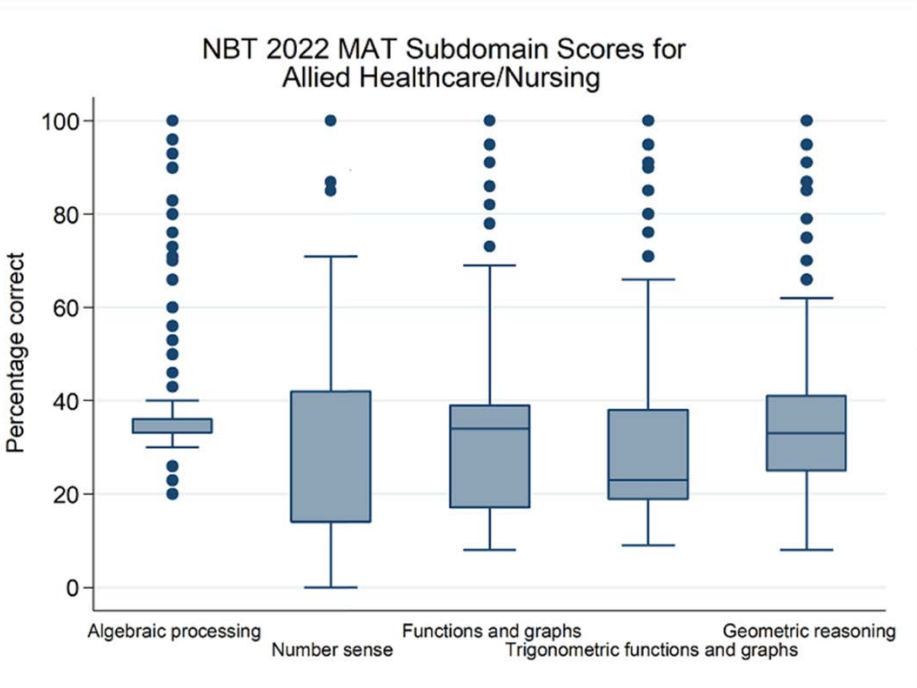

Figure 37 Allied Healthcare/Nursing NBT MAT subdomain performance, 2022 intake

Applicants indicating the area of Art and Design as their first choice (n = 643) are unlikely to have taken NSC Mathematics; many may have taken Mathematical Literacy and would therefore not have been equipped to write the NBT MAT test. If this is the case, low scores in all subdomains represented in the boxplots should be interpreted with caution (Figure 38). It is interesting to note that the scores for this group in the Algebraic processing and Number sense subdomains are slightly higher than those for applicants to the Allied Healthcare/Nursing group.

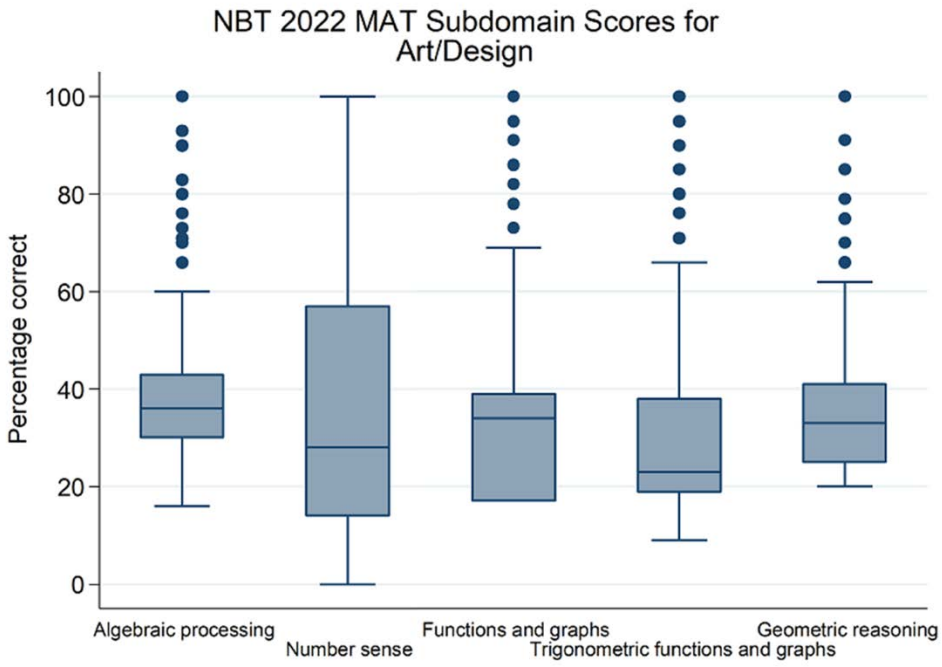

Figure 38 Art/Design NBT MAT subdomain performance, 2022 intake

The median scores of candidates who applied to study courses in Business/Commerce/Management (n = 3,380) were between 25% and 40% or less in all subdomains, i.e., in the Intermediate Lower band (Figure 39). The Number sense subdomain shows the lowest median, indicating that 50% of the candidates' scores fell below 30%. Economics, in particular, is heavily dependent on the subdomains Algebraic processing, Number sense and Functions and graphs. Once registered in these courses, students will need considerable support in order to cope with the mathematical component of their studies.

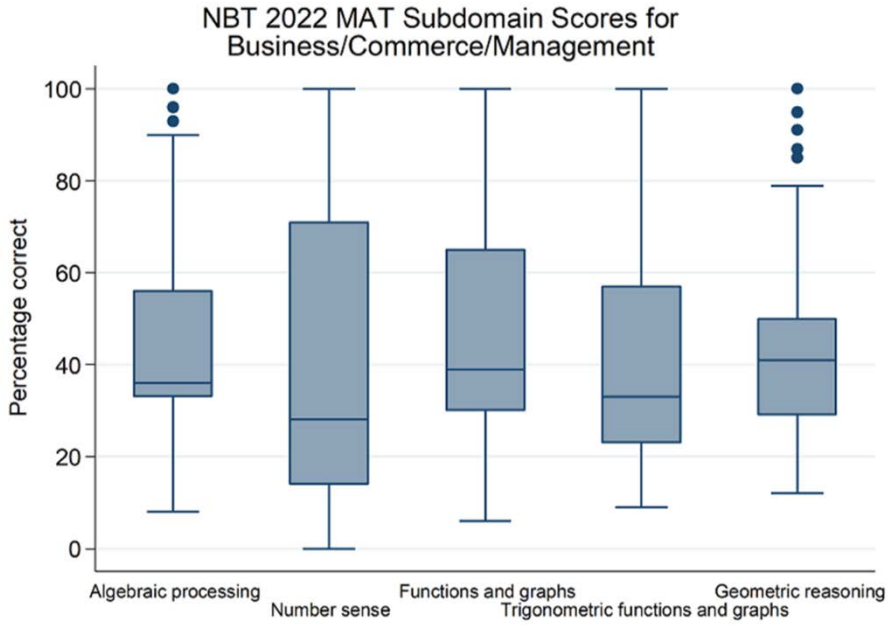

Figure 39 Business/Commerce/Management NBT MAT subdomain performance, 2022 intake

The boxplots in Figure 40 below show the subdomain performance of those intending to study Education (n = 744). These scores are generally low, with medians below 33% (in the Basic band) and more candidates' scores falling below 40%. These candidates' content knowledge will therefore need extensive remediation. Education faculties' students (especially those planning to teach the Sciences and/or Mathematics) will need much support to develop comprehension and skill in all these subdomain areas before they will be able to fully comprehend the topics that they will be studying and one day teaching.

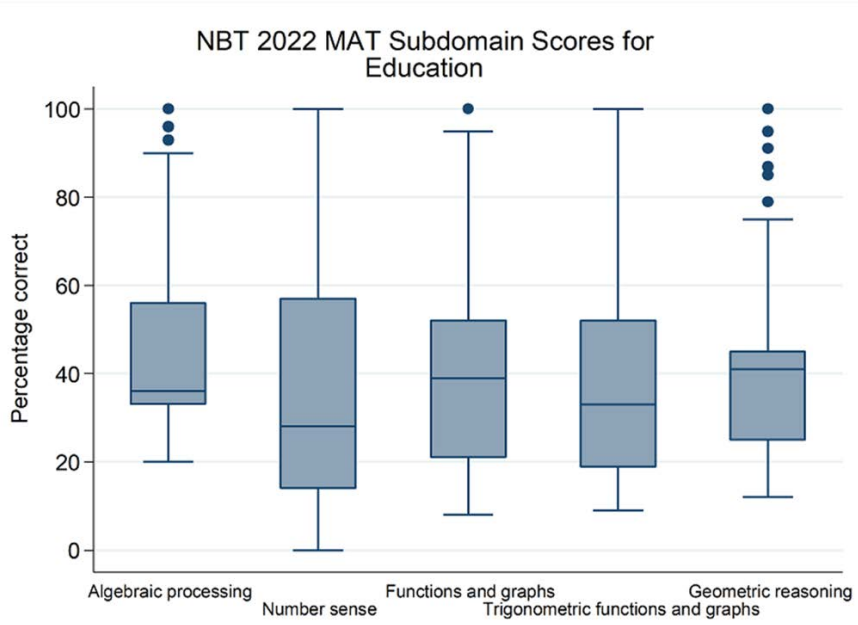

Figure 40 Education NBT MAT subdomain performance, 2022 intake

Figure 41 shows candidates who intended applying to the faculty of Engineering/Built Environment (n = 2,498). Median scores in all subdomains were significantly low, falling into the Intermediate Lower band. The candidates applying to study courses which are heavily dependent on Mathematics have NBT MAT subdomain scores that are below 43%. Mathematics is central to this area of study and many of these candidates, if admitted to this area of study, will need extensive support in all subdomains. Considering the QL scores and MAT scores together, it seems that certain essential but missing building blocks in QL may be undermining mathematical performance; simultaneous and targeted support in both QL and MAT may be needed to address the problem.

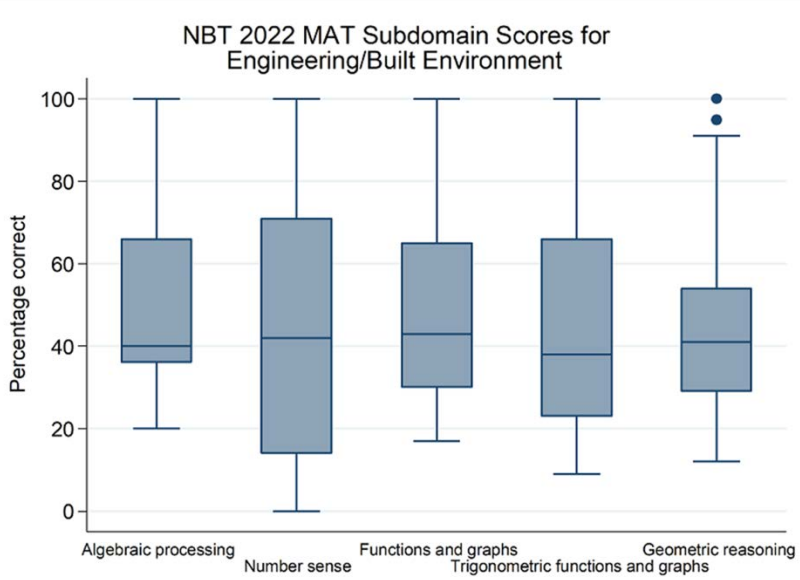

Figure 41 Engineering/Built Environment NBT MAT subdomain performance, 2022 intake

The Health Sciences consortium (n = 11,629) makes use of the NBTs in its selection programme; however, there are many more applicants than can be accommodated, and only the top-performing candidates will be selected. Those candidates who do not end up in their intended field of study will enrol in other areas. If they enrol for Science degrees, or for any other programmes where Mathematics is a requirement, they will need support in all subdomains. The boxplots below show that in all subdomains the medians are below 40% and, in the Intermediate Lower band, indicative of substantial support requirements (Figure 42).

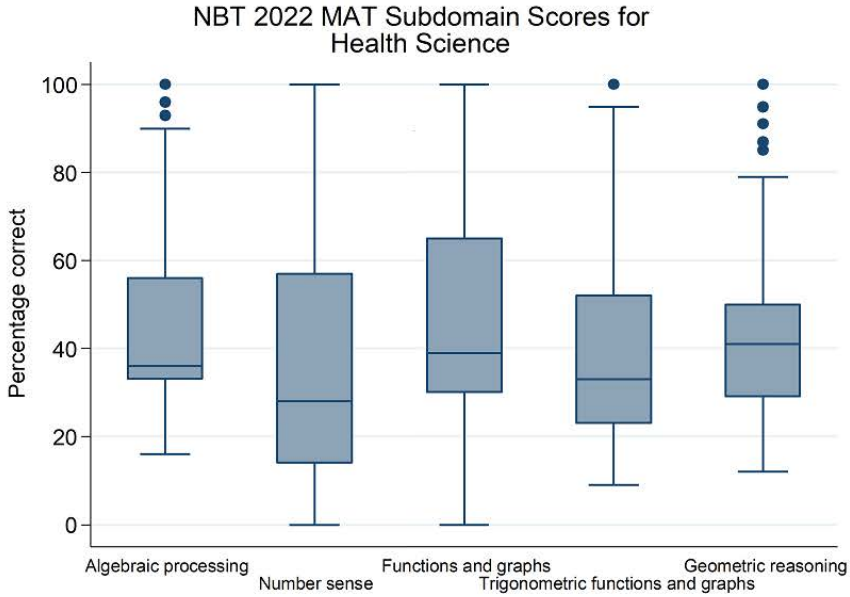

Figure 42 Health Sciences NBT MAT subdomain performance, 2022 intake

It is possible that candidates intending to study in the area of Hospitality/Tourism (n = 388) did not take Mathematics at school, and may have taken Mathematical Literacy, which would not have equipped them to write the MAT test. The boxplots in Figure 43 below show that in all subdomains the medians are below 36% and this is indicative of substantial support requirements should they enrol for courses that require these skills.

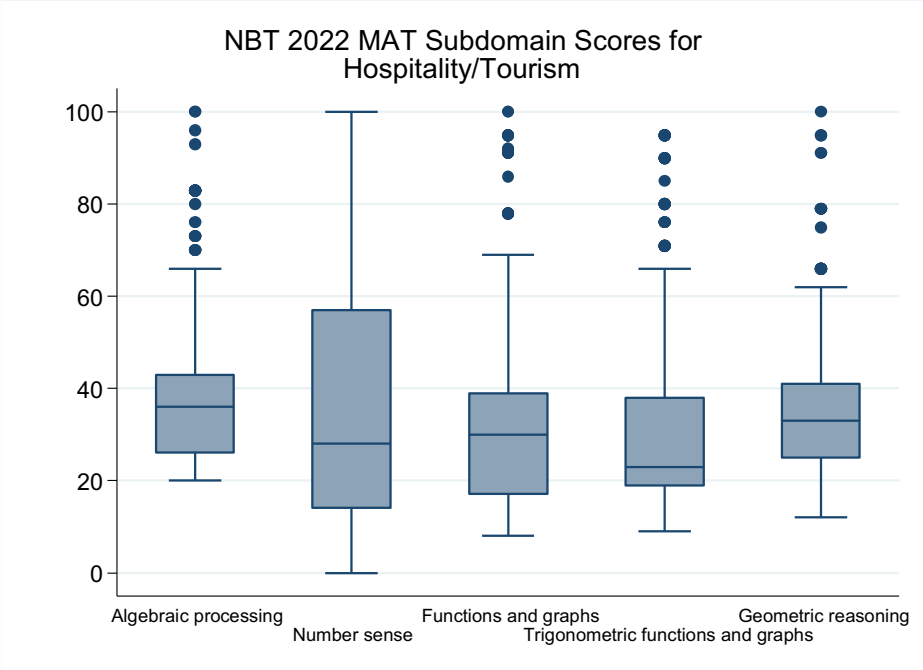

Figure 43 Hospitality/Tourism NBT MAT subdomain performance, 2022 intake

Mathematics is not generally a requirement for Humanities (n = 662). Since the majority of the candidates whose scores are reflected in the boxplots below are unlikely to be studying Mathematics courses, it is difficult to interpret these scores. The boxplots below show that in all subdomains the medians are below 40% and mostly fall into the Basic band, indicative of substantial support requirements should they enrol for courses that require these skills (Figure 44).

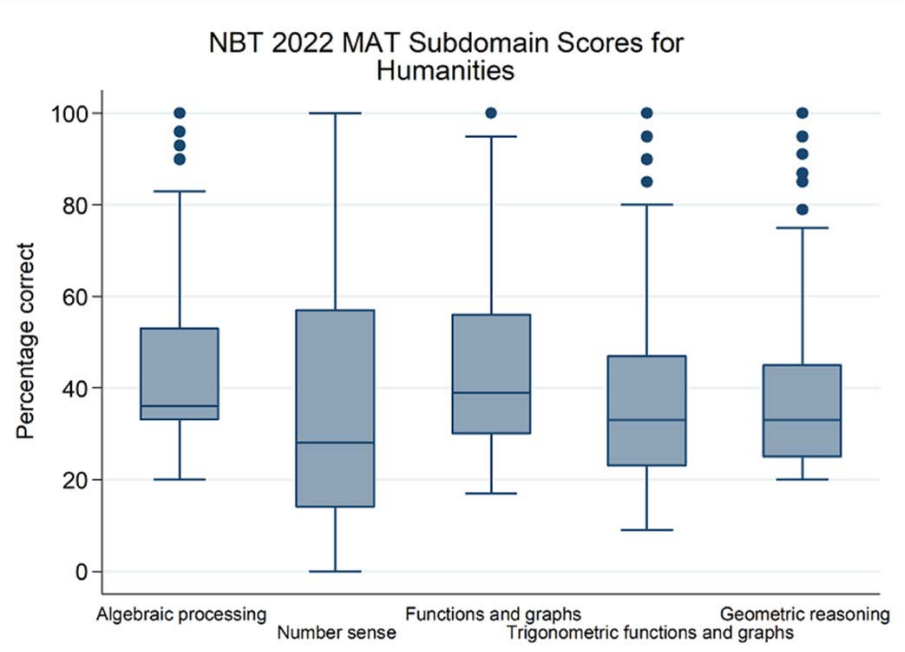

Figure 44 Humanities NBT MAT subdomain performance, 2022 intake

In many institutions, Mathematics is a requirement for degrees in Information and Communication Technology (n = 737). The high-scoring outliers in this group are unlikely to need support in Mathematics. The median scores in all subdomains reflected in the boxplots below are 40% or lower and thus fall into the Basic or Intermediate Lower bands (Figure 45). The low scores are indicative of the extensive mathematical support that candidates in this group will need in all subdomains, except possibly Geometric reasoning. The components of this subdomain (analytic geometry, angles and shape, area and volume, circle geometry) may not be important for ICT courses.

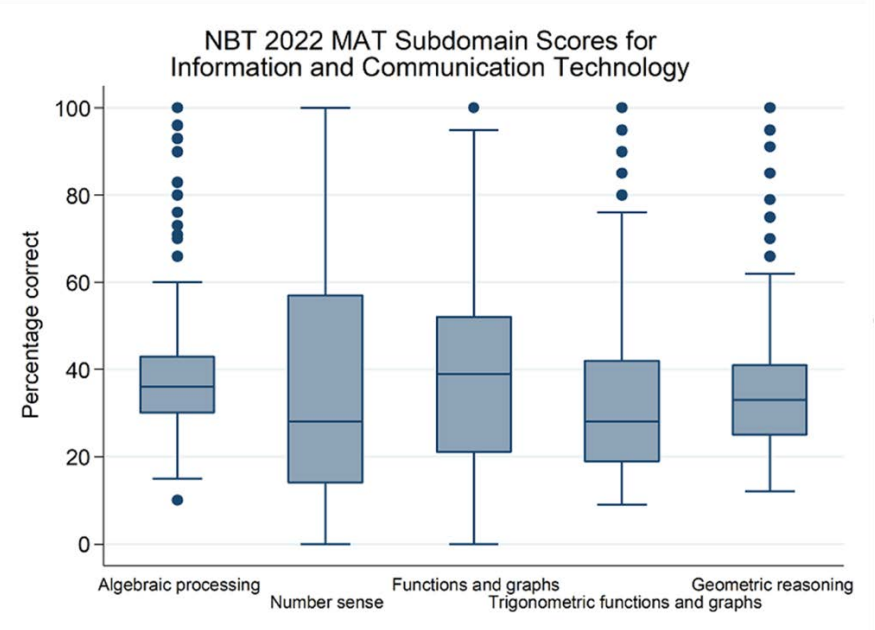

Figure 45 Information and Communication Technology NBT MAT subdomain performance, 2022 intake

Mathematics is generally not a requirement for Law (n = 1,263). Since the majority of the candidates whose scores are reflected in the boxplots below are likely to enrol for Law, and are unlikely to be studying Mathematics courses, it is not necessary to comment further on these scores, apart from raising one specific concern: students in the Law

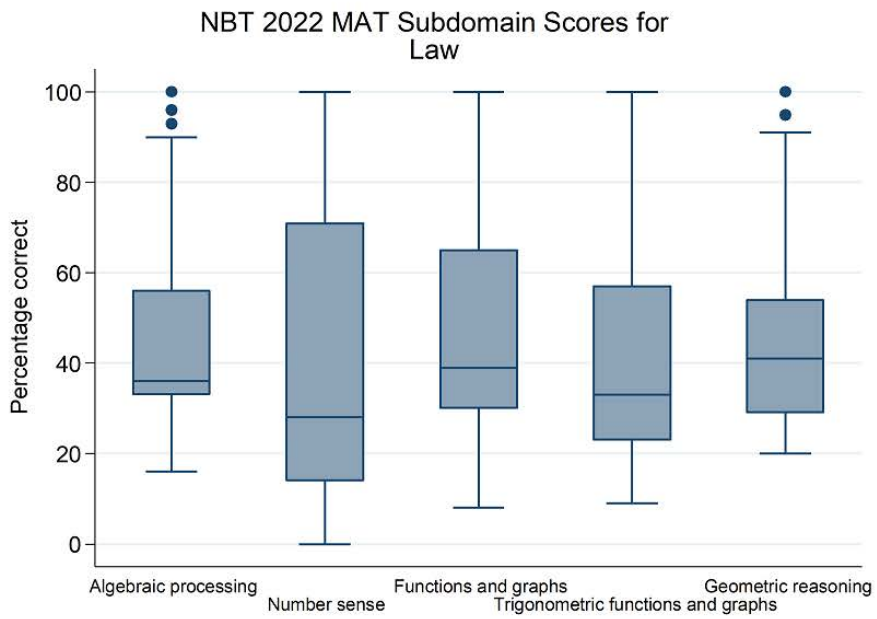

Figure 46 Law NBT MAT subdomain performance, 2022 intake

faculty will need support (even if it is provided via QL support courses) in the MAT subdomain Number sense if

they are to be able to make logical decisions with regard to number relationships, orders of magnitude, etc. The boxplots below show that in all subdomains the medians are below 40% (Figure 46) and fall into the Basic or Intermediate Lower bands, indicative of substantial support requirements should they enrol for courses that require these skills.

Mathematics is a core course for Science and Mathematics programmes. It is a matter of concern that for candidates intending to register for Science and Mathematics programmes (n = 1,164), the medians in all subdomains are around 58% and below, as shown in Figure 47 – therefore, either in or close to the Intermediate band. Mathematical support will need to be provided for those who enrol in these courses, and performance in Geometric reasoning

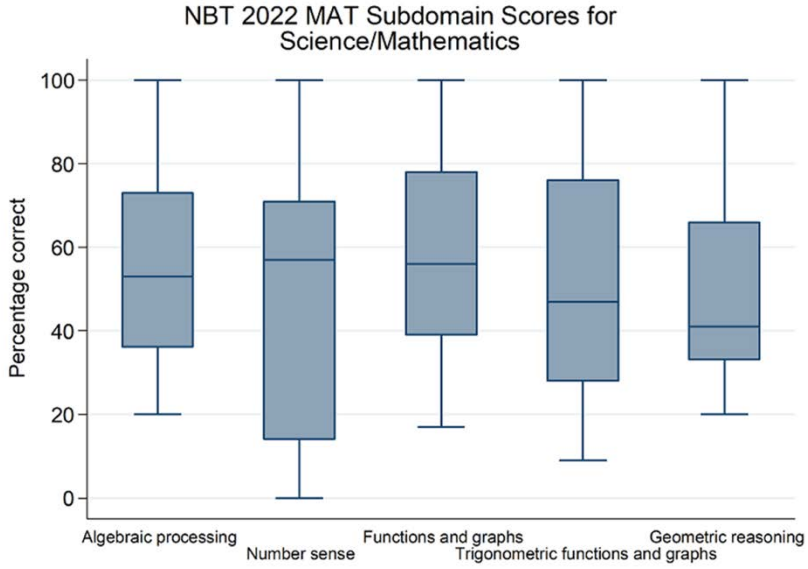

Figure 47 Science/Mathematics NBT MAT subdomain performance, 2022 intake

and Trigonometric functions and graphs (medians are 41% and 47%) must be addressed if candidates are to cope with their mathematical studies.

Since we cannot be certain in which fields the "Other" students (n = 7,739) will eventually enrol, it is difficult to interpret these scores. The boxplots in Figure 48 show that in all subdomains the medians are below 40% and fall into the Intermediate Lower band, indicative of substantial support requirements.

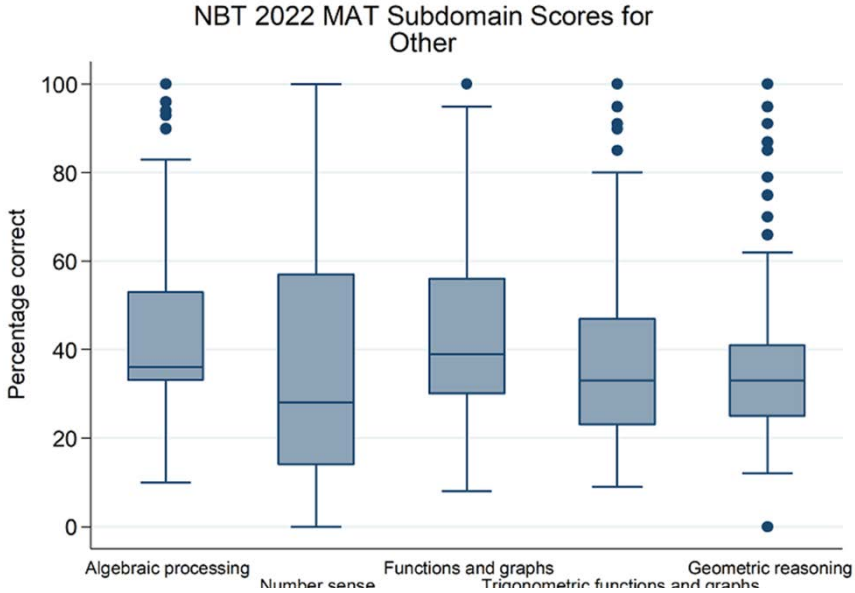

Figure 48 Other NBT MAT subdomain performance, 2022 intake

6. PERFORMANCE ON THE 2022 NBT HIGHER EDUCATION INTAKE CYCLE TESTING AND PERFORMANCE IN COGNATE NSC SUBJECTS IN 2021

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

Table 19 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 20.

Table 20 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, NSC MTHN against NBT QL, NSC MTLN against NBT QL, NSC MTHN against NBT MAT, and NSC PSCN against NBT MAT show heterogenous variance. The point cloud of the scatterplot for NSC MTLN against NBT QL also shows some non-linear trend.

6.3 SELF-REPORTED DEMOGRAPHICS

The 2022 intake cycle NBT cohort / 2021 NSC cohort self-classified their biographical details. The cohort consisted of approximately 27% males and 55% females (19% unspecified). Approximately 48% were black, 11% were coloured and 11% white. The majority were South African citizens. The candidates spoke a total of eleven official languages. Approximately 28% 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, 91% were at a Bachelor's Degree level and the remainder were at a Higher Certificate or Diploma level (Table 21).

Table 21 Self-reported demographics

	NBT & NSC Writers Full Sample		Bachelor's		Diploma or Higher Certificate	
	N	%	n	%	n	%
	GENDER					
Male	8,919	26.65	8,148	26.81	771	25.07
Female	18,356	54.85	16,567	54.51	1,789	58.18
Unspecified	6,192	18.5	5,677	18.68	515	16.75
Total	33,467	100	30,392	100	3,075	100
	POPULATION GROUP					
Black	16,074	48.03	14,129	46.49	1,945	63.25
Coloured	3,609	10.78	3,223	10.6	386	12.55
Indian/Asian	1,872	5.59	1,787	5.88	85	2.76
White	3,456	10.33	3,417	11.24	39	1.27
Other	57	0.17	52	0.17	5	0.16
Unspecified	8,399	25.1	7784	25.61	615	20.00
Total	33,467	100	30,392	100	3,075	100
	CITIZENSHIP					
South African	24,998	74.69	22,534	74.14	2,464	80.13
SADC country	37	0.11	36	0.12	1	0.03
Other African Country	40	0.12	39	0.13	1	0.03
Other	40	0.12	40	0.13	0	0
Unspecified	8,352	24.96	7,743	25.48	609	19.8
Total	33,467	100	30,392	100	3,075	100
	HOME LANGUAGE					
Afrikaans	1,913	5.72	1,797	5.91	116	3.77
English	9,257	27.66	8,530	28.07	727	23.41
isiNdebele	212	0.63	184	0.61	28	0.91
isiXhosa	3,780	11.29	3,271	10.76	509	16.55
isiZulu	3,219	9.62	2,926	9.63	293	9.53
Sesotho	2,094	6.26	1,803	5.93	291	9.46
Sesotho sa Leboa	1,131	3.38	997	3.28	134	4.36
Setswana	1,133	3.39	1,011	3.33	122	3.97

siSwati	488	1.46	450	1.48	38	1.24
Tshivenda	745	2.23	674	2.22	71	2.31
Xitsonga	824	2.46	731	2.41	93	3.04
Other Language	220	0.66	195	0.64	25	0.81
Unspecified	8,451	25.25	7,823	25.74	628	20.42
Total	33,467	100	30392	100	3075	100
	GR12 LANGUAGE					
Afrikaans	1,851	5.53	1,719	5.66	132	4.29
English	22,440	67.05	20,241	66.6	2,199	71.51
Unspecified	9,176	27.42	8,432	27.74	744	24.2
Total	33,467	100	30,392	100	3,075	100

HE ADMISSION		
Bachelor's Degree	30,392	90.81
Diploma/Higher Certificate	3,075	9.19
Total	33,467	100

6.4 DESCRIPTIVE STATISTICS

Table 22 Descriptive statistics – NBTs and NSC

	N	mean	sd	min	p25	p50	p75	max
TOTAL COHORT								
ALScore	33,024	58.17	14.36	19	46	58	70	96
QLScore	33,022	48.68	16.63	15	35	44	59	99
MathsScore	26,040	42.16	17.83	15	28	35	52	97
MTHN	27,982	61.64	18.32	0	48	62	76	100
MTLN	5,557	69.01	13.98	15	60	71	80	99
ENHN	20,563	69.69	10.36	34	62	70	77	100
ENFN	12,904	72.31	8.810	40	66	73	79	98
PSCN	23,220	62.59	17.28	13	50	63	76	100
BACHELOR'S DEGREE								
ALScore	29,994	59.45	14.07	19	48	60	71	96
QLScore	29,993	49.92	16.75	15	36	46	61	99
MathsScore	23,848	43.41	18.02	15	29	37	54	97
MTHN	25,626	63.97	17.14	0	52	64	77	100
MTLN	4,865	71.63	12.12	15	63	73	81	99
ENHN	18,752	71.02	9.590	38	64	71	78	100
ENFN	11,640	73.42	8.220	43	68	74	79	98
PSCN	21,220	65.08	15.80	16	53	65	77	100
DIPLOMA/CERTIFICATE								
ALScore	3,030	45.42	10.46	24	37	43	52	85
QLScore	3,029	36.38	8.400	16	31	34	39	87
MathsScore	2,192	28.48	6.020	23	25.50	27	29	85
MTHN	2,356	36.22	9.050	2	30	36	43	76
MTLN	692	50.61	12.22	16	42	49	59	87
ENHN	1,811	56.00	7.800	34	50	56	61	80
ENFN	1,264	62.17	7.560	40	57	62	67	85
PSCN	2,000	36.23	7.580	13	31	36	42	70

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. Half of the MTLN candidates scored above 60%, but this is not reflected in the QL scores of 44%.

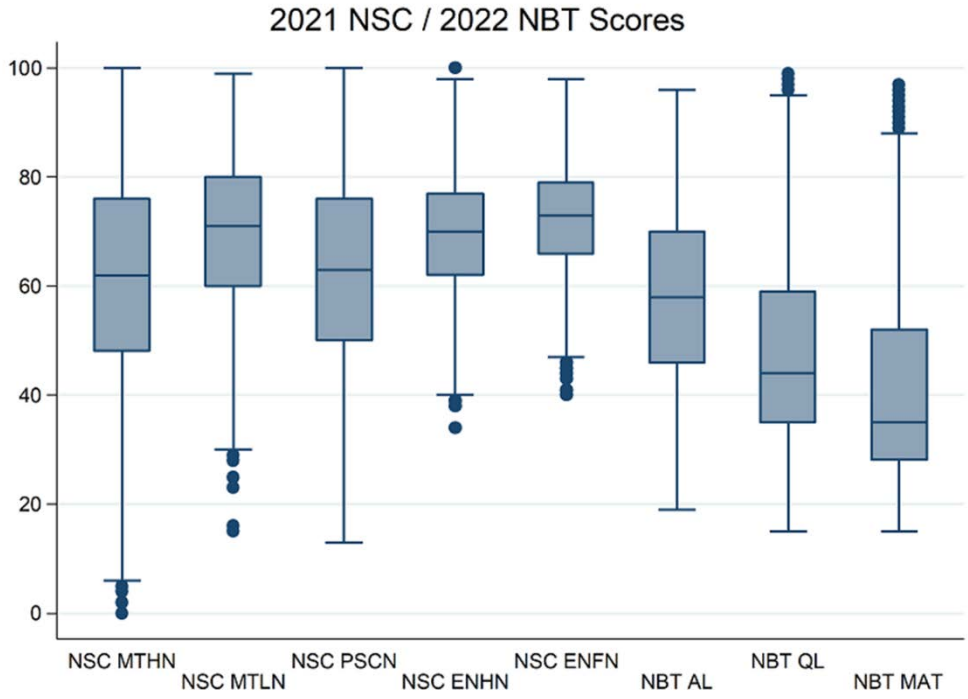

Figure 49 2021 NSC/2022 Intake NBT scores distribution

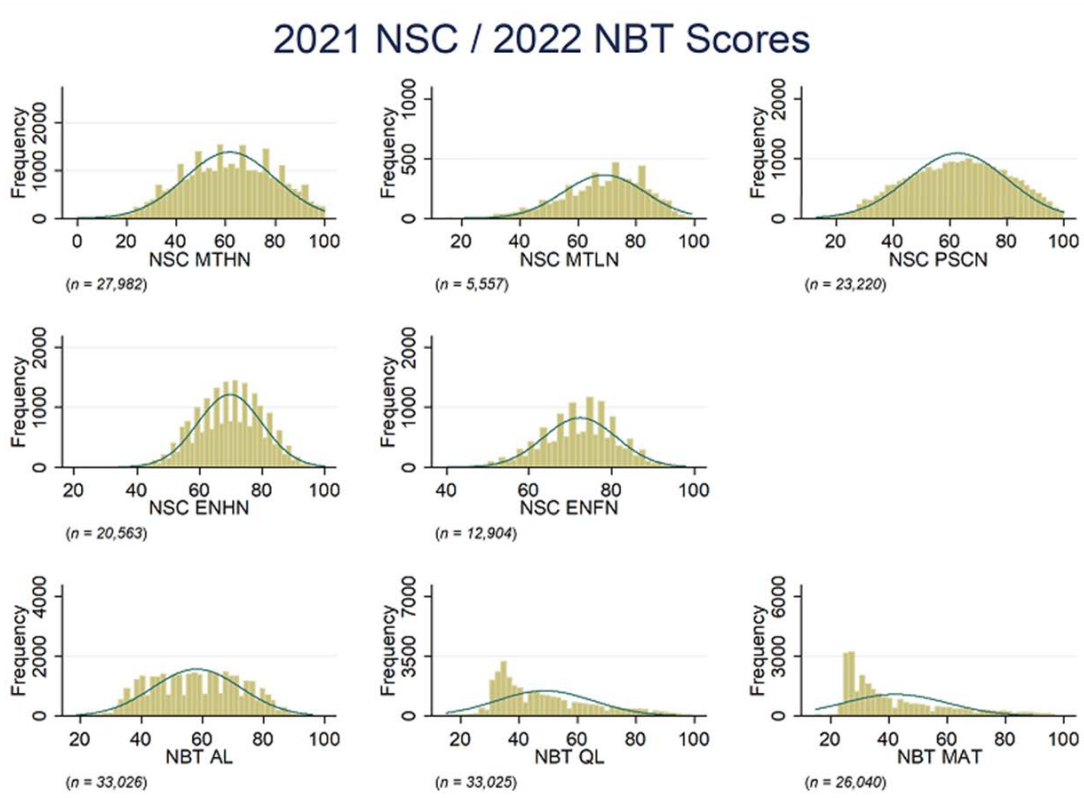

Figure 50 2021 NSC/2022 Intake NBT scores frequencies

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 the proportion of their Afrikaans counterparts when comparing the scores according to intended faculty. Figure 51 shows 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 tests in English (Figure 52) for the same faculties. The faculty group with the highest proportion of candidates in the Intermediate Lower band was Allied Healthcare/Nursing for the English cohort (50%) and, for the cohort that wrote in Afrikaans, the faculty group with the highest proportion of candidates in the Intermediate Lower band was Art/Design (44%). The faculty groups with the highest proportion of candidates in the Intermediate Upper band were Art/Design and Business/Commerce/Management (both 45%) in the Afrikaans cohort, and Art/Design (41%) in the English cohort. It is worth mentioning that in all the English and Afrikaans cohorts, the majority of candidates in each faculty group fell into the Intermediate bands. Perhaps most notably, 89% of the candidates in the Afrikaans cohort of Art/Design (see Figure 51) and 85% of the candidates in the English cohort of Allied Healthcare/Nursing (see Figure 52) fell into either the Intermediate Lower or Intermediate Upper bands. This suggests that the majority of the candidates in these cohorts would need some type of support to develop their AL skills to handle the demands of academic study in higher education.

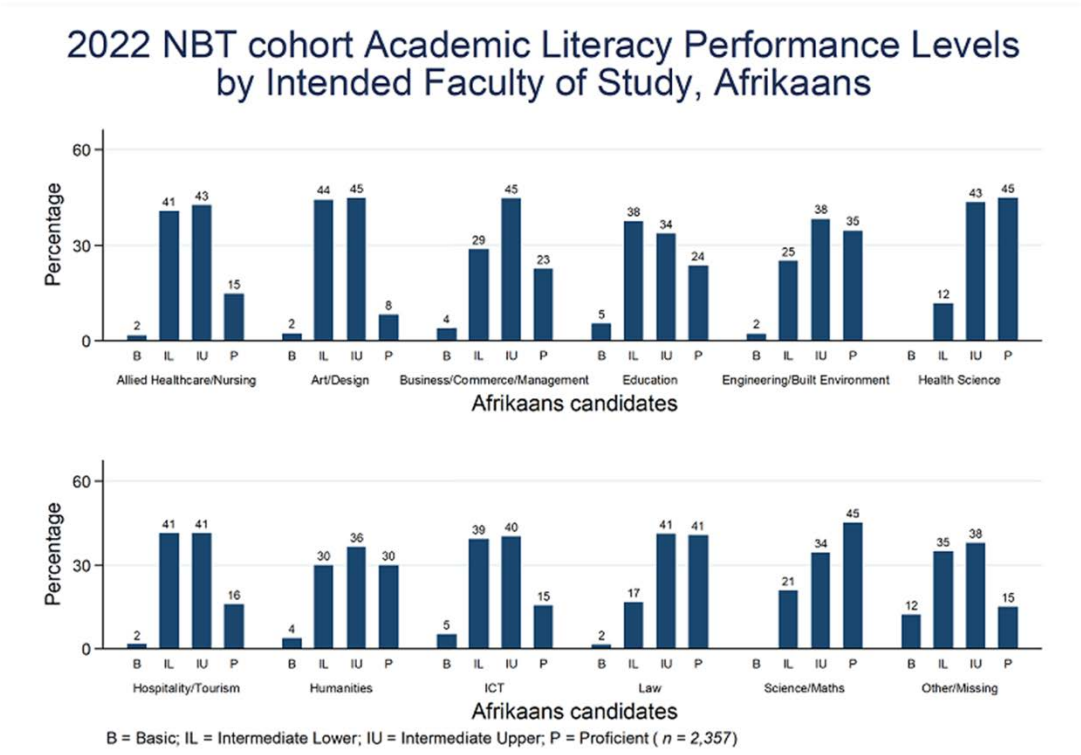

Figure 51 2022 Intake - NBT AL performance levels by intended programme of study for Afrikaans writers

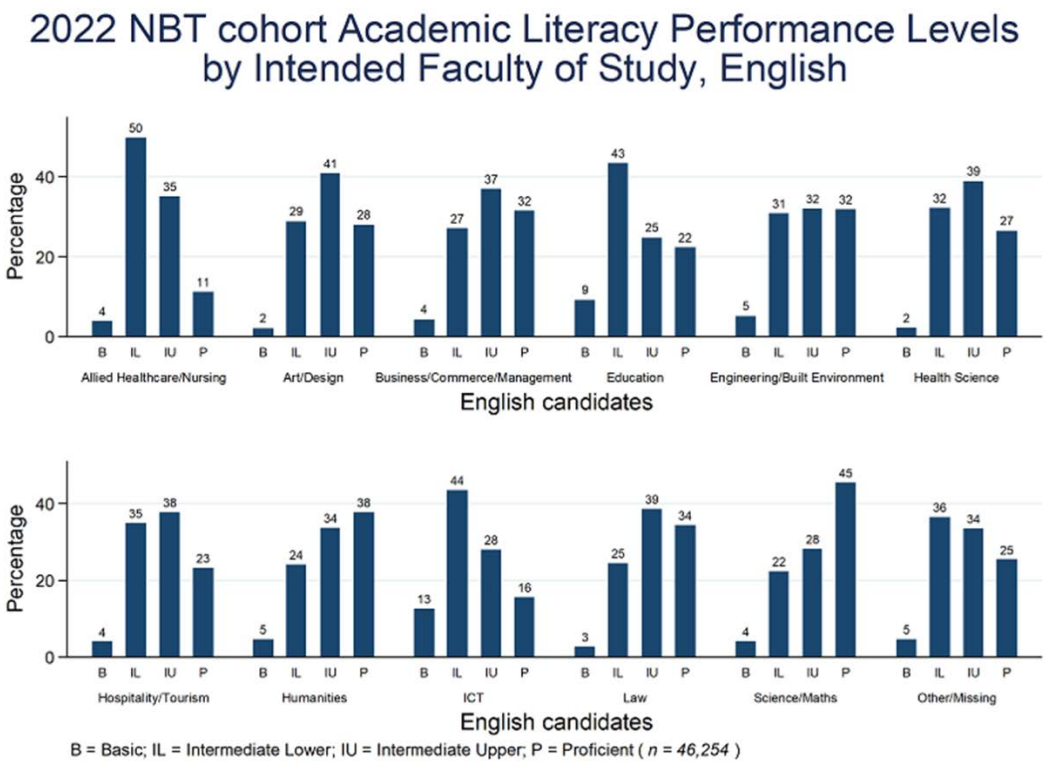

Figure 52 2022 Intake - NBT AL performance levels by intended programme of study for English writers

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 (Figures 53 and 54). The proportion of candidates who wrote in Afrikaans whose scores fell into 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 (57%), Humanities (42%) and Hospitality/Tourism (58%) faculties showed the largest proportions of candidates in the Basic band (Figure 54).

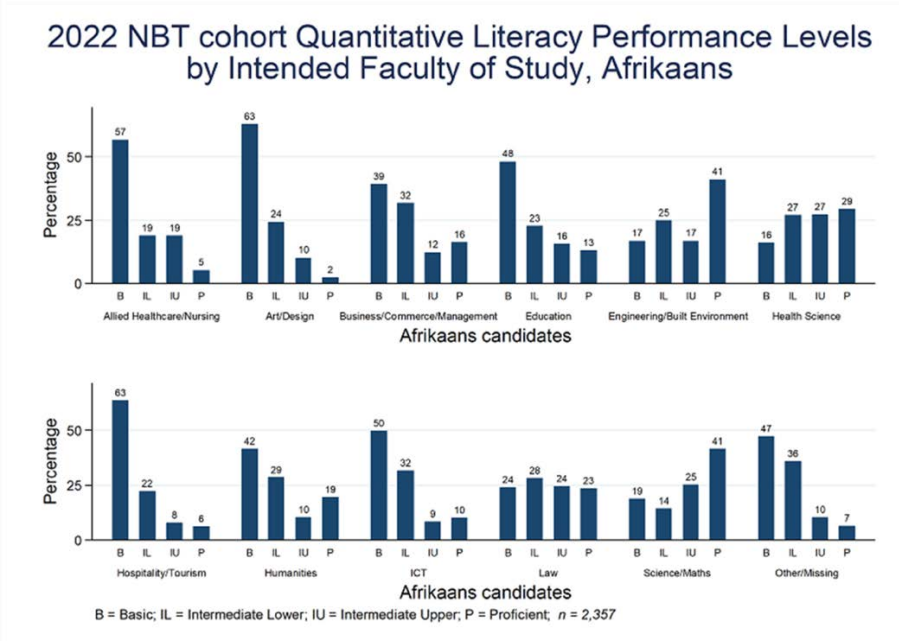

Figure 53 2022 Intake - NBT QL performance levels by intended faculty of study for Afrikaans writers

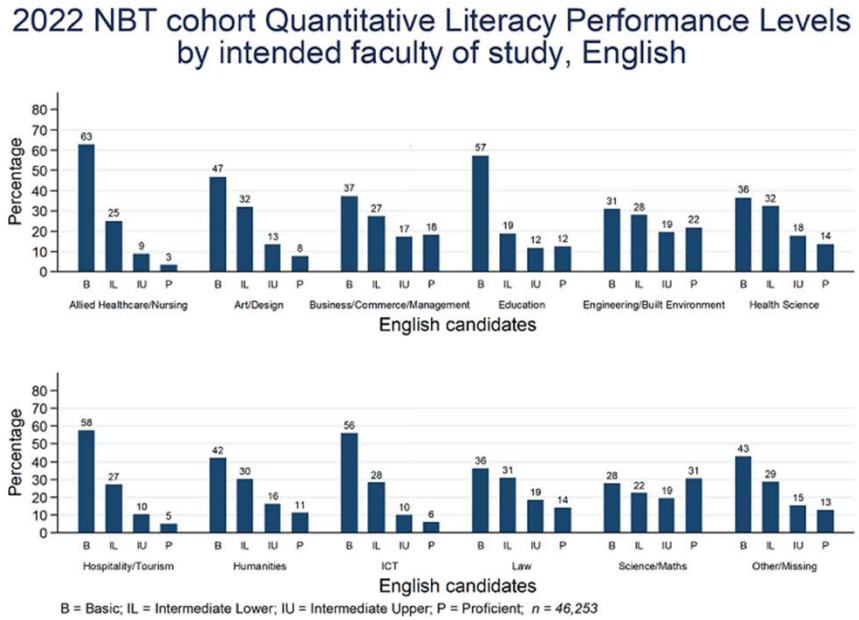

Figure 54 2022 Intake - NBT QL performance levels by intended faculty of study for English writers

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 (Figures 55 and 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 (83% of the Afrikaans group, 76% of the English cohort) and Humanities (61% of the Afrikaans group, 57% of the English cohort).

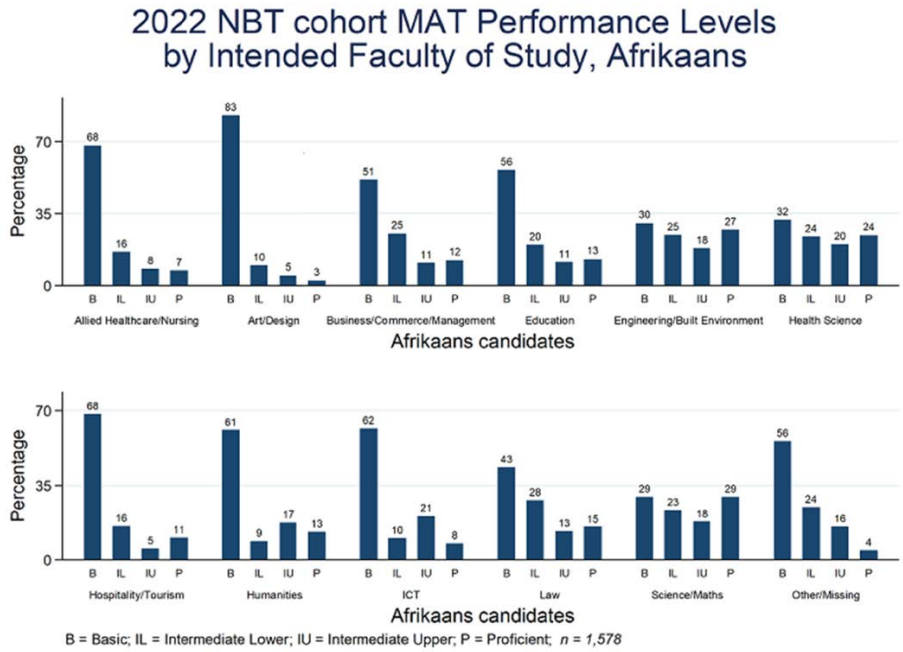

Figure 55 2022 Intake - NBT MAT performance levels by intended programme of study for Afrikaans writers

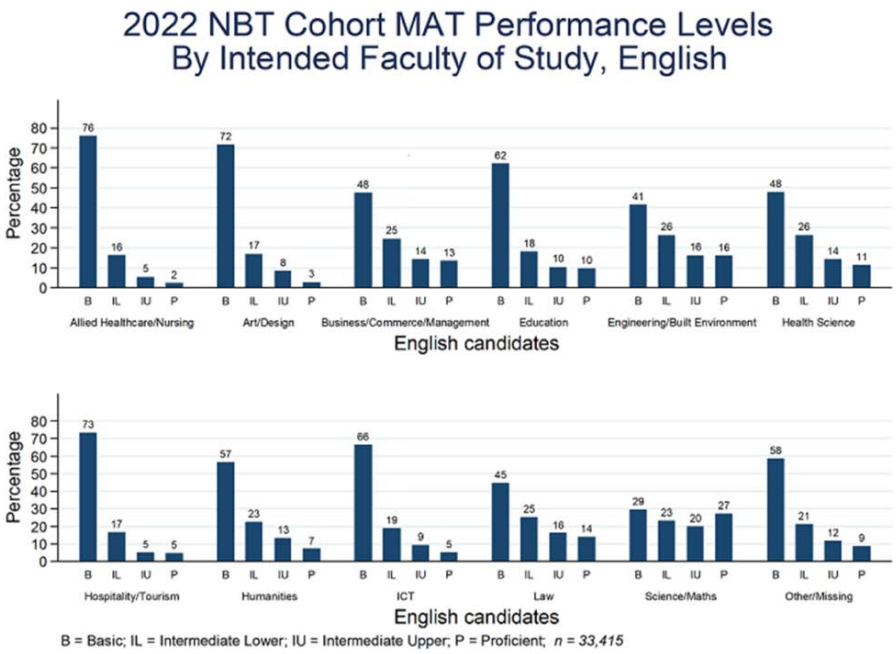

Figure 56 2022 Intake - NBT MAT performance levels by intended programme of study for English writers

7.2 Comparison of the 2020 intake results to the 2022 intake results

In this section the AL, QL and MAT performance of the candidates is examined in the 2020 and 2022 intake cycles to investigate broad trends of the NBTs over time. In broad terms, the 2022 intake cohort performed fairly similarly to the 2020 intake cohort in terms of all three domain proficiency categories (AL, QL and MAT).

7.2.1 National cohort

Figure 57 shows that there was a slight improvement in AL performance from the 2020 intake cohort to the 2022 intake cohort. The proportion of scores in the Proficient category for this domain increased slightly from 23.36% of the cohort to 25.90%, while the proportion of the scores in the Basic category decreased from 15.32% to 4.15%.

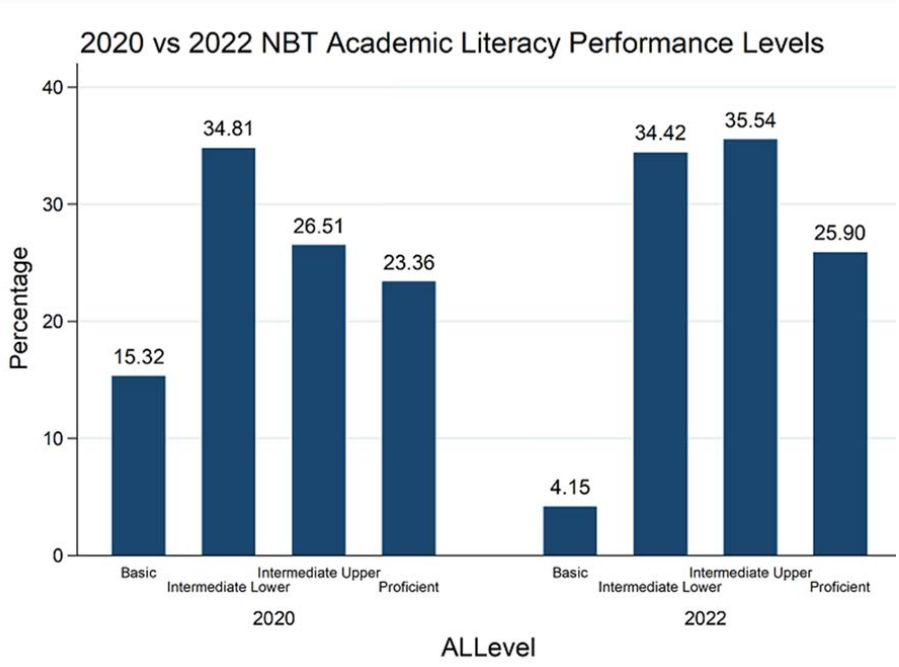

Figure 57 Performance in NBT AL, 2020 and 2022 intake cycles

For QL performance, the proportions of candidates whose QL scores were in the Proficient band increased from 10.64% in the 2020 intake to 12.97% in the 2022 intake (Figure 58). There have also been slight changes in the proportions in the Intermediate bands: a decrease from 28.75% to 28.57% for the Intermediate Lower band and an increase from 15.14% to 15.45% for the Intermediate Upper band. There was a decrease in the proportions of candidates with scores in the Basic band in QL between the 2020 intake and the 2022 intake, from 45.48% to 43.01%. 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.

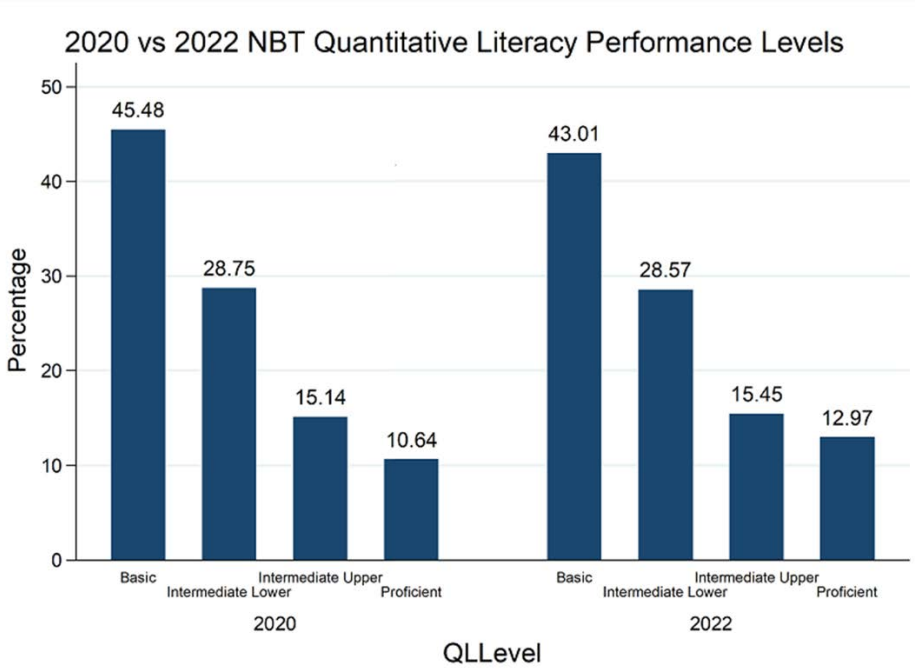

Figure 58 Performance in NBT QL, 2020 and 2022 intake cycles

Figure 59 shows that performance in MAT has increased in the Proficient band, from 9.94% in the 2020 intake to 10.59% in the 2022 intake. The proportions of scores in the Basic band have increased from 50.96% to 53.85% over the same period. The proportions in the two Intermediate categories (Lower and Upper considered together) decreased slightly, from 26.07% and 13.03% in the 2020 intake to 22.90% and 12.66% in the 2022 intake.

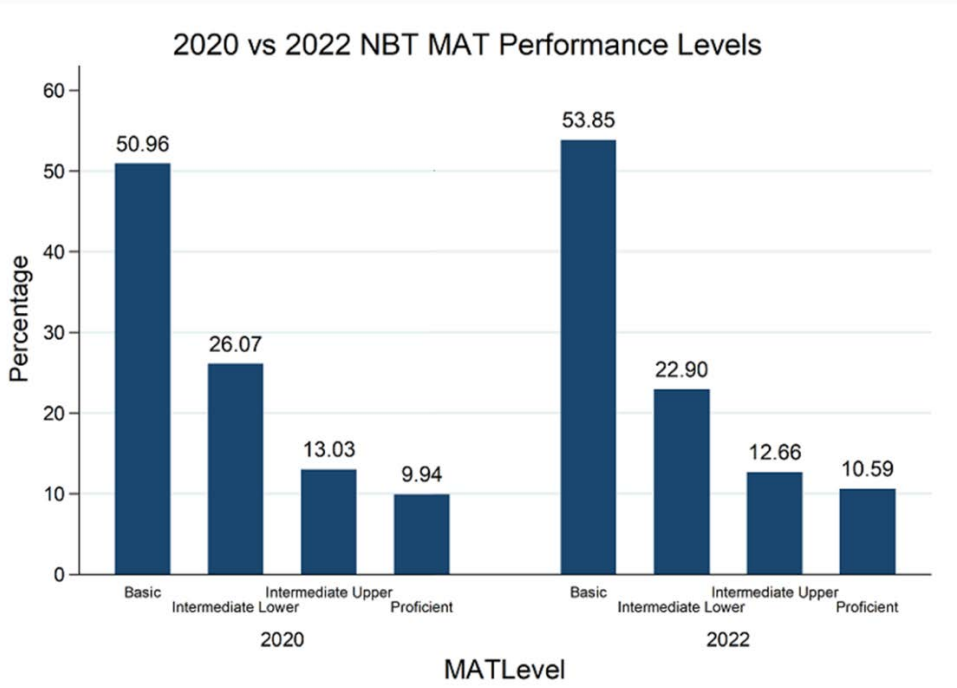

Figure 59 Performance in NBT MAT, 2020 and 2022 intake cycles

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 (2.6%) than their English counterparts (4.2%). In the Intermediate band the Afrikaans group constituted a lower proportion of the Intermediate Lower category (26.7%) than their English counterparts (34.8%); the Afrikaans candidates constituted a higher proportion of those in the Intermediate Upper band (40.8%) than their English counterparts (35.2%).

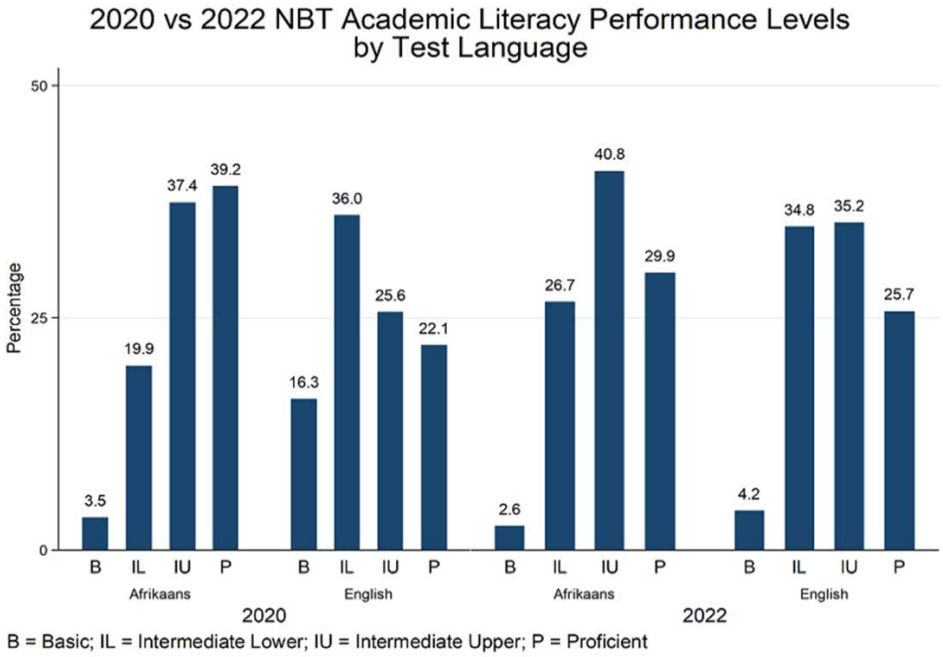

Figure 60 NBT AL performance by test language 2020 and 2022 intake cycles

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 26.2% in 2020 to 20.0% in 2022. The proportion of candidates who wrote the test in English in the Proficient band increased from 9.4% in 2020 to 12.6% in 2022. The proportion of candidates who wrote in Afrikaans and whose scores fell into the Basic band increased from 23.7% in 2020 to 35.1% in 2022 (Figure 61). For those who wrote in English there was a decrease in the proportion in the Basic band from 47.3% in 2020 to 43.4% in 2022. Overall, the pattern of performance for both language groups was not the same and the candidates who wrote the QL test in English performed better than those who wrote it in Afrikaans, apart from those in the Proficient band.

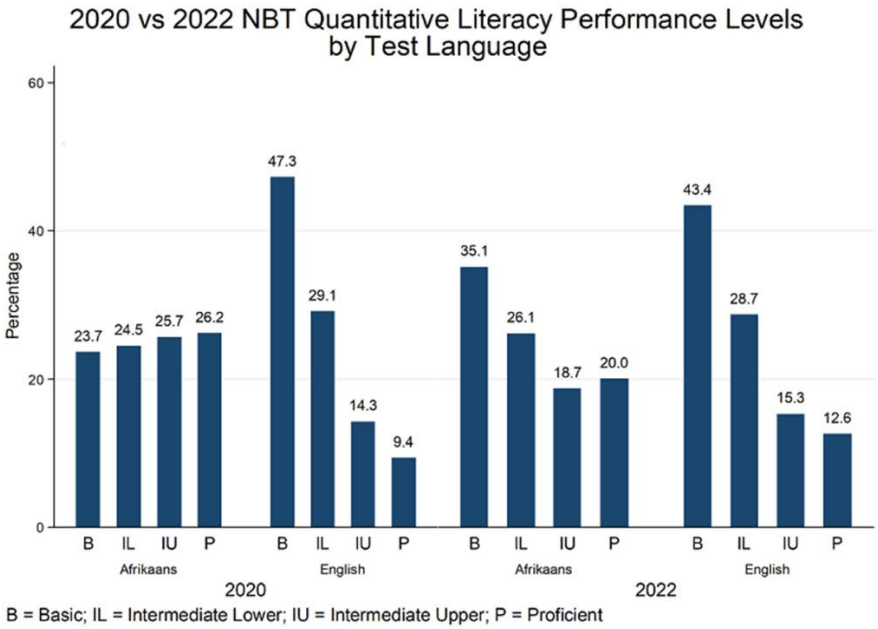

Figure 61 NBT QL performance by test language 2020 and 2022 intake cycles

For the candidates who wrote the MAT test in Afrikaans and the candidates who wrote the MAT test in English, the differences remained smaller. In 2020, 22.8% of the Afrikaans candidates had scores in the Proficient band, compared to 18.4% in 2022. Of the English cohort, 10.2% of the candidates' scores were in the Proficient band in 2022, compared to 8.9% in 2020. In 2022, 25.6% of the Afrikaans candidates and 53.0% of the English candidates had scores in the Basic band; and 21.9% of the Afrikaans cohort and 22.9% of the English cohort 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.

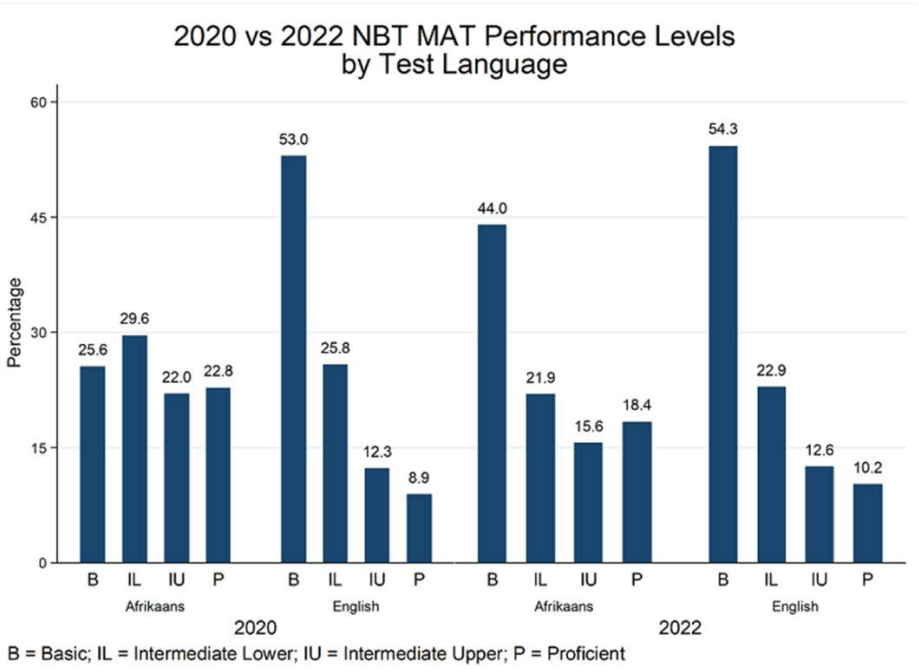

Figure 62 NBT MAT performance by test language 2020 and 2022 intake cycles

Citizenship

For the 2022 intake, more non-South Africans were in the Proficient category (33.60%) compared to South Africans (22.83%), more South Africans were in the Intermediate Lower category (37.15%) compared to non-South African writers (21.43%), more non-South Africans were in the Intermediate Upper band (43.46%) compared to South Africans (34.79%), and more South Africans were in the Basic band (5.23%) compared to non-South Africans (1.51%). From the graph, non-South African candidates performed better in the NBT AL Proficient band than did South African candidates, in both the 2020 and the 2022 intake cycles.

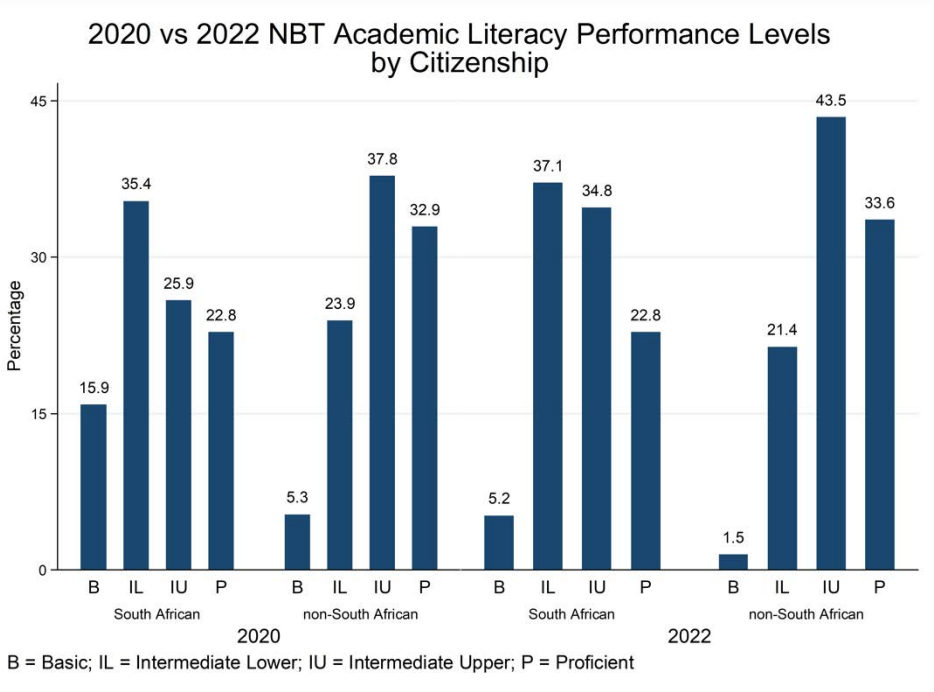

Figure 63 NBT Academic Literacy performance levels by citizenship

In terms of QL performance, the non-South African candidates outperformed the South African candidates in the 2022 intake cycle. The proportion of non-South African candidates whose scores were in the Proficient band (16.35%) was higher than the proportion of South African candidates (11.18%) (Figure 64). Non-South Africans performed better in QL than the South African candidates, except in 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.

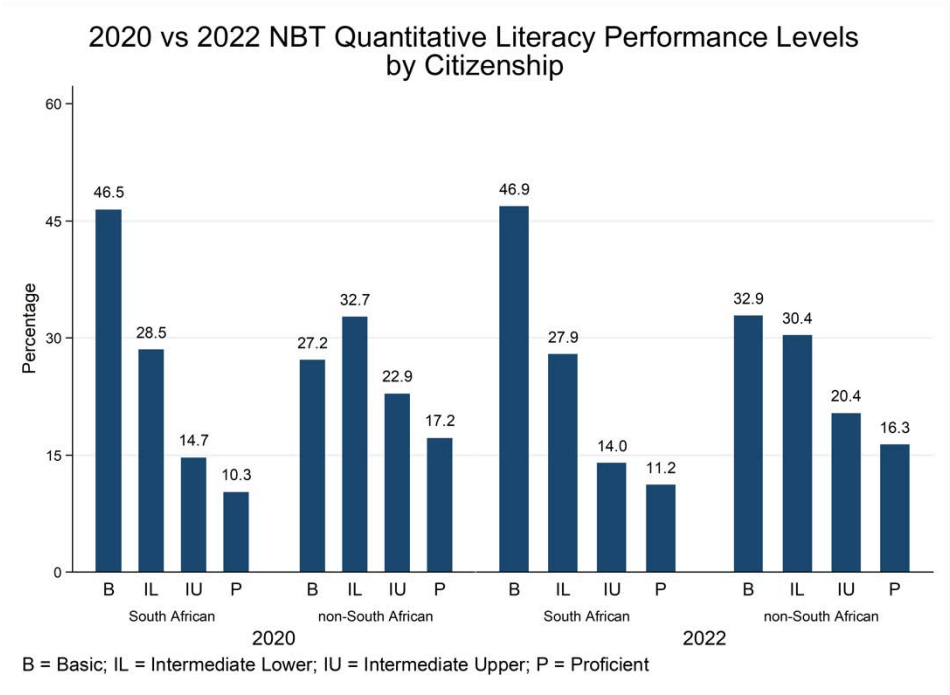

Figure 64 NBT Quantitative Literacy performance levels by citizenship

South African candidates performed better in the Proficient band for MAT than the non-South African candidates. In the 2022 intake, 54.58% of the South African candidates were in the Basic band, while 45.34% 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: South African candidates comprised 10.19% of the total South African candidates and non-South African candidates comprised 13.87% of the non-South African candidates. The slight differences in the Proficient and Basic bands may indicate differences in schooling or institutions attracting high-achieving students from other countries.

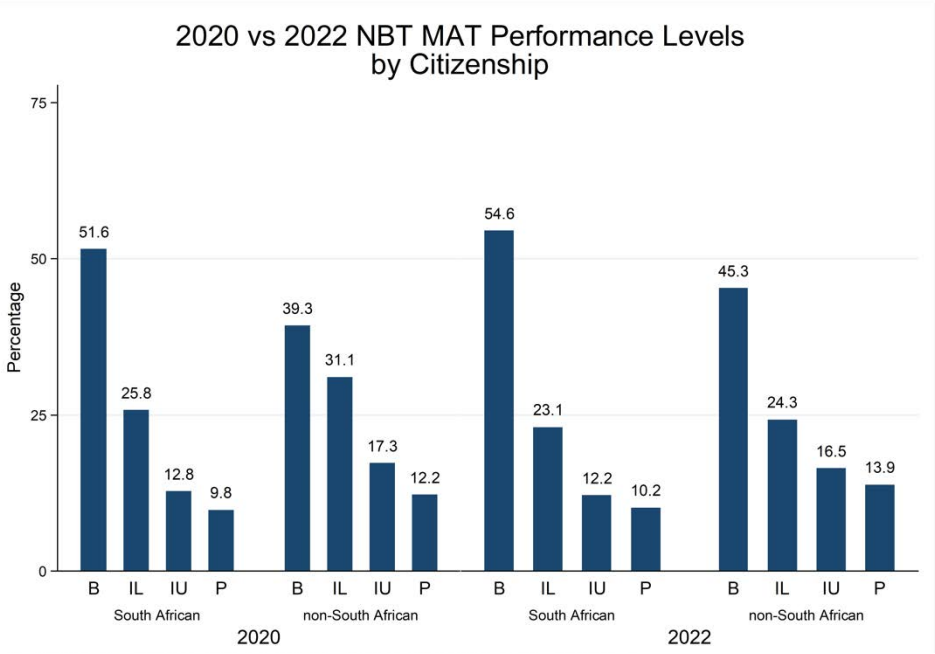

Figure 65 NBT MAT performance levels by citizenship

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 23 and Figure 66 below.

For AL, just over a quarter of Bachelor's Degree candidates (29.7%) were in the Proficient band, and approximately 10.7% of the Diploma/Higher Certificate candidates were in the Proficient band. Fifty-six percent of Diploma/Higher Certificate candidates had scores in the Intermediate Lower band and 28% had scores in the Intermediate Upper band.

For QL, about 15.6% of the Bachelor's Degree candidates had scores in the Proficient band; approximately 46.1% of the Diploma/Higher Certificate candidates had scores in the Basic band.

For MAT, about 49.1% of the Bachelor's Degree candidates had scores in the Basic band; approximately 88.8% of the Diploma/Higher Certificate candidates had scores in the Basic band.

Table 23 Frequency tables of benchmark bands for the NBT domains

AL	Basic	Intermediate Lower	Intermediate Upper	Proficient	Total
AL					
Bachelor's n	700	8,879	11,505	8,910	29,994
%	2.33	29.60	38.36	29.71	100
Diploma/Certificate n	154	1,700	852	324	3,030
%	5.08	56.11	28.12	10.69	100
QL					
Bachelor's n	10,668	9,295	5,341	4,689	29,993
%	35.57	30.99	17.81	15.63	100
Diploma/Certificate n	1,396	1,381	214	38	3,029
%	46.09	45.59	7.07	1.25	100
MAT					
Bachelor's n	11,709	5,916	3,264	2,959	23,848
%	49.10	24.81	13.69	12.41	100
Diploma/Certificate n	1,946	205	21	20	2,192
%	88.78	9.35	0.96	0.91	100

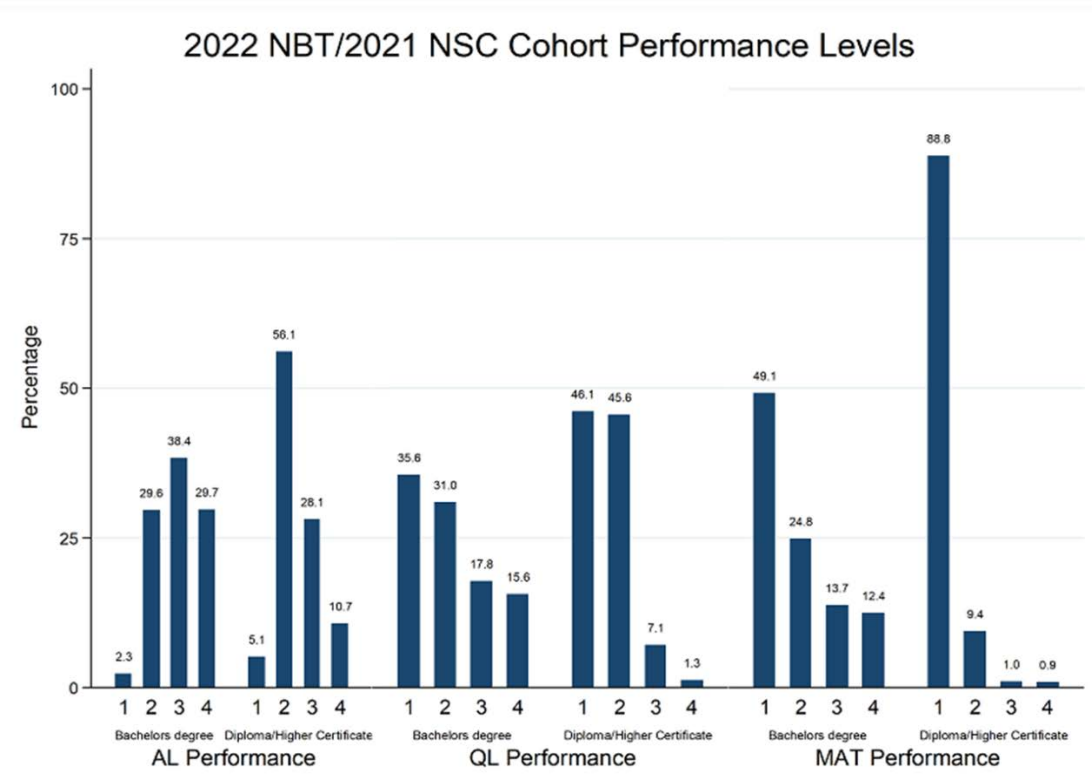

Figure 66 NSC cohort performance levels on NBT

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 2022 intake of higher education students who wrote the NSC in 2021.

Table 24 Correlation matrix for the 2021 NSC and 2022 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							
	29,994							
NBT QL	0.7051	1						
	29,993	29,993						
NBT MAT	0.5535	0.7263	1					
	23,450	23,450	23,848					
NSC MTHN	0.3227	0.5333	0.7417	1				
	25,241	25,241	23,421	25,626				
NSC MTLN	0.5537	0.6153	0.3729	0.5161	1			
	4,853	4,852	514	150	4,865			
NSC ENHN	0.7187	0.6019	0.5616	0.5537	0.5838	1		
	18,550	18,550	14,148	15,156	3,731	18,752		
NSC ENFN	0.6665	0.4653	0.4249	0.3643	0.4504	.	1	
	11,444	11,443	9,700	10,470	1,134	0	11,640	
NSC PSCN	0.3175	0.4697	0.6658	0.8772	0.5650	0.5685	0.4253	1
	20,890	20,890	19,836	21,209	11	11,659	9,561	21,220

Table 25 Correlation matrix for the 2021 NSC and 2022 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							
	3,030							
NBT QL	0.6099	1						
	3,029	3,029						
NBT MAT	0.2221	0.3941	1					
	2,147	2,146	2,192					
NSC MTHN	0.0246	0.1921	0.2720	1				
	2,315	2,315	2,075	2,356				
NSC MTLN	0.4916	0.4694	0.0313	1	1			
	688	687	102	2	692			
NSC ENHN	0.6163	0.4194	0.1169	0.0284	0.3467	1		
	1,780	1,780	1,205	1,285	507	1,811		
NSC ENFN	0.4893	0.2721	-0.0189	-0.0214	0.3613	.	1	
	1,250	1,249	987	1,071	185	0	1,264	
NSC PSCN	0.0006	0.0593	0.1165	0.4795	-0.3105	0.0878	0.0419	1
	1,968	1,968	1,787	1,993	7	1,011	989	2,000

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 0.7187 between NSC ENHN and NBT AL for those with a Bachelor's Degree pass, and a correlation of 0.6163 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 (Tables 24 and 25). 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.

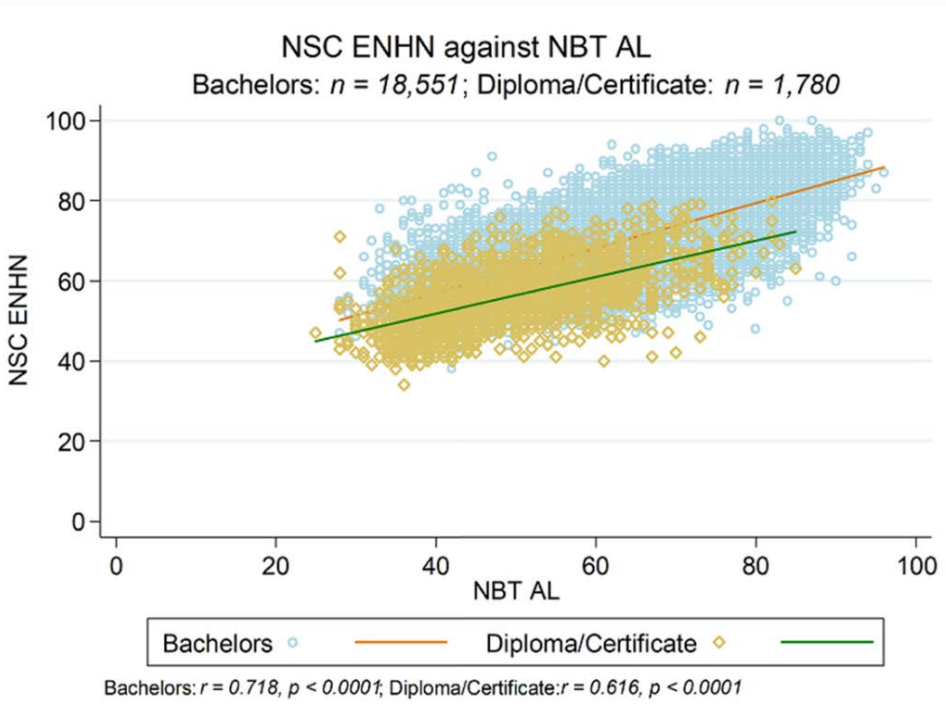

Figure 67 NSC ENHN against NBT AL

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 0.665 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 0.489. 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.

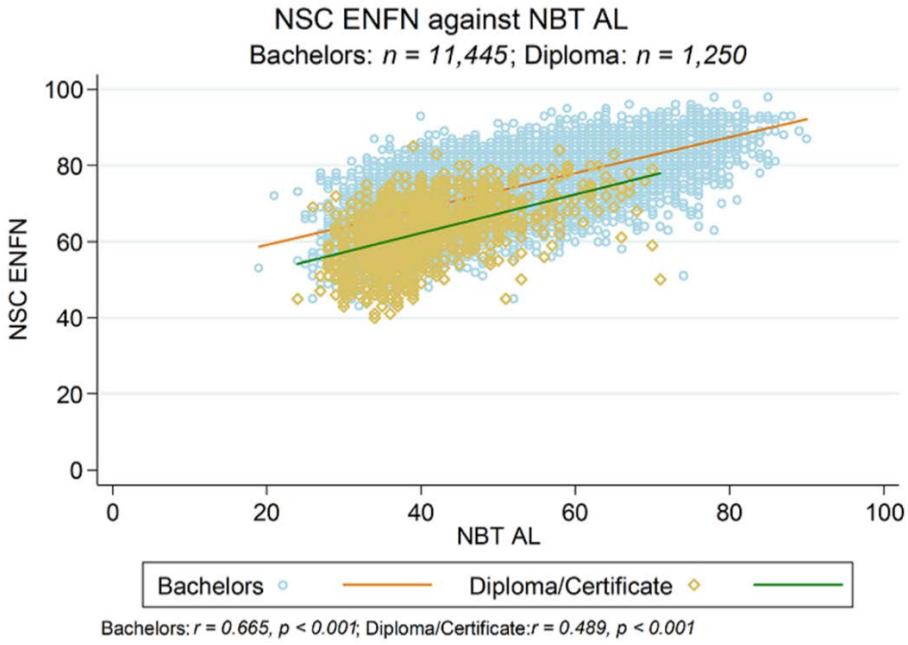

Figure 68 Scatterplot NBT AL vs NSC English First Additional Language

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 2022 intake of higher education students who wrote the NSC in 2021.

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 0.533 between NSC MTHN and NBT QL for the Bachelor's Degree candidates and a mere 0.394 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.

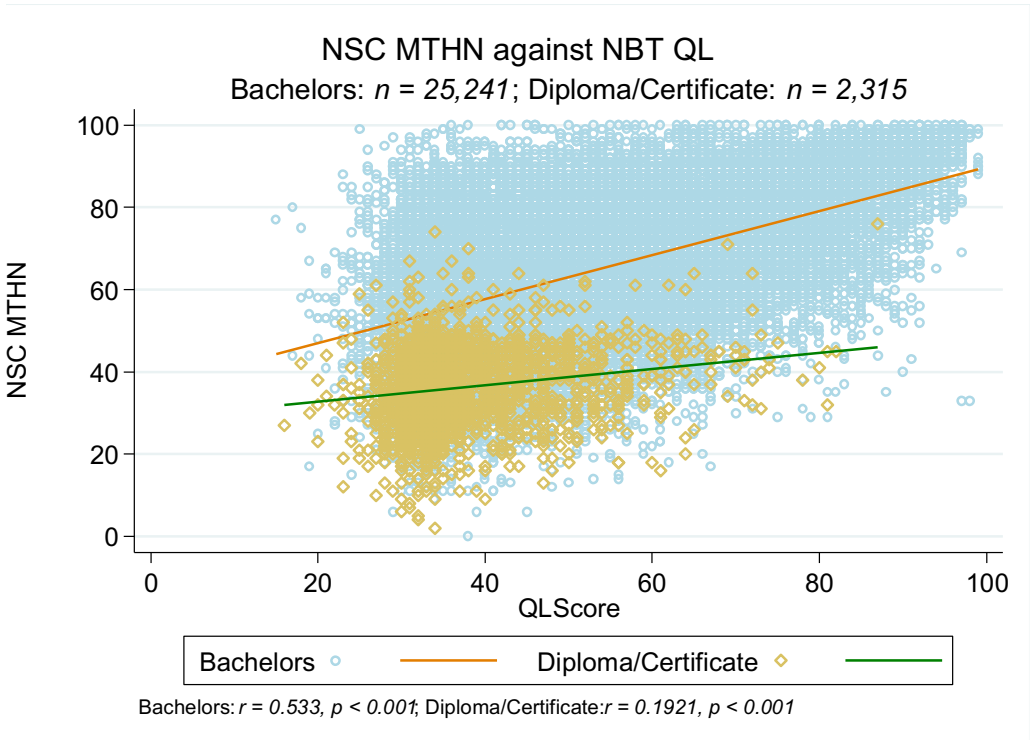

Figure 69 Scatterplot NBT QL vs NSC Mathematics

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 0.614 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 0.469. 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.

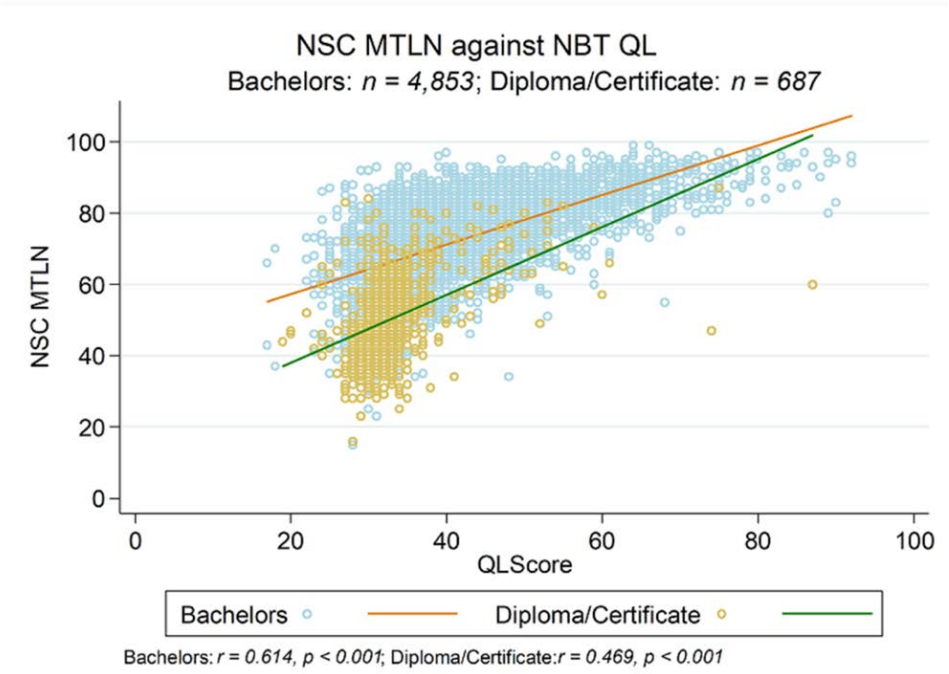

Figure 70 Scatterplot NBT QL vs NSC Mathematical Literacy

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 2021.

There was a correlation of 0.742 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

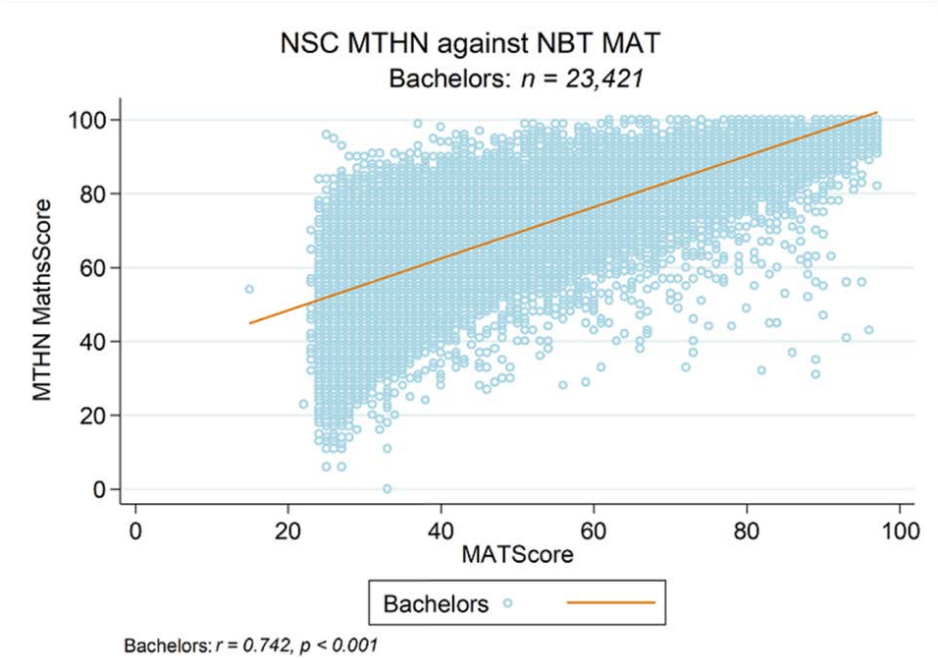

Figure 71 NBT MAT vs NSC MTHN

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 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 2022 intake of higher education students who wrote the NSC in 2021.

There was a correlation of 0.666 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.

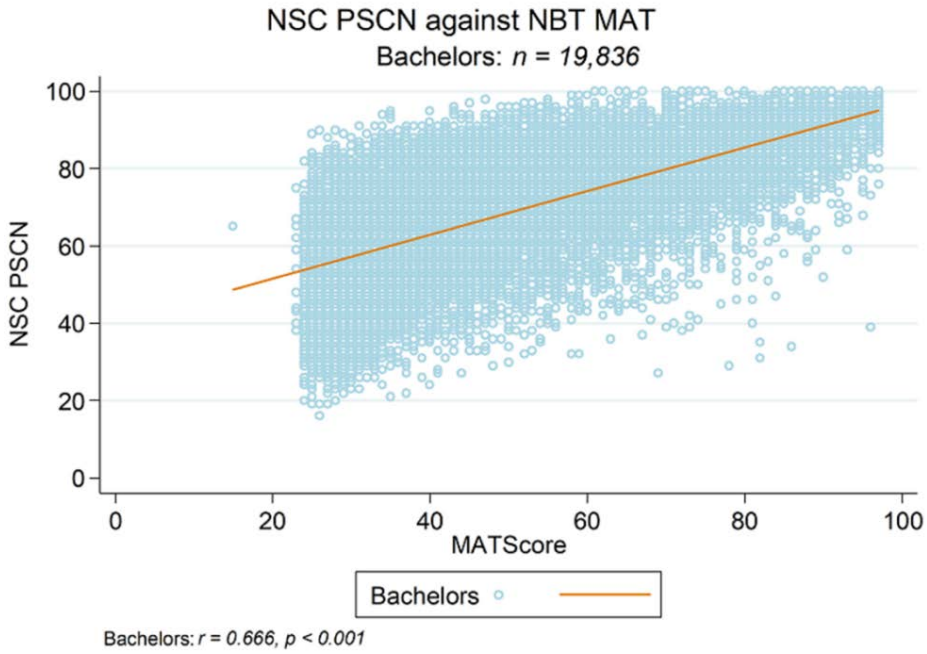

Figure 72 NSC PSCN vs NBT MAT

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 2022 intake results show that prospective higher education students performed slightly better in the NBT MAT test. 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.

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