August 2010

Evaluating the South African National Senior Certificate in relation to selected international qualifications: A self-referencing exercise to determine the standing of the NSC

Research jointly undertaken by Umalusi and Higher Education South Africa (HESA)

Subject reports:

Geography
Life Sciences (Biology)
Physical Sciences (Physics & Chemistry)
Mathematics
English First Additional Language

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HIGHER EDUCATION SOUTH AFRICA

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Council for Quality Assurance in General and Further Education and Training

Evaluating the South African National Senior Certificate in relation to selected international qualifications: A self-referencing exercise to determine the standing of the NSC

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with

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This research project was an organic extension of work undertaken by Umalusi in the 2008 *Maintaining Standards* project, and the evaluation instrument developed and refined for that project formed the basis for the equivalence evaluation undertaken here. The instrument has a long developmental history in Umalusi's research, but the instrument that formed the basis for the current project was designed by Dr Heidi Bolton and Elizabeth Burroughs. Nevertheless, in order for the instrument to be able to answer the questions necessary for the new research, the instrument needed adaptation. These changes were ably effected by Celia Booyse and Dr Sharon Grussendorff.

Furthermore, Ms Booyse and Dr Grussendorff managed the project ably together, and were responsible for much of the writing of the overview report. Elizabeth Burroughs also assisted in this task, as did the Umalusi subject team leaders who were responsible for the subject reports. Umalusi would also like to thank the various Umalusi subject teams responsible for the data analysis – with respect to both the curricula and the exams – which made this final report possible. Their unstinting hard work and willingness to be stretched by challenges must be duly acknowledged. The teams were as follows:

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Nandipha Nonkwelo
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Patience Voller

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Contents

List of acronyms

CIE	Cambridge International Examinations
CIE AS Level	Cambridge Advanced Subsidiary Level
CIE A Level	Cambridge Advanced Level
FAL	First Additional Language
HESA	Higher Education South Africa
IGCSE	International General Certificate of Secondary Education
IBO	International Baccalaureate Organisation
IB SL	International Baccalaureate Standard Level
IB HL	International Baccalaureate Higher Level
NCS	*National Curriculum Statement*
NSC	*National Senior Certificate*
NQF	National Qualifications Framework
SC	*Senior Certificate*

Glossary

Candidates	This term is used to cover learners and students registered for or enrolled in programmes of study for the qualifications being evaluated. Where specific reference is made to teaching approaches, the term learner will still be applicable.
Educators	This term is used to cover reference to teachers, instructors or any person teaching a programme, subject or course.

Executive summary

1. Background

In 2008, a new South African qualification, the *National Senior Certificate (NSC)* replaced the Senior Certificate, commonly known as 'the matric'. The examinations, based on the *National Curriculum Statement (NCS)* for Grades 10 to 12, led to the issuing of the *National Senior Certificate (NSC)* exit-level qualification. In short, the NSC is the new matric that replaced the *Senior Certificate (SC)*, based on the NATED 550 curricula.

During 2008, Umalusi conducted research which compared the NSC curriculum and exams (exemplars and the first 2008 papers) to those of the *Senior Certificate*, both Higher and Standard Grades. The primary purpose for this research was to ensure continuity of standard between the old and new qualifications. For this process, an evaluation instrument, based on previous Umalusi research (2006–2008), was developed that addressed key areas in curriculum and examination analysis.

In 2008, HESA approached Umalusi to assist it in an equivalence-setting exercise for the *National Senior Certificate*, as it needed "to establish whether a foreign qualification could be recognised as fully or partially comparable to the NSC, and the minimum requirements for admission to degree, diploma and higher certificate status in South Africa" (HESA, 2008:1). While Umalusi is satisfied that it has been able to establish a clear understanding of the relationship of the NSC to the SC in both its Higher and Standard Grade forms, its comparability with international qualifications at equivalent educational levels was uncertain. For Umalusi, as the Quality Council for qualifications in General and Further Education and Training, the next step was to ascertain its standing in relation to other, similar international qualifications. Such a step has been regarded as a critical part of understanding the standard embodied by the qualification, its curricula and examinations.

Consequently, in 2009, in collaboration with HESA, Umalusi formulated an NSC-based equivalence-setting research project, in which this new qualification, its curricula and exams were benchmarked against the equivalent-level curricula and examinations of the various Cambridge International Examinations (CIE) and those of the International Baccalaureate (IB). In addition, the Namibian National Senior Secondary Certificate (NSCC) qualification was considered an example of the Cambridge qualification, contextualised within the Southern African environment.

While this report assists in establishing whether these international qualifications could be recognised as fully or partially comparable to the NSC, and may provide data helpful in determining the minimum requirements for admission to degree, diploma and higher certificate status in South Africa, it does not make recommendations regarding the minimum requirements for admission to higher education.

However, this benchmarking study and the empirical data obtained on equivalence-setting will be of great value to HESA in formulating an admission requirement policy that leads to consistency in decisions regarding treating candidates from school-leaving examinations more equitably. Tough and Brooks (2007) argued a few years ago that equivalence-setting studies and therefore also the perceived fairness of admission requirements would affect how students, parents and educators view the education system as a whole, and would therefore smooth the admission process.

2. Structure of the qualifications

Chapter 2 of the overview report provides a fairly detailed description of the NSC and the international qualifications it has been evaluated against and can therefore be read together with the subject reports. These qualifications are the International Baccalaureate (IB) at both Standard Level and Higher Level, and the following qualifications offered by Cambridge International Examinations: the International General Certificate of Secondary Education (IGSCE), the AS Level and the A Level.

The structure of each qualification includes some background information, a description indicating the duration of the qualification, its target group, the number of subjects included in the qualification, and the rules of combination that determine the qualification. The number of teaching hours, the nature of the assessment, the rating scales used for assessment, the pass requirements for certification and the current HESA admission requirements have also being taken into consideration in the equivalence-setting analysis. These descriptions will help readers to understand that the comparison cannot be regarded as a straightforward process, since qualifications differ in terms of duration, the number of subjects candidates are expected to study, and the additional demands that may be made on candidates in terms of how the qualifications are defined.

The fact that these qualifications differ in various dimensions meant that the Umalusi evaluation teams grappled in various ways to deal with these differences.

The critical features of the South African National Senior Certificate (NSC) and the selected international qualifications in this equivalence-setting project can be seen in Table 1on the next page.

Table 1: The critical features of the NSC and the selected international qualifications being evaluated

Qualification	Number of years for qualification	Educational years	Sublevels of qualification	Age of target candidate	Number of subjects prescribed for qualification/ no of subjects compulsory	Number of hours allocated for study per subject in total	Assessment rating scale	Minimum pass
National Department of Education, South Africa								
NSC	3 years	10–12 years of education	Grade 10 Grade11 Grade12	15–17	7 prescribed 4 compulsory	280–400	1 (Not achieved) to 7 (Outstanding)	2 (Elementary achievement) 3 required in Home Language
International Baccalaureate Organisation								
IB Diploma	2 years	12–13 years of education	Standard Level Higher Level	16–19	6 prescribed learning areas with a variety of electives; 3 additional core requirements for qualification; subjects offered at Standard or Higher Level	150 (SL subjects) 240 (HL subjects)	1(Lowest)–7 (Highest), per subject; 3 points for the additional qualification requirements; maximum points achievable: 42 + 3 = 45	4–7 are regarded as pass marks in a subject; qualification pass requirement: 24 (maximum marks = 45)
Cambridge International Examinations								
IGCSE	2 years	10–11 years of schooling	Core Extended	14–16	7 or more 2 languages	150	C–G A*, A–E	C C
A Level	2 years	12–13 years of schooling	AS Level (exit level qualification)	16–18	3–4 subjects prescribed; none compulsory; subjects selected at either AS or A Level (Candidates who have achieved AS Level subject, may choose to further their studies at A Level)	180 + 180 = 360 (cumulative over AS and A Level)	A (highest achievement) E (minimum required performance) A* (highest achievement) E (minimum required performance)	D D
Department of Education, Namibia/CIE								
NSSC	2 years	10–11 years of schooling 12 years of schooling	NSSC OL NSSC HL	16–18	6 subjects from Group 1, 5 of which are further grouped into 6 fields of study	320	A–G 1 (highest) to 4 (lowest)	C 3

3. Methodology

The Umalusi evaluation teams were asked to address the following matters in the research questions:

a) Comparability of the NSC curriculum with the other curricula

The teams had to give an opinion as to whether the NSC curriculum is comparable with the curricula belonging to the other international qualifications. For example, could the language curriculum of the IB be accorded the same value, or greater or less value, than the NSC, particularly in relation to the breadth, depth and cognitive complexity of the learning embodied in its respective curricula? Teams were also requested to comment specifically on the respective value ('creditworthiness') they would assign to each of the curricula. The following additional questions were posed to each team:

- What is your opinion about the assumption of equal/comparable creditworthiness (value) of the curricula included in this research? Please give reasons for your position.
- What worth would you attach to each curriculum?
- What reasons / justifications could you offer from the evaluation process in support of your opinion?

The matter of the comparability of the curricula (including exams) is not only important in terms of a more nuanced national understanding of how the premier South African school exit qualification compares with similar qualifications internationally, it is equally of importance to South African higher education institutions that need to determine how international school-leaving qualifications compare with the South African qualification they usually work with.

b) Mapping of NSC curriculum against the other curricula for determination of admission to higher education

The evaluation teams were also requested to assess whether the international qualifications could in terms of curricula be mapped in relation to the South African NSC. This mapping exercise would enable HESA in future to determine appropriate minimum admission requirements to South African higher educational institutions for candidates with these international educational qualifications.

c) Overview of assessment requirements

The evaluation teams were requested to provide a brief overview of the assessment requirements in the various curricula, offering a judgement on how the curriculum content (concepts) and expected skills are examined. The following questions were posed:

- By scanning the exam papers, did you find a lowering of expectations from what was indicated in the curriculum?
- Are the expected learning outcomes examined sufficiently?
- What cognitive demands are apparent in the papers?
- How would you judge the overall standard of the assessment?

d) Comparison with Namibian Senior Secondary Qualifications:

The evaluation teams were requested to do an 'ex post facto-check' on the Namibian NSSC OL (Ordinary Level, equivalent to IGSCE/O Level) and NSSC HL (Higher Level, equivalent to HIGSCE/AS Level) as SADC-contextualised examples of CIE qualifications. The teams were asked to:

- Give their opinion as to whether the Namibian curricula are comparable to the NSC curricula.
- Judge whether the curricula, as reflected in the examinations, are comparable with, or of a higher or lower level of cognitive demand than the NSC curricula.
- Justify their assessment by referring, for instance, to content, scope, level and abilities.

In addition, chapter three describes the composition of the teams and the work processes entailed. This chapter also describes the evaluation instruments as refined for the project. The structure of the instrument shaped both the findings made by the subject teams as well as the way in which these findings were reported, as will be evident in the final chapter of this report.

4. Trends across the curricula

The findings from the five teams are not entirely consonant with one another, but differences aside, certain stable relationships between the NSC and the other qualifications are present. Chapter 4 of the overview report draws together trends that have been discerned across the subject reports presented by the five Umalusi team leaders. This chapter looks for patterns that seem to emerge as common perceptions from the work done separately. Furthermore the chapter draws together the insights from the team reports to help South African educationists – and HESA in particular – to understand the status or standing of the new South African school-leaving qualification (NSC) in relation to the international qualifications against which it has been benchmarked.

Organising principle and coherence

It was found that the NSC curriculum has the strongest explicit organising principles. These principles are clearly described in the NSC curriculum documents. Moreover, the NSC curriculum documents are organised according to learning outcomes and knowledge areas, rather than traditional topic clusters. Furthermore, the NSC curriculum's organising principles are integrally linked to the assessment standards per learning outcome and per grade and also have reference to the critical and developmental outcomes which form a standard part of South African qualification description.

There are no clear organising principles in the curriculum documents of the CIE qualifications and the IBO qualifications, but when considering the assessment guidelines, the Umalusi evaluation teams found assessment objectives as an organising principle. The description of the assessment objectives is made in such a manner that educators can use these objectives in determining their planning and methodology.

Sequencing, progression and pacing

In most of the subjects reviewed, the NSC curriculum shows the greatest attention to sequencing, progression and pacing. The NSC curriculum specifies content by year of study, and builds progressively on concepts across grades, facilitating vertical progression on a year-by-year basis for Grades 10 to 12, with external examination at the end of year 12. A fair degree of guidance is given to educators. At the same time, the Umalusi evaluation teams

commented that the pacing was regarded as too strenuous by many educators, or that insufficient balance was provided for different aspects of the curriculum. The attention to sequencing, progression and pacing is a strength of the NSC curriculum that could be built on in future to provide further support to educators.

In the CIE and IB curricula, a lot is assumed regarding sequencing and pacing. It seems that the educators have considerable latitude in planning the sequencing and pacing of the curriculum to suit the qualification expectations and to comply with the assessment guidelines.

Content and skills specification, and coverage

In general, there is a high degree of overlap of the NSC curriculum when compared with the CIE and IB curricula in terms of topics covered (breadth of content). All five of the Umalusi subject evaluation teams found that most of the topics covered in the IB and CIE curricula are covered in the core topics of the NSC curriculum. Within each broad learning area, it was observed that there are both notable overlaps and notable differences in the specification of sub-topics, but that these differences in sub-topics seem to link appropriately to the contexts of the envisaged candidates.

In terms of depth of content coverage, it seems that the NSC fits neatly between the CIE AS and A Levels as well as between the IB SL (Standard Level) and HL (Higher Level), as can be seen in the subject-specific comments in the individual subject reports. In terms of depth of content, the NSC seems to be closest to the IB SL and CIE AS Level.

Aims, purpose, vision, general outcomes and articulation

It was noted that all of the curricula evaluated list their aims and purposes clearly. Although the ways in which the aims are described differ, all of the curricula list similar aims for their respective courses. The aims of all of the curricula are described in a fairly broad way, and so are suited to a range of contexts. None of the curriculum documents explicitly deals with how the aims should be achieved. A concern raised by the Umalusi evaluation teams was that because these aims are expressed so broadly, they may not be very useful at a practical classroom level and may therefore have an impact on the enacted curriculum. However, the NSC curriculum documents do give some indicators as to how the assessment standards can serve as guidelines to educators in terms of planning and teaching.

Teaching approach and subject methodology

The NSC curriculum prescribes an outcomes-based approach to teaching, where the outcomes are the focus of the learning and teaching. The desired approaches are more clearly specified in the NSC than in any of the other curriculum documents. The approach described in the NSC encourages a move away from rote learning and content transmission, both traditional modes of teaching in South African classrooms. However, the learner-centred and activity-based approach recommended is not always easy to implement in under-resourced South African school contexts.

Although the organising principles of the CIE and IBO qualifications are based on assessment objectives, the approaches still seem to be learner-centred and skill-related. For instance, in the CIE IGSCE English FAL curriculum, candidates' listening skills are highly valued, but the detailed description of the teaching and assessment of the skills clearly points to a deeply learner-involved teaching approach.

Assessment guidance

Most Umalusi subject evaluation teams found that the NSC has the most detailed assessment guidance, for both internal and external assessment. Both the structure and weighting of the examinations are detailed in the *Subject Assessment Guidelines*.

In the CIE and IBO curricula, the assessment objectives are clear and to the point. There are also clear indications as to where there is an extension of papers (for instance to indicate the transition and difference between AS and A Levels), which papers are compulsory, and where choices are involved. The assessment guidance for these curricula clearly indicates what is applicable to internal assessment and what will be covered in external assessment. In most instances, the weighting of the assessment is stated as well.

Availability and user-friendliness of the curricula

It seems that while the NSC curriculum documents provide the most detailed guidance in several different respects, this comprehensiveness (level of detail) tends to compromise their simplicity, and most Umalusi evaluation teams reported these documents to be complex and lengthy. In contrast, the other curriculum documents were clearly laid out, using simple language and providing straightforward assessment objectives to be achieved.

Comparison of the value of NSC curriculum with the other curricula

In summary, for most of the elements in terms of which the curricula were assessed, the NSC curriculum fits comparably within the range of the selected curricula. More specifically, the common finding was that its content and level seem most similar to the IB SL and CIE AS Level, and in some instances such as English FAL, more like the CIE A Level.
In terms of collating depth, breadth and level of difficulty, the results of most (but not all) of the Umalusi subject evaluation teams may be summarised as follows:

Increasing depth and level of difficulty ↓	South Africa	International Baccalaureate Organisation (IBO)	Cambridge International Examinations (CIE)	Namibia
		IB Mathematical Studies SL	IGCSE	Namibian OL
	NSC	IB SL	AS Level	Namibian HL
		IB SL	AS Level	

The Umalusi evaluation teams were requested to consider whether the international qualifications could be mapped in relation to the NSC in order to enable HESA to determine appropriate minimum admission requirements at higher educational institutions. From the analysis, the following general points can be made:

- The CIE AS-Level and IB SL courses can be considered comparable to the NSC. Consequently, it was concluded that in terms of admission to South African higher education institutions, both in terms of the depth of content in the curricula and in terms of the cognitive demand of the examinations, the CIE AS Level and the IB SL could be viewed as leading to the attainment of an educational level that is similar to that of the NSC subjects. Furthermore, when comparable admission points tables are determined, performance on the AS Levels, the IB HL and the NSC subjects should receive similar points by using the percentages.
- Overall, the IB HL and full A-Level courses are the most demanding, if examination difficulty

and depth of curriculum content are taken into account. As a result, the educational level attained is likely to be higher than that of the NSC. Consequently, while both these qualifications are acceptable for higher education admissions, when comparable admission points tables are determined, higher points will have to be awarded for achievement in A Level and IB HL courses than for NSC subjects.

- The IGCSE should not be considered at all comparable to the NSC. It would thus not be appropriate to set equal education entrance criteria for the IGSCE qualification as the education level attained is not equivalent to that of the NSC.

There were some differences in the above overall trends with respect to specific subjects, and it is advised that readers consult the detailed subject-specific reports for a more detailed analysis of these findings.

5. Curriculum reports

The subject reports, to follow, provide detailed information regarding the strengths and weaknesses of the various curricula and examinations, and will, for the South African education system in particular, point to ways in which our own subject curricula and assessment can be strengthened and improved. Finally, it is worth noting, that, though the Umalusi teams began with the same instrument, each team had to grapple with the data at its disposal. Each team has consequently worked slightly differently than the others, and reported on their findings in ways suited to their subject. Nonetheless, while teams drew different inferences about the relationships between the levels of demand expressed in the different curricula and exams for their respective subjects, there was nevertheless a reasonably high degree of consonance between these reports, which is evident from a reading of the subject reports themselves.

The reports can be viewed on the Umalusi and HESA websites.

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Comparison of Geography curricula of the NSC and other international qualifications (IQs)

Details of evaluators:

Evaluators: Dr Peter Beets (Team Leader), Mrs Zamanyuswa Shabalala, Mrs Kedi Molapo, Dr Sue Cohen

Documents:
In compiling this report the following documents were referred to (our reference number for the document in this report appears in the right column):

(a) NSC curriculum: National Curriculum Statement (NCS)

National Curriculum Statement for Grades 10-12	1
Subject Assessment guidelines	2
Learning Programme Guidelines	3
Examination Guidelines	4
Examination Paper 1 and Memorandum 2008	5
Examination Paper 2 and Memorandum 2008	6

(b) Curricula/Syllabi of International Qualifications

IGCSE Geography 0460 Syllabus (2008)	7
IGCSE Paper 1, Insert, Mark Scheme 2008	8
IGCSE Paper 2, Insert, Mark Scheme 2008	9
IGCSE Paper 4, Insert, Mark Scheme 2008	10
IGCSE Paper 5 Mark Scheme (only) 2008	11
GCE A/AS Geography 9696 Syllabus (2008)	12
GCE Paper 1, Insert, Mark Scheme 2008	13
GCE Paper 2, Insert, Mark Scheme 2008	14
GCE Paper 3, Insert, Mark Scheme 2008	15
IBO Geography (Diploma Programme) Syllabus 2005	16
IBO Paper 1 Higher level and Standard Level 2006	17
IBO Paper 2 Standard Level 2006	18
IBO Paper 2 Higher Level 2006	19
IBO Paper 1 Higher level and Standard Level 2007	20
IBO Paper 2 Higher Level 2007	21
Namibian Paper 1 Ordinary Level 2007	22
Namibian Paper 2, Insert Ordinary Level 2007	23
Namibian Paper 3, Insert Ordinary Level 2007	24
Namibian Paper 1 Higher Level 2007	25
Namibian Paper 2, Higher Level 2007	26
Namibian Paper 3, Insert Higher Level 2007	27
Namibian Paper 1 Ordinary Level 2008	28

Namibian Paper 2, Insert Ordinary Level 2008	29
Namibian Paper 3, Insert Ordinary Level 2008	30
Namibian Paper 1 Higher Level 2008	31
Namibian Paper 2, Higher Level 2008	32
Namibian Paper 3, Insert Higher Level 2008	33
NSSC Higher Level Syllabus 2007	34
NSSC Ordinary Level Syllabus 2007	35

Specific aspects of the curricula

1. Content specification and coverage

The content and skills prescribed in the NSC curriculum and in the international curricula and syllabi were compared with regard to specification, weighting and focus.

1.1.Content specification

The broad content topics covered in the above-mentioned curricula and syllabi at the secondary school exit level e.g. National Curriculum Statement (NCS) for Grade 12, have been listed in **Table 1a** (Physical Geography) and Table 1b (Human Geography). Where the topic is specified in the related curriculum/syllabus, a "Y" has been entered under the Specified ("S") column. Where the topic is examinable in the final examination a "Y" has been entered under the Examined ("E") column.

The content specification is generally clear. In some curricula (e.g. IGCSE; IB) the content and outcomes are linked in a more helpful way than is done in the NCS and broad concepts/ big ideas are described, making it clearer to educators what depth of analysis is required of candidates, and what the focus of the topics are. The NCS has some supporting documents (Documents 2 and 3) which attempt to give educators more pedagogical guidance. The examination guidelines are however not as helpful as it is mainly a more detailed list of topics.

In each of the curricula/syllabi, the content is organised broadly into Physical Geography topics, Human Geography topics and general geographical skills and techniques. An analysis of the content topics shows that there are certain key content areas within these, which appear in these curricula – like settlement, climatology, geomorphology and economic geography, including resource management and development issues. However, while all other curricula include population geography, this is missing from the NCS at the exit level (Grade 12).

Table 1a: Content topics (Physical Geography)

CONTENT SPECIFIED	NCS		CIE - IGCSE		CIE - AS		CIE - A		IB-SL		IB-HL		Nam OL		Nam HL	
	S	E	S	E	S	E	S	E	S	E	S	E	S	E	S	E
Climatology																
Energy budgets and global distribution of energy	Y	Y			Y	Y										
Global air circulation	Y	Y													Y	Y
Weather processes and phenomena					Y	Y							Y	Y	Y	Y
Mid-latitude cyclones	Y	Y							Y	Y	Y	Y				
Subtropical anticyclones	Y	Y														
Tropical cyclones	Y	Y							Y	Y	Y	Y				
Desert climates							Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Local climates - valley climates	Y	Y							Y	Y	Y	Y				
Human made climates (urban climates)	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y				
Climate hazards	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y				
Climate change: effects/ impact & human response	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y				
Production and working with meteorological data	Y	Y	Y	Y									Y	Y	Y	Y
Cloud types			Y	Y												
Total number of examinable sub-topics specified		**25**		**6**		**18**		**11**		**8**		**8**		**3**		**4**
Geomorphology																
Drainage basin system	Y	Y			Y	Y			Y	Y	Y	Y	Y	Y	Y	Y
River discharge	Y	Y			Y	Y			Y	Y	Y	Y	Y	Y	Y	Y
River channel processes	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y
Fluvial landforms	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y
River types and characteristics	Y	Y						Y	Y	Y	Y	Y	Y	Y	Y	Y
Catchment & drainage systems: impact/management	Y	Y			Y	Y			Y	Y	Y	Y	Y	Y	Y	Y
Topography: horizontal/inclined strata/massive igneous rocks	Y	Y														
Slopes	Y	Y			Y	Y			Y	Y	Y	Y			Y	Y
Mass movement	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y				
Plate tectonics: volcanoes, earthquakes and fold mountains			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Weathering			Y	Y	Y	Y							Y	Y	Y	Y
Marine processes and landforms			Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Coral reefs							Y	Y								
Factors affecting the shoreline environment									Y	Y	Y	Y				
Sustainable management of coasts						Y	Y	Y	Y	Y	Y					
Desert landforms						Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
		25		**17**		**34**		**28**		**28**		**28**		**30**		**29**

Table 1a: Content topics (Physical Geography) (Continued)

CONTENT SPECIFIED	NCS		CIE - IGCSE		CIE - AS		CIE - A		IB-SL		IB-HL		Nam OL		Nam HL	
	S	E	S	E	S	E	S	E	S	E	S	E	S	E	S	E
Biogeography/detailed studies of tropical and arid environments																
Ecosystems									Y	Y	Y	Y			Y	Y
Succession									Y	Y	Y	Y				
Human impact on ecosystems									Y	Y	Y	Y	Y	Y	Y	Y
Tropical forest climates - linking vegetation and soil			Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Savana climates - linking vegetation and soil			Y	Y			Y	Y					Y	Y	Y	Y
Arid & semi-arid desert climates - linking vegetation and soil			Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mediterranean vegetation region													Y	Y	Y	Y
TOTAL PERCENTAGE for PHYSICAL GEOGRAPHY	**50**		**33**		**52**		**50**		**44**		**44**		**33**		**33**	

Table 1b: Content topics (Human Geography)

CONTENT SPECIFIED	NCS		CIE - IGCSE		CIE - AS		CIE - A		IB-SL		IB-HL		Nam OL		Nam HL	
	S	E	S	E	S	E	S	E	S	E	S	E	S	E	S	E
Settlement Geography																
Classification of settlements - size; function; shape; urban/ rural	Y	Y	Y	Y					Y	Y	Y	Y	Y	Y	Y	Y
Location of settlements and patterns	Y	Y	Y	Y	Y	Y						Y	Y	Y	Y	Y
The urban hierarchy and spheres of influence	Y	Y			Y	Y			Y	Y	Y	Y	Y	Y	Y	Y
Land use	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y
Human interactions in rural settlements	Y	Y			Y	Y							Y	Y	Y	Y
Human interactions in urban settlements	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
		25		**17**		**18**		**6**		**9**		**9**		**17**		**17**
Population Geography																
World population growth			Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y
Regional differences in population growth and change			Y	Y	Y	Y							Y	Y	Y	Y
Population resoure relationships			Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y
Population structure			Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y
Factors influencing population density and distribution			Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y
Management of population change	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y
		0		**17**		**30**		**10**		**3**		**3**		**17**		**17**
Economic Geography																
Types of economic activity	Y	Y	Y	Y									Y	Y	Y	Y
Location of economic activities	Y	Y							Y	Y	Y	Y	Y	Y	Y	Y
Environmental and socio-economic injustices	Y	Y													Y	Y
Informal sector - importance and challenges in different contexts	Y	Y														
Influence of globalisation on economies and change	Y	Y														
Agriculture	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Food as a resource	Y	Y								Y	Y	Y	Y		Y	Y
Industrial systems	Y	Y					Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Aspects of change in productive activities									Y	Y	Y	Y				
Impact of human activities on quality of life and environment			Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sustainable development in industrial and agricultural/ fishing activities									Y	Y	Y	Y				
Leisure activities and tourism			Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Transport: role in economic development	Y	Y							Y	Y	Y	Y				
Trade	Y	Y					Y	Y								

Table 1b: Content topics (Human Geography)

CONTENT SPECIFIED	NSC		CIE - IGCSE		CIE - AS		CIE - A		IB-SL		IB-HL		Nam OL		Nam HL	
	S	E	S	E	S	E	S	E	S	E	S	E	S	E	S	E
Globalisation	Y	Y					Y	Y	Y	Y	Y	Y				
Changes in labour									Y	Y	Y	Y				
Regional development and its management							Y	Y	Y	Y	Y	Y				
		22.5		**21**		**0**		**26**		**26**		**26**		**33**		**33**
Resource use and management																
Concept of and classification of resources									Y	Y	Y	Y				
Patterns in the production and consumption of resources									Y	Y	Y	Y				
Water - availability, distribution and supply of water	Y	Y	Y	Y					Y	Y	Y	Y				
Sustainable use and management of water	Y	Y	Y	Y					Y	Y	Y	Y	Y	Y		
Energy resources			Y	Y			Y	Y							Y	Y
Sustainable development, resource conservation and management			Y	Y					Y	Y	Y	Y	Y	Y	Y	Y
Areas at risk from environmental threats			Y	Y			Y	Y					Y	Y	Y	Y
		2.5		**12**		**0**		**8**		**10**		**10**		**0**		**0**
Geographical regions																
Concept of a region									Y	Y	Y	Y				
In depth study of (local) region									Y	Y	Y	Y				
		0		**0**		**0**		**0**		**8**		**8**		**0**		**0**
TOTAL PERCENTAGE for HUMAN GEOGRAPHY	**50**		**67**		**48**		**50**		**56**		**56**		**67**		**67**	

The following points are worth noting regarding the content in the **specified curriculum:**

a) The IB, CIE A-Level and Namibian curricula have sections on biogeography and ecology which are not part of the other curricula, and the IB has a section on the concept of regions as well as in-depth regional studies that are not in any of the other curricula (other than biogeographical regions). Globalisation is a theme in the NSC and in the A-Level and IB curricula, but is not specifically mentioned in the others. While not specified as such directly in all curricula, they do all contain elements of human/environmental interactions - impacts and responses.

b) Within each broad area, there are both notable overlaps and notable differences in the specification of sub-topics. For example: -
   - with regard to climate, the NSC and AS- and A-Level curricula include work on heat budgets. While there is a heavy emphasis on the understanding of the SA climate in the NSC curriculum, the international examinations focus on tropical and arid region climates;
   - in geomorphology, while all curricula include fluvial processes and landforms, some syllabi (IGCSE, AS & A Levels, IBO and Namibian) include geomorphological processes and landforms in marine and arid environments and also plate tectonics which are not specified in the NSC curriculum;

- in the NSC curriculum, the study of industrial location patterns and processes in South Africa is specified, whereas contexts for the study of broad principles in the area are left open in all other curricula;
- only the Namibian curriculum specifies the study of the impact of HIV and AIDS on population and settlements.

These differences in sub-topics seem to link to the contexts of the envisaged candidates.

c) It is important to note that this study only looks at Grade 12 in the NSC, and some sections that are not indicated as specified are included in lower grades (e.g. population in Grade 10; a focus on development in Grade 11; plate tectonics in Grade 10)

d) The content specified in the IB curriculum is notably more abstract and requires greater depth of knowledge and understanding than in any of the other curricula. The following requirements on the topic of **population movements** serves as an example:
   - In the IBO under the core theme Population, Resources and Development, the following is required in respect of the topic 'population movements': "Explain how migrations can be described in terms of push and pull factors and how they can be modified by the mobility potential of a population. Illustrate specific migrations using a variety of models, including Lee's model. Identify and explain voluntary and forced population movements between rural and urban areas and poor and rich areas, and also the population displacements resulting from war and/or environmental disruptions. Know the consequences of such movements at both points of origin and destination. Show a more detailed knowledge of a specific refugee movement case study." (Document 16, p. 13)
   - The IGCSE curriculum documents provide the following guidance with regard to curriculum expectations on the mentioned topic: "Describe and suggest reasons for population migrations. Reference should be made to internal movements such as rural urban migration as well as to international migrations both voluntary and involuntary." (Document 7, p. 9)
   - On the same topic in both the AS- and A-Level curricula, the following is expected of learners: "Internal and external migration (excluding all movements of less than one year's duration); reasons for migration, process and patterns of migration and impacts on source and receiving areas, including population structures." (Document12, p. 8)
   - In both the Namibian curricula the following is expected of learners on the topic of 'population movements': "Discuss reasons for population movements. Reference should be made to internal movements, both voluntary and involuntary." (Document 34 & 35, p. 11)
   - In the NSC curricula this topic is covered in Grade 10. The only curriculum guidance is the following: "Population movements: rural-urban migration, urbanisation." (Document 1, p. 27).

1.2. Content weighting

Overall, each curriculum requires equal attention to be paid to the physical and human sections. However, in the IB, there is a strong focus on *population, resources* and *development*. This comprises a core compulsory theme and an examination paper for both the standard and higher levels, weighted as 3/5 and 3/7 respectively of the time allocated and 40 % of the overall marks for standard level and 25% of the higher level marks.

Based on an analysis of the percentage of marks allocated in examinations per different section and subsections as organised in **Graph 1** and **Table 2**, a few other trends emerge:

Graph 1: Percentage of content examined in different curricula/syllabi

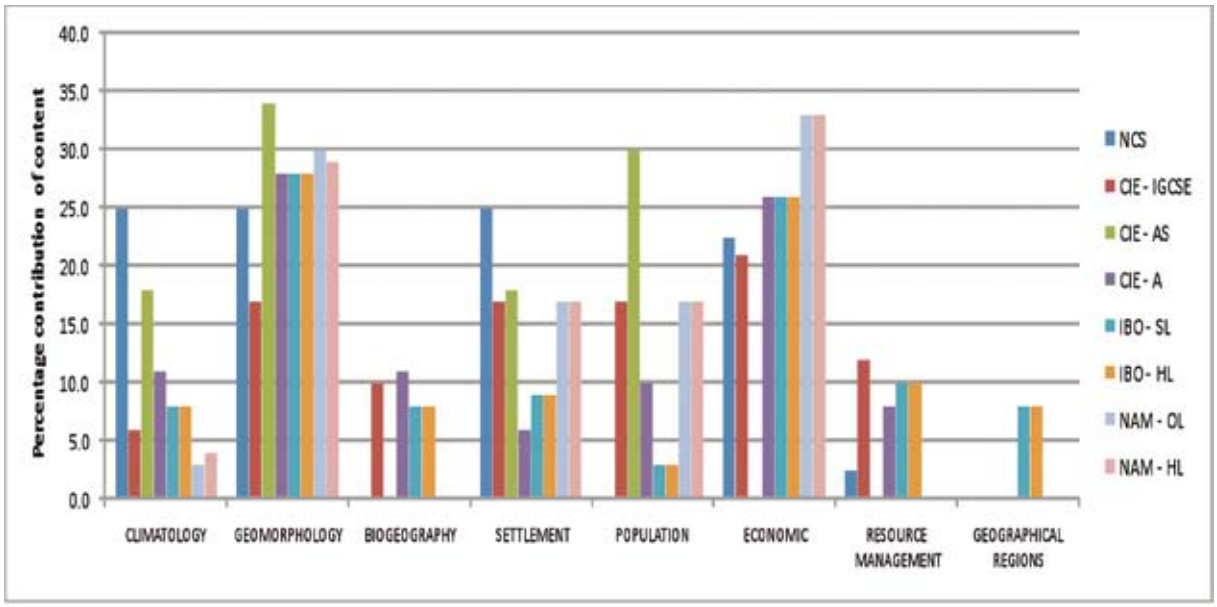


Table 2: Geography examination weighting in percentages

Section	Sub-section	NSC	IGCSE	CIE AS Level	CIE A Level	IB Standard	IB Higher	Namibia Ordinary	Namibia Higher
PHYSICAL	Climatology	25	6	18	11	8	8	3	4
	Geomorphology	25	17	34	28	28	28	30	29
	Biogeography	-	10	-	11	8	8	-	-
	TOTAL	**50**	**33**	**52**	**50**	**44**	**44**	**33**	**33**
HUMAN	Settlement	25	17	18	6	9	9	17	17
	Population	-	17	30	10	3	3	17	17
	Economic Geogr	22.5	21	-	26	26	26	33	33
	Resource use/man.	2.5	12	-	8	10	10	-	-
	Geog. regions	-	-	-	-	8	8	-	-
	TOTAL	**50**	**67**	**48**	**50**	**56**	**56**	**67**	**67**
TOTAL PERCENTAGE		**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

a) In most curricula/syllabi (except the IGCSE and Namibian), a roughly 50/50 split is maintained between physical and human geography. In the mentioned exceptions, there is a definite greater focus on human geography.

b) The IB curricula are the only ones that cover all sub-sections and also set examination questions from them. This clearly indicates that the IB curricula in terms of content coverage show the highest level of breadth.

c) The AS-Level curriculum shows the lowest level of breadth mainly because candidates only write Paper 1, while candidates doing the A-Level course write two other papers covering content from the biogeography, economic transition and development as well as resource use and management sub-sections.

d) In all curricula, candidates are required to answer questions from all sections covered – except in the NSC where candidates can choose to favour one section above the other

(two questions are set in each section, and the candidate must answer three).

e) Within the broad physical and human sections in papers set for each curriculum, there are, however, noticeable differences in the degree of choice that learners have with regard to subtopics. In the NSC curriculum, candidates can expect to have to answer questions on any of the subtopics, and so are required to study each subtopic equally; in the A- Level and IB papers, learners may choose to focus on a few subtopics in each broad section, and be assured of a choice of question in the subtopics they have chosen. This means that they are able to study fewer topics in more depth than in the other curricula.

We were not able to quantify the amount of class time that is needed to cover each subsection in each curriculum. However, we have been able to make some deductions about the time to be allocated to the two broad sections (physical and human) based on the hours specified in the case of the IB, and in the exam weightings in the case of the IB and the other curricula.

1.3. Content focus

The focus of the content was determined for the different curricula/syllabi. The content focus is described as "discipline specific" when the content is only relevant to the discipline of Geography and as "generic" when it is applicable to subjects outside of Geography. Content is described as "everyday" when it has application outside of the classroom, relevant to learners' everyday life - in other words, it can be described as "everyday" *in addition* to being either discipline-specific or generic.

Generally, the content specified for the different curricula is discipline specific. Exceptions to this are:

a) Some of the economic sub-topics which might be covered in an Economics curriculum (e.g. sectors of economic activity);

b) Tourism which could form part of the Tourism curriculum; agricultural systems which may be covered in Agriculture Sciences;

c) Some of the biogeography and ecology which overlap with Life Sciences;

d) The water cycle and human impacts on the environment (such as global warming and acid rain) which might also be part of the Physical Sciences curriculum.

e) In most curricula/syllabi on average more than two thirds of the content is of a disciplinary nature while a third can be regarded as generic (please see **Table 3**).

Please note: The team did not have access to other examining boards' curricula in subjects other than Geography and so have based some of the team's allocation of topics as generic or discipline-based on the team's understanding of the nature of these disciplines and own knowledge of the NSC curricula in other subjects.

Table 3: Content focus per curriculum/syllabus based on sub-themes covered

CONTENT FOCUS	NSC	IGCSE	CIE AS Level	CIE A Level	IB Standard	IB Higher	Namibia Ordinary	Namibia Higher
Disciplinary	72.1	76.3	88.0	64.5	68.9	71.2	66.0	66.0
Generic	27.9	23.7	12.0	35.5	31.1	28.8	34.0	34.0
TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Every day life	100	100	100	100	100	100	100	100

f) In our opinion, all of the content is applicable to life beyond the classroom. It enables learners to understand physical and human environmental processes and patterns globally and in the physical and social environments in which they live. This enables them to make sensible decisions in their own contexts (such as why not to build on a floodplain) and enables them to engage in informed debate about issues of social and environmental justice, and to make informed judgements and decisions.

1.4. Skills specification

In each curriculum a range of skills is specified, which we have classified into the following categories: mapwork skills (such as reading, interpreting and synthesising information on maps), and using mapwork techniques, (such as calculating distances and gradients); geographical enquiry skills (such as following the scientific methods of enquiry: using various data gathering and measuring instruments and techniques; working with data, statistics and other sources (reading, analysing and constructing tables and graphs; and using statistical techniques, such a measures of central tendency and correlation); communication skills (such as report writing and writing a sustained and well structured argument); demonstrating the recall and understanding of knowledge (by stating, listing, defining and writing explanations of knowledge learnt). **Table 4** provides more detail.

There is considerable overlap in the skills noted in each curriculum - both general information processing skills and discipline-based skills such as those related to mapwork. However, there are also some gaps in skills specified in certain curricula (see table). It is only in the NSC curriculum that there is specific mention of skills related to the use of GIS – though at present the knowledge of, rather than the use of GIS is examined, as few schools have access to the requisite resources to actually use GIS. The level of difficulty is moderate (average) in all of the curricula, except the IB where more advanced (deep) quantitative methods are specified.

Note: The IGCSE has an optional computer-based examination paper, but the evaluation team did not have access to it. No other curriculum/syllabus made specific mention of the use of a computer – though, by implication the NSC curriculum does, as GIS is computer-based.

Table 4: Geographical skills and techniques

SKILLS SPECIFIED	NCS		CIE - IGCSE		CIE - AS		CIE - A		IB-SL		IB-HL		Nam OL		Nam HL	
	S	E	S	E	S	E	S	E	S	E	S	E	S	E	S	E
GEOGRAPHICAL SKILLS AND TECHNIQUES																
Skill to recall acquired knowledge		**31**		**36**		**57**		**45**		**9.3**		**9.3**		**39**		**44**
Mapwork skills and techniques																
Reading maps and photographs	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Analysing and interpreting various maps	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Analysing and interpreting various photographs	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Using map techniques	Y	Y	Y	Y					Y	Y	Y	Y	Y	Y	Y	Y
Understanding map projections	Y	Y														
Drawing maps	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				
		16		**23**		**4.5**		**1.5**		**4.8**		**4.8**		**7.5**		**6.5**
Geographical enquiry skills and techniques																
Identifying issue and planning inquiry/research	Y	Y	Y	Y					Y	Y	Y	Y	Y	Y	Y	Y
Collecting and integrating information from variety of sources	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Organising or transforming information	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				
Reading, analysing and interpreting data/information	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Describing limitations of research methods used					Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Making effective conclusions and presenting substantiated findings	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
		34		**41**		**38**		**54**		**86**		**86**		**54**		**50**
Geographical Information Systems																
Data management	Y	Y														
Data manupilation and analysis	Y	Y														
Product generation	Y	Y														
Application	Y	Y														
		20														
TOTAL PERCENTAGE		**100**		**100**		**100**		**100**		**100**		**100**		**100**		**100**

1.5. Skills weighting

In all of the curricula the teaching of skills should be integrated into the teaching of the content topics. Based on the document analysis, the following significant differences and trends became apparent:

a) In all but the Cambridge AS- and A-Level curricula there are specific papers or coursework tasks related specifically to skills in addition to the skill demands in more content-based papers.

b) The NSC curriculum has a compulsory mapwork paper, worth 20% of the total external examination mark.

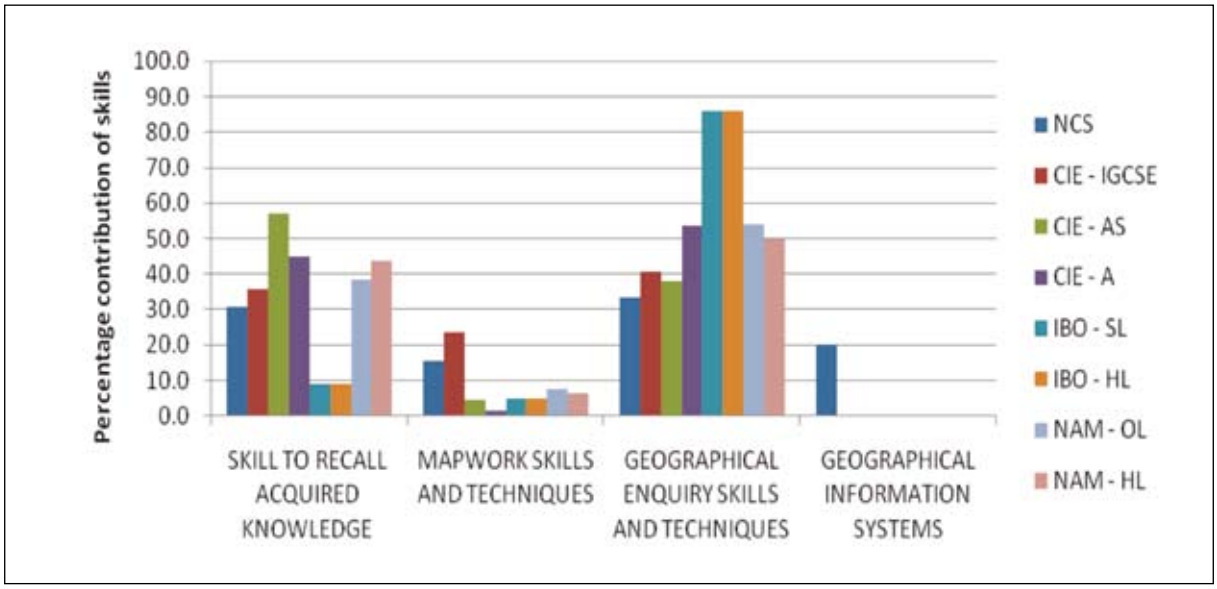
c) In the IB curricula candidates may choose as one of their 2 (Standard Level) or 4 (Higher Level) options, a question on mapwork, and, in addition, must complete coursework research/fieldwork tasks which count 20% (Standard Level) and 25%(Higher Level) of the total examination mark. **Note:** this weighting of fieldwork skills is not apparent in our tables as these were based largely on an analysis of the external papers, and the fieldwork component in the IB is assessed internally).

d) In IGCSE, Paper 2 (25% of the total mark) is based on mapwork and data interpretation questions while Paper 4, an alternative to coursework, focuses on research methods and fieldwork, as does the coursework (27.5% of the total mark).

e) In Namibia, the ordinary level's Paper 2 (30%) is a skill-based paper – based on data interpretation and mapwork, while on the higher level, Paper 3 focuses on fieldwork techniques and counts 25% of the total examination mark and a compulsory topographical mapwork question forms part of Paper 2, and counts 25% of this paper.

When one looks at the type of skills emphasised in each curriculum, whether integrated in separate examination papers or in coursework, noticeable differences in relative weightings are apparent (see **Table 4** and **Graph 2**).

Graph 2: Percentage of skills examined in different curricula/syllabi



a) The NSC and IGCSE curricula have the greatest emphasis on mapwork skills of all the curricula, while this is notably underweighted in the A-Level assessment.

b) Geographical enquiry skills and techniques are most prominent in CIE A-Level, IB and Namibia curricula, while the NSC curriculum is notably weak in this area;

c) The NCS is the only curriculum that specified Geographical Information Systems (GIS) in the skills section. However, in the question papers, learners are only expected to recall acquired knowledge about GIS.

d) The IB papers and the A-Level papers are distinctly more demanding in terms of the skills of synthesising information and presenting well formulated and sustained arguments (both elements of "Geographical enquiry skills and techniques" in **Graph 2**) than the other curricula, which make few demands of learners with regard to this skill.

Where time has been allocated to skills specifically, we have been able to reflect these, but generally, the requirement has been that skills be integrated with the teaching of the content. The same broad pattern of equivalence emerges from this analysis.

1.6. Skills focus

Many of the mapwork skills, especially those related to 1: 50 000 topographical maps and 1:10 000 orthophoto maps, as well as certain geographical enquiry skills and selected graphical representations, are subject specific. However, the majority of skills are common to other subjects or disciplines. Working with data is required in Mathematics/Mathematical Literacy, Economics, and Physical and Life Sciences for example. The use of diagrams is common to most subjects. Fieldwork techniques are required in certain aspects of Life Sciences (weather and soil readings; sampling) and in subjects such as Economics and Business studies (especially surveys). The subject History also places emphasis on the interpretation of pictures and written sources. Research skills are generic, but are dealt with in a subject specific manner in the Geography curricula and in great depth in some (such as the IB syllabi). Altogether, about 25% of the skills contained in the curricula are subject specific, and all have relevance in everyday living (though some, such as reading 1: 50 000 topographical maps might have relevance in more specialised contents than others.)

Most of the skills noted require the application of techniques and approaches to unfamiliar contexts. Some of the skills are easy – such as identifying symbols on a map, or extracting information for a written text. Most skills are at least of moderate difficulty and some are more clearly difficult - such as some of the statistical techniques required in the IB curricula as well as the essay type answers required in the IB and in the A-Level examination papers. However, to a large extent, the degree of difficulty depends on the complexity and abstractness of the data, content or statistics in which the skill is being applied, and so while a general evaluation has been made, it must be borne in mind that there will be variations from curriculum to curriculum and across content in any one curriculum. For example, demonstrating fieldwork skills and writing up the results can be a very different exercise depending on the breadth and depth of the study, and the content area in which it is based.

2. Organising principle and coherence

It is important that a curriculum have a clear organising principle to enable learners to construct their knowledge meaningfully. Absence of an organising principle could therefore contribute to the level of difficulty of a curriculum.

In all the curricula provided, the organising principles are clear. In each, there is a set of aims, objectives/outcomes to be achieved, and a description of the content organised according to themes/topics and sub-themes/topics. In all curricula/syllabi, there is a description of requirements in terms of physical and human geography content and skills. The following is a more detailed and specific description of the organising principle(s) in each curriculum/ syllabus:

a) In the NSC curriculum the learning material specified is organised around content conceptual themes that focus broadly on Physical and Human Geography as well as geographical skills and techniques. In each of these there are sub-themes. Furthermore the teaching of geography focuses on three Learning Outcomes: geographical skills and techniques, geographical knowledge and understanding and thirdly application. These are addressed based on a clearly indicated progression via assessment standards per grade.

b) In the IGCSE the content is described in themes and sub-themes and there are outcomes associated with each content area. There are four broad assessment objectives related to information processing skills and there are specific objectives that unpacked these in the content of each theme.

c) In the CIE AS- and A-Level curricula/syllabi there are four broad sets of assessment outcomes and the content is described in terms of themes and sub-themes in both physical and human geography. In both the AS- and A-Level curricula/syllabi, the candidates must cover a common core of topics in both physical and human geography. A-Level candidates focus on two additional topics in each of these areas from a set of possible four topics in each.

d) In the IB curricula there are 4 broad sets of themes, located in physical and human geography, and in topographical mapping, with sub-topics and related outcomes in each. Candidates do one compulsory theme (Populations, resources and development) and then at the Standard Level choose 2 topics from across the three other themes or if they are attempting the Higher Level choose 4 topics from across the three other themes. In addition, they must develop geographical skills and techniques in the context of each of the options they choose.

e) In the Namibian curricula, there is a set of overarching aims and the content is described by means of four broad themes covering physical, human geography and research and mapwork techniques each with subtopics and associated specific objectives.

In all cases, the organising principles are readily evident even if not explicitly stated as organising principles. Likewise, in all cases the curriculum is coherent with the organising principle(s).

3. Sequence, progression and pacing

Progression is achieved in a course when the content and skills increase in cognitive demand within a given year, and from one year to the next. The sequencing and pacing of material in the course therefore needs to be appropriately structured to allow for this development. The various curricula were considered in this light.

3.1 On a closer interrogation of the nature of sequence, progression and pacing in the various curricula, the following trends emerged:

a) In none of the curricula leading to a specific examination level/grade is the sequence in which work must be done specified, although in the NSC curriculum documents there is an example of a possible sequence for Grade 12 work provided in the learning programme and the subject assessment guidelines (Documents 2 and 3). The NCS as a whole specifies content per grade. Pacing is also suggested in Document 2, but educators have reported that the pace required by the amount of work to be covered in the year is too demanding. Document 3 (p. 23) also notes that educators should build progression into their lessons in terms of increasing conceptual difficulty, greater contextual breadth and more demanding skills, but this document does not give a clear indication of what this means in terms of the content and skills prescribed.

b) The IGCSE is a two year course, but there is neither allocation of content to different years nor any indication of how time should be allocated to different components.

c) In curricula which are offered at different levels (such as the Cambridge AS Level and A Level, the IB Standard and Higher Levels and the Namibian Ordinary and Higher Levels) differences are generally made clear. In the AS- and A-Level syllabi/ curricula, all candidates must cover specified content across 5 themes and write a core paper, and then those who wish to may progress to the optional themes in each of a Human and Physical Geography option. Thus candidates progressing to A Level may opt to do the core paper and the optional papers in one session, or may do the core paper in one session, and the other two in another – i.e. they have some control of their pace of work. The nature of the progression here lies in greater depth of content and more specialisation in certain aspects of a broad set of options.

d) In the IB Levels. The differences between the two relate to the time allocated to each level (150 hours for Standard Level compared with 240 for the Higher Level) and to the number of options each must study – 2 for Standard Level and 4 for Higher Level, meaning that there is a greater expectation of both depth and breadth for Higher Level candidates. In addition, the research reports for the Higher Level must be longer and the criteria make more demands on the candidate to describe, justify and reflect on their methodology and explain and support their findings (Document 16, pp. 53&56).

e) In the Namibian curricula, there is only a poor indication of the difference in the work required for each level – the Higher Level curriculum has the same content as the Ordinary Level described under Section A, and there is then a Section B which gives additional, more demanding content under the same themes and subthemes – presumably making the difference between the two levels. The pace must also be more demanding as both curricula are intended to be covered in two years of study.

3.2 In none of the curricula is there specification of a sequence within the year(s) that shows progression in terms of content or skills. The team suspects that guidance about sequencing of content and skills are either given in workshops by and meetings with curriculum advisors, or it will be communicated in other documentation.

3.3 When analysing the curriculum documents in terms of progression on content or skills, the following became evident:

a) The IGCSE is only offered on one level (Document 7).

b) In the NSC curriculum, also offered as a one year curriculum for examination (Grade 12), progression is however evident across the three years of the Further Education and Training band in the assessment standards for Gr. 10 to Gr. 12 (Document 1, pp. 14 – 23); there is also progression from global to continental to local contexts (which are not necessarily progressive in terms of conceptual difficulty).

c) In the progression from AS Level to A Level, the degree of specialisation in certain optional content topics increases, and thus the demand in terms of depth and complexity of understanding in the content also increases (Document 12). These changes are evident in the examination questions; with the A-Level paper having a greater emphasis on longer and more sustained answers (Documents 14 and 15).

d) In the IB, there are greater demands in terms of the number of topics selected, and the demands of the research project (Document 16).

e) In the Namibian curricula, the Ordinary and Higher levels are distinguished by an increased amount of content in the Higher Level, with issues that are more complex being introduced here (Documents 34 and 35).

3.4 A number of significant trends were identified on investigating increase in cognitive demand.

a) In the NSC curricula, differences in cognitive demand are described in the assessment standards; for example Grade 10: "*Identify similarities and differences in process and spatial patterns between places or between regions*"; Grade 11: "*Compare and contrast processes and spatial patterns between places and/or between regions*"; Grade 12: "*Account of the similarities and differences in processes and spatial patterns between places and between regions*" (Document 1, pp. 20 to 21). However, as mentioned already, there is no obvious specified progression in cognitive demand over the year other than that in general terms (Document 3, p. 23).

b) In IGCSE there is no progression in cognitive demand indicated over the 2 year syllabus described (Document 7).

c) In the AS- and A-Level curricula, the increase or decrease is as illustrated in **Table 5** (also see Document 12, p. 5):

In addition, there is a greater demand on longer pieces of sustained writing in the A-Level curriculum (examination paper) and also more demand in terms of focusing on optional topics at greater depth than in the AS-Level curriculum (Document 12, p. 4 and 5).

Table 5: Changes in cognitive demand between AS and A Levels

COGNITIVE DEMAND IN TERMS OF:	% in AS Level	% in A Level
Knowledge	30	32.5
Understanding	30	32.5
Skills and inquiry	20	15
Evaluation and decision making	20	20

d) In the IB, the cognitive demand increase is related to three factors:
- increase in the number of topics to be studied in the optional papers at Higher Level;
- the concomitant increase of the weighting of these optional papers relative to the core paper compared at the Higher Level;
- the significantly greater demand in terms of research skills at the higher level, e.g. at the Higher Level hypothesis-based research with a fieldwork report is expected compared to a fieldwork exercise of given research assignment at the Standard Level (Document 16, pp. 40, 41).

e) In the Namibian curricula, content of greater complexity is added to the Higher Level curriculum, e.g. the Population and Settlement sections of the Ordinary Level paper does not contain topics such as "*Quality of life*"; "*Multiracial societies*"; "*Population and food supply*" (Document 34, p. 17; Document 35, p. 11-12).

3.5 With regard to what must have been covered by the end of each year of study, the following were found:

a) In the NSC curricula all the content and skills that must have been covered by the end of the Grade 12 year on which the examination is based is clearly specified. Everything that is specified must be covered (Documents 1, pp. 30–32; 2, pp. 20–30; 3, pp. 35–46 and also 4, the entire document).

b) In the IGCSE, all the content for the examinations at the end of two years of study is given in Document 7, pp. 6–12; pp. 13-22. However, no details related to each year of study are provided.

c) In the AS-Level curriculum, all the topics for examination in the Core paper are specified (Document 12, pp. 4&5 and 6&7). For the A-Level curriculum all the content to be covered in addition to the core is also specified (Document 12, pp. 4&5 and 8–14). Candidates have a choice regarding how much of the total curriculum (core and options) they complete for one examination session.

d) In the IB all the content is the same for both levels and is described in great depth (Document 16, pp. 9&10). No indication of what must be covered in each year of either curriculum is provided.

e) In Namibian Ordinary Level (Document 35, pp. 2–13) and Higher Level (Document 34, pp. 2–20) curricula/ syllabi content for the examination is described, but there is no indication of what must be covered in each year.

4. Aims/purpose/vision/outcomes

The NSC and the international curricula were examined with regard to the specified aims, purpose, vision and/or outcomes.

4.1 In general, the aim relate to the educational purposes of the curriculum. These include the acquisition of knowledge, information processing and communicating skills, and attitudes and qualities which should not be assessed by examination, but which do form part of any geography course. The following is the general trend in terms of aims in the different curricula/syllabi:

a) In the NSC curriculum there is a definite link between the stated aims (document 1, p. 9) and the intended learning outcomes (Document 1, pp. 14–16). The aims focus on the development and use of enquiry and map skills and techniques in order to construct knowledge and critical understanding of the changing nature and interrelatedness of human existence and the environment over space and time so that learners become informed, critical and responsible citizens who can make sound judgements and take appropriate action that will contribute to equitable and sustainable development of human society and the physical environment.

b) The IGCSE curriculum (Document 7, p. 1) aims to encourage candidates to develop:

- a sense of place and an understanding of relative location on a local, regional and global scale
- an awareness of the characteristics and distribution of a selection of contrasting physical and human environments;
- an understanding of some of the processes affecting the development of such environments;
- an understanding of spatial effects of the ways in which people interact with each other and with their environments; and
- an understanding of different communities and cultures throughout the world and an awareness of the contrasting opportunities and constraints presented by different environments.

c) The CIE AS- and A-Level curricula (Document 12, p. 2) divide the aims into two groups, one dealing with Geography as a subject discipline; its content and its role and value, and another dealing with skills and attitudes.

- In terms of the first group the aim is focused on developing awareness of the relevance of understanding and solving human and environmental problems; introducing candidates to components of physical and human geography; encouraging understanding of processes operating at different scales; developing a sense of relative location; understanding causes and effects of change over space and time; understanding the importance of scale and making students aware of the problems of explanation in the subject.
- With regard to the second group the emphasis is on knowledge and ability to use appropriate skills and techniques; encouraging a concern for accuracy and objectivity when working with data; developing the ability to handle and evaluate different types and sources of information; developing the skill to think logically and to present an ordered and coherent argument in coherent ways, and promoting an appreciation of the need to conserving the environment and improving the quality of life.

d) The IB curriculum aims (Document 16, p. 4) highlight similar aspects as those mentioned in the other curricula. The following are the main trends in their aims:

- developing a global perspective and a sense of world interdependence; an understanding of the interrelationship between people, place and the environment; a concern for the quality of the environment; an understanding for the need to plan and manage for present and future generations
- appreciating the relevance of geography in analysing contemporary world issues and develop and modify values and attitudes in relation to it; recognise the need for social justice, equality and respect for others
- developing an appreciation of the range of geographical methodologies and apply appropriate techniques of inquiry.

e) The Namibian curricula/ syllabi (Ordinary level – Document 35, p. 2 and Higher Level – Document 34, p. 2) captures the aims mentioned of the other mentioned curricula/syllabi. It is however the only one that specifically intends to aim at encouraging learners to acquire and develop an understanding of HIV and AIDS and its impact on development.

4.2 None of the documents give direct guidance as to how each aim should be achieved, but there are clear links between the aims related to knowledge and skills and the statements of objectives and outcomes/assessment standards in each document. In certain documents, such as the NSC, IGCSE, IB and Namibian curriculum documents, these are more finely described than in others (for example the CIE AS and A Levels). In the different curricula, different design features are used to work towards the stated aims:

a) In the NSC curriculum learning outcomes and assessment standards are specified (Document 1, pp. 14–23)

b) In the IGCSE curriculum learning outcomes in terms of indicated content are formulated (Document 7, pp. 6–12)

c) In the AS- and A-Level curriculum, assessment objectives are identified (Document 12, p. 12)

d) Learning outcomes serve as the pedagogical link to the aims in the IB curriculum (Document 16, pp. 12 – 39)

e) In the Namibian curricula specific objectives are used as the design feature that links to the aims (Ordinary level: Document 35, pp. 3–13; Higher level: Document 34, pp. 3–20)

However, there is generally not even this kind of implicit support for educatorss with regard to how to achieve aims related to attitudes and values in any of the documents.

4.3 In all the curricula examined, the aims are closely related to the aims of the discipline, and broad and inclusive enough to be applicable to learners in all contexts who might engage with the curriculum. None of the aims in any of the documents makes specific reference to any specific context.

However, the principles underpinning the NSC curriculum as a whole include a reference to the value of indigenous knowledge systems related particularly to the African context. (Document 1, p. 4; Document 3, p. 12) None of the aims is culturally/religiously/regionally specific in any way that it is likely to exclude any candidate, or be offensive to them.

4.4 The evaluation team has not had access to other curriculum implementation documents pertaining to the international qualifications, which might give more detailed information about articulation. The analysis of the documents at the team's disposal brought the following deductions to light:

a) In the NSC curriculum articulation with the General Education and Training (GET) band as well as the NQF levels are described in terms of learning outcomes and assessment standards (Document 3, pp. 10 - 11). The Geography curriculum is located within the Further Education and Training (FET) curriculum, a qualification at NQF Level 4.

b) The IGCSE curriculum states that it is for candidates at age 16+. (Document 7, p. 10). No indication of articulation is given.

c) The curricula for the AS- and A Levels mention that the curriculum is for candidates working beyond O Level and IGCSE (Document 12, p. 1). The articulation between the AS- and A Levels is provided – it is clear that the AS Level is the foundation for the A-Level curriculum.

d) The IB curriculum is described as a pre-university course for candidates between ages 16 and 19 (Document 16, p. 1). A description is provided of the required mix of higher and standard level subjects in order for candidates to gain access to university study.

e) Both the Namibian Ordinary Level (Document 35, p. 1) and Higher Level (Document 34, p. 1) can be attempted after completion of the Junior Secondary Certificate.

5. Teaching approach and subject methodology

5.1.General teaching/ learning approach

The *general* teaching and learning approach of the various curricula was considered, and the following points are noted:

a) The desired approaches are more clearly specified in the NSC curriculum than in the other documents – a learner centred, activity-based approach (Document 1, p. 2); there are no similar statements of broad approach in the other documents.

b) In the NSC curriculum, as already stated, the aims relate to developing tools to interpret, analyse and make judgements based on information gathered; to develop a frame of reference for asking and answering geographical questions through developing knowledge and understanding of the changing nature and interrelatedness of human existence and the environment and to prepare learners to be informed, critical and responsible citizens who can make sound judgements of human society. All these aims can be met by using a leaner centred and activity-based approach (Document 1, p. 9). In the context of limited policy material, it is not possible to answer this question with reference to the other curricula.

c) The approach described in the NSC curriculum is appropriate to the South African context as it encourages a move away from rote learning and content transmission. However, a leaner centred and activity-based approach is not always easy to implement in the school contexts currently prevailing in many South African schools where classrooms are overcrowded and poorly resourced, and where educators do not all have the necessary skills to implement this approach effectively.

d) An enquiry-based approach is particularly relevant to the broad outcomes of the learning area, which require candidates to develop competence in geographical skills, understanding of knowledge and the ability to apply knowledge and skills in new contexts. This approach offers opportunities for candidates to practice skills rather than to learn about them, to ask questions and to find ways of answering them – all of which support a move toward higher order cognitive skills related to the content. A leaner centred approach should mean that knowledge is contextualised for all candidates, and that educators will teach in a manner that helps these candidates to construct geographical knowledge.

e) The approaches are suited to the candidates at any level. At this level candidates have a broad base of knowledge and skills from work done in the GET, and the enquiry-based and learner centred approaches will encourage learners to build actively on this base by engaging with new knowledge and skills. The learner centred approach allows learners to link what they are learning in class to the outside world, and to make meaning of their own social and physical environments.

5.2. Subject-specific methodology

The following points refer to the *subject-specific* teaching and learning approach of the various curricula:

a) Where specified, the curricula propose a thematic studies approach to the content (Document 1, p. 12; Document 7, p. 6; Document 12 – not specified but implicit in description of content; Document 16, p. 6). Furthermore the NSC curriculum explicitly refers to the use of systematic, systems and issues-based approaches (Document 1, p. 12) and the IB curriculum refers to these more indirectly (Document 16, pp. 12, 18, 22, 26). The curricula have much in common in the subject specific methodologies they propose – though in some these are more explicitly stated than in others.

These methodologies include:

- the **integration of knowledge** across themes and topics (Document 1, p. 11; Document 3, p. 10, 22; Document 7, p. 13, Document 16, p. 38);

- the **integration of skills** into the content sections so that they are tools for learning not ends in themselves (Document 1, page 11; Document 3, p. 10; Document 7, pp. 14–16; Document 12, p. 14; Document 16, p. 11; Document 34, p. 25; Document 35, p. 19),
- the use of **case studies** (Document 7, pp. 6, 13; Document 12, p. 10; Document 16, p. 9; Document 34, p. 2; Document 35, p. 2)
- **practical investigation tasks** (Document 2, p. 15; Document 7, pp. 17, 21; Document 12, p. 14; Document 16, pp. 40, 49; Document 34, pp. 21–27; Document 35, pp. 18-22)
- **resource-based tasks** (Document 4, p. 2; Document 7, p. 16; Document 12, pp. 14; Document 34, p. 23; Document 35, p. 18)

b) In general, the subject – specific approaches are well aligned with the curriculum aims. They support learners in integrating knowledge across the topics, in developing information processing and communicating skills; in relating theoretical perspectives to 'real world' contexts at different scales and in developing a sense of the interrelationships between the physical and human environments - all common aim across the curricula. However, it might be suggested that the methodologies suggested do not necessarily support the development of the attitudes and values mentioned in the aims - and that the inclusion of role-play and simulation activities might be included to assist educators in this regard.

Generally, the motivation for the methodologies proposed is not well articulated in the curricula – but some instances of this are to be found as follows: In the NCS (Document 1, p. 12) there is a link between the systematic, systems and issues approaches and aims such as understanding the wholeness of the environment. In the IGCSE curriculum (Document 7, p. 13) mention is made of case studies as affording an opportunity to present candidates with an integrated approach to the study of content. In the AS- and A-Level curriculum (Document 12, p.14) case studies are identified as opportunities for introducing candidates to a wide variety of stimulus material for interpretation and analysis. In the IB curriculum (Document 16, p. 24), case studies are also indicated as key in illustrating links between physical processes and human responses. This syllabus also highlights skills integration as necessary for enriching understanding (p. 11)- such as in seeing trends and anomalies(p.12); practical fieldwork as a means to 'amplify, reinforce and extend geographical concepts and skills taught in class', and to 'foster autonomy, cooperation and self esteem while developing organization, investigation and presentation skills'(p. 46). In the NCS emphasis is also placed on affording learners an opportunity to 'learn by doing' (Document 1, p. 12).

c) The subject specific approaches are best suited to contexts where educators are well trained in resource-based and enquiry approaches, have access to rich content bases for case studies, and a range of resources (such as data, tables, graphs, pictures for use with their learners and resources that make fieldwork possible). It is likely that each curriculum is offered across a spectrum of contexts, where these ideal conditions are available to different degrees. In some of the curricula, this fact is recognised, and either restriction is placed on what elements of the curriculum may be offered for formal assessment, and/ or training in the delivery and management of certain aspects of the curriculum are offered. For instance, IGCSE (Document 7, p. 4) requires educators to apply the internally assessed fieldwork component, and offers training to support them. The Namibian curriculum recognise that many educators will not be able to implement the practical work component to a sufficient degree to allow for internal assessment, and so assesses candidates' knowledge and understanding of fieldwork techniques and methods through an externally set 'theoretical' paper (Document 35, p. 23; Document 34, p. 21).

d) The content in the curricula relates to developing both theoretical and applied knowledge and understanding of physical and human processes, patterns and relationships. Approaches that favour the use of case studies, the integration of knowledge gained in various topics and the integration of information processing skills across the curriculum are well suited to this type of content. In addition, the emphasis on practical work and the use of enquiry-based and active learning approaches supports the development of skills themselves, rather than knowledge about the skills. Issue-based approaches allow learners to engage with attitudes and values embedded in certain topics – but as noted, before, more guidance as to how to enhance this aspect of learning needs to be provided in the curricula. References to page numbers in the curriculum documents were provided in (a) and (b) above.

e) The subject specific approaches are suited to learners at this level as they allow candidates to develop knowledge and skills through an active engagement with resources. This helps to concretise information and assists learners in building meaningful knowledge. The only document where specific reference to this aspect is made is in the NCS (Document 1, p. 12) – nothing is found in other documents.

6. Assessment guidance

The following comments can be made about the guidance as well as tasks given for internal assessment within the various curricula:

6.1 Types and clarity of guidelines given for internal assessment

a) In the NSC curriculum clear guidelines are given for the nature and number of school-based tasks, with their weightings, and some guidelines as to when they should be completed (Document 2, pp.14&15). However, little guidance is provided in terms of the assessment of these tasks.

b) The guidelines in the syllabus of the IGCSE make it clear that not all schools may enter candidates for internal assessment, and might have to write an alternative external paper instead. They give the number of tasks to be set (20, the time allocation, the length and the marks for each). They also give the relative weighting for different cognitive levels (their assessment objectives) that must be met in terms of the tasks (Document 7, pp. 3&4). In addition, the document (Document 12, pp. 17–20) provides detailed guidance to the educator as to how to design the assignments, and how to assess the tasks using a rubric provided. A number of examples of tasks are provided. In addition, educators are informed of the availability for the training courses offered by the examination board.

c) The AS- and A- Level curricula stipulate no internal assessment component.

d) In the IB curricula for both Standard and Higher Levels, the number of tasks, their percentage contribution to the overall mark and the nature of the task (fieldwork) are specified (Document 16, pp. 40 and 41). In addition, detailed information about the requirements for fieldwork, guidelines regarding the choice of topics, suggested methods of data collection, the structure of the written reports, time allocation and detailed assessment criteria, making clear how to distinguish among different levels of competence are provided. (Document 16, pp. 46-59).

e) No internal assessment component is explained for the Namibian curriculum.

6.2 Types and clarity of tasks given for internal assessment

a) Prescribed tasks in the NSC curriculum documents are: 2 examinations, 2 tests, and 3 'other' tasks which might be any of the following or other tasks: practical tasks (such as one based on map skills), a research task; fieldwork task, a model, a case study, a creative response, data handling, contextual analysis task and a project. A suggested structure of the examinations, and suggested weightings for different cognitive levels are provided - but no guidelines are given for the other forms of assessment (Document 2, pp. 16&17).

b) In the IGCSE curriculum, the tasks are both inquiry-based tasks and must be located in both the prescribed human and natural environmental topics, or in a combination of these. They should both have a strong fieldwork and primary data collection component (Document 7, pp. 17-20).

c) For the AS- and A-Level curricula, no internal assessment component is specified.

d) With regard to the IB Higher Level (HL) curriculum, the task is a fieldwork task, which should be hypothesis-based and relate to a theme in the curriculum; for the Standard Level (SL)

the task is either a fieldwork exercise or a research assignment related to the theme in the curriculum (Document 16, pp. 40 and 41). Further clarity regarding the tasks is provided on pages 46–59 in Document 16.

e) As mentioned, there is no internal assessment component in the Namibia curricula.

6.3 Types and clarity of guidelines given for external assessment

a) In the NSC curriculum documents, the number of papers and the mark allocations, the time, the content, types of questions and the structure of each paper is given (Document 2, p. 17; Document 4, pp. 1 – 17).

b) In the IGCSE curriculum, the number of papers, their duration and mark allocation, the content focus of each and the cognitive level weightings are provided for each (Document 7, pp. 3–50). In addition, the curriculum document specifies very clearly what competencies candidates should be able to demonstrate in the examinations (Document 7, pp. 6–16).

c) The AS- and A-Level curriculum provide the number of papers, and the topics to be covered, compulsory and choice sections, the length of the paper and its percentage contribution to the final mark, as well as the relative weighting of cognitive levels for each paper (Document 12, pp. 4-5).

d) In the IB curriculum the number of papers, the percentage contribution of each to the total mark, the duration of each paper, the topics covered and the structure of each paper, including optional and compulsory sections, are all indicated (Document 16, pp. 40–42).

e) For the Namibian Ordinary and Higher Levels, the number of papers, the duration of each, the marks allocated, the relative weighting of the cognitive levels, the number of questions to be answered, the type of questions, and the choices allowed are all given for each paper. There are also explanatory notes for educators related to the techniques of geographical investigation that are focussed on in Paper 3 (Document 35, pp. 16-22; Document 34, pp. 23–27).

6.4 Types and clarity of tasks given for external assessment

a) NSC: Two examination papers: Paper 1 theory, Paper 2 mapwork and geographical skills and techniques.

- Paper 1 covers all sections of the stated content selections. There are 4 questions, each covering two physical or two human geography questions (with sub questions). In total, learners must answer 3 questions. The tasks include short objective type questions; source-based questions, short essay-type questions.
- Paper 2 has multiple choice questions, geographical techniques and calculations; application of theory/map and photo interpretation and questions on geographical information systems (Document 4, pp. 2-17; Document 2, pp. 16-17).

b) In terms of the IGCSE curriculum the following tasks are indicated:

- Paper 1: Resource-based questions on the theory covered in the themes, with gradients of difficulty; the questions involve problem solving and free response writing, and may be require knowledge of a case study (Document 7, p. 13).

- Paper 2 is a skills-based paper, assessing candidates' ability to handle various ways of depicting geographical information; there is one question based on a topographical map of a tropical area. The questions are content neutral, and do not require specific information of place (Document 7, pp. 14–16).
- Paper 4 is an alternative to coursework and comprises a series of tasks that is related to one or more of the syllabus themes. The questions test knowledge of fieldwork methodology and techniques associated with gathering, representing and processing information from fieldwork (Document 7, pp. 4, 21and 22).

c) For the AS Level there is one examination paper. This paper has questions on all of the topics in the core Human and Physical Geography content. There is a range of tasks, including skill-based tasks making reference to a variety of resources, including survey maps and structured tasks with opportunities for extended writing (Document 12, pp, 4-5).

For the A Level there are three examination papers:

- Paper 1 as for AS Level (the same paper);
- Paper 2 consists of a range of questions drawn from the topics in the Physical Geography options, and
- Paper 3 with questions across topics in the Human Geography options. In both these papers tasks include structured questions that involve interpretation of data as well as opportunities for extended writing (Document 12, pp. 4-5).

d) In the IB curriculum two papers are prescribed:

- Paper 1 is set on the core themes. Structured questions comprising closely related parts of the curriculum are normally based on stimulus response questions, the first part assesses knowledge while other parts assess understanding, application and analysis/evaluation of the theme and require more extended responses.
- Paper 2 consists of questions on both the physical and human options, and the mapwork option. Each question has an essay question, which gives little guidance to the candidate, and an alternative structured response data or stimulus response question (apart from the one question on the topographical map, which has no essay question). The structured questions require students to respond to data and draw conclusions, to develop ideas and relate them to different but related topics within the theme (Document 16, p. 44).

e) For the Namibia Ordinary Level three papers are set:
- Paper 1: Resource-based questions that involve problem solving, located in the three curriculum themes (Physical world, economic development and use of resources; Population and settlement studies). The questions require free response writing.
- Paper 2: Questions are skills-based and are aimed at assessing learners' ability to handle various ways of depicting geographical information. Mapwork questions, data response questions, questions requiring the identification and analysis of settlement patterns.
- Paper 3: Consists of investigative tasks on issues related to one or more specified topics from the syllabus themes. Questions assess the methodology used in a range of enquiry skills related to fieldwork (questionnaires, observation and recording of information), counts – e.g. pedestrian and traffic, measurement techniques appropriate to river studies, beach studies and the weather. Methods used at a weather station to record the weather using observation and instruments should be studied in order to describe patterns of weather.

f) At the Namibia Higher level, three papers are also set but have different characteristics:
- Paper 1: Resource-based questions that involve problem solving, located in the three curriculum themes (physical world, economic development and use of resources; Population and settlement studies); questions require free response writing.
- Paper 2: Resource-based questions that involve problem solving, located in the three curriculum themes (physical world, economic development and use of resources; Population and settlement studies); questions require free response writing.
- Paper 3: Consists of a series of tasks on issues relating to one or more of the syllabus themes. Questions assess the methodology used in a range of enquiry skills related to fieldwork (questionnaires, observation and recording of information, counts – e.g. pedestrian and traffic, measurement techniques appropriate to river studies, beach, weather and urban studies. Methods to process and present data, including cartographical techniques and statistical techniques will also be assessed.

7. Comments on examinations

The examination papers of the various curricula were considered in terms of coverage of the curriculum content and expected skills. (In-depth analysis of the examination questions was not required). The points below address this issue:

- In all of the curricula analysed, with the exception of the NSC curriculum, there is a good correspondence between what is stated as required learning and what is assessed. In the NSC curriculum a notable drop in demand was found between the intended and examined curricula. Evidence for this includes the fact that while data response questions are set, only a small number of marks are allocated to actual engagement with the data, and the majority can be earned for mere recall. In addition, while the curriculum specifies that learners should be able to make and justify an informed opinion, there is little evidence of these competences being assessed. GIS is described in the skills section, but the assessment relates only to knowledge of the concepts associated with GIS and not to any ability to use GIS or interpret data gathered from GIS techniques.
- Generally, a representative sample of the course outcomes is examined in the various curricula, though in some cases there are noticeable gaps. For example, in the Cambridge (CIE) AS- and A-Level examination papers there is less attention paid to outcomes related to working with sources than is implied in the curriculum, and in the South African NSC papers, outcomes related to enquiry skills and to the development of higher order cognitive skills are under-represented.
- There is a wide range in the level of cognitive demand of the examination papers of the different courses. In the IB examination papers, there is a weighting toward high order questions, with evaluation judgement and synthesis being required along with the analysis of a range of sources. In the A-Level papers, there is a combination of less demanding recall questions, and higher order questions where learners must synthesise information and apply it to the writing of an extended answer. In most of the other courses' examination papers, there are medium and lower order questions with less demand for extended responses. In the NSC examination papers, cognitive demands are diluted by the setting of many short-answer questions that do not lend themselves to learners having to select and organise information to produce a more extended coherent response.
- Generally, the examination papers are well set, with clearly expressed questions and legible supporting documents. The examination papers cover the content satisfactorily, and offer a range of types of question and of resources to be engaged with. However, there are, as noted above, clear differences in the cognitive demands of the papers across the different curricula. In addition, in some of the assessment, the internal assessment is poorly specified or does not contribute to the assessment of the range of outcomes specified as it might

(e.g. the actual implementation of investigation tasks.) The IB is one curriculum where this concern is not applicable.

8. Comments on Namibian Senior Secondary Curricula

The evaluation team did an "ex post facto-check" of the Namibian NSSC Ordinary Level (OL) and Higher Level (HL) as contextualised examples of CIE qualifications. The following points are made in this regard:

- The Namibian curricula compare well with the NSC curricula in terms of the overall aims/ outcomes and the broad content and skills requirements. While there are many similarities in terms of contents and skills, there are also differences, which are embedded in the related context(s). For example, where the Namibian curricula place greater emphasis on research methods, the NSC curriculum focuses on Geographical Information Systems. However, amidst these detail-differences, the Umalusi Geography team regards the Namibian HL as of a similar value as the NSC curriculum. In terms of content, the HL requirements are similar to those of the NSC curriculum in terms of breadth, depth and theoretical and abstract knowledge.

- The Geography evaluation team also regards the Namibian OL as of a lower value than the NSC curriculum, since the content is less demanding in terms of breadth, depth and theoretical and abstract knowledge.

- The type of examination questions set to examine knowledge and understanding of the content are similar in all three curricula, with few demands made on extended writing or deep and complex responses to questions set. However, an important distinction here is that while the NSC examination papers might not at present be examining higher order skills to any extent, they are clearly expressed in the assessment standards as skills that the candidates should develop. Such expression is much less evident in the Namibian curricula at both levels. With regard to skills, the NSC curriculum has a much stronger mapwork component – both in terms of skills specified and demands made in assessment. However, in other areas of graphical responses and data handing the Namibian curricula are much stronger than the NSC curricula. In addition, while the NSC curricula does have a suggested enquiry-based task as an option for internal assessment, the Namibian curricula have an entire paper devoted to the assessment of candidates' understanding of research methodology and their ability to interpret data from a range of research techniques, and to evaluate these techniques.

9. Conclusion

An attempt was made to ascertain the level of comparability of the various international qualifications with the NSC. This is discussed for each of the curricula below:

Level of IB (Higher and Standard Level) and NSC curricula

The evaluation team has rated the IB (Higher and Standard Level) as of a **higher demand than the NSC** because, while developing a broad base of knowledge in issues in Human Geography, it also allows for in-depth exploration of a range of relevant topics. The content specified places an emphasis on theoretical understanding of processes and patterns, and the application of these to case studies. Candidates thus develop a global perspective, and a range of concepts, which they can apply in various contexts. The data handling and graphical analysis required of candidates is also of a high standard, with candidates

being expected to manage statistical techniques beyond those in any of the other curricula (Document 16, p. 11). The questions set in the examination paper make high cognitive demands on candidates – requiring understanding, application and analysis of key issues, and extended responses. While candidates always have an alternative to the essay questions set, even the structured questions make demands on candidates' extended writing skills. Candidates thus have to recall knowledge, synthesise and organise information in a coherent manner, and demonstrate deep understanding. There are few opportunities for simple and unsupported responses. In addition, the internal assessment component makes demands on candidates to conduct an enquiry in a rigorous manner, and while there is educator support, it places an emphasis on independent investigation. Although the demands here are greater for Higher-Level candidates, they are none the less also challenging for candidates on the Standard Level.

Level of CIE AS Level and NSC curricula

The AS-Level curriculum develops a broad base of knowledge in both Physical and Human Geography. When the evaluation team compare the content breadth with that specified in the NSC curriculum, it is the team's opinion that the demands are lower than those of the NSC curriculum. Although the AS-Level paper includes "Population", which is not covered in the NSC curriculum at Grade 12-level, there are notable omissions in the AS-Level curriculum with regard to economic geography and to development studies. Although the NSC curriculum does not directly specify development studies at Grade 12, there are strong elements of this area infused into the description of the economic geography section. The AS-Level examination papers do place a greater emphasis on extended writing than do those of the NSC, but the requirements related to graphical and data analysis are significantly lower. Hence we would conclude that in terms of depth the **AS-Level curriculum is similar to the NSC curriculum.**

Level of CIE A-Level and NSC curricula

The evaluation team is of opinion that, in terms of breadth of content covered, the CIE A-Level curriculum is similar to the NSC curriculum. However, the demands of the A-Level curriculum are higher than those of the NSC curriculum in terms of depth. The A-Level curriculum builds on the core developed in the AS-Level curriculum, and further demands an in-depth study of two topics chosen from a range in both Physical and Human Geography. In these topics, candidates need to develop a sound theoretical knowledge, and apply this in the context of case studies from more and less developed countries. This makes the course more rigorous in terms of depth of content than the NSC curriculum. The data handling skills and graphical techniques required are not well articulated in the curriculum, and the examination papers suggest that a relatively low level of skill is required in these areas of analysis. On the other hand, the examination papers demand a degree of extended writing that is similar to that in the structured response questions of the IB Standard Level, and demand that candidates draw on theoretical understanding, synthesise information and use it to answer a question or justify an evaluation. Despite certain similarities, the absence of a requirement for the inclusion of an independent study in the overall assessment make this curriculum less demanding than the IB curriculum.

Level of CIE IGCSE and NSC curricula

The **IGCSE is far less demanding than the NSC curriculum in terms of both breadth and depth of prescribed content**. There are fewer topics specified, and the degree of detail and of abstractness in these is notably less than in the topics in the NSC curriculum (see **Table 1**). The outcomes associated with content themes do not refer to the need for candidates to be

able to make value judgements and justify their choices. However, in the examinations, the IGCSE candidates are required to interpret and analyse a broad range of data presented in a variety of ways. They are expected to draw conclusions from the analysis of resources, and use the information in the resources to support these. The questions that are set require learners to draw meaning from the resources provided, and not merely to use them as a prompt to recall. In addition, those candidates who are allowed to take the course work option have to demonstrate an ability to work independently on an authentic inquiry task, while those who take the externally set Paper 4 do have to engage with questions related to research methodology and techniques. Overall, while the content demands are not as great in the IGCSE curriculum as in the NSC curriculum, the demands with regard to data analysis and interpretation are higher, and there is a greater emphasis on understanding and implementing research methods and techniques. Thus while the content demands are less in the IGCSE curriculum, the assessment places less emphasis on recall and simple responses than is the case in the NSC curriculum (Documents 8, 9, 10 and 11).

Level of Namibian Ordinary Level and NSC curricula

Since the content is less demanding in terms of breadth, depth and theoretical and abstract knowledge than the NSC curriculum, the evaluation team concluded that the Namibian Ordinary Level is of **a lower demand than the NSC curriculum**.

Level of Namibian Higher Level and NSC curricula

In terms of content, the Namibian Higher Level curriculum requirements are similar to those of the NSC curriculum in terms of breadth, depth and theoretical and abstract knowledge. The evaluation team therefore concluded that the Namibian Higher Level is of a **similar demand than the NSC curriculum**.

Comparison of the Life Sciences curricula of the NSC and Biology curricula of various international qualifications (IQs)

Evaluators: Dr Edith Dempster (Team Leader), Mr Peter Preethlal, Mrs Susan Wiese, Mrs Lizette Cilliers

Subject: Life Sciences (Biology)

Grade: 10-12

Documents: NCS2 2007, Cambridge IGCSE 2009, Advanced Secondary and Advanced Level 2009, International Baccalaureate Standard Level and Higher Level 2009, Namibia Ministry of Education Ordinary Level and Higher Level 2008.

International qualifications

Table 1: List of examining authorities and qualifications studied.

	Examining authorities	Qualifications
National Senior Certificate subjects involved: Life Sciences	**Cambridge International Examination (CIE)** **Subject analysed: Biology**	International General Certificate of Secondary Education, Advanced Subsidiary and Advanced Level curricula 2009
	International Baccalaureate Organisation **Subject analysed: Biology**	Diploma Standard and Higher Level 2009
	Namibia **Subject analysed: Biology**	Namibia Senior Secondary Certificate Higher Level and Ordinary Level

Table 2: Table 2: List of documents consulted

Circular 67/ 2007 New Content Framework Life Sciences	1
NCS2 Life Sciences Grade 10	2
NCS2 Life Sciences Grade 11	3
NCS2 Life Sciences Grade 12	4
Cambridge IGCSE 2009 Biology 0610 Syllabus	5
Cambridge AS/A Level 2009 9700	6
Cambridge Teaching AS Biology Practical Skills	7
Cambridge Teaching A2 Biology Practical Skills	8
IB Diploma Programme Guide	9
Subject Assessment Guidelines Life Sciences 2008	10
National Curriculum Statement Life Sciences 2003	11
Namibia Senior Secondary Certificate Biology Syllabus Higher Level	12
Namibia Senior Secondary Certificate Biology Syllabus Ordinary Level	13

1. Overview of each curriculum

The **NSC curriculum** provides a list of content separately for each of **three** years of study, Grade 10, 11 and 12. Each year is examined separately, with only Grade 12 being examined externally. The curriculum is arranged around three learning outcomes, which are intended to form the core of the curriculum. The three learning outcomes, as stated in the NCS2 Content Framework, are:

Learning Outcome 1: Investigating phenomena in the Life Sciences.
Life Sciences focuses on exploring and investigating phenomena in the Life Sciences using inquiry, problem-solving and critical thinking skills. These include diverse ways of collecting data, analyzing data, reporting results and drawing valid inferences and conclusions from the data collected. Life Sciences investigates living systems through a range of different techniques, and learners will acquire investigative skills relevant to each knowledge area.

Learning Outcome 2: Constructing Life Sciences knowledge.
The learner is able to demonstrate construction, acquisition, understanding and application of Life Sciences facts and concepts to explain phenomena relevant to Life Sciences

Learning Outcome 3: Applying Life Sciences in society.
The learner shows understanding of: the history of some scientific discoveries, the nature of science, how indigenous knowledge relates to living systems, applications of Life Sciences in industry, career opportunities in Life Sciences, and how Life Sciences is applied in everyday life

.

In its original form, as expressed in the NCS Policy document (Document 11), the learning outcomes were built through a series of assessment standards that progressed through the Grades. However, as the NCS has rolled out over the FET phase, the assessment standards have receded until they play very little role in the design of learning programmes and in assessment. The policy document (Document 11) and the new content framework document released in 2007 (Document 1) list the content under the three separate learning outcomes, while in some provinces, the "assessment syllabus" (Documents 2, 3 and 4), developed and distributed by subject advisors in each province, lists all content in one column, with no separation into discipline-specific knowledge, applications, and skills or learning outcomes. This document is distributed to schools and is the one that is most useful to educators, according to subject advisors.

The **Cambridge IGCSE syllabus** for Biology (Document 5) provides an outline of the content, skills and assessment specifications for the **two-year** courses for examination at age16-plus. The IGCSE syllabus content is organised in three columns, with the main topics and concepts in the first column, the centre column showing amplification of the core topics and concepts that is prescribed for all candidates, and the right-hand column showing supplementary material for students following the extended curriculum. Educators are advised to draw attention to the relevance of concepts to the candidates' everyday life wherever possible (Document 5, p. 7).

The **IGCSE Extended Curriculum** (referred to in this report as IGCSE X) follows the same curriculum as the IGCSE, but with some additional material in each topic studied. Thus each topic is studied in more depth than the normal curriculum.

The **Namibian Senior Secondary Certificate** is offered at two levels: a Higher Level (Document 12) and an Ordinary Level (Document 13). The difference between the two levels is not

made explicit in the documents. Most candidates register for the Ordinary Level curriculum, with a very small number of candidates writing the Higher Level examinations. The syllabus documents are intended for **two years** of study, and prepare candidates for the exit level examinations in Namibia, hence "Senior Secondary Certificate". The documents are clearly based on CIE documents, but a distinct Namibian flavour is added. Content is organised in three columns, giving topics, general objectives, and specific objectives, thus providing clear guidelines for educatorss. Suggestions for practical activities are made at the end of each topic.

The Cambridge Advanced Subsidiary Level and **Advanced Level Syllabus** for Biology (2009) provide the syllabus for the one-year (AS Level) or two-year (A Level) qualification (Document 6). The subject content is presented as learning outcomes, and the examination will assess candidates' knowledge and understanding of these (Document 6, p. 8). The syllabus document emphasizes that it is not intended to be a teaching syllabus, nor is it intended to prescribe a teaching sequence. Educators should exercise their own judgement in making choices about sequencing and pacing, and should incorporate additional material such as social, environmental, economic and technological aspects of Biology wherever possible throughout the syllabus (Doc 6, p. 9). A further assumption is made that educators will select examples to illustrate concepts and content from a wide range of organisms (Document 6, p. 10). The Advanced Level syllabus is an extension of the AS-Level syllabus. Candidates for the AS-Level study eleven Core units and are examined after one year of study. A-Level candidates study the same eleven units as the AS-Level candidates, plus a further ten units including Core and Applications of Biology content. They are examined at the end of two years of study. A candidate who has completed an AS Level and wishes to proceed to the A Level year may do so, carry their AS-Level results over, and write only the additional papers required for the A-Level qualification. Candidates who register initially for the A-Level qualification write all the papers in one examination session at the end of two years of study.

The **International Baccalaureate** Programme is a two-year programme of study, offered at two levels: a Standard Level and a Higher Level (Document 9). Besides the study programme in the individual subjects, the IBO programme requires candidates to study the theory of knowledge, which is integrated into each subject. Through this component of the subject, candidates are encouraged to think about the nature of knowledge and the process of learning in their subjects, thus developing metacognitive knowledge. They are encouraged to integrate this learning across all their subjects, culminating in an extended essay, which investigates a topic of special interest to the candidate. The integrated essay requires independent research by the candidate, and results in a substantial piece of writing, similar to the kind of work students would be required to produce during University study.

In addition to the essay, students in the IBO are required to engage in experiential learning through a range of artistic, sporting, physical and service activities (Document 9, p. 2).

The organisation of the IBO curriculum document is topics, followed by sub-topics, with estimated teaching times to cover the material. The outcomes expected of learners at the end of the course of study are expressed in the form of assessment statements, e.g., "*5.1.2 Distinguish between autotroph and heterotroph*". The assessment statements indicate to examiners what candidates can be expected to do at the end of the course. Educator's notes appear alongside some assessment statements and provide further guidance to educators (Document 9, p. 7).

2. Aims of the curriculum

The aims of the curriculum, as stated in each curriculum, are shown in **Table 3**.

Curriculum	Aim
NCS	The subject Life Sciences prepares learners for additional education and training, vocational careers and the world of work, and self-employment. It caters for careers such as medicine, bioengineering, psychology, nursing, education, marine biology, and environmental science. (Doc. 1, p. 4 – 5, Doc. 11, p. 7, p. 11)
IGCSE	The aim of the IGCSE curriculum is to provide education in concepts that are relevant to the student's everyday life and to the natural and man-made world. Teachers and learners should aim to develop transferable lifelong skills relevant to the increasingly technological environment in which people live. Aims are also expressed in terms of developing knowledge, skills, attitudes and values relevant to Biology (Doc. 5, p. 1-2, 7).
Namibia	The aim of the syllabus is to equip learners with the necessary knowledge, skills and attitude for tertiary education or the world of work. Aims related to knowledge, skills, attitudes and values are very similar to IGCSE (Doc. 12 & 13, p. 2).
AS/A-Level	The aim of the Cambridge AS/A Level is to encourage understanding and application of concepts rather than recall of factual material in Biology. It aims to prepare students for higher education, or to be informed citizens in scientific matters. Aims in terms of knowledge, skills, attitudes and values are almost identical to IGCSE, with a few additions (Doc. 6, p. 1 – 2, 8 – 9).
IBO	The Diploma programme is a rigorous, pre-University course of study designed for students in the 16-19 age range. It aims to encourage students to be knowledgeable and inquiring, but also caring and compassionate. There is a strong emphasis on encouraging students to develop inter-cultural understanding, open-mindedness, and the attitudes necessary for them to respect and evaluate a range of points of view (Doc. 9, p. 1, 3, 40).

All curricula express two-fold aims: to provide a foundation for further study, and to develop well-educated citizens who may enter the world of work, and who are able to make informed decisions in the modern world. The IBO is more focused on preparation for university study. The CIE curricula and the Namibian curricula share a common set of aims, which are related to knowledge, skills, attitudes and values. The list of aims contained in these documents provide a comprehensive range of relevant skills, knowledge, attitudes and values for the study of Biology, developing the skills of working as a biologist, being able to apply biological knowledge in everyday life, acting in an environmentally responsible manner, and demonstrating a critical awareness of the nature and limitations of scientific knowledge.

This list of aims is contained in the New Content Framework for Life Sciences in South Africa, although expressed differently in the form of a list of objectives (Document 1, p. 1).

Guidance provided for achieving the aims

The NSC curriculum provides guidance for achieving the aims in that it incorporates numerous references to careers in biological fields of work, and creates opportunities for students to debate topical issues related to Biology (Document 1). It makes specific provision for developing skills that are valued in the world of work. Preparation for further study in Biology emerges from the exposure to the structured content knowledge and the range of skills.

The IGCSE does not explicitly mention careers in Biology in the content framework. This is to be expected, since it is not intended to be a final qualification, but should lead on to further study in a vocational field or an academic field.

The Namibian curriculum aims to prepare learners for tertiary education or the world of work.

There are very few mentions of careers in Biology. Opportunities for achievement of the aims is interspersed through the curriculum.

The AS-Level, A-Level and IB curricula provide ample opportunity for the development of knowledge and skills. Preparation for aims relating to attitudes and values are less explicit in the curriculum. The IB provides opportunities for candidates to develop skills that will prepare them for the world of work and for responsible world citizenship, through their involvement in the Group 4 Project.

3. Content

3.1 Organising principle and coherence

The organising principle here is interpreted as a statement that indicates how the content and skills were selected and organised in the syllabus. The organising principle is explicit in some cases, and not well stated in others. It is shown in **Table 4.**

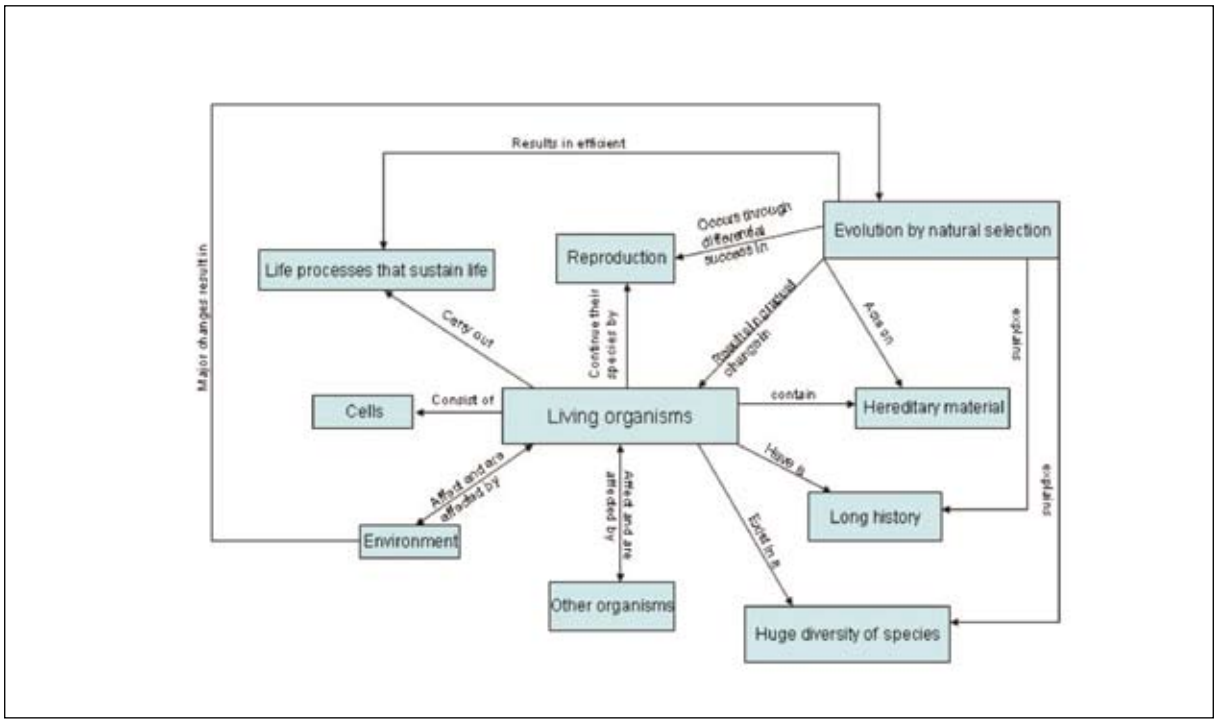
Table 4: Organising principle for each curriculum

Curriculum	Organising principle
NCS	Life Sciences is the systematic study of life in the natural and human-made environment. Understanding basic life processes and interdependence between living and non-living components of the environment are priorities. Skills of inquiry, problem-solving, critical thinking, and application of knowledge are developed. Learners also gain an understanding of the relationships between science, technology and society with a view to becoming responsible citizens. The subject matter is arranged into four strands: Life at the molecular, cellular and tissue level; Life processes in plants and animals; Environmental Studies; Diversity, heredity and evolution. (Doc 11, p. 9; Doc. 1, p. 5)
IGCSE	The specified content of the IGCSE syllabus has been limited in order to permit flexibility in teaching programmes. Learners should be exposed to a variety of learning experiences designed to enhance the development of skill and comprehension in concepts that are relevant to the student's everyday life. (Doc 5, p. 2, p. 7)
Namibia	The aims of the Namibian syllabus are to increase knowledge and understanding of the physical and biological world. This includes use of the natural environment to satisfy human needs, and ecologically sustainable ways of changing the environment. Essential skills such as critical thinking, investigating phenomena, interpreting data, are developed to understand the value and limitations of scientific knowledge and methods, and their application to daily life. Applications of scientific knowledge and attitudes to human health are emphasized (Doc 12, p. 2).
AS/A-Level	Learners should be exposed to a variety of learning experiences designed to enhance the development of skill and comprehension. Practical activities should underpin all teaching of the syllabus (Doc. 6, p. 10)
IBO	Through studying any science subject, students should become aware of how scientists work and communicate with each other. While the scientific method may take on a variety of forms, it is the emphasis on a practical approach, through experimental work, that distinguishes the science subjects, from other subjects. Four basic biological concepts run throughout the course: structure and function, universality versus diversity, equilibrium within systems, and evolution (Doc. 9, p. 9, 40).

The NSC and IB curricula state organising principles in terms of which the content has been selected and organised, i.e., some form of rationale upon which choices were made for the organisation of subject matter. In the NSC curriculum documents, the organising principle is stated broadly in the Policy Document (Document 11) and more specifically with regard to the content framework in Document 1 (p. 1). The content framework describes the vision of a holistic approach to the study of Biology, with interlinking concepts, centred around two foci: the whole living organism and evolution by natural selection.

This is reproduced below in **Diagram 1**. All other concepts link to these foci. The levels of organisation of living systems from molecules through to biomes forms the organising principle for three of the knowledge areas: Life at the Cellular Level (molecules, cells, tissues and organs); Life Processes in Living Organisms (organ systems and whole organisms), and Environmental Studies (ecosystems, populations, communities and biomes). The fourth knowledge area intersects with all three knowledge areas and includes Diversity, heredity and evolution.

Diagram 1: An overview of the holistic nature of Life Sciences



Content in the IB curricula is organised in relation to four principles: structure and function, universality versus diversity, equilibrium within systems, and evolution. This represents an attempt to identify higher-order integrating concepts that organise knowledge in the curriculum. This is absent in the Cambridge curricula and Namibian curriculum. All four curricula mention the development of skills alongside the development of concepts.
The content in the NSC curriculum can be mapped onto the overview, and links are made explicit in the text of the curriculum where links should be made. It then remains for textbook writers and educators to interpret the curriculum in this way. The IB curricula do not indicate how the content maps onto its stated organising principle, and this is not made explicit in the syllabus listing.

3.2 Sequence, progression and pacing

The NCS is the only curriculum that specifies content by year of study. The progression may be externally controlled through the operation of cluster moderation, since internal assessment is monitored, controlled tests are scheduled for the same time of the year within clusters, and mid-year and end-of-year examinations are set and issued by the Department of Education. These monitoring measures ensure that most schools progress through the curriculum at the same pace, and all will complete the whole syllabus by the end of each year.

The IGCSE, Namibian and IB curricula are not separated by year of study, and therefore no comment can be made about progression/advancement across the period of the curriculum. All curriculum documents identify clearly what skills must have been achieved

and what content must have been covered by the end of the whole programme of study, and in the case of the NSC and the AS- and A2-Levels curricula, each year of study.

The sequence in which content is taught is not prescribed in any curriculum, although guidance is provided in the NCS (Doc. 1, p. 4), where the sequence of knowledge areas is specified, partly because of the timing in the year when it is best to teach ecology, but also where concepts in one knowledge area rely on prior concepts being developed.

The NSC curriculum builds progressively on concepts such as evolution, which are developed gradually from the fossil record in Grade 10, descent with modification and biogeography in Grade 11, and Darwin's theory of evolution by natural selection in Grade 12, together with genetics. The study of systematics develops from a study of kingdoms in Grade 10 to selected phyla in Grade 11, in conjunction with tree-thinking. The study of ecology progresses from the biosphere, biomes and ecosystems in Grade 10 to population and community ecology in Grade 12. A fair degree of guidance is given to educators; however, this may not be sufficient for educators who are unfamiliar with some of the new concepts and subject matter in the curriculum.

The advantage accruing from integration of the curriculum is that it facilitates vertical progression of concepts. In that sense, the NSC curriculum has an advantage over those international curricula, which have no defined organising principle.

3.3 Comparing content coverage

A generic list of content was constructed using the following headings:

1. Introduction to the study of Biology
2. Cell Biology
3. Plant Biology
4. Animal Biology
5. Ecology
6. Diversity and Evolution
7. Applied Biology

These headings are commonly used in core Biology courses, and are included in foundational Biology courses at university level. Topics were then listed under each heading to reflect a generic list of topics most frequently encountered in core biology courses. The list was constructed through discussion and consensus within the group. The list was kept as short as possible by not adding new topics if a topic could be included in an existing topic, or if a topic would never be taught separately from an existing topic. As curricula were analysed, the list was expanded if new topics were encountered that could not be accommodated in the existing list.

After analysis was complete, the list was again scrutinised and topics were combined or eliminated if they occurred in only one curriculum, or if they did not warrant separate listing. The final list consisted of 72 topics.

A potential flaw in this analysis is that the level of subdivision of the main knowledge area can skew the results and appear to indicate falsely that a particular knowledge area is more heavily weighted than other knowledge areas. The results should therefore not be interpreted to indicate weighting, but rather to indicate presence or absence of the topic in the curriculum, and depth of study of each topic. The list of topics identified is shown in **Table 5** on the next page.

Table 5: Generic list of topics identified in this study

1. Introducing Biology	**4. Animal Structure and function (continued)**
Defining the science of life, its scope and its importance.	Structure and function of digestive system and accessory organs; process of digestion and absorption
2. Cell Biology	Reproduction, growth and development
Inorganic elements, ions, molecules and life	Structure and function of nervous tissue, incl. conduction of nerve impulse
Structure and function of organic molecules of life	Structure and function of organs of the central and peripheral nervous system, incl. skin receptors
Compositions and properties of enzymes	Structure and function of autonomic nervous system, incl. parasympathetic n.s
Prokaryotic, eukaryotic, plant and animal cells	Structure, function and functioning of eye
Structure and function of cell organelles, cell wall and cell membranes	Structure, function and functioning of ear
Movement of substances across cell membranes Photosynthesis	Behaviour
Cellular respiration (aerobic and anaerobic)	Structure and functioning of endocrine system Homeostasis
Mitosis	**5. Ecology**
Meiosis	Biomes
Plant tissues	Ecosystems - abiotic and biotic characteristics
Animal tissues	Energy and matter flow
Organs	Nutrient and water cycles in ecosystems.
3. Plant structure and function	Population ecology
Morphology and anatomy of a root	Community ecology - Interactions in the ecosystem
Morphology and anatomy of a stem	Ecological succession
Morphology and anatomy of a leaf	Conservation of the natural environment
Adaptations to different environments	**6. Systematics, heredity and evolution**
Gaseous exchange	Diversity and the Linnean classification system
Transpiration and plant-water relations	Diversity of microorganisms
Translocation of food in plants	Plant diversity
Reproduction in flowering plants	Animal diversity
Life cycles in non-flowering plants	History of life and phylogenies
Growth and development in plants (germination)	Genetics
Tropisms and growth factors in plants	DNA structure and function and the genetic code
Asexual reproduction	Control of gene expression
4. Animal Structure and function	Evolution by natural selection
Structure and function of bone,cartilage, areolar and muscle tissue	Supporting evidence for evolution
Structure and function of skeleton and joints	Population genetics and population evolution
Structure and functioning of muscles	Speciation
Structure and function of epithelial tissue	Human evolution
Structure and functions of organs of the circulatory system and circulation of blood	**7. Applied biology**
Structure and functions of blood tissue	Biotechnology and agricultural applications
Immune system	Gene technology/ recombinant DNA technology
Structure and functions of organs of the gaseous exchange system	Human genome
Process of ventilation and gaseous exchange	Industrial uses of biological processes and products
Structure and function of excretory organs and process of excretion	Human health and disease
Types of nutrition (autotroph, heterotroph, etc.)	Disorders of cell division and genetics, e.g. cancer,

Table 5: Generic list of topics identified in this study (continued)

7. Applied biology (continued)
Downs' syndrome
Disease and disorders of human organ-systems
Healthy practice
Diseases caused by microorganisms
Environmental issues
Human population growth and demand for food
Effects of altering ecosystems, e.g. deforestation, loss of biodiversity
Effects of industrialisation, e.g. pollution
Nature of science
Indigenous knowledge

All topics in each curriculum are examinable. The IB curricula are unique in that it consists of a core and a choice of several options. Candidates choose any two of the options. The core and the options are available at two levels: Standard Level or Higher Level. Additional material is prescribed for the Higher Level in the Core and all the Options.
Two parameters were chosen for comparison among curricula: breadth and depth, where breadth is the total number of topics studied per course of study, and depth is the level at which topics are studied, relative to a first-year university textbook. The value of depth versus breadth in high school science courses has been studied in a large group of undergraduate university students by Schwartz et al. (2008), who found that studying at least one Biology topic in depth at high school was positively correlated with success in university science, and studying a large range of Biology topics superficially was negatively correlated with success in university science courses.

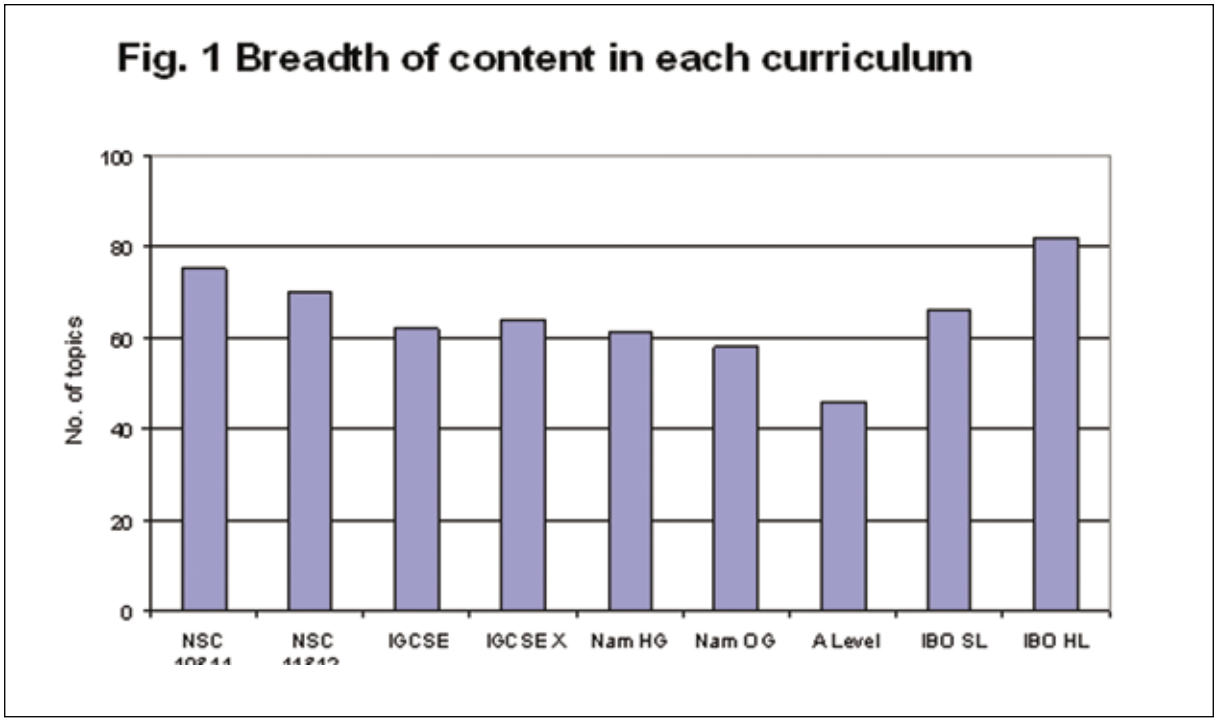
Breadth was measured as the total number of topics studied per course of study. Depth was estimated as *superficial*, *medium*, or *deep*, where "*deep*" is close to the benchmark of a standard first-year university textbook, superficial is considerably less rigorous than the benchmark level; while "*medium*" is somewhere in between. The IB required special treatment since candidates chose any two electives from a range available. The evaluation team calculated the average breadth and depth of the core and all possible combinations of two electives, which amounted to 21 combinations for the SL, and 10 combinations for the HL curriculum.

In the figures which follow, results are presented for each two-year curriculum. This was considered to be a valid form of comparison, since all curricula except the NSC and AS-Level curricula are two-year curricula, with no option for exit at the end of the first year. The NSC has examinations at the end of each year of study, but only the Grade 12 examination is an external examination and is recognized as an exit-level qualification. The NSC Grade 12 examination is based only on content prescribed for that year of study. This means it is only comparable with CIE AS-Level examinations, since all other qualifications examine two years of study in the final examination.

In order to benchmark other curricula against the NSC curriculum, two combinations of two-year study periods of the NSC were considered: Grades 10 & 11, and Grades 11 & 12. It should be remembered that this analysis is not the examined curriculum, but the implemented curriculum, and is subject to the assumption that teaching of the full curriculum in both grades takes place.

3.3.1 Breadth of content in the curriculum

Figure 1 shows the breadth of each curriculum, measured as the number of topics covered in each two-year curriculum.



Overall breadth of content is lowest for the Cambridge A-Level curriculum, and highest for the IB HL curriculum. The NSC Grade 10 & 11 combination had greater breadth than the Grade 11 & 12 combination, and both NSC combinations had greater breadth than IGCSE, Namibian, A-Level and IB Standard Level curricula.

An additional consideration is the amount of teaching time available for Biology in each curriculum. Each curriculum shown in **Figure 1** is a two-year curriculum, and therefore comparable in that sense. However, the number of subjects studied in each qualification varies, and the number of hours of teaching varies. This information is added in **Table 6**.

Table 6 shows that the density of teaching is highest in the IBO SL, followed by the IGCSE, NSC curriculum for Grade 10, IB HL, and NSC curriculum for Grade 11. The NSC curriculum for Grade 12 has substantially lower teaching density than other grades, and is on a par with the AS-Level and the Namibian Higher Level and Ordinary Level curricula. The CIE A-Level curriculum has a very low teaching density.

Teaching density must be considered in conjunction with depth of the content studied, since a smaller number of topics studied in greater depth, and a smaller number of topics studied superficially will give the same measure of teaching density. Depth of study is considered under 1.4.2: Depth of Content.

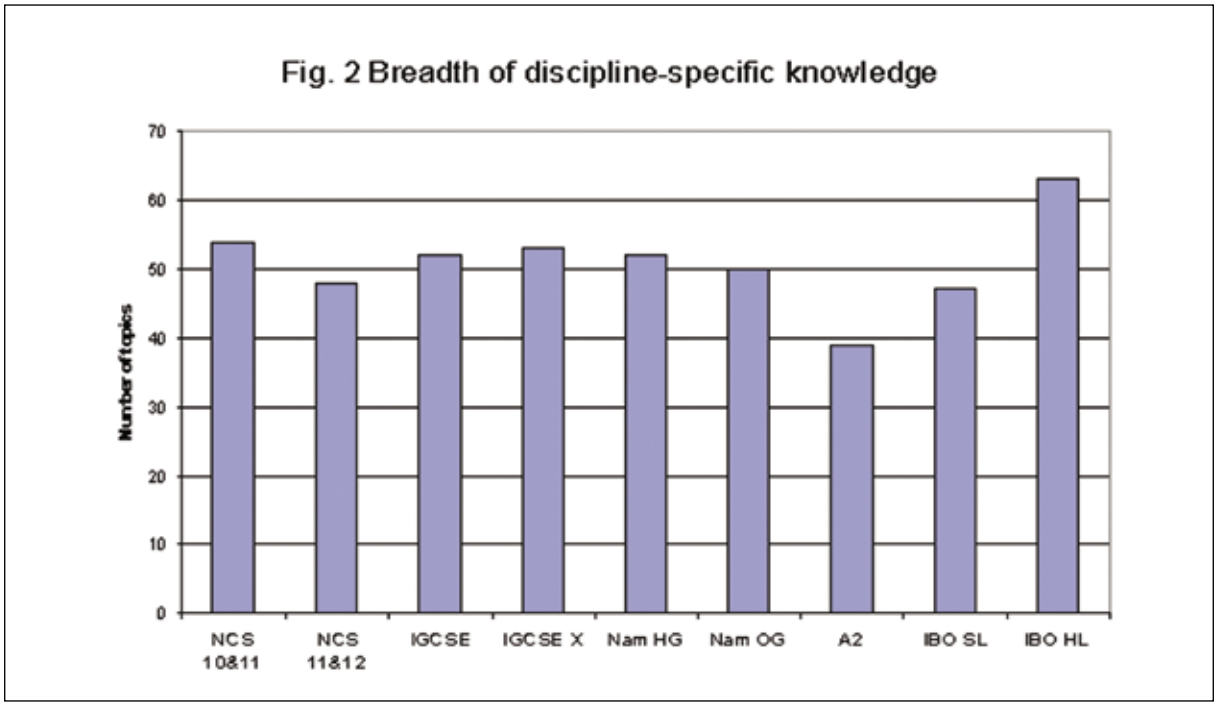
Overall breadth includes Applied Biology, which is often a single mention of an application within a broader discipline-specific topic, whereas the discipline-specific topics were usually substantial sections of work. In order to avoid inflation of breadth because of over-emphasis of applied biology topics, a separate calculation of breadth was carried out, omitting applied biology. The resulting graph is shown as **Figure 2**.

Table 6: Number of subjects studied, number of teaching hours per subject, and "teaching density[1]" for Biology in each qualification.

	South Africa NSC	CIE IGCSE	Namibia SSC	CIE AS and A Levels	IB Diploma Programme
Number of subjects	6 + Life Orientation	6	6 – combination of HL and OL	At least 4 for AS Level. Usually 3 for A Level	6 – usually 3 SL and 3 HL
Number of hours of tuition per subject	Gr 10: 108 h Gr 11: 108 h Gr 12: 78 h	150 h over 2 years	320 h over 2 years	180 h in AS Level 360 h over 2 years in A-Level	150 h for SL 240 h for HL
Teaching density	Gr 10: 0.37 Gr 11: 0.32 Gr 12: 0.2	0.4	HL: 0.19 OL: 0.18	AS: 0.2 A: 0.1	SL: 0.44 HL: 0.34

1 Teaching density is calculated as the number of topics per hour of tuition

Figure 2 shows that removing Applied Biology brings the NSC curriculum into alignment with IGCSE, Namibian, and IB SL curricula, while the A-Level curriculum remains less broad, and the IB HL broader than all other curricula. It should be borne in mind that the Cambridge IGCSE and A-Level curricula do not specify the applied content, but advise educators to incorporate applications where appropriate throughout the curriculum. In the IB curricula, Applied Biology may occupy up to 41% of the curriculum in the SL and 30.5% in the HL curriculum, depending on the choices of electives. At a minimum, it may occupy 21.2% of the SL and 18.3% of the HL curriculum.



One may conclude, therefore, that the NCS differs from the Cambridge and IB curricula in its prescription of a significant amount of Applied Biology topics in the curriculum.
Figures 1 and **2** also reflect the differences in purpose of the two Cambridge curricula: IGCSE is intended to provide an understanding of biological phenomena that are relevant to the learner's everyday life, whereas the A-Level curriculum aims to give a thorough introduction to the study of Biology. The CIE A-Level curriculum is thus more focused, while IGCSE is broad.

3.3.2 Depth of curriculum

Depth of the curriculum was calculated as the percentage of the total number of topics studied in the course of the curriculum assigned to each level of depth. A topic may have been revisited twice or more times over the course of the two years of study, in which case the deepest level of study was taken as the depth.

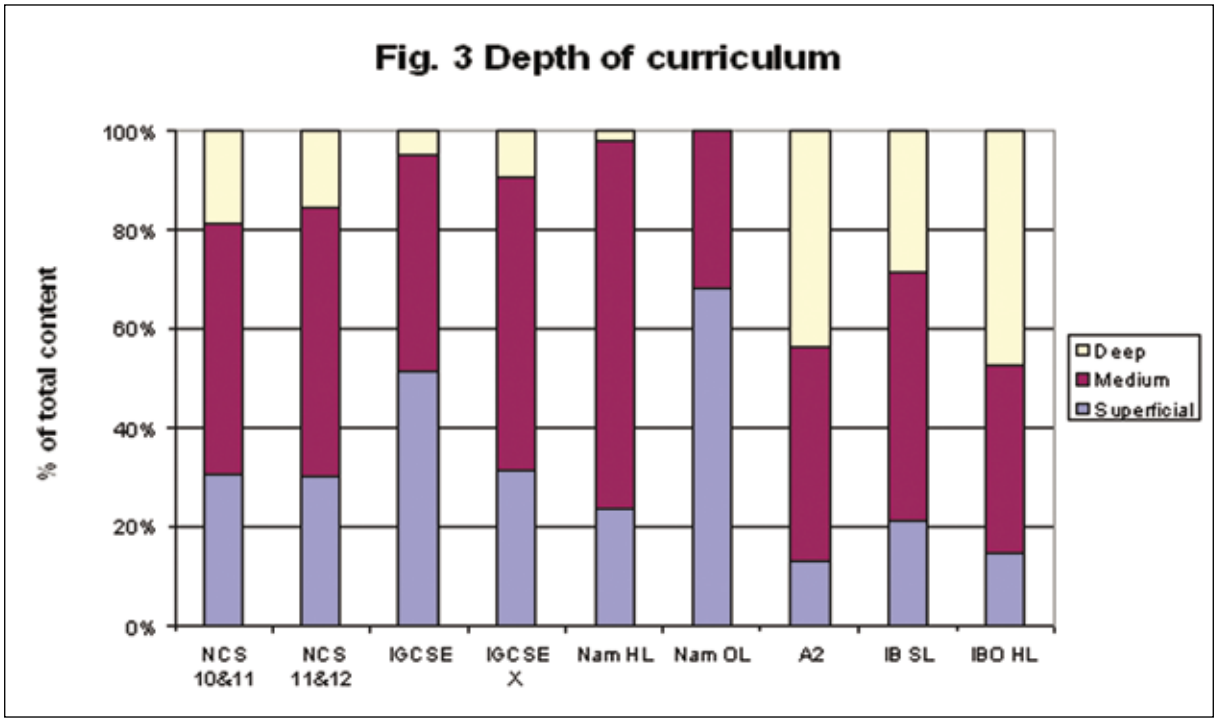


Figure 3 shows that the A-Level and the average IB Higher Level curricula stand out as having the greatest proportion of topics studied at a deep level, and the lowest proportion of topics studied at a superficial level. The IB Higher Level electives were notable for covering topics at a depth equivalent to the first-year Biology textbook, and occasionally deeper than that. The NCS for Grades 10 & 11 and the NCS for the Grades 11 & 12 combinations had similar proportions of superficial, moderate and deep content, and both combinations were substantially less deep than the CIE A-Level and the average IB Higher Level, and rather less deep and more superficial than the average IB Standard Level curriculum.

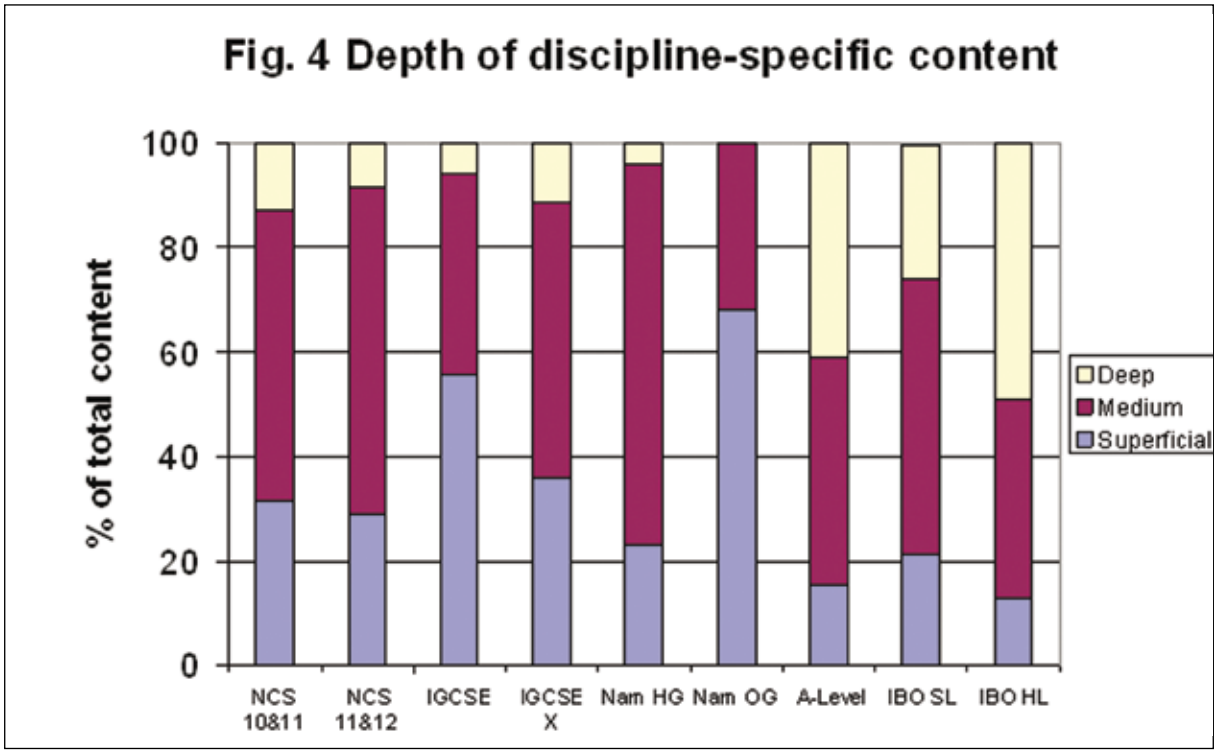
In comparison with IGCSE, the NCS had a comparable proportion of superficial topics to IGCSE extended curriculum, fewer moderate topics, and more deep topics than IGCSE X. The normal IGCSE was substantially less demanding than NCS. Namibia's Higher Level syllabus had more medium-depth content than the NCS, but less deep content. The Namibian Ordinary Level syllabus had much more superficial content and no deep content.

Summing up: The team is of opinion that the South African NSC curriculum (for both Grades 10 & 11 and Grades 11 & 12) intermediates between the IGCSE and A-Level curricula, although the IGCSE Extended Curriculum approaches the depth of the NCS. Namibia's HL

syllabus is similar to the IGCSE X, while its OL syllabus is substantially more superficial than any other curriculum in this study. The order in increasing levels of depth would be:

1. Namibia OL
2. IGCSE
3. IGCSE X/Namibia HL
4. NCS 11& 12
5. NCS 10 & 11
6. Average IB SL
7. A2
8. Average IB HL
9. AS Level

In order to correct for possible inflation or deflation of depth due to the over-emphasis of Applied Biology, the depth of the curricula were re-calculated without the Applied Biology topics, yielding **Figure 4**.



The omission of applied Biology means that the NCS loses depth, particularly in Grades 11 & 12. However, it is still apparent that A-Level, IB SL and HL are substantially different curricula from NCS, IGCSE and Namibian curricula in the depth of content studied. Namibian HL and IGCSE X both have a similar depth profile to the NCS for Grades 10 & 11 and Grades 11 & 12.

Breadth and depth have been shown to play a significant role in the future success of students in higher education (Schwartz et al., 2008). A secondary school curriculum that includes one or two topics studied in depth is associated with successful study at tertiary level, even at the expense of breadth. With this in mind, A-Level, IB SL and IB HL curricula could be predicted to provide better preparation for tertiary study than the NSC, Namibia or IGCSE curricula, all of which claim to prepare candidates for further study in science, although this is not the only aim of the curriculum. Teaching density provides a measure of the amount of teaching time devoted to teaching the curriculum, and taken in conjunction with the depth factor, gives an indication of the effectiveness of the curriculum. A deep curriculum with high teaching density could be worse than a superficial curriculum with low teaching density.

Table 7 summarizes the results for breadth and depth, seeking evidence of combinations of depth without breadth, which Schwartz et al. (2008) found to be the best combination for Biology at secondary school level, as an indicator of success in future study at tertiary level.

Table 7: Summary of breadth, depth and teaching density in 2-year exit-level curricula[1] analysed in this study

	NCS 11 & 12 (12 only)	IGCSE	IGCSE X	Namibia HL	A2	IBO SL	IBO HL
Breadth	48 (25)	52	53	52	39	47	63
% Deep topics	8% (12%	6%	11%	4%	41%	25%	49%
Teaching density	0.38 (0.2)	0.4	0.4	0.19	0.1	0.44	0.34

1Applied Biology is excluded from this analysis

The significance of **Table 7** is that preparation for tertiary study often assumes that adequate foundations in a discipline require a broad exposure to the full range of foundational topics. Schwartz et al.'s study showed that breadth in secondary school study was detrimental to progress in tertiary education, and depth of study in one or more topics was beneficial. Applying the principles suggested by Schwartz et al. (2008) to the present study, the curriculum best suited to tertiary study is the A-Level curriculum, followed by the IB HL curriculum, although it appears to be very broad in addition to having depth. The IB SL curriculum has similar breadth to the NSC Grades 11 & 12 curricula, but it has more depth, thus making it a better preparation for tertiary study.

The remaining curricula have breadth with very little depth. It should also be borne in mind that in the South African NSC, only the final year of study is examined, whereas in the other qualifications the last two years of study are examined. The depth of content studied in the NSC Grade 12 curriculum is greater than the combined Grade 11 & 12 year, but is still far from the depth and breadth of the A-Level and IB curricula.

Adding teaching time to the summary factors, the A-Level curriculum has the lowest teaching density by far, emphasizing that those candidates study fewer topics in greater detail than other curricula. The Namibian curriculum also offers a low teaching density, but little depth, indicating that those candidates receive good grounding in a broad range of topics. The South African NSC candidates have experienced lower teaching density in Grade 12 than they did in the two preceding years, but again, their curriculum lacks depth. The IGCSE and IGCSE X candidates study a broad range of topics at a fairly rapid rate, with IGCSE X candidates who would study those topics at a level of depth comparable with the South African NSC candidates. One might predict that candidates who have passed the IGCSE X might cope with tertiary study as well as candidates who hold the South African NSC. Finally, candidates who have passed the IB HL and SL, while not perfectly prepared for tertiary study, according to Schwartz et al. (2008), are certainly far better prepared than candidates who hold the NSC.

3.3.3 Content coverage

Content coverage was compared in the curricula to identify where possible gaps exist that may affect students' preparation for tertiary level study. The total number of topics in each knowledge area was calculated as a percentage of the total number of topics identified in the curriculum. The results are shown in **Table 8**. The IGCSE X curriculum is very similar to the

IGCSE curriculum, and the Namibia OL curriculum is very similar to the Namibia HL curriculum, therefore these two are omitted in **Table 8**. The AS-Level curriculum is the first year of the A2 curriculum, and is not shown separately from the A2 curriculum.

Table 8: Breadth of coverage per knowledge area, expressed as a percentage of total number of topics in the curriculum

	NCS 10	NCS 11	NCS 12	IGCSE	Nam HG	A2	IB SL[1]	IB HL[1]
Cell Biology	30	0	3	21	21	24	18 -24	15-15
Plant Biology	5	14	11	18	21	13	0	11
Animal Biology	15	26	26	26	21	26	24 - 29	20 - 36
Ecology	10	9	11	7	8	9	8 - 18	9 - 16
Diversity & Evolution	15	17	20	11	15	13	11 - 25	9 - 13
Applied Biology	23	34	29	16	15	15	21 - 44	18 - 31
Total number of topics	40	35	35	62	61	46	66[2]	82[2]

1 IB is offered as a core and two elective modules. Breadth is shown as the minimum and maximum possible dependent on the choice of electives.
2 The total number of content topics for IB SL and HL is shown as the average for all possible combinations of Core and Electives (21 for SL and 10 for HL).

Table 8 shows that each knowledge area was covered in each curriculum with the exception of Plant Biology in the IB SL curriculum. This represents a significant gap in the knowledge of IB SL candidates entering tertiary level study in general biology courses.

The percentage coverage per knowledge area is rather similar across the curricula, in particular with regard to Animal Biology, where it occupies about 25% of the content in each curriculum. Ecology occupies about 10% of the content, and diversity and evolution between 10 and 20%. Applied Biology occupies a greater proportion of the curriculum in the South African NSC than in Cambridge curricula, and in the IB the choice of electives could weight the curriculum heavily with Applied Biology. The percentage overlap with the NSC curriculum was calculated as the number of topics that occurred in both NSC curriculum and each of the international curricula, calculated as a percentage of the total combined number of topics in both the NSC and the international qualification in that content area. **Table 9** shows this analysis by major content area.

Table 9: Percentage overlap in content coverage between the NCS and international curricula

	Percentage overlap between the NCS and international curriculum				
	IGCSE	Namibia HG	A2 Level	IB SL Core	IB HI Core
Cell Biology	100%	100%	81%	88%	88%
Plant Biology	91%	91%	55%	0%	73%
Animal Biology	81%	63%	63%	56%	69%
Ecology	50%	63%	50%	63%	13%
Systematics, heredity and evolution	64%	82%	55%	64%	64%
Applied Biology	85%	69%	54%	85%	85%

Table 9 shows the overlap in breadth. The curricula most similar to the South African NSC curriculum are the IGCSE and the Namibian curricula, and the most dissimilar curricula are the A2 and IB Core curricula. This table reinforces the findings elsewhere, which is that the IGCSE, NCS and Namibian curricula are designed to give a broad overview of Biology, whereas the IB and particularly the A2 are more selective, with a narrower range of topics, which are

covered at greater depth. In terms of preparation for further study, we note the omission of Plant Biology from the IB SL curriculum, but note Schwartz et al.'s (2008) findings that studying fewer topics in depth was a better predictor of future success in tertiary study than studying a broad range of topics without depth.

3.4 Content weighting

Content weighting in terms of classroom time per topic is assigned for IB, but not for other curricula. It is therefore not possible to evaluate content weighting from time allocations for the curricula included in this study.

3.5 Discipline-specific versus everyday knowledge

In the total content list, 77 out of the 94 (82%) topics were discipline-specific, and 17 (18%) were related to everyday life (required by school-leavers in order to cope with everyday living). There were no generic topics (useful for more than one school subject/ useful for academic study in general). It should be noted, however, that a substantial proportion of the content in Animal Biology covers human anatomy and physiology, which could be regarded as related to everyday life, since it increases knowledge about a student's own body. However, knowledge about diseases and disorders of humans was recorded under Applied Biology, not under Animal Biology. The content list is therefore biased towards the discipline-specific knowledge.

The analyses in the "Content coverage" section above give details of the content focus of each curriculum. This is summarized on the next page.

Table 10: Balance of discipline-specific: Applied Biology in each curriculum, expressed as a percentage of the total number of content topics in that curriculum

	NCS 10	NCS 11	NCS 12	IGCSE	Nam HG	A2	IB SL[1]	IB HL[1]
Discipline-specific (%)	77	66	71	84	85	85	71	77
Applied Biology (%)	23	34	29	16	15	15	29	23
Total content topics	40	35	35	62	61	46	66	82

1Average for all possible combinations of core and electives.

The implications of the relative weighting of discipline-specific and applied topics are debated at length in the literature on science education, with different authors arguing for different positions. Aikenhead (2006), for example, argues that a curriculum that focuses strongly on the academic discipline at the expense of everyday relevance marginalizes non-Western communities, and has not been shown to prepare students better for tertiary study, nor to improve general scientific literacy among the general population. Donnelly (2006), on the other hand, argues that induction into the ontology and epistemology of science is an important goal of science education at senior secondary level, and that general scientific literacy is a product of any kind of college education, whether intended to develop scientific literacy or not.

A criticism of heavy weighting on applied biology is that it does not contribute to the hierarchical development of knowledge in the discipline. In other words, it adds more content horizontally, but does not contribute to development of conceptual understanding of the way scientists understand and interpret living systems. Abstract and theoretical principles and theories arise from the discipline, not the everyday knowledge, and opportunities to develop

an abstract way of thinking about living systems is lost if applied biology overtakes disciplinary content in the curriculum.

There are no established rules about how much applied biology is too much in a senior secondary curriculum. One can see in the curricula studied here, that applied biology was always less than 30%, but the NSC curriculum and average IB curriculum had the highest proportion of applied content of all the curricula studied. One might speculate that the CIE and Namibian curricula provide better preparation for tertiary level study, provided that the content is structured so that it develops conceptual understanding. A further consideration is that study in Biology at secondary school is not a prerequisite for entry to study in Biology modules at South African universities. However, induction into the discourse, practical skills and foundational knowledge of Biology sets students who have studied Biology at school at an advantage in first-year Biology modules.

4. Skills specification

Skills were analysed by constructing a list of skills that are used in Biology. These were divided into thinking and reasoning skills, skills of conducting an investigation, skills specific to Biology, and skills that are used in other contexts. The final list of skills is shown in **Table 11**. Each curriculum was analysed by searching for specific mention of skills. Levels of difficulty cannot be specified for each skill listed in **Table 11**(on the next page), since many of the skills may be performed at many levels of complexity.

Table 11: Skills analysed by category and presence in each curriculum

	NCS10	NCS 11	NCS 12	IGCSE	Namibia HG	As Level	A2 Level	IB SL Core	IB HL Core
1. Thinking and reasoning skills									
Inductive reasoning								■	■
Deductive reasoning	■			■		■	■	■	■
Hierarchical classification		■		■			■	■	■
Inference	■		■	■	■	■	■	■	■
Support an argument with evidence				■	■	■	■	■	■
Evaluate hypotheses, theories and models			■			■	■	■	■
Problem-solving				■	■	■	■	■	■
2. Conducting an investigation									
Planning an investigation/ generating a hypothesis	■	■	■	■	■	■	■	■	■
Making predictions		■	■	■	■	■	■	■	■
Following instructions	■	■	■	■	■	■	■	■	■
Setting up and/or manipulating apparatus		■	■	■	■	■	■	■	■
Making observations accurately/ Collecting data	■	■	■	■	■	■	■	■	■
Using ICT to collect and process data						■	■	■	■
Recording observations appropriately, e.g. drawing, measurements, descriptions	■	■	■	■	■	■	■	■	■
Conducting repeats of the procedure		■	■			■	■	■	■
Analyzing data (incl. diagrams) appropriately	■	■	■	■	■	■	■	■	■
Identify irregular observations and measurements		■		■	■	■	■	■	■
Presenting results in an appropriate format		■	■	■	■	■	■	■	■
Drawing justified conclusions based on the results		■	■	■	■	■	■	■	■
Writing a report		■	■	■	■		■	■	■
Evaluating investigative procedures	■	■		■	■	■	■	■	■
3. Skills specific to Biology									
Interpreting phylogenetic trees		■							■
Using a microscope	■			■	■	■	■	■	■
Calculating magnifications	■			■					■
Use of Guide books, keys and distribution maps for identifying species	■	■	■	■	■				■
Dissection	■								
Analyse given micrographs, karyograms, graphs.					■	■	■	■	■
Construct models	■	■	■		■				
4. Skills that may be used in other subjects									
Construct a timeline			■						
Statistical analysis of data				■	■	■	■	■	■
Working in a group	■	■				■	■	■	■
Researching a topic in books or other resources	■	■	■	■	■	■	■	■	■
Translating information from one format to another, e.g. words to diagrams	■	■		■	■	■	■	■	■
Debate topical issues	■	■	■					■	■
Making a poster		■	■						
Presenting a talk		■	■					■	■

Skills are listed in **Table 11**, and their presence in each curriculum mapped as a shaded block. Thinking and reasoning skills are not easy to identify, since they are implicit rather than explicitly identified. This is the least accurate part of the skills focus table. All curricula include the steps of carrying out an investigation in varying degrees of detail, with the use of ICT to collect and process data being particularly emphasized in the IB (Document 9, p. 30-32), but also listed in the A-Level /AS Level curricula as an aim of the course of study (Document 6, p. 9). Investigations are identified as hypothetico-deductive experimental work. The specific skills of observation, drawing, recording observations descriptively and in diagrams, using a microscope, and calculating magnifications are included in most curricula. This is a foundational competence in Biology, yet most schools in South Africa do not have microscopes, and the existence of excellent visual materials and photographs mean that microscope use has all but vanished from classrooms. It would be interesting to find out whether A-Level and IB candidates have actually used microscopes.

Using keys and identification guides to identify organisms in the local environment is an important tool in enabling candidates to gain familiarity with the local biodiversity. This is explicitly taught in all curricula except the A-Level curriculum. This is a foundation skill for ecological surveys, which receives superficial or medium attention in most curricula, with little field requirements.

Dissection and constructing models are also foundational skills of biologists, but are not required in most curricula except the South African NSC curriculum. Again, the lack of laboratory facilities may prevent South African educators from actually carrying out the prescribed dissections and model-building.

Generic skills include looking up information in various resources, preparing a poster, making a timeline, problem-solving, and calculating summary statistics. Some of these generic skills are developed in different curricula, with fewer in the NCS than in other curricula. Life-related skills are those that would be useful beyond the formal educational context, such as working in a group, presenting a report, debating topical issues and using various types of reasoning. These are present in all curricula.

To summarize this section, the NCS covers a more representative range of discipline-specific skills than any other curriculum in this study. However, the A-Level and IB curricula provide opportunity for more advanced laboratory skills than other curricula.

4.1 Skills weighting

The weighting of each separate skill in terms of examination time was not specified in any of the documents. Information was given in terms of the weighting of practical skills papers in the final assessment. This is given below. Overall, practical work is weighted at 20-25% of the final mark, or 25% of the total time in the IB curricula. The NCS deviates from this norm, in that only 12.5% of the final mark is directly derived from practical activities, but the final examination papers may contain questions that test knowledge of practical work and skills.

Table 12: Weighting of skills in terms of examination time or teaching time

Curriculum	NCS	IGCSE	Namibia	AS	A2	IBO SL	IBO HL
Weighting	40% of final paper on LO1. Reducing to 20% from 2010. 12.5% of final mark from Practical activities done during year.	Paper 4, 5 or 6. 20% of final mark	Paper 3 19% of final mark.	Paper 3: 23% of final mark	Paper 3: 12% Paper 5: 12% of final mark	40h/ 150h for Practical activities = 27%	60h/ 240h for Practical activities = 25%
Source	Doc. 7, p. 9-11 Doc. 7, p. 9	Doc 5, p. 5	Doc 12, p. 34	Doc. 6, p. 5	Doc 6, p. 22, p. 27	Doc 9, p. 18	Doc 9, p. 18

5. Teaching approach and subject methodology

5.1 General teaching/ learning approach

Teaching/learning approaches

The South African NSC curriculum prescribes an outcomes-based approach to teaching, where the outcomes are the focus of the teaching. These are assessed through assessment standards, which provide descriptors of achievement of learning outcomes at various levels in the FET phase.

The Cambridge IGCSE and AS- and A-Level curriculum documents describe the teaching approach for the subject, not for the programme as a whole. The IB has an overall teaching approach, which entails developing particular attitudes and values as well as knowledge and skills (Document 9, p. 1). However, no particular pedagogy is promoted in the documentation.

Suitability of general pedagogy to all contexts

Outcomes-based education may not be suited to all contexts in which the FET curriculum is enacted in South Africa. The IB approach of prioritising attitudes and values as well as knowledge and skills may suit certain international contexts, but not others. Since the particular contexts are unknown, a definitive judgement cannot be made.

5.2 Subject-specific methodology

In the content framework for the NCS Life Sciences, the three learning outcomes are retained as organisers of the content, but the assessment standards are not mentioned. However, since the assessment standards are policy, they are retained in textbooks and for formal assessment purposes. The "Assessment Syllabus" delivered to educators by subject advisers in some provinces is a list of content that educators are required to teach, without reference to learning outcomes or assessment standards.

The IGCSE promotes a teaching approach which incorporates practical biology, the development of useful abilities and skills, positive attitudes, care for the environment, an awareness of the nature of science and its use and abuse, and the cultivation of a sustained interest in biology. It expresses a desire that educators will provide a variety of learning experiences that enhance the candidates' learning experiences. Learning experiences have two purposes: to develop transferable skills, and to prepare candidates for their assessment (Document 5, p. 1-2).

In all other curricula, Biology is clearly seen as a subject that requires an active programme of practical work to accompany the theoretical teaching. This is an appropriate teaching methodology for the subject. Whether it is possible to enact it in all the countries where each curriculum is applied is unknown.

6. Assessment guidance

The international curriculum documents analysed provided detailed and specific guidance on assessment. This is summarised in **Table 13**.

Internal assessment tasks are most specifically detailed in the NCS, where they constitute 25% of the final mark. The Subject Assessment Guidelines give details of the number and types of tasks to be included in the internal assessment (Document 10: 9-11). The continuous assessment mark comprises a mixture of practical work and other work that does not necessarily entail using the specific investigative skills of Biology.

The IB specifies that 24% of the final mark is drawn from continuous assessment of Practical work, which is not assessed as a practical examination in this qualification. The IGCSE curriculum also makes provision for a 20% internal assessment of practical work as a contribution to the final mark.

The Namibian curriculum documents indicate that internal assessment of practical work will be phased in, and detailed guidance is provided for this to take place. The guidance is the same in almost every respect to that provided for the IGCSE internal assessment of practical work. However, in all CIE curriculum documents, the proviso is stated that only approved schools may offer continuous assessment of practical work.

Table 13: Internal assessment tasks and weighting in the curricula analysed in this study.

	NCS		CIE		IBO		Namibia	
	Gr. 10 & 11	Gr 12	IGCSE	A Level	SL	HL	SL	HL
Internal	2 Practical tasks (50%); 1 Research project (20%); 2 tests (20%); 1 midyear exam (10%)	2 Practical tasks (40%); 1 Assignment (20%); 2 tests (20%); midyear and trial exams (20%)	Practical work		Interdisciplinary project and a mixture of short- and long-term investigations, including some complex investigations that make high conceptual demands on students.		To be phased in	To be phased in
Weighting	25% (10: 9-11)	25% (10: 9-11)	20% (5: 3-6, 25-30)	0% (6: 5-6, 22-30)	24% (9: 13-15)		0% (12: 33-36)	0% (13: 28-30)

Table 14 highlights an important difference between the NSC external assessment and all the international qualifications. The way the examinations are structured is fundamentally different: where all the international qualifications assess the whole curriculum through differently structured examination papers, the NSC partitions the curriculum and assesses it in two separate examination papers. The format of the two papers is identical, consisting of a number of MCQ and one-word-answer questions, followed by a section of short-answer questions, data-response questions, and an extended-response question.

The "backwash" effect caused by the assessment is that the knowledge areas are compartmentalised and it stifles opportunities to create links across knowledge areas. One particularly harmful effect in Grade 12 is that genetics is examined in a separate paper from evolution, thus in effect isolating genetics conceptually from evolution.

All other curricula are examined holistically through different styles of examination papers, most frequently a multiple choice paper, a paper containing structured questions, with opportunities for some extended answers, and a Practical paper.

Each curriculum provides a guide to the expectations in terms of the cognitive levels to be expected in the examination papers as a whole. This information is indicated in **Table 14.** It shows that the NCS expects that in Grade 12, 50% of the marks should be for questions requiring cognitive skills above the levels of recall and comprehension. This is equivalent to the requirements for the IGCSE and the Namibian OL curriculum, and lower than the requirement for AS- and A-Level curricula and the Namibian HL curriculum. The IB curricula divide the cognitive levels somewhat differently, but appear to have a higher weighting on lower order cognitive skills in its external assessment than other curricula.

Overall, the most stringent curriculum in terms of the cognitive level specified for the external assessment is Namibia's HL, which allows only 40% of marks to be allocated to Knowledge with comprehension. The next highest level is the AS- and A-Level curricula, where 45% of the marks may be at this cognitive level.

Table 14: Structure of external assessment

Curriculum	Paper	Weighting in final exam mark	Description	Weighting per objective
NCS Gr 10, 11 & 12	1	50%	MCQ, short answers, data response and free response questions on Cell Biology and Life Processes.	Gr 10: Knowledge 20% Comprehension 40% Application 30% Higher abilities 10%
	2	50%	MCQ, short answers, data response and free response questions on Environmental Studies & Heredity and Evolution.	Gr 11 & 12: Knowledge +Comprehension 50% Application + Higher abilities 50%

Table 14: Structure of external assessment (Continued)

Curriculum	Paper	Weighting in final exam mark	Description	Weighting per objective
IGCSE	1 2 OR 3 4 OR 5 OR 6	30% 50% 20%	MCQ Short answers and structured questions OR Extended theory short answer and structured answers Optional internal assessment OR Practical Test on experimental and observational skills OR Written paper designed to test familiarity with lab-based procedures	Knowledge with understanding: 50% Handling information and solving problems: 30% Experimental skills and investigations: 20%
AS Level	1 2 3	31% 46% 23%	MCQ Structured questions Advanced Practical skills	Knowledge with understanding: 45% Handling information and solving problems: 32% Experimental skills and investigations: 23%
A Level	1 2 3 4 5	15% 23% 12% 38% 12%	MCQ Advanced Practical skills AS Structured questions A2 Structured questions Planning, analysis and evaluation	Knowledge with understanding: 45% Handling information and solving problems: 32% Experimental skills and investigations: 23%
IB SL	1 2 3	20% 32% 24%	MCQ One data-based question + short-answer questions + 1 extended-response question Short answers	Objectives 1 & 2: Recall, comprehend, apply procedures: 64% Objective 3: Analysis, synthesis, evaluation: 36%

Curriculum	Paper	Weighting in final exam mark	Description	Weighting per objective
IB HL	1 2 3	20% 36% 20%	MCQ One data-based question + short-answer questions + 2 extended-response questions. Short answer questions + 1 extended-response question.	Objectives 1 & 2: Recall, comprehend, apply procedures: 64% Objective 3: Analysis, synthesis, evaluation: 36%
Namibia OL	1 2 3	20% 50% 30%	MCQ Short answers & structured questions Practical skills	Knowledge with understanding: 50% Handling information and solving problems: 30% Experimental skills and investigations: 20%
Namibia HL	1 2 3	33% 48% 19%	MCQ Short answers & structured questions Practical skills	Knowledge with understanding: 40% Handling information and solving problems: 40% Experimental skills and investigations: 20%

The examined curriculum

A number of factors affect the level of difficulty of the assessment in a curriculum. The examination paper is one factor, but the curriculum on which the assessment is based is another. In Section 6.2, the team investigates the breadth and depth of the assessed curriculum in each qualification included in this study. This analysis differs from those included earlier, in that the focus is not on two-year units of curriculum, but on the curriculum on which assessment was based. In the case of the NSC, the examination is based on only the Grade 12 curriculum, and in the AS-Level it is only one year of study. In all other curricula, two years of study are examined.

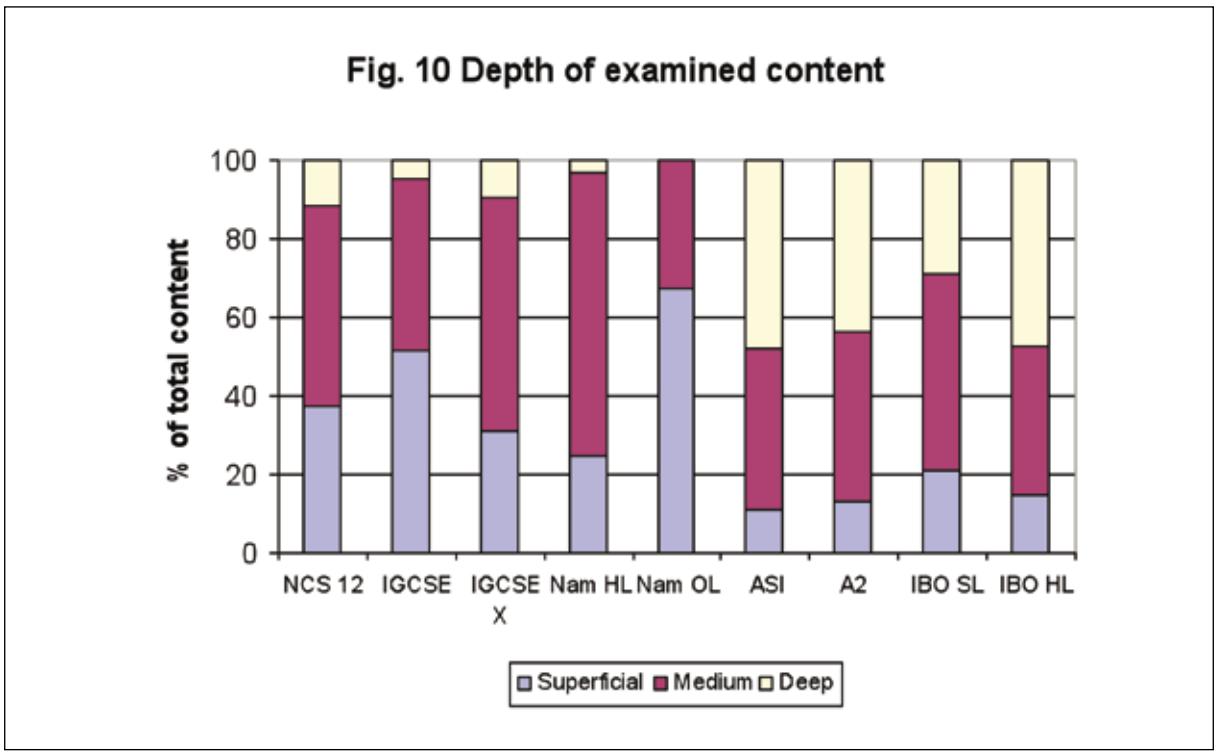


Figure 10 shows that the depth of content examined at the end of each course of study falls into two distinct groups: IGCSE, IGCSE X, Namibia and NCS, where very little "*deep*" material is examined, and AS, A2, IB SL and IBO HL, where considerably more "*medium*" and "*deep*" material is examined. The Namibian Ordinary Level examined curriculum has the greatest amount of superficial material, and no "*deep*" material in the examined curriculum.

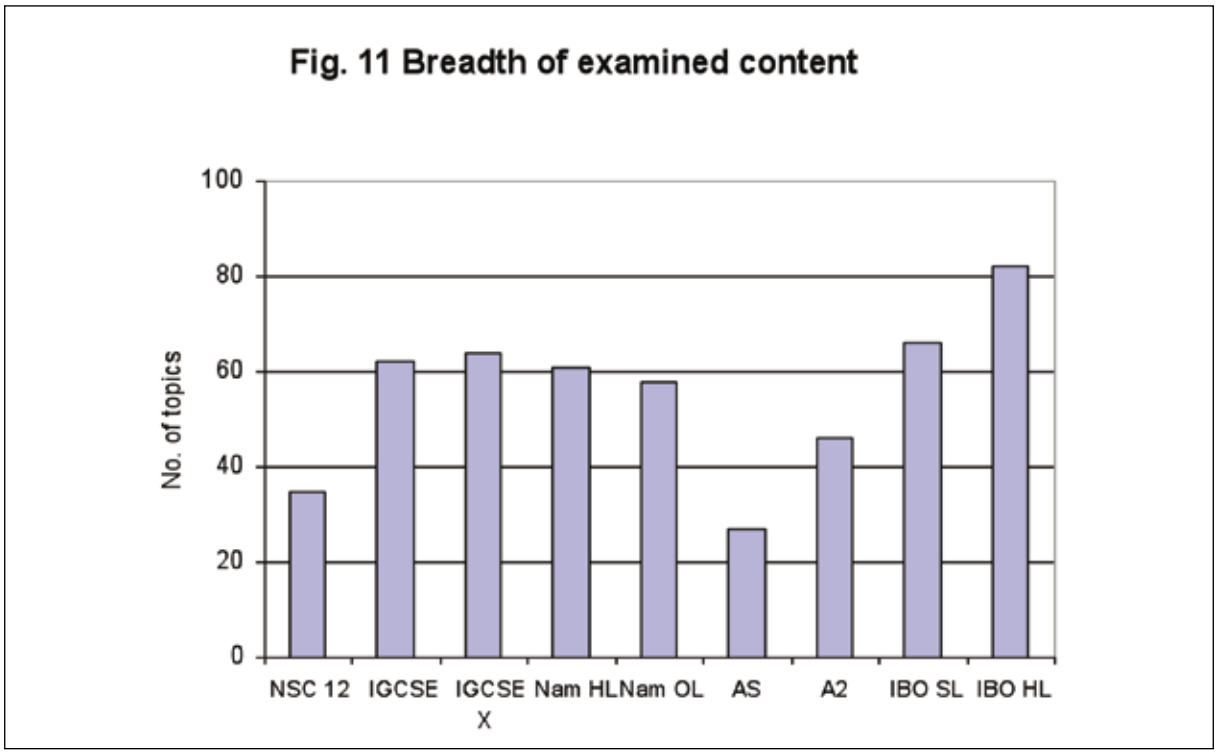


Figure 11 shows the breadth of each examined curriculum, and shows that the AS-Level and the NCS Grade 12 examine a smaller range of topics than any other curricula. The A2 examined curriculum is broader than the NCS, but less broad than the Namibian, IGCSE or IB SL curricula.

The examined curriculum for IGCSE is below the level of the NCS Gr 12. IGCSE X is at the same level as NCS Grade 12. Curricula for the AS Level, A2 Level, IB SL and HL are above the level of NCS Grade 12.

6.3 Analysis of examination papers

Examination papers for 2008 were analysed, using an adaptation of the Revised Bloom's Taxonomy that analysed each question according to a three-level cognitive skill-knowledge type, and a three-level degree of difficulty. The tool is attached. The examination papers were analysed by the four analysts working together. Each question was debated and where differences of opinion existed, the question was debated until a consensus was reached. If no consensus was reached, the question was recorded as half in each category preferred.
The number of marks allocated to each cognitive skill-category was totalled, as was the total for each level of difficulty. This was totalled for each examination paper. The totals for a particular qualification were then weighted as given in the documentation for a qualification. The graphs show the results obtained. It should be noted that the NSC examination papers analysed here were for the curriculum that preceded the Content Framework (Doc. 1) analysed in the Curriculum section of this report.

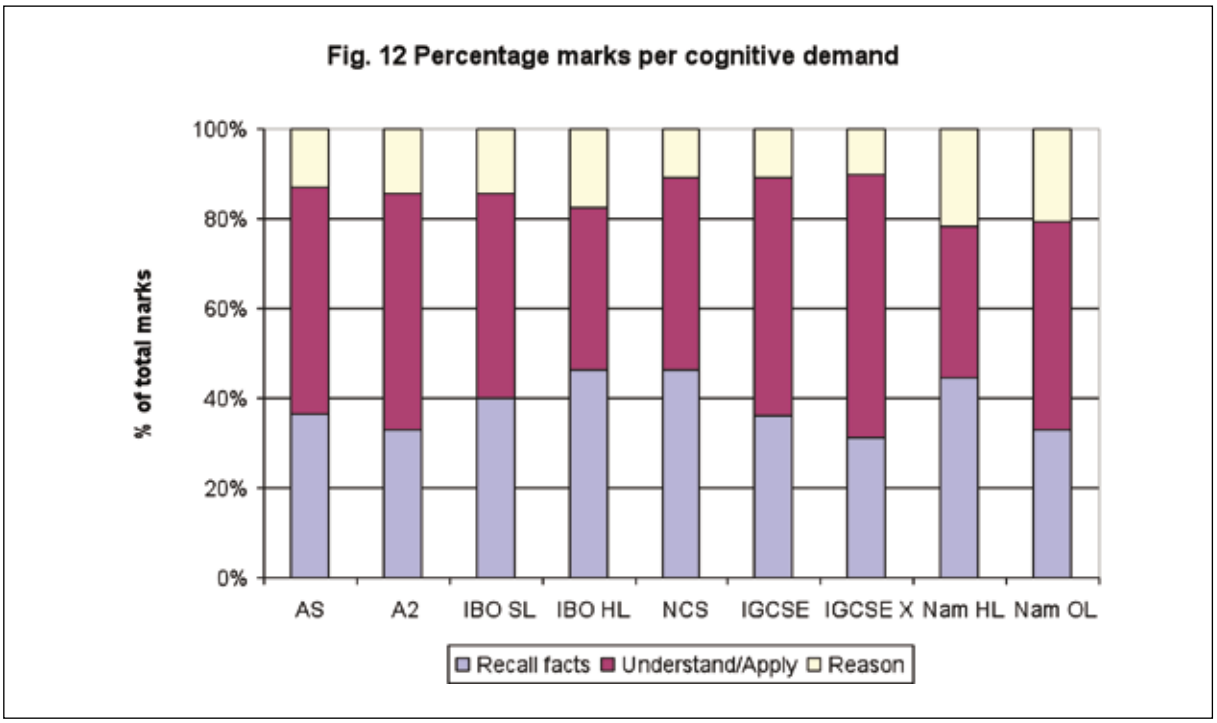


Figure 12 shows the results for the types of questions. In contrast to the analysis of depth in the curriculum, the differences among the qualifications were not so apparent in the analysis of examination papers. The Namibian examination papers stand out as having the largest proportion of marks allocated for reasoning types of questions. Other papers were relatively uniform in having less than 20% of the marks for these types of questions.
Within the CIE qualifications, the team expected that the A2 papers and the IGCSE X papers should have a lower proportion of marks for recalling facts, and a higher proportion of marks for the higher order cognitive skills. This is indeed the case. In all four CIE examination papers, the highest proportion of marks was located in understanding conceptual knowledge and applying procedures.

The IB papers, NSC and the Namibian HL examination papers had over 40% of their marks allocated for recall-type questions. This is surprisingly high in the case of the IB, which was aligned with the A-Level curriculum in terms of purpose and depth of coverage. An unexpected finding was that both the Namibian OL paper and the IB SL paper had fewer marks in the "*Recall factual knowledge*"-type of questions than their HL counterparts. Both examination papers had more marks in the "*understanding concepts and applying procedures*"- category than their HL counterparts. The implication is that the Namibian OL and the IBO SL papers tested higher order cognitive skills than the HL papers did, which is inconsistent with the purpose of the two levels of the curriculum. The NSC papers contained an even split between recall factual knowledge and higher order questions, with the weighting on understanding conceptual knowledge and applying procedures rather than reasoning and synthesis.

Fig. 13 Percentage marks per level of difficulty

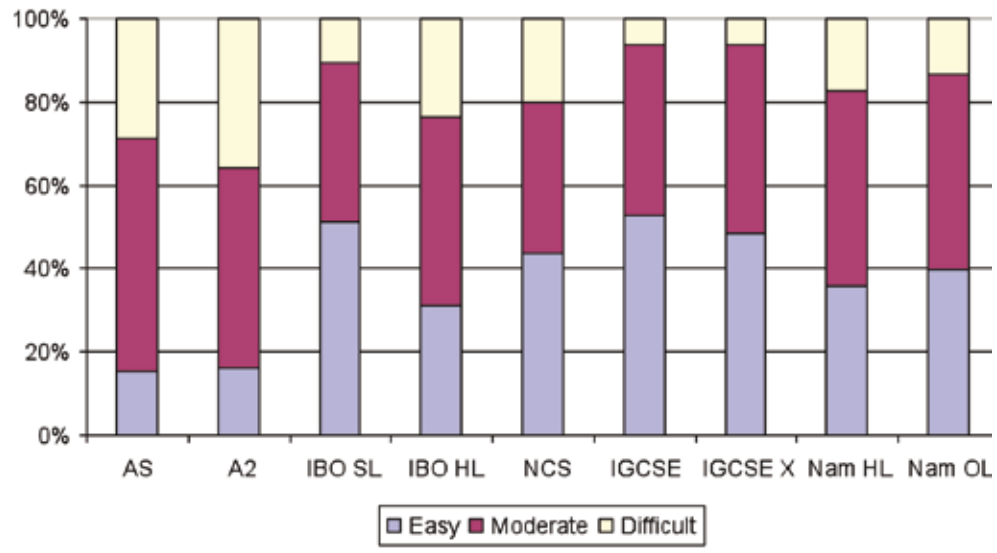


Figure 13 shows the analysis of marks by level of difficulty. It should be noted that judgements about the level of difficulty included consideration of the wording of the question, as well as what the learner had to do to answer the question. The judgement was independent of the cognitive demand of the question. Thus a factual recall question was not necessarily easy, and a reasoning question was not necessarily difficult. The AS-Level and A2-Level papers emerged as having the highest percentage of marks for moderate and difficult questions, followed by IB HL. The Namibian HL and OL examination papers were at about the same level of difficulty as the NSC papers, and both were more difficult than the IGCSE, IGCSE X and IB SL examination papers.

The percentages are shown in **Table 15 (**on the next page**)**.

Table 15: Percentages of marks for question types and levels of difficulty in external examination papers

	CIE		IBO		SA	CIE		Namibia	
	AS	A2	SL	HL	NCS	IGCSE	IGCSE X	HL	OL
Recall factual knowledge	36.4	33.1	40.0	46.2	46.2	36.2	31.3	44.7	33.0
Understand Conceptual knowledge /Apply procedure	50.7	52.3	45.7	36.3	42.8	53.0	58.6	33.6	46.3
Reason and synthesize	12.9	14.5	14.3	17.5	11.0	10.8	10.1	21.8	20.8
Easy	15.4	16.1	51.2	31.2	43.7	52.8	48.4	35.7	39.8
Moderate	55.9	48.3	38.0	45.0	36.3	41.1	45.5	46.9	47.0
Difficult	28.7	35.6	10.8	23.8	20.00	6.1	6.1	17.3	13.3

To summarize: Analysis of curriculum differentiated the A-Level and IBO curricula from all other curricula in terms of the depth at which topics were studied. The NCS and IGCSE X were rather intermediate in their depth of content, while Namibia and the IGCSE were more superficial.

Analysis of examination papers corresponded to some extent with analysis of the curricula. The AS- and A-Level examination papers were the most difficult papers, and contained the least proportion of marks for questions requiring recall of factual knowledge. The IBO exam papers were surprisingly weighted at lower cognitive levels, and with easier question papers than the A-Level papers. It is possible that this compensates for the demands of the very broad and deep curriculum offered by the IBO.

The Namibian curriculum was categorised as broad and relatively superficial, particularly at the OL, yet the examination papers tested more high order cognitive skills than other examination papers, particularly the OL paper. There appears to be a mismatch of examination papers with level of curriculum. However, although the papers assessed higher order cognitive skills, the OL questions were not particularly difficult to understand or to answer, hence the weighting at the lower range of levels of difficulty. There were more difficult questions in the HL papers than in the OL papers.

The NSC curriculum was categorised as broad, although less so in the examined year (Grade 12), and of medium depth. The examination papers were weighted rather heavily in recalling factual knowledge, with just over 10% of the marks for questions requiring reasoning and synthesis. However, the examination papers were rather difficult to answer, giving a similar profile to Namibian HL. The NSC papers contained more difficult questions than the IBO SL papers, but less than the IBO HL papers.

The CIE IGCSE curriculum was characterised as broad, with little depth, although the IGCSE X added depth in certain topics. The papers were well balanced in terms of cognitive demand and levels of difficulty, and were consistent with the intentions of the curriculum, which was to emphasize meaningful understanding rather than recall of facts. The proportion of difficult questions was the lowest in the study, which is consistent with the curriculum.

Table 16: Summary of examined curriculum factors and examination factors in comparison of the NSC and international qualifications

Qualification	Examined Curriculum Breadth	Examined Curriculum Depth	Exam cognitive demand (% higher order)	Exam level of difficulty (% difficult)
CIE AS Level	Narrow	Deep	64%	29%
CIE A Level	Narrow	Deep	67%	36%
IB HL	Broad+	Deep	54%	24%
IB SL	Broad	Medium-Deep	60%	11%
NSC Grade 12	Narrow	Medium	54%	20%
Namibia HL	Broad	Medium	55%	17%
IGCSE X	Broad	Medium	69%	6%
IGCSE	Broad	Superficial-Medium	64%	6%
Namibia OL	Broad	Superficial	67%	13%

Taking all factors into consideration, the ranking of an exit-level pass in Biology by qualification would be as follows:

1. CIE A Level
2. CIE AS Level
3. IB HL
4. IB SL
5. Namibia HL
6. NSC Grade 12
7. IGCSE X
8. IGCSE
9. Namibia OL

7. Conclusion

Table 17 summarizes the results for breadth and depth of the curricula, seeking evidence of combinations of depth without breadth, which Schwartz et al. (2008) found to be the best combination for Biology at secondary school level, as an indicator of success in future study at tertiary level.

Table 17: Summary of breadth, depth and teaching density in 2-year exit-level curricula[1] analysed in this study

	NCS 11 & 12 (12 only)	IGCSE	IGCSE X	Namibia HL	A2	IB SL	IB HL
Breadth	48 (25)	52	53	52	39	47	63
% Deep topics	8% (12%)	6%	11%	4%	41%	25%	49%
Teaching density	0.38 (0.2)	0.4	0.4	0.19	0.1	0.44	0.34

1Applied Biology is excluded from this analysis

The significance of **Table 17** is that preparation for tertiary study often assumes that adequate foundations in a discipline require a broad exposure to the full range of foundational topics. Schwartz et al.'s study showed that breadth in secondary school study was detrimental to progress in tertiary education, and depth of study in one or more topics was beneficial.

Applying the principles suggested by Schwartz et al. (2008) to the present study, the curriculum apparently best suited to tertiary study is the A-Level curriculum, whereas the IB HL curriculum is too broad in addition to having depth. The IB SL has similar breadth to the NCS Grades 11 & 12, but it has more depth, thus making it a better preparation for tertiary study. There is no universal benchmark of what constitutes the "correct" level of breadth and depth for a senior secondary school curriculum. One could argue that the A-Level curriculum is too deep for a school curriculum, just as one could argue that the NSC curriculum is too superficial. Aikenhead (2006) claims that too much emphasis on disciplinary knowledge discourages students, particularly those from marginalised communities, providing an argument for less depth in the curriculum in African countries. The counter-argument would be that providing a superficial curriculum fails to induct marginalised children into the culture of science, thus further disadvantaging them. There is no final answer to the question of what is the correct level for a school curriculum.

The remaining curricula have breadth with very little depth. It should also be borne in mind that the South African NSC curriculum examines only the final year of study, whereas all other curricula examine the last two years of study. The depth of content studied in the NCS Grade 12 year is greater than the combined Grade 11 & 12 year, but is still far from the depth and breadth of the A-Level and IB curricula.

Adding teaching time to the summary factors, the A-Level curriculum once more shows its advantage in that it has the lowest teaching density by far, meaning that those students have far more time on task, fewer topics to study, and greater depth in those topics. The Namibian curriculum also offers a low teaching density, indicating that one might expect those candidates to have a good grasp of the content they have been taught, but the topics lack depth. The South African NSC candidates have experienced lower teaching density in Grade 12 than they did in the two preceding years, but again, their curriculum lacks depth. IGCSE and IGCSE X have studied a broad range of topics at a fairly rapid rate, with IGCSE X having studied those topics at a level of depth comparable with the NSC candidates. One might predict that students who have passed IGCSE X might cope with tertiary study as well as candidates who hold a NSC. Finally, candidates who have passed IB HL and SL, while not perfectly prepared for tertiary study, according to Schwartz et al. (2008), are certainly far better prepared than candidates who hold the NSC.

Preparation for tertiary level study in Biology includes developing the skills of investigation in Biology as well as acquiring core knowledge in the subject. Skills were identified from each curriculum document and compared among the different curricula. Thinking and reasoning skills were not easy to identify, since they are implicit rather than explicitly identified.

All curricula include the **steps of carrying out an investigation** in varying degrees of detail, with the use of ICT to collect and process data being particularly emphasized in the IB, but also listed in the A- or AS-Level curriculum as an aim of the course of study (Document X, p. 9). Investigations are identified as hypothetico-deductive experimental work. The specific skills of **observation, drawing, recording observations descriptively and in diagrams, using a microscope, and calculating magnifications** are included in most curricula. This is a foundational competence in Biology. **Using keys and identification guides** to identify organisms in the local environment is explicitly taught in all curricula except the A-Level curriculum. **Dissection** and **constructing models** are not mentioned in most curricula except the NCS. The lack of laboratory facilities may preclude South African educators from actually carrying out the prescribed dissections and model-building.

Generic skills include **looking up information** in various resources, **preparing a poster, making**

a timeline, problem-solving, and **calculating summary statistics**. Some of these generic skills are developed in different curricula, with fewer in the NCS than in other curricula. Life-related skills, such as **working in a group, presenting a report, debating topical issues** and **using various types of reasoning**, are present in all curricula.

To summarize this section, the NCS covers a more representative range of discipline-specific skills than any other curriculum in this study. However, A-Level and IB provide opportunity for more advanced laboratory skills than other curricula. It is also important to note that all the qualifications except the NSC have a compulsory practical examination. Candidates who have completed the A-Level or IB courses or in fact the IGCSE or the Namibian OL or SL would therefore be at an advantage on entering tertiary education, since they were compelled to do practical work.

An attempt was made to assign relative values to the credit worthiness of the various curricula on the basis of the findings of this report. Assuming that the NSC curriculum is valued at 20 credits, the values of the other curricula are:

Curriculum	*Credits*
CIE IGCSE	15 credits
CIE IGCSE X	18 credits
Namibia Standard Level	12 credits
Namibia Higher Level	22 credits
CIE AS Level	28 credits
CIE A Level	30 credits
IB SL	23 credits
IB HL	26 credits

Justification is given in the text above. Please refer specifically to the sections on the comparisons of breadth and depth of curriculum, skills, and examined curriculum.

COMPARISON OF THE MATHEMATICS CURRICULA OF THE NSC AND VARIOUS INTERNATIONAL QUALIFICATIONS (IQs)

Evaluators: Ms Lynn Bowie (Team leader); Ms Alison Kitto; Mr Williams Ndlovu; Ms Mariamma Raju.

1. INTRODUCTION

The team compared the curriculum of the NCS for Mathematics (Grades 10-12) with the Mathematics curricula of various courses from the International Baccalaureate (IB) Organization and the Cambridge International Examinations (CIE). In addition the team analysed the Namibian curricula as a contextualised examples of the CIE qualifications. The courses evaluated from within each of these qualification bodies are listed below together with the documents the team used to gather information for each of the courses. As the evaluation team provides references to these documents throughout the report, they have included the abbreviation (in brackets and in bold) when referring to the particular document.

1.1 Courses analysed and abbreviations used

- NCS for MATHEMATICS (Grades 10-12)

  - Course: Core
    Document 1: National Curriculum Statement Grades 10 -12 (General) Mathematics (**NC**)
    Document 2: National Curriculum Statement Grades 10 – 12 (General) Subject Assessment Guidelines Mathematics (**NA**)
    Document 3: National Curriculum Statement Grades 10 – 12 (General) Learning Programme Guidelines Mathematics (**NL**)
    Document: Mathematics Examinations Guidelines Grade 12 2009 (**NE**)
    Document 4: National Senior Certificate Grade 12 Mathematics Paper 1 November 2008 **(N P1**)
    Document 5: National Senior Certificate Grade 12 Mathematics Paper 2 November 2008 (**N P2**)
    Document 6: Province of Eastern Cape, Department of Education, Mathematics Grade 10 Work schedule (Core): 2008 (**EC10WS**)
    Document 7: Province of Eastern Cape, Department of Education, Mathematics Grade 11 Work schedule (Core): 2008 (**EC11WS**)
    Document 8: Province of Eastern Cape, Department of Education, Mathematics Grade 12 Work schedule (Core): 2008 (**EC12WS**)
  - Course: Core and Optional
    All documents as for core
    Document 9: National Senior Certificate Grade 12 Mathematics Paper 3 November 2008 (**N P3**)

- International Baccalaureate Organization (IB) Diploma Programme:

  - Course: Mathematical Studies SL[1]
    Document 10: Mathematical Studies SL Curriculum, First examinations 2006 (**IBSS**)
    Document 11: Examination for Mathematical Studies SL, Paper 1, Wednesday 7 May 2008 (afternoon) (IBSS P1)
  - Course: Mathematics SL
    Document 12: Mathematics SL Curriculum: First examinations 2008 (**IBS**)
    Unfortunately we could not obtain any examinations for Mathematics SL
  - Course: Mathematics HL[2]
    Document 13: Mathematics HL Curriculum: First examinations 2008 (**IBH**)
    Document 14: Examination for Mathematics HL, Paper 1, Wednesday 7 May 2008 (afternoon) (**IBH P1**)
    Document 15: Examination for Mathematics HL, Paper 2, Thursday 8 May 2008 (morning) (**IBH P2**)
    Document 16: Examination for Mathematics HL, Paper 3 – Statistics and Probability, Monday 19 May 2008 (afternoon) **(IBH P3S**)
    Document 17: Examination for Mathematics HL, Paper 3 – Discrete Mathematics, Monday 19 May 2008 (afternoon) (**IBH P3D**)
  - Mathematics HL and Further Mathematics SL
    All documents as for Mathematics HL course
    Document 18: Further Mathematics SL Curriculum, First examinations 2006 (**IBF**)

- Cambridge International Examinations (CIE)

  - Course: International General Certificate of Secondary Education (IGCSE) Core
    Document 19: IGCSE Syllabus Mathematics 0580, Mathematics (with coursework) 0581, for examination in June and November 2009 (**IG**)
    Document 20: IGCSE examination Mathematics Paper 1 (Core) May/June 2008 (**IG P1**)
    Document 21: IGCSE examination Mathematics Paper 3 (Core) May/June 2008 **(IG P1**)
  - Course: International General Certificate of Secondary Education (IGCSE) Core
    Document 22: IGCSE Syllabus Mathematics 0580, Mathematics (with coursework) 0581, for examination in June and November 2009 (**IG**)
    Document 23: IGCSE examination Mathematics Paper 2 (Extended) May/June 2008 (**IG P2**)
    Document 24: IGCSE examination Mathematics Paper 4 (Extended) May/June 2008 (**IG P4**)
  - Course: General Certificate of Education Advanced Subsidiary (AS)
    Document 25: Curriculum for Mathematics 9709 GCE A/AS Level for examination in 2008 (**AC**)
    Document 26: Examination GCE A/AS Level 9709 Mathematics Paper 1 May/June 2008 (A **P1**)
    Document 27: Examination GCE A/AS Level 9709 Mathematics Paper 2 (October/ November 2007) (**A P2**)
    Document 28: Examination GCE A/AS Level 9709 Mathematics Paper 4 October/ November 2007 (**A P4**)
    Document 29: Examination GCE A/AS Level 9709 Mathematics Paper 6 October/ November 2007(**A P6**)
  - Course: General Certificate of Education Advanced Level (A level)
    All documents as for AS course except A P2

[1] SL is an abbreviation for Standard Level which for the IB means a 150-hour course
[2] HL is an abbreviation for Higher Level which for the IB means a 240 hour course.

Document 30: Examination GCE A/AS Level 9709 Mathematics Paper 3 (October/ November 2007) (**A P3**)
Document 31: Examination GCE A/AS Level 9709 Mathematics Paper 5 (October/ November 2007) (**A P5**)
Document: Examination GCE A/AS Level 9709 Mathematics Paper 7 (October/November 2007) (**A P7**)

- Namibia

  - Namibia Senior Secondary Certificate Mathematics Ordinary Level (Core)
    Document 32: Namibia Senior Secondary Certificate Ordinary Level and Higher Level, Syllabus Synopsis, October/November 2008 (**NamS**)
    Document 33: Namibia Senior Secondary Certificate, Mathematics Ordinary Level, Paper 1 2008(Core) (**Nam P1**)
    Document 34: Namibia Senior Secondary Certificate, Mathematics Ordinary Level, Paper 3 2008(Core) (**Nam P3**)
  - Namibia Senior Secondary Certificate Mathematics Ordinary Level (Extended)
    Document 35: Namibia Senior Secondary Certificate Ordinary Level and Higher Level, Syllabus Synopsis, October/November 2008 (NamS)
    Document 36: Namibia Senior Secondary Certificate, Mathematics Ordinary Level, Paper 2 2008(Extended) (**Nam P2**)
    Document 37: Namibia Senior Secondary Certificate, Mathematics Ordinary Level, Paper 4 2008(Extended) (**Nam P4**)
  - Namibia Senior Secondary Certificate Mathematics Higher Level
    Document 38: Namibia Senior Secondary Certificate Ordinary Level and Higher Level, Syllabus Synopsis, October/November 2008 (**NamS**)
    Document 39: Namibia Senior Secondary Certificate, Mathematics Higher Level, Paper 1 2008 (**NamH P1**)
    Document 40: Namibia Senior Secondary Certificate, Mathematics Higher Level, Paper 2 2008 (**NamH P2**)

1.2 Overview of each curriculum

1.2.1 National Curriculum Statement (NCS) South Africa

All candidates writing the National Senior Certificate (NSC) at the end of Grade 12 have to offer either Mathematics or Mathematical Literacy. This report considers the Mathematics curriculum only and does not make any comparisons with the Mathematical Literacy curriculum. The Subject Assessment Guidelines for the NCS for Mathematics (see Document NA) indicate that certain assessment standards from the NCS for Mathematics have been designated as core and others as optional. Only the core assessment standards are to be examined in Papers 1 and 2 for the foreseeable future. The optional assessment standards will be examined separately in an optional paper, Paper 3. The topics dealt with in the optional assessment standard are Euclidean geometry, probability, sampling, interpretation of statistics and working with bivariate data. Candidates who elect to do the optional assessment standards will have their results for these assessment standards reported separately on their National Senior Certificates. Enrolment figures for Paper 3 were very low in 2008. The Mathematics evaluation team, where possible, made comparisons with both the core and the optional sections of the NCS.

In the report the Mathematics evaluation team will use the following abbreviations:

NCS core: Refers to the core assessment standards only.

NCS optional: Refers to the core assessment and the optional assessment standards together.

1.2.2 International Baccalaureate Organization (IB) Diploma Programme

The IB Diploma Programme is considered a rigorous, pre-university course (Documents IBSS, IBS, IBH, IBF, p1) and is a 2 year programme. Candidates may choose to take one of 4 offerings in Mathematics. The descriptions of these courses taken from the IB curriculum documents (Documents IBSS, IBS, IBH, IBF p4) are summarised below.

Mathematical Studies Standard Level (SL): 150 teaching hours. For candidates who do not anticipate a need for Mathematics in their future studies.

Mathematics SL: 150 teaching hours. For candidates who will need a sound mathematical background in their future studies in areas like chemistry, economics, psychology or business administration.

Mathematics HL: 240 teaching hours. For candidates who have a good background in Mathematics and expect to include Mathematics as a major component of their university studies (e.g. studies in Mathematics itself or Physics or Engineering). This course consists of a core component and a choice of one of four optional components.

Mathematics HL + Further Mathematics SL: 240 +150 = 390 teaching hours. The Further Mathematics curriculum is taken in conjunction with Mathematics HL. Thus it is designed for candidates who intend to make Mathematics a major component of their university studies. If candidates do Mathematics HL and Further Mathematics SL they will do the core component of Mathematics HL, all four optional components of Mathematics HL and some work in geometry. Although it is possible to take Further Mathematics SL on its own a candidate who does this is assumed to have knowledge of the topics covered in Mathematics HL. For this reason in this analysis we will consider Further Mathematics SL in combination with Mathematics HL.

1.2.3 Cambridge International Examinations

The evaluation team analysed three levels at which the Cambridge International Examinations take place: International General Certificate of Secondary Education (IGCSE), Advanced Subsidiary Level (AS Level) and Advanced Level (A Level)

The IGCSE is a 2 year programme. Candidates may either take the Core curriculum or the Extended curriculum (which includes all the topics in the Core curriculum and extra work). Those taking the Core curriculum are eligible for grades C to G only. Those taking the Extended curriculum are eligible for grades A* to E only. As the team's analysis of the Extended curriculum showed it to be beneath the level of NSC Grade 12 we decided not to analyse the Core curriculum separately as it would clearly be well below the level of the NSC curriculum.

AS Level:

There are three options a learner can take here

i) Pure Mathematics 1 (P1) and Pure Mathematics 2 (P2)

ii) Pure Mathematics 1 (P1) and Mechanics 1 (M1)

iii) Pure Mathematics 1 (P1) and Statistics 1 (S1)

A Level:

i) Pure Mathematics 1 and 3 (P1 and P3) and Mechanics 1 (M1) and Statistics 1 (S1)

ii) Pure Mathematics 1 and 3 (P1 and P3) and Mechanics 1 (M1) and Mechanics 2 (M2)

iii) Pure Mathematics 1 and 3 (P1 and P3) and Statistics 1 (S1) and Statistics 2 (S2)

1.2.4 Namibia Senior Secondary Certificate

The Umalusi evaluation team analysed two levels at which the Namibian Senior Secondary Certificate takes place: Ordinary Level and Higher Level.

Ordinary Level: In a similar way to IGCSE, learners may take either the Core or Extended curriculum. Those taking the Core curriculum are eligible for Grades C to G only. Those taking the Extended curriculum are eligible for Grades A* to E only.

Higher Level: This course is described as enabling learners to experience a wide range of mathematical topics and methods in order to develop an appreciation for both the power and elegance of the subject. It is divided into two components; however there are no options at this level and learners must take both components.

2. CONTENT AND SKILL SPECIFICATION AND COVERAGE

Although the Umalusi instrument for curriculum evaluation requested the team to look at content and skills separately, the team found that the content and skills in mathematics were inextricably linked and so it became impossible to do so. The team thus has looked at content and skills together and report on them in this way here.

2.1 Content and skill specification

The team created a detailed list of skills and content covering all the curricula; then indicated whether each item in the skills and content list was specified for each of the curricula. Having done this, the team decided it was not possible to determine whether each of the content and skill items were easy, moderate or difficult as the Umalusi instrument required. This is because, for example, "using the sin rule to solve a problem" can be really easy or cause considerable difficulty depending on the kind of problem chosen. In addition the various curricula might approach the same item from the skill and content lists at very different levels of depth. The team thus needed to find an alternate method to provide an evaluation of the depth and breadth of the curricula. The Mathematics evaluation team has done this using the following procedure:

a) The evaluation team grouped the detailed list of skills and content into what they, for ease of reference, have chosen to call topic areas.

b) In turn the team grouped these topic areas into broader topic areas, and where possible, how grouped these broader topic areas into even broader topic areas. So for example, the content and skills "*investigate, generalise and apply the effect of various transformations on (x;y)*", "*investigate, generalise and apply the effect on the coordinates of the vertices of a polygon after enlargement through the origin by a constant factor of k*" etc were grouped together in the topic area "*transformation geometry*". The topic areas "*transformation geometry*", "*Euclidean geometry*" and "*Analytical geometry*" were grouped together in the broader topic area "*Geometry*".

c) The team furthermore created a table in which they listed the broad topic areas, with sub-topics where appropriate, down the left hand column. Then, using the detailed list of content and skills together with examination papers for the curricula they made a judgment about the depth with which each sub-topic was treated relative to the NCS. The judgment they made in terms of sub-topics was used to provide a judgment about the depth of the broad topic areas in relation to the NCS. In each case the evaluation team stated whether a particular sub-topic (or broad topic area) was treated at a depth that was similar to, lower than or higher than the level of that sub-topic/topic in the NCS. Where a topic was present in a curriculum, but not in the South African NSC curriculum, the team made a judgment about the level at which it was specified in the curriculum and examined in the examination papers the team had access to. For these topics the team used the term "*introductory*" to indicate a fairly basic level, the team used the term "*moderate*" to indicate a level similar to level at which topics in the NCS are dealt with and "*advanced*" to indicate a higher level than topics in the NCS are generally dealt with.

d) **Tables 1**, **2**, **3** and **4** below give the results of this analysis.

*Note for **Tables 1** and **3**:*

The level specified in each of the columns for the IB and CIE curricula gives the depth of that topic relative to the level of that topic in the core curriculum of the NCS. Where comparison to the optional NCS is made, it is stated explicitly.

In the NCS column the team indicates whether the sub-topic/topic is in the core (C) or only part of the optional section (O) of the NCS.

Table 1: Comparison of IB curricula with the NCS

	IB Mathematical studies SL	IB Maths SL	IB Maths HL	Maths HL + Further Maths	NCS
1 Number and number relationships	lower	similar	higher	higher	C
1.1 Number	lower	similar	higher	higher	C
1.2 Patterns, sequences and series	lower	similar	higher	higher	C
2 Annuities and Financial Maths	lower	none	none	none	C
3 Functions and algebra	lower	similar	higher	higher	C
3.1 Solve equations and inequalities	lower	similar	higher	higher	C
3.2 Multiplication and factorisation	not specified	similar	similar	similar	C
3.3 Simultaneous eq	lower	in presumed knowledge	in presumed knowledge	in presumed knowledge	C
3. 4 Remainder and factor theorem	not specified	none	higher	higher	C
3.5 Exponents and logs	not specified	similar	higher	higher	C
3.6 Functions and graphs	lower level	similar	higher	higher	C
3.7 Linear programming	none	none	none	none	C
4 Mathematical modelling	not specified	specified as portfolio item	specified as portfolio item	specified as portfolio item	C

	IB Mathematical studies SL	IB Maths SL	IB Maths HL	Maths HL + Further Maths	NCS
5 Calculus		slightly higher	higher	higher	C
5.1 Differential calculus	lower	similar	higher	higher	C
5.2 Integral calculus	none	moderate	moderate - advanced	moderate - advanced	none
6 Trigonometry	lower	slightly lower	slightly higher	slightly higher	C
7 Geometry	lower level, less extensive	presumed knowledge similar to core lower level than optional	presumed knowledge similar to core lower level than optional	higher than optional	C
7.1 Analytic	lower	in presumed knowledge	in presumed knowledge	in presumed knowledge	C
7.2 Euclidean	none	none	none	higher than optional	C
7.3 Transformation	none	in presumed knowledge	in presumed knowledge	in presumed knowledge	C
7.4 Mensuration	similar	in presumed knowledge	in presumed knowledge	in presumed knowledge	C
8 Probability, data handling and stats	slightly higher than core, but lower than optional	higher than core similar to optional	higher than core and optional	higher than core and optional	C
8.1 Data handling and descriptive stats	similar	similar	similar	similar	C
8.2 Interpretation of descriptive stats and bias in use of statistics	not specified	not specified	not specified	not specified	O
8.3 Bivariate	higher than core similar to optional	not specified	not specified	not specified	O
8.4 Probability	higher than core lower than optional	higher than core similar to optional	higher than core and optional	higher than core and optional	O
8.5 Distributions	none	moderate	moderate - more than Mathematics SL	advanced	none

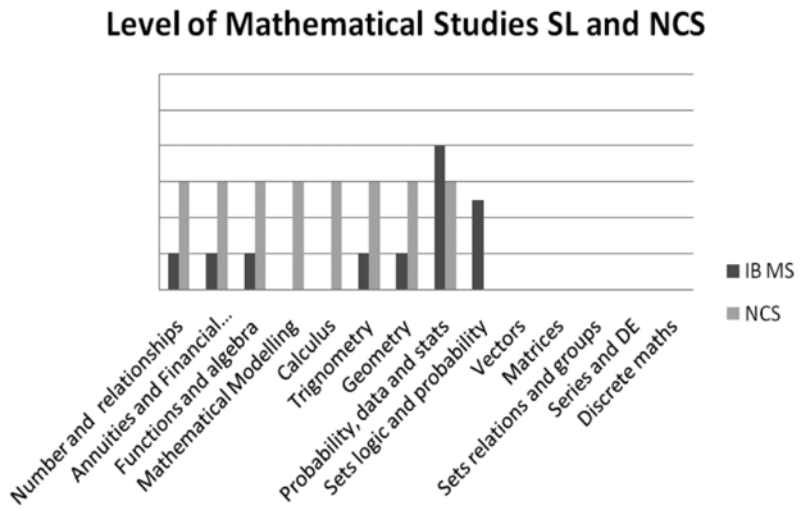
	IB Mathematical studies SL	IB Maths SL	IB Maths HL	Maths HL + Further Maths	NCS
9 Sets, logic and probability	introductory	none	none	none	none
10 Vectors	none	introductory	moderate	moderate	none
11 Matrices	none	introductory	moderate	moderate	none
12 Sets, relations and groups	none	none	moderate - advanced (but only do this if they choose it as their optional topic)	moderate - advanced	none
13 Series and differential equations	none	none	moderate - advanced (but only do this if they choose it as their optional topic)	moderate - advanced	none
14 Discrete maths	none	none	moderate - advanced (but only do this if they choose it as their optional topic)	moderate - advanced	none
15 Numerical solution of equations	none	none	none	none	none
16 Mechanics	none	none	none	none	none

The team summarised the information about the relative levels of the various IB curricula in comparison to the NCS in graphical form. To do this, the evaluation team put every main topic area on the horizontal axis and drew a column up to the middle gridline if the topic was present in the NCS and no column if it was not present in the NCS. For each of the IB curricula the evaluation team then placed columns next to the NCS column and gave them a length that represented the level of the topic in the IB curriculum relative to that of the South African NSC curriculum. So, for example, a slightly shorter column would indicate that the topic is treated at a slightly lower level in the IB curriculum than in the NCS. Although these graphical representations do provide a way of seeing the difference in the level and breadth of the curricula, it is important not to read too much into them. The topics listed on the horizontal axis are not all equal in scope. Although the height of the columns gives an indicator of the level it is no more than a rough indicator. It would not be correct, for example, to assume a column that is twice as high as another column indicates the topic was twice as difficult.

The graphs for each of the curricula as well as the conclusions the team drew about the comparability of the curricula are presented over the page:

Table 2: Graphical representation of the IB Mathematics curricula relative to the NCS

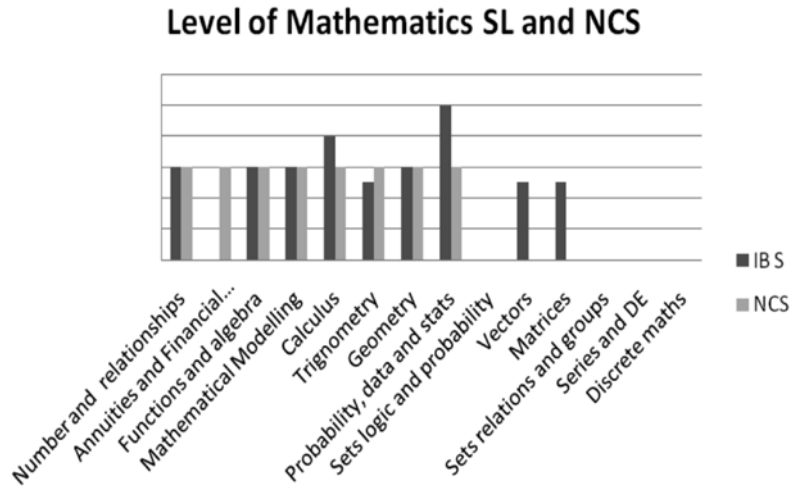
GRAPHICAL REPRESENTATION



Level of IB Mathematical Studies SL in comparison with the NCS
The graphical representation indicates that the level of Mathematical Studies SL is below that of the NCS.

Although Mathematical Studies offers probability, data and statistics at a slightly higher level and offers sets, logic and probability which the NCS does not, it does not offer any calculus nor does it specify any mathematical modelling and it offers the rest of the topics at a lower level.
For these reasons the team would argue that the IB Mathematical Studies is not of comparable credit worthiness to the NCS.

The Mathematical Studies curriculum would not provide sufficient background for candidates to be admitted to courses in higher education that require the South African NSC Mathematics.

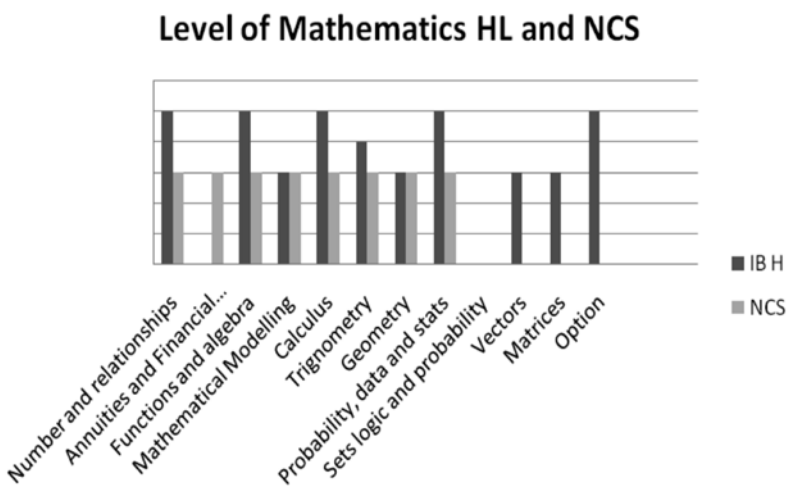


Level of IB Mathematics SL in comparison with the NCS
The graphical representation indicates that the level of IB Mathematics SL is comparable with that of the South African NSC curriculum.

Although IB Mathematics SL has trigonometry at a slightly lower level than the NCS, it offers probability, data and statistics at a higher level and calculus at a slightly higher level. Although there is no financial mathematics in IB Mathematics SL, two topics (matrices and vectors) which are not in the NCS are included in the course.

For these reasons the team would argue that IB Mathematics SL is of comparable credit worthiness to the NCS.

The Mathematics SL curriculum would provide sufficient background for candidates to be admitted to courses in Higher Education that require the South African NSC Mathematics.

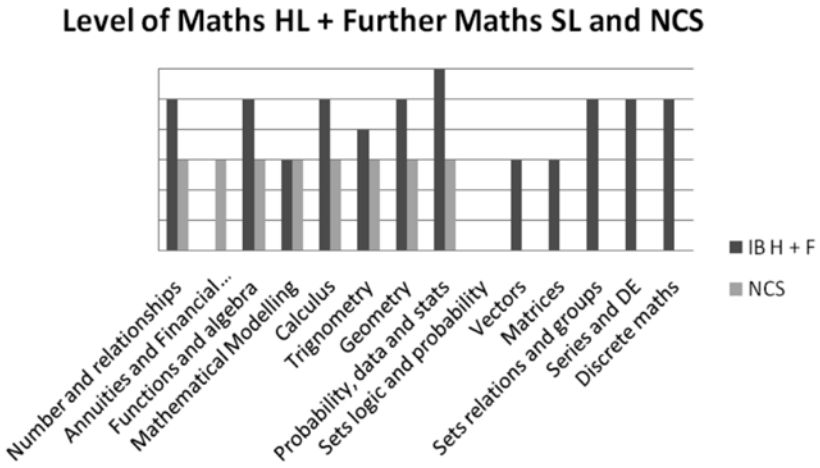


Level of IB Mathematics HL in comparison with the NCS
The graphical representation indicates that the level of IB Mathematics HL curriculum is higher than that of the NCS.

A few key topics are offered in Mathematics HL at a higher level than in the NCS. In addition Mathematics HL offers additional topics at a moderate or higher level.

For these reasons the team would argue that IB Mathematics HL is of greater credit worthiness to the NCS.

The IB Mathematics HL curriculum would provide sufficient background for candidates to be admitted to courses in higher education that require the South African NSC Mathematics. Some of the topics dealt with in IB Mathematics HL are typically dealt with in 1st year university mathematics courses and thus a candidate passing IB Mathematics HL should be able to pass 1st year Mathematics.



Level of IB Mathematics HL + Further Mathematics SL in comparison with the NCS
The graphical representation indicates that the level of IB Mathematics HL + Further Mathematics SL is much higher than that of the NCS.

Most of the topics are offered in IB Mathematics HL + Further Mathematics SL at a higher level than in the NCS. In addition IB Mathematics HL + Further Mathematics SL offers a number of additional topics at a moderate or higher level.

For these reasons the team would argue that IB Mathematics HL + Further Mathematics SL is of greater credit worthiness to the NCS.

The IB Mathematics HL + Further Mathematics SL curriculum covers a number of topics that are typically dealt with in 1st year university mathematics courses. Candidates entering higher education institutions with Mathematics HL + Further Mathematics SL could potentially be given credit for some 1st year level Mathematics courses.

Table 3: Comparison of IB curricula and NCS

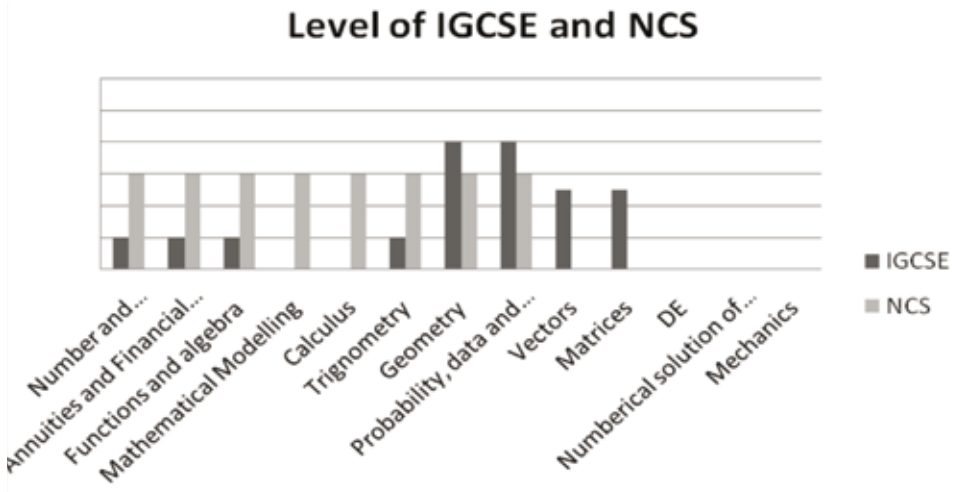
	IGCSE Extended	AS Level done P1 and P2	AS Level done P1 and M1 or S1	A Level core (i.e. P1 and P3)	NCS
1 Number and number relationships	lower	similar	similar	higher	C
1.1 Number	lower	not specified but other topics covered would required similar knowledge of number of NCS	not specified but other topics covered would required similar knowledge of number of NCS	higher	C
1.2 Patterns, sequences and series	lower	similar	similar	higher	C
2 Annuities and Financial Maths	lower	none at AS level lower level done in IGCSE	none at AS level lower level done in IGCSE	none at AS level lower level done in IGCSE	C
3 Functions and algebra	lower	similar	lower	higher	C
3.1 Solve equations and inequalities	lower	slightly higher	slightly lower	higher	C
3.2 Multiplication and factorisation	similar	assumed done in IGCSE	assumed done in IGSCE	higher	C
3.3 Simultaneous eq	lower	similar	similar	similar	C
3. 4 Remainder and factor theorem	none	higher	none	higher	C
3.5 Exponents and logs	lower	higher	lower	higher	C
3.6 Functions and graphs	lower	similar	similar	similar	C
3.7 Linear programming	lower	basics done in IGCSE	basics done in IGCSE	basics done in IGCSE	C
4 Mathematical modelling	not specified	not specified	aspects relating to mechanics covered in M1	aspects relating to mechanics covered in M1 and M2	C
5 Calculus	none	slightly higher	slightly higher	higher	C
5.1 Differential calculus	none	similar	similar	higher	C
5.2 Integral calculus	none	moderate	introductory	moderate – advanced	none
6 Trigonometry	lower	slightly higher	slightly less	higher	C
7 Geometry	similar – slightly higher	very little done in AS level, but done in IGCSE at similar to slightly higher	very little done in AS level, but done in IGCSE at similar to slightly higher	very little done in A level, but done in IGCSE at similar to slightly higher	C
7.1 Analytic	lower	similar	similar	similar	C
7.2 Euclidean	more than core, lower than optional	done in IGCSE	done in IGCSE	done in IGCSE	O
7.3 Transformation	higher	done in IGCSE	done in IGCSE	done in IGCSE	C
7.4 Mensuration	slightly higher	done in IGCSE	done in IGCSE	done in IGCSE	C

	IGCSE Extended	AS Level done P1 and P2	AS Level done P1 and M1 or S1	NCS	
8 Probability, data handling and stats	more than core, less than optional	Nothing further done. Done in IGCSE at similar level to core, but less than optional	If S1 not done then as for IGCSE. If S1 done then higher than optional	If S1 not done then as for IGCSE. If S1 done than higher than optional	C
8.1 Data handling and descriptive stats	similar	done in IGCSE	done in IGCSE and higher done in S1	done in IGCSE and higher done in S1	C
8.2 Interpretation of descriptive stats and bias in use of statistics	more than core similar to optional	done in IGCSE	done in IGCSE and higher done in S1	done in IGCSE and higher done in S1	O
8.3 Bivariate	similar	done in IGCSE	done in IGCSE	done in IGCSE	O
8.4 Probability	similar to core	done in IGCSE	done in IGCSE and similar level to optional done in S1	done in IGCSE and similar level to optional done in S1	O
8.5 Distributions	none	none	introductory	moderate-advanced	none
9 Sets, logic and probability	none	none	none	none	none
10 Vectors	introductory	introductory	introductory	moderate	none
11 Matrices	introductory	introductory done in IGCSE	introductory done in IGCSE	introductory done in IGCSE	none
12 Sets, relations and groups	none	none	none	none	none
13 Series and differential equations	none	none	none	introductory differential equations only	none
14 Discrete maths	none	none	none	none	none
15 Numerical solution of equations	none	introductory	none	moderate	none
16 Mechanics	none	none	Introductory – moderate if M1 done	Introductory – moderate if M1 done Moderate – advanced if M1 and M2 done	none

The information in **Table 3** was summarised graphically in a similar way to that in **Table 1**. This summary is provided in **Table 4** below.

Table 4: Graphical representation of the CIE Mathematics curricula relative to the NCS

GRAPHICAL REPRESENTATION

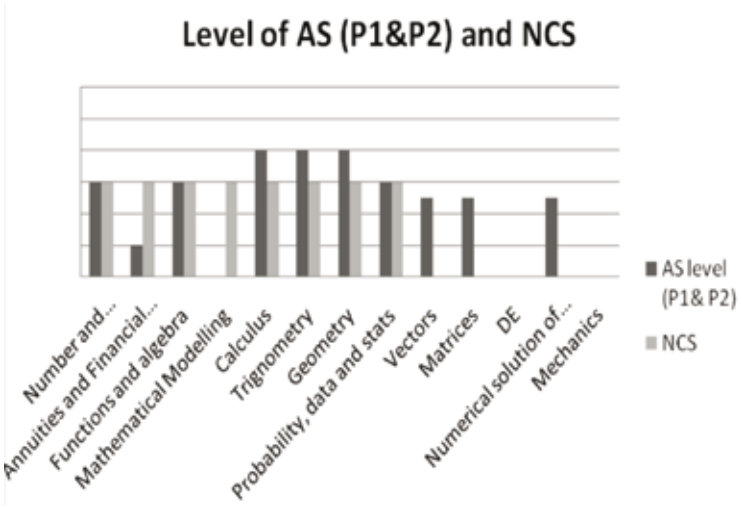


Level of CIE IGCSE (extended) in comparison with the NCS
The graphical representation indicates that the level of the CIE IGCSE is below that of the NCS.

Although IGSCE offers probability, data and statistics and geometry at a slightly higher level and offers introductory vectors and matrices which the NCS does not, it does not offer any calculus nor does it specify any mathematical modelling and it offers the rest of the topics at a lower level.

For these reasons the team would argue that IGCSE is not of comparable credit worthiness to the NCS.

The IGCSE curriculum would not provide sufficient background for learners to be admitted to courses in higher education that require the South African NSC

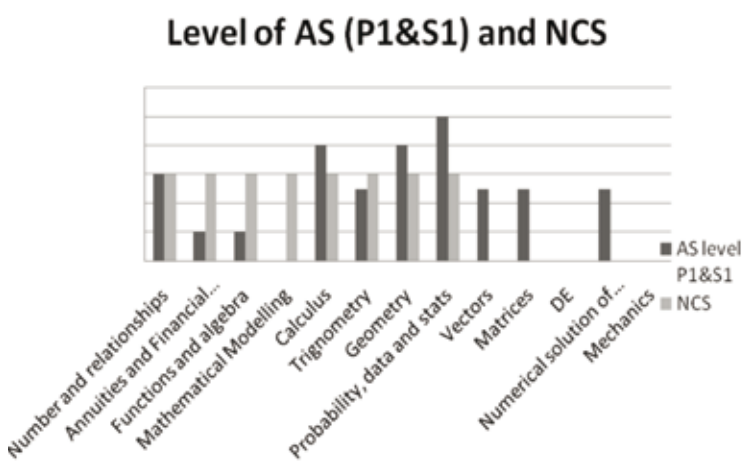


Level of the CIE AS Level (P1&P2) in comparison with the NCS
The graphical representation indicates that the level of the CIE AS Level (P1&P2) is comparable with that of the NCS.

Although AS Level (P1&P2) does not offers a lower level of financial mathematics and does not specify mathematical modelling, it offers probability, data and statistic, calculus, trigonometry and geometry at a slightly higher level. In addition three topics (matrices, vectors and numerical solution of equations) which are not in the NCS are included in the course.

For these reasons the team would argue that the CIE AS Level (P1&P2) is of comparable credit worthiness to the NCS.

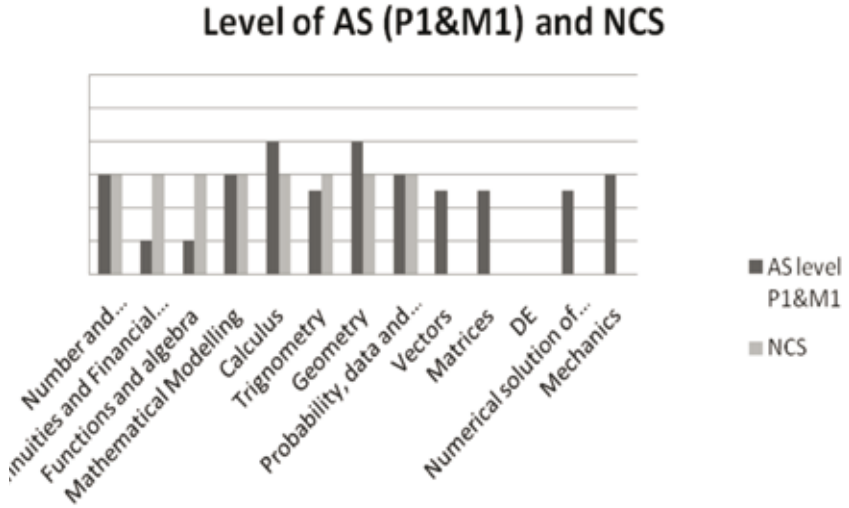
The AS-Level (P1&P2) curriculum would provide sufficient background for learners to be admitted to courses in higher education that require the South African NSC Mathematics.



Level of the CIE AS Level (P1&M1) in comparison with the NCS
The graphical representation indicates that the level of the AS Level (P1&M1) is comparable with that of the NCS, but that it has a different emphasis.

Although the AS Level (P1&M1) does not offer some of the pure mathematics topics at the same level as they in the NCS, it does offer topics in Applied Mathematics (i.e. from mechanics) which the NCS does not. In addition three topics (matrices, vectors and numerical solution of equations) which are not in the NCS are included in the course. For these reasons the team would argue that the CIE AS Level (P1&M1) is of comparable credit worthiness to the NCS.

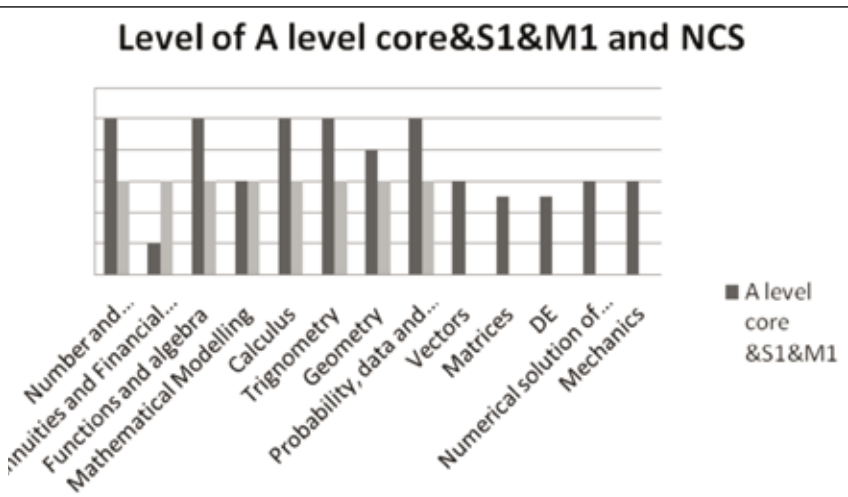
The AS-Level (P1&M1) curriculum should provide sufficient background for candidates to be admitted to courses in higher education that require the South African NSC Mathematics, however candidates would need to be aware of particular topic gaps (e.g. exponents and logs, the factor theorem, compound angles in trigonometry) they would have that those who did the South African NSC wouldn't have and would need to study these independently.



Level of CIE AS Level (P1&S1) in comparison with the NCS
The graphical representation indicates that the level of the CIE AS Level (P1&S1) is comparable with that of the NCS, but that it has a different emphasis.

Although the AS Level (P1&S1) does not offers some of the pure mathematics topics at the same level as they in the NCS, it does offer topics in probability, data and statistics at an advanced level which the NCS does not. In addition three topics (matrices, vectors and numerical solution of equations) which are not in the NCS are included in the course. For these reasons, the team would argue that the CIE AS Level (P1&S1) is of comparable credit worthiness to the NCS.

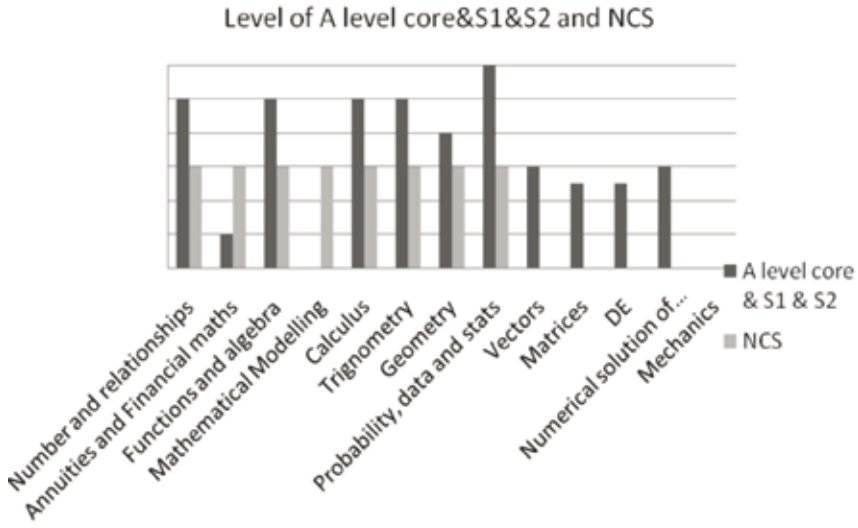
The CIE AS Level (P1&S1) curriculum should provide sufficient background for candidates to be admitted to courses in higher education that require the South African NSC Mathematics, however candidates would need to be aware of particular topic gaps (e.g. exponents and logs, the factor theorem, compound angles in trigonometry) they would have that those who did the NCS wouldn't have and would need to study these independently.



Level of the CIE A Level (core&S1&M1) in comparison with the NCS
The graphical representation indicates that the level of the CIE A Level (core&S1&M) is higher than that of the NCS.

Most key topics are offered in A Level (core&S1&M1) at a higher level than in the NCS. In addition Mathematics HL offers additional topics at a moderate level. For these reasons, the team would argue that the CIE A Level (core&S1&M1) is of greater credit worthiness to the NCS.

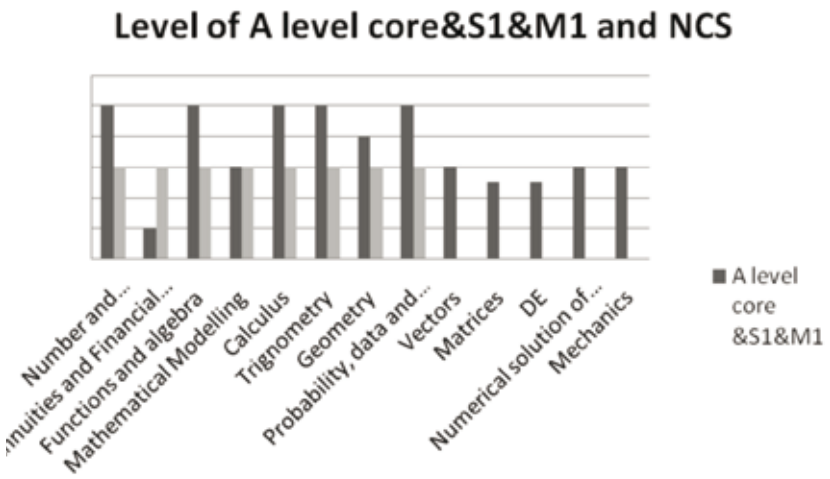
The A-Level (core&S1&M1) curriculum would provide sufficient background for candidates to be admitted to courses in higher education that require the South African NSC Mathematics. Some of the topics dealt with in the A-Level (core&S1&M1) curriculum are typically dealt with in 1st year university Mathematics, Statistics and Applied Mathematics courses and thus a candidate passing the A Level (core&S1&M1) should be able to pass 1st year Mathematics, Statistics and Applied Mathematics. Candidates entering higher education institutions with a pass in the A Level (core&S1&M1), could potentially be given credit for some 1st year level mathematics courses.



Level of CIE A Level (core&S1&S2) in comparison with the NCS
The graphical representation indicates that the level of the CIE A Level (core&S1&S2) is higher than that of the NCS.

Most key topics are offered in A Level (core&S1&M1) at a higher level than in the NCS. In addition IB Mathematics HL offers additional topics at a moderate level. For these reasons the team would argue that the CIE A Level (core&S1&S2) is of greater credit worthiness to the NCS.

The CIE A-Level (core&S1&S2) curriculum would provide sufficient background for candidates to be admitted to courses in higher education that require the South African NSC Mathematics. Some of the topics dealt with in the A Level (core&S1&S2) are typically dealt with in 1st year university Mathematics and Statistics courses and thus a learner passing A Level (core&S1&S2) should be able to pass 1st year Mathematics and Statistics. Learners entering higher education institutions with A Level core&S1&S2 could potentially be given credit for some 1st year level mathematics or statistics courses.



Level of the CIE A Level (core&M1&M2) in comparison with the NCS
The graphical representation indicates that the level of the CIE A Level (core&M1&M2) is higher than that of the NCS.

Most key topics are offered in A Level (core&M1&M2) at a higher level than in the NCS. In addition Mathematics HL offers additional topics at a moderate level and mechanics at an advanced level. For these reasons, the team would argue that the CIE A Level (core&M1&M2) is of greater credit worthiness to the NCS.

The A -Level (core&M1&M2) curriculum would provide sufficient background for candidates to be admitted to courses in higher education that require the South African NSC Mathematics. Some of the topics dealt with in the CIE A Level (core&M1&M2) are typically dealt with in 1st year university Mathematics and Applied Mathematics courses and thus a candidate passing A Level (core&M1&M2) should be able to pass 1st year Mathematics and Statistics.

Candidates entering higher education institutions with a pass in A Level (core&M1&M2) could potentially be given credit for some 1st year level Mathematics or Applied Mathematics courses.

2.2 Content and skill weighting

In this section the team were required to look at both the percentage of class time and the percentage of examination marks allocated to the content and skills in the examination. This presented the team with a number of difficulties which are discussed below.

2.2.1 Content and skill weighting in terms of percentage class time

There were two key difficulties here: the first is that the different ways qualification authorities package their courses into different components might mean a comparison of individual components on percentage class time will distort the picture and the second is that the amount of class time allocated for each of the curricula compared differed.

To exemplify the first issue, the team investigated how the South African NSC and the IB Mathematics courses are packaged. The NSC Mathematics Grade 10 – 12 is a 3-year course, whereas the IB Mathematics SL course is part of the 2-year Diploma Programme. The weighting in terms of class time for the topic area *number and number relations* is 5% for the IB Mathematics SL course and 10% for the NCS which would suggest these two curricula have a different emphasis. However if one incorporated the last year of the Mathematics course of the IB Middle Years Programme (which precedes the Diploma Programme) it might be possible that this difference would disappear.

The team members were of opinion that it would not help to restrict themselves to make the NSC a comparable 2-year course by looking at Grade 11 and 12 only. This is because

the curricula for the NSC are designed as a 3-year course, but if one conceived of a course ending in Grade 10 followed by a 2-year programme one might choose to arrange the topics differently i.e. some topics which are taught in Grade 11 could be brought back to Grade 10 and vice versa.

The second issue is more straightforward. The number of hours for each curriculum is given below:

Table 5: Teaching hours

Curriculum	Total number of teaching hours	Number of years over which course is taken	Reference
NCS	340 - 400	3 years	EC10WS; EC11WS; EC12WS
IB Mathematical Studies SL	150	2 years	IBSS p2
IB Mathematics SL	150	2 years	IBS p2
IB Mathematics HL	240	2 years	IBH p2
IB Mathematics HL + IB Further Mathematics SL	390	2 years	IBH p2; IBF p2
CIE IGCSE	not specified	2 years	IG p1
CIE AS Level and A Level	not specified	not specified	

Apart from the obvious difficulty of having no indication of teaching hours from the CIE, the team realised that the number of hours for each course differs. Thus a 5% weighting in terms of class time implies a very different number of hours for the NCS and IB Mathematics SL, for example.

The combination of these two issues has meant that an analysis of class time weighting was not useful for a comparison of the curricula.

2.2.2 Weighting of marks in the examination

Although the Examination Guidelines for the NCS (Document NE, p4-5) provide a breakdown of the weighting of marks in the examination for the various topic areas and for each of four cognitive levels (knowledge, performing routine procedures, performing complex procedures and problem solving) neither the IB nor the CIE curricula do this.

The curricula for the CIE A Level and AS Level did not provide any specification about weighting in the examination (apart from stating the weighting in the overall mark of each of the two papers at AS Level and each of the 4 papers at A Level). Similarly the CIE IGCSE Core and Extended curricula simply gave information about the relative weighting of each of the two papers in the overall mark.

The IB curricula did not provide a breakdown of information about the weighting of examinations in terms of the broad topic areas. They do provide, what they call, a "weighting of objectives" which lists the percentage weighting of each of 11 objects. Here, for example, they specify that "know and use mathematical concepts and principles" needs to be weighted at 15% and "formulate a mathematical argument and communicate it clearly" at 10%. There is no comparable listing for either the NSC or the CIE curricula.
Thus there was no specified examination weighting that could be used to make comparisons across the curricula.

2.3 Content and skill focus

In this section the Umalusi curriculum evaluation instrument requested the team to rate content as either discipline-specific and required for a single subject only, or as useful for more than one school subject/useful for academic study in general, or as general knowledge required by school-leavers in order to cope with everyday living. In the context of Mathematics which is both a discipline in its own right and a tool in many other disciplines, this is hard to do. The kind of topics taught at school level in Mathematics lead into Further Mathematics, can be applied in other disciplines and often can be applied in everyday life. For example the linear function can be studied as a mathematical entity in its own right or it can be used to model situations of change at a constant rate (e.g. distance-time where velocity is constant in the Physical Sciences or cost-versus electricity tariffs where the cost per kilowatt hour is constant). In addition the nature of mathematical knowledge is such that one often has to build a substantial basis of mathematical skills in order to be able to apply them in other disciplines. For example, in order to solve questions modelling population growth requiring differential equations a student might need facility with algebra, functions, differential and integral calculus. A course that works towards ensuring that a candidate has the necessary skills to do the population-modelling might if evaluated topic by topic looked highly weighted towards the discipline-specific side however the focus is clearly towards developing a skill that is useful in other disciplines. The team thus felt that there was no sensible way to categorise topics as either *discipline-specific, generic or everyday*.

However the curricula did differ in their focus and the team felt it was important to reflect these differences. The team thus looked at the relative weighting of pure Mathematics, Applied Mathematics and Statistics in the curricula and at the way extra-mathematical contexts are described in the curricula or reflected in the examinations. This is discussed in detail below.

2.3.1 The relative weighting of Pure Mathematics, Applied Mathematics and Statistics

Although the courses are called "Mathematics" they incorporate elements from the disciplines of Pure Mathematics, Statistics and Applied Mathematics. The team reflects the relative weighting of these in Table 6. In the case of the NCS the weighting could be reflected both in terms of an estimate of class time spent on the topics and on the examination weighting over Grade 10, 11 and 12. The IB curricula provide detail in terms of class time, but do not give information about the weighting of topics in the examination. Thus the weighting given for the IB curricula is in terms of class time only. The Cambridge curricula provide no information in terms of class time, but do provide the examination weighting of broad topic areas for A Level and AS Level. Thus the weighting for the Cambridge A-Level and AS-Level curricula are given in terms of examination weighting only. No information about either class weighting or topic weighting in the examination was provided for the IGSCE curriculum.

Within the category Statistics, the team included "*Statistics and Probability*". The distinction between Pure Mathematics and Applied Mathematics was often difficult to make. As explained above, calculus is used extensively in Applied Mathematics and thus could be classified as belong to both disciplines. However the team made the decision to allocate such topic areas to Pure Mathematics. Topic areas that were allocated to applied mathematics were only those that were clearly demarcated as existing for the purpose of application e.g. financial mathematics, linear programming, mathematical modelling, mechanics.

Three words of caution needed to be noted in interpreting the table below:

i) The number of hours of class time for each of the curricula differ so if the curriculum that reflects the greatest percentage of class time for statistics, for example, cannot necessarily be interpreted as spending the most time on statistics.

ii) A lack of weighting in the Applied Mathematics column does not necessarily mean that the taught curriculum offers few applications. It is entirely possible that a number of the pure mathematics topics could be taught in a contextualised manner.

iii) The table contain a mixture of exam weighting and class time weighting.

Table 6: Exam and class weighting of Pure Mathematics, Applied Mathematics and Statistics

	Pure Mathematics	Applied Mathematics	Statistics
NCS core (class time weighting)	79%	15%	6%
NCS core (exam weighting grades 10-12)	79%	11%	10%
NCS + optional (exam weighting grades 10-12)	70%	9%	21%
IB Mathematical Studies (class time weighting)	56%	14%	30%
IB Mathematics SL (class time weighting)	77%	3%	20%
IB Mathematics HL core (class time weighting)	77.5%	2.5%	20%
IB Mathematics HL core + Statistics and probability option (class time weighting)	65%	2%	33%
IB Mathematics HL core + any of other options (class time weighting)	81%	2%	17%
IB Mathematics HL + Further Mathematics SL (class time weighting)	76.5%	1.5%	22%
IGSCE	no information on weighting available		
AS Level P1 and P2 (exam weighting)	100%	0%	0%
AS Level P1 and M1 (exam weighting)	60%	40%	0%
AS Level P1 and S1 (exam weighting)	60%	0%	40%
A Level P1, P3, M1, S1 (exam weighting)	60%	20%	20%
A Level P1, P3, M1, M2 (exam weighting)	60%	40%	0%
A Level P1, P3, S1, S2 (exam weighting)	60%	0%	40%

This table suggests that the NCS has a similar weighting in Pure Mathematics to the IB Mathematics SL and most of the IB Mathematics HL offerings. However the NCS core focuses less on Statistics and more Applied Mathematics than the IB courses. The IB Mathematical Studies has less of a focus on Pure Mathematics and a much greater weighting on Statistics than the NCS core.

The AS-Level courses allow learners to specialise in Pure Mathematics or combine Pure Mathematics with either Statistics or Mechanics. The A-Level courses allow learners to combine Pure Mathematics with either Statistics or Mechanics or both.

2.3.2 Use of extra-mathematical contexts in the curricula and examinations

The application of Mathematics to everyday contexts is emphasized in the introductory chapters of the NCS (Document NC), and is reflected in a number of the assessment standards where the content and skills to be covered are outlined. For example, in each grade there is an assessment standard that deals specifically with mathematical modelling of real-life contexts (see Assessment Standards 10.2.6; 11.2.6, and 12.2.6 in Document NC). A number of other assessment standards also reflect this desired focus, as can be seen in the statement "…*critically analyze investment and loan options and make informed decisions as to the best options*…" (Assessment Standard 12.1.5, Document NC), for example. Content areas such as *annuities and finance* and *data handling* in the NCS also have an overt application focus. However the NCS is also clear that applications and modelling are not the only focus and state: "*Mathematics is a discipline in its own right and pursues the establishment of knowledge without necessarily requiring applications in real life*" (Document NC, p. 9).

In the IB curricula, Mathematical Studies SL is described as specifically geared towards mathematical applications in the real-world, Mathematics SL as geared towards developing mathematical techniques, but applying them where possible and Mathematics HL and Further Mathematics as focusing on a balance between rigour, structure and problem solving in appropriate contexts. The team only had available examinations from Mathematical Studies SL and Mathematics HL, but these reflect the greater emphasis on applications in Mathematical Studies and on abstract mathematics in Mathematics HL. However in all the IB examinations the Statistics and Probability questions tended to be contextualised. In addition in the Mathematical Studies curriculum a project involving extra-mathematical contexts is specified. In the Mathematics SL and Mathematics HL curricula two pieces of portfolio work are stipulated. One has to be a mathematical modelling task which would require work on an extra-mathematical context and the other has to be a mathematical investigation which might require work on an extra-mathematical context.

In the Cambridge curricula the description of the subject includes both abstract and pure mathematics. Within the IGCSE curricula the assessment in the core curriculum is described as having a greater focus on recalling, applying and interpreting mathematical knowledge in the context of everyday situations (IG, p2) than the extended curriculum, whereas the extended curriculum is described as having a greater focus on problem-solving, mathematising a relatively unstructured The IGCSE exam papers contain a mixture of contextualised and non-contextualised questions. At the AS Level and A Level the Pure Mathematics exam papers have very little or no contextualised questions whereas the Statistics and Mechanics papers are largely contextualised. Thus at the AS Level if a candidate took P1 and P2, it would be possible for that candidate to deal with very little contextualised mathematics. However if candidates took any other option at AS Level or did A Level they would have a split of contextualised to non-contextualised mathematics of roughly 40:60.

3. Organising principle and coherence

In each of the curricula studied the content and skills have been organised according to content areas of mathematics. This organisation into content areas of mathematics is coherent.

3.1 The South African NSC

The NSC curriculum is organised into four learning outcomes namely Learning Outcome 1: Number and Number Relationships; Learning Outcome 2: Functions and Algebra; Learning Outcome 3: Space, Shape and Measurement and Learning Outcome 4: Data Handling and Probability (Document NC, p.12-14). The Assessment Standards which provide details of what the candidates need to be able to do are listed under these Learning Outcomes.

3.2 The IB courses

The IB Mathematical Studies SL course is organised into 8 topics namely Introduction to the graphic display calculator; Number and Algebra; Sets, Logic and Probability; Functions; Geometry and Trigonometry; Statistics; Introductory Differential Calculus; Financial Mathematics.

The IB Mathematics SL course is organised into 7 topics namely Algebra; Functions and Equations; Circular functions and Trigonometry; Matrices; Vectors; Statistics and Probability; Calculus.

The IB Mathematics HL course is organised into core content and optional content. The core content is organised into 7 topics namely Algebra; Functions and equations; Circular Functions and Trigonometry; Matrices; Vectors; Statistics and probability; Calculus. The optional content is organised into four topics namely Statistics and Probability; Sets, Relations and Groups; Series and Differential Equations; Discrete Mathematics.

The IB Further Mathematics course is organised into four topic namely Geometry; Statistics and Probability; Sets, Relations and Groups; Series and Differential Equations; Discrete Mathematics.

For each of the IB Mathematics courses details of the content to be learnt is listed under each of the topics specified.

3.3 The CIE courses

The IGCSE core and extended curricula are organised according to 37 topics namely: Number, Set notation and Language; Squares, Square roots and cubes; Directed numbers; Vulgar and decimal fractions and percentages; Ordering; Standard form; The four rules; Estimation; Limit of accuracy; Ratio, Proportion, Rate; Percentages; Use of an electronic calculator; Measures; Time; Money; Personal and household finance; Graphs in practical situations; Graphs of functions; Straight line graphs; Algebraic representation and formulae; Algebraic manipulation; Functions; Indices; Solutions of equations and inequalities; Linear programming; Geometrical terms and relationships; Geometrical constructions; Symmetry; Angle properties; Locus; Mensuration; Trigonometry; Statistics; Probability; Vectors in two dimensions; Matrices; Transformations.

Details of the content and skills to be learnt are listed under each of these topics specified. The list of topics for the IGCSE is long, but is ordered so that the first 16 deal largely with

number, the next 9 with algebra and functions, the next 7 with geometry and trigonometry, the next 2 with statistics and probability and the final 3 with vectors, matrices and transformations.

The A-Level and AS-Level courses are organised into the broad areas of pure mathematics, applied mathematics and probability and statistics. Within each of these broad areas the there is further organisation into topics. These are given below for each of the broad areas:

Pure Mathematics 1: Quadratics; Functions; Coordinate geometry; Circular measure; Trigonometry; Vectors; Series; Differentiation; Integration

Pure Mathematics 2: Algebra; Logarithmic and exponential functions; Trigonometry; Differentiation; Integration; Numerical solution of equations

Pure Mathematics 3: Algebra; Logarithmic and exponential functions; Trigonometry; Differentiation; Integration; Numerical solution of equations; Vectors; Differential equations; Complex numbers

Mechanics 1: Forces and equilibrium; Kinematics of motion in a straight line; Newton's laws of motion; Energy, work and power

Mechanics 2: Motion of a projectile; Equilibrium of a rigid body; Uniform motion in a circle; Hooke's law; Linear motion under a variable force

Probability and Statistics 1: Representation of data; Permutations and combinations; Probability; Discrete random variables; The normal distribution

Probability and Statistics 2: The Poisson distribution; Linear combinations of random variables; Continuous random variables; Sampling and estimation; Hypothesis tests

For each of these broad areas the details of the content to be learnt is listed under each of the topics specified.

4. Sequencing, progression and pacing

4.1 Sequencing, progression and pacing within each year of study

None of the curricula specified how the content and skills should be sequenced within each year of study.

For the South African NSC curriculum suggested work schedules are drawn up at the provincial, district and school levels which can provide educators with guidance as to the sequence in which they should teach topics and the length of time they should spend on them. Examples of these are the work schedules the team looked at from the Eastern Cape Provincial Department of Education (Document EC10WS; EC11WS; EC12WS). However these documents are not prescriptive and only provide one suggested ordering of topics. The suggested work schedules educators get from provincial, district and school level might differ. The team thus did not feel able to make a judgment on whether progression or advancement is evident in the sequencing of skills and content within each year. For the IB curricula and the CIE curricula no sequencing of curricula within each year of study is provided. The CIE A-Level and AS-Level curricula in particular do not specify the period over which the curricula are to be taught.

4.2 Sequencing across the years of study

The CIE IGCSE and IB curricula do not specify what content and skills need to be taught in each year of study.

The CIE A-Level and AS-Level curricula do not specify what content and skills need to be taught in each year of study, but does state that "*Units P2, M2, S2 are sequential to units P1, M1, S1 respectively, and the later unit in each subject area may not be used for certification unless the corresponding earlier unit is being (or has already been) used*" (AC, p. 3). A similar point is made up P3 being sequential to P1. (AC, p. 3). However these statements make it clear that it is left up to the centres, schools or educators to decide how to sequence the content and skills across the years. In addition in the A-Level curriculum it is possible for a candidate to take M1 and S1 as their optional units and thus broaden the topics they study rather than "progress" to further study in particular topic areas.

The South African NSC curricula specify what content and skills need to be taught in each grade level. In each case it is clear that this ensures that prerequisite knowledge is in place prior to it being needed as a basis for new knowledge in a later grade. For the NSC curriculum, document NL provides explicit guidelines on the need to ensure conceptual progression (p.16) and suggests that conceptual progression should be evident across the assessment standards. For most of the topics in the NSC curricula the progression through the years is clear: for example, the basics of *Analytical Geometry* are dealt with in Grade 10, expanded to include lines in Grade 11 and *Circles and Tangents* in Grade 12 (Document NC, pp. 34-35). Although this is in many cases true there are a number of instances where the separation into various grade levels has no obvious progression-related justification. For example *Simple and Compound Growth* is dealt with in Grade 10 and Decay in Grade 11 (Document NC, pp. 18-19), *Arithmetic sequences* in Grade10 and *Geometric sequences* in Grade11 (Document NC, pp. 18-19). There is no real "progression" in this. It instead perhaps reflects a desire to revisit a topic area each year. The team also noted that the progression of skills in *Linear programming* from Grade 11 to Grade 12 (Document NC, p. 31) is somewhat artificial.

4.3 Increase in cognitive complexity over the period

The hierarchical nature of mathematics as a discipline means that new knowledge builds on old knowledge and for this reason in the NSC curricula the cognitive demand increases each year as new knowledge in each of the topic areas is added. However although the allocation of skills and content to the various grades reflects the hierarchical nature of mathematics and hence does provide for an increase in cognitive demand over the years, there is no explicit and detailed discussion of this progression.

The CIE IGCSE, AS-Level and IB curricula do not specify what content and skills need to be taught in each year of study and thus one cannot judge how the topic areas will be spread over the two years of study.

Within the CIE A-Level curriculum the hierarchical nature of mathematics as a discipline means that unit P3 is more complex than unit P1 and unit M2 is more complex than unit M1 and unit S2 is more complex than unit S1. It is thus likely that if learners do unit P1 and S1 or M1 in their first year of study and unit P3 and S2 or M2 in their second year of study the cognitive demand will increase over the two years. However as noted in Section 4.2 above this sequencing does not necessarily have to be followed.

4.4 Allocation of content to each grade

For the NSC curriculum there is clear specification of what needs to be covered each grade. The NSC curriculum documents NA (pp. 15-22) and NC (pp. 16-61) list what must have been covered in each grade of Grades 10, 11 and 12.

For the IB and CIE curricula not such specification is given.

5. Aims/purpose/vision/outcomes

5.1 The aims of the curricula

All the curricula list their aims and purposes clearly. Although the nuance of the way in which the aims are described differ, all the curricula list the following as aims of the course: That the candidates should

- develop the ability to communicate using mathematical representations;
- develop confidence in their ability to do Mathematics and enjoy and appreciate the discipline
- acquire the mathematical content and process required for further study
- develop their mathematical problem-solving abilities
- work with mathematical practices like abstraction, generalisation and proof
- apply Mathematics in extra-mathematical contexts

In other words the curricula put forward the appreciation and mastery of Mathematics as a discipline in its own right as well as the development of the ability to use mathematical tools in other disciplines and contexts as their overarching goals.

5.2 Guidance for achieving aims

The team queried whether it was the role of a curriculum document to provide guidance as to how the aims of the curriculum might be achieved. The evaluation team therefore felt that this would be something that would need to be done in the context of teacher education and professional development. None of the curriculum documents explicitly dealt with how the aims should be achieved. However the NSC curriculum documents do give some indicators for this in the manner in which the assessment standards are described. For example, in the assessment standards on number patterns, the NCS states that "*learners need to conjecture, generalise, justify and prove*" (Document NC, pp. 18-19). This asks the candidates to engage in practices which are core to the discipline of Mathematics itself. And, for example, one of the assessment standards on trigonometry explicitly requires from candidates to use trigonometric and geometric models in real-life contexts (Document NC, p. 36). This gives flesh to the aim of using Mathematics to make sense of society and of using mathematical knowledge in problem-solving situations.

5.3 Do the aims take into account the various contexts in which the curricula will be enacted

The aims of all of the curricula are described in a fairly broad way and so are suited to a range of contexts.

The IBO offers 4 different mathematics courses at the Diploma Programme level which means that learners can choose the type of course that best suits their purposes. The CIE AS-Level and A-Level courses allow candidates the option of taking either AS or A Levels and of taking

various combinations of optional units within these. Again this means that candidates are able to tailor the course to their needs. As both the IBO and CIE courses are international courses that will be taken by learners in different countries this flexibility is important.

5.4 The articulation of the curriculum with other parts of the education system

The South African NSC curriculum document indicates that Mathematics needs to be taken by candidates interested in pursuing careers in the scientific or technologic al fields and will provide links to Mathematics in higher education institutions (Document NC, p. 11) These ideas are also discussed in the Learning Programme Guidelines (Document NL, p. 7) together with further examples of further learning and careers for which Mathematics is needed. Both the curriculum document and the Learning Programme Guidelines state that Mathematics in the FET band builds on the mathematical base established in the GET band (Document NC, p. 11; Document NL, pp. 9-10) For Learning Outcome 3, this is explicitly stated as building on the experiences of the GET band to "make more formal and extended levels of knowledge accessible" (Document NC, p. 13) and for Learning Outcome 4 as expanding on the data handling of the GET band and deepening the understanding of probability gained at the GET band (Document NC, p. 14).

The CIE AS-Level and A-Level courses are described as being "*intended to provide continuity from O level or IGCSE Mathematics courses*" (AC, p. 1) and the knowledge of content of O level/IGCSE Mathematics is assumed (AC, p. 5). One of the aims of the AS-Level and A-Level courses is to "*acquire the mathematical background necessary for further study in this or related subjects*". No further information is provided about the articulation of the AS- and A-Level courses with other parts of the education system. It is possible that these might be provided in other general documents relating to CIE programmes. It is also possible that the fact that these courses will be enacted within the educational systems of different countries means that it is difficult to provide more detailed information than this.

The CIE IGCSE courses are simply described as "*designed as two-year courses for examination at age 16-plus*". No further information is given about articulation with other parts of the education system.

The IB courses are part of the Diploma Programme (DP) which is described as "*a rigorous pre-university course of studies, leading to examinations, that meets the needs of highly motivated secondary school students between the ages of 16 and 19 years. Designed as a comprehensive two-year curriculum that allows graduates to fulfil requirements of various national education systems, the DP model is based on the pattern of no single country but incorporates the best elements of many*" (IBF, p. 1). The purpose of each of the four mathematics courses offered as part of the DP describe clearly how they relate to possible further study (see Section 1.2.2 above). For each of the four mathematics courses a list of presumed knowledge is provided (IBSS, pp. 10-11; IBS, pp. 9-11; IBH, pp. 10-12; IBF, p. 4). This means that in the context of a programme that might be enacted in the context of different educational systems clear indications of the prerequisite knowledge is provided.

6. Teaching approach and subject methodology

None of the curricula provided detailed information about the either the general pedagogic approach that should be adopted nor did they attempt to describe subject-specific teaching approaches. The team did not feel that it was the place of a curriculum document to provide this information.

7. Assessment guidance

7.1 Assessment guidance in the South African NSC curriculum

The Subject Assessment Guidelines (Document NA) together with the Examination Guidelines (Document NE) provide information on both internal and external assessment. These, together with their weighting are provided in the table below:

Table 7: Assessment tasks in the NCS in grade 12

	Weighting out of 400 marks
Internal assessment	**100**
Test 1	10
Investigation or project	20
Assignment 1	10
Assignmnet 2	10
Examination 1	15
Test 1	10
Examination 2	25
External assesment	**300**
Paper 1	150
Paper 2	150
Optional: Paper 3	100 (these marks are reported separately and not incorporated into a learner's overall mark for core mathematics.

(from Document NA, p. 2 and p. 11)

The internal programme of assessment for Grade 12 provided (Document NA, p. 11) provides information on the type of task and the weighting of the task. However the types of tasks are simply listed by name (e.g assignment, project). None of the NSC curriculum documents provide clear guidelines as to what exactly is meant by an investigation, a project or an assignment.

Details of the externally set final examinations are provided in the Examinations Guidelines (Document NE, pp. 3- 5). This document provides details of the topic weightings in the 2 core and 1 optional examination papers (Document NE, p. 4), the weighting in terms of the four categories of cognitive demand (Document NE, p. 5) and gives details of the time allocation and number of marks for each examination paper (Document NE, p. 3).

7.2 Assessment guidance in the IGCSE

Candidates can either take the IGCSE core curriculum or IGCSE extended curriculum. They can take either of these curricula either without course work or with coursework. The weighting, time allocation, brief description and number of marks are provided for each of these in the curriculum document (Document IG, pp. 3&4) and this is summarised below:

Table 8: Assessment tasks in the IGCSE curricula

IGCSE core curriculum without coursework	IGCSE extended curriculum without coursework	IGCSE core curriculum with course work	IGCSE extended curriculum with course work
Paper 1 weighting 35% 1 hour short answer questions	Paper 2 weighting 35% 1 ½ hours short answer questions	Paper 1 weighting 30% 1 hour short answer questions	Paper 2 weighting 30% 1 ½ hours short answer questions
Paper 3 weighting 65% 2 hours structured questions	Paper 4 weighting 65% 2 ½ hours structured questions	Paper 3 weighting 50% 2 hours structured questions	Paper 4 weighting 50% 2 ½ hours structured questions
		Paper 5 weighting 20% coursework	Paper 6 weighting 20% coursework
Only grades C to G are awarded	Only grades A* to E are awarded	Only grades C to G are awarded	Only grades A* to E are awarded

Internal assessment is only part of IGCSE if the course is done "*with coursework*". The curriculum document (Document IG, p. 4) makes it clear that a centre can only offer the IGCSE courses with course work if the educators undergo special training in assessment. The coursework component (i.e. Paper 5 or Paper 6) is described in detail in the curriculum document (Document IG, pp. 11-22).

The coursework assignment is suggested as being between 8-15 pages in length and should take between 10 – 20 hours. It should aid the development of problem-solving, practical use of mathematics and independent work (Document IG, p. 11). Details of assessment and moderation processes are also provided (Document IG, pp. 12-18).

In addition to the information about external assessment given in the table above a specification grid is provided (document IG, p. 2). This describes which of the curriculum aims are emphasized more in the core or extended curricula and whether they are assessed in the short-answer questions, the structured longer answer questions or the coursework.

7.3 Assessment guidance in CIE AS- and A-Level curricula

The curricula for the CIE AS- and A-Level courses do not specify any internal assessment. Information about the external assessment is provided in the curriculum (AC, p. 3&4) and is summarised in **Table 9** below.

Table 9: Assessment tasks in the AS-Level and A-Level curricula

	Compulsory units		Optional Units		
AS Level Mathematics	P1 weighting 60% 1 ¾ hours, 75 marks	**AND**	P2 weighting 40% 1 ¼ hours, 50 marks **OR** M1 weighting 40% 1 ¼ hours, 50 marks **OR** S1 weighting 40% 1 ¼ hours, 50 marks		
A Level Mathematics	P1 weighting 30% 1 ¾ hours, 75 marks and P3 weighting 30% 1 ¾ hours, 75 marks	**AND**	M1 weighting 20% 1 ¼ hours, 50 marks **OR** M1 weighting 20% 1 ¼ hours, 50 marks **OR** S1 weighting 20% 1 ¼ hours, 50 marks	**AND** **AND** **AND**	S1 weighting 20% 1 ¼ hours, 50 marks M2 weighting 20% 1 ¼ hours, 50 marks S2 weighting 20% 1 ¼ hours, 50 marks

Information is given about the approximate number of questions in each examination paper (about 10 for P1 and P3, and 7 for the other papers) and the fact that questions will be arranged in order of increasing mark allocation with no choice of questions (Document AC, p. 4). No further detail is provided about the examination papers.

7.4 Assessment guidance in the IB curricula

Assessment guidance for both internal and external assessment is provided in all the IB curricula (Documents IBSS, pp. 27-45; IBS pp. 28-48; IBH pp. 53-76; IBF pp. 37-48) and these are summarised here.

Table 10: Assessment tasks in the IB curricula

	Mathematical Studies SL	Mathematics SL	Mathematics HL	Further Mathematics SL
External assesment	Paper 1 weighting 40% 1 ½ hours 15 compulsory short –response questions Paper 2 weighting 40% 1 ½ hours 5 compulsory extended-response questions	Paper 1 weighting 40% 1 ½ hours equal weighting of short-response and extended-response questions no calculator allowed Paper 2 weighting 40% 1 ½ hours equal weighting of short-response and extended-response questions Graphic display calculator required	Paper 1 weighting 30% 2 hours equal weighting of short-response and extended-response questions on compulsory core no calculator allowed Paper 2 weighting 30% 2 hours equal weighting of short-response and extended-response questions on compulsory core Graphic display calculator required Paper 3 weighting 20% 1 hour Extended response questions on the option chosen Graphic display calculator required	Paper 1 weighting 35% 1 hour 4-6 compulsory short-response questions Paper 2 weighting 65% 4-6 compulsory extended-response questions based on the whole syllabus
Internal assesment	Project weighting 20% about 20 of the 150 teaching hours should be allocated to the project.	Two pieces of work 20% One on mathematical modelling one a mathematical investigation. about 10 of the 150 teaching hours should be allocated to this work.	Two pieces of work 20% One on mathematical modelling one a mathematical investigation. about 10 of the 240 teaching hours should be allocated to this work.	none

For all the IB curricula the nature of external assessment is described in some detail. This includes the nature (i.e. short or extended response) and number of the questions. No weighting according to topic areas is provided. A weighting of objectives is given (Documents IBSS, p. 34; IBS, p. 38; IBH, p. 66; IBF, p. 48).

For the internal assessment details of the project work in the case of mathematical studies and the portfolio work on mathematical modelling and mathematical investigation in the case of mathematics SL and HL are provided. These details include the purpose, requirements, time allocation and assessment criteria.

8. Other issues not identified in Umalusi instrument, but that need to be reported on

8.1 Technology

The CIE and NSC curricula and examinations assume that the learners will have access to a basic scientific calculator. The NSC curriculum encourages the use of other available technology where possible (Document NC, p. 10). Candidates doing the IB curricula are expected to have access to a graphic display calculator (GDC). This alters the nature of some of the mathematical work done in the IB curricula. For example, solutions of equations are done using the GDC, candidates can work with a variety of functions because of access to the GDC.

8.2 Format of curriculum

The evaluation team found the format of the IB curricula particularly clear to work with. For each broad topic area the content was listed alongside which amplifications and exclusions were listed and thereafter teaching notes. These served to make the content requirements of the curriculum explicit.

9. The ex post facto-check on the Namibian curricula and exams

The syllabus synopsis that the team had for Namibia Senior Secondary Certificate Ordinary and Higher Level did not provide any detail about the Mathematics curricula and did not specify the content to be examined. However the team analysed the examination papers for these curricula and used this to make a judgment on the level of the Namibian curricula.

The Namibian Ordinary Level (core) examination papers (Documents Nam P1, Nam P3) contained content and skills at a similar level to the IGCSE core examination papers (documents IG P1, IG P3). The Namibian Ordinary Level (extended) examination papers (Documents Nam P2, Nam P4) contained content and skills at a similar level to the IGCSE extended examination papers (documents IG P2, IG P4).

Thus the team we felt that the Namibian Ordinary Level was of a lower level than the NCS.

The Namibian Higher Level examination papers (Document NamH P1 and NamH P2) cover content that is similar to that specified at the CIE AS Level. However there is a greater focus on geometry than in the CIE AS Level and some basic statistics is included. This similarity suggests that Namibian Higher Level examination papers will be comparable with the South African NSC standard.

Comparison of the Physical Sciences curricula of the NSC with International Qualifications (IQ's)

Details of evaluators:

Subject: Physical Sciences

Evaluators: Dr Sharon J Grussendorff (Team Leader), Ms Mmapaseka Stephen, Ms Akeda Isaacs, Dr André van der Hoven

Documents:

In compiling this report the following documents were referred to:

NSC curriculum: National Curriculum Statement (NCS)

- *National Curriculum Statement* for Grades 10 – 12 (2003) – Herein referred to as Document 1
- *Learning Programme Guideline* (2008) – Herein referred to as Document 2
- *Subject Assessment Guidelines* (2008) – Herein referred to as Document 3
- *Examination Guideline* (2008) – Herein referred to as Document 4

International Qualifications curricula

- CIE Physics 0625 IGCSE 2009 syllabus – Herein referred to as Document 5
- CIE Chemistry 0620 IGCSE 2009 syllabus – Herein referred to as Document 6
- CIE Physics 9702 A/As Level 2009 syllabus – Herein referred to as Document 7
- CIE Chemistry 9701 A/As Level 2009 syllabus – Herein referred to as Document 8
- IB Diploma Programme Physics Guide 2009 – Herein referred to as Document 9
- IB Diploma Programme Chemistry Guide 2009 – Herein referred to as Document 10

Introduction

In this report the South African National Curriculum Statement (NCS) and accompanying documentation for Physical Sciences is compared with the Physics and Chemistry courses of the Cambridge International Examination (CIE) and the Physics and Chemistry courses of the International Baccalaureate Diploma Programme (IB). A brief comparison is also made with the Namibian Senior Secondary Physical Sciences course.

Structure of the Courses

The South African National Senior Certificate (NSC):

In the Further Education and Training band (FET) of the NSC, Physics and Chemistry have been combined into one single course, namely Physical Sciences. This course is offered at one level, with no distinctions made for candidates of different aptitudes or interests.

Cambridge International Examinations (CIE):

Two educational qualifications are considered in the CIE:

- The International General Certificate of Secondary Education (IGCSE):
  The IGCSE Physics and Chemistry courses are separate stand-alone courses. Each course consists of a Core curriculum (herein abbreviated as IGCSE C) for students who are expected to achieve a Grade D or below, and an Extended curriculum (herein abbreviated as IGCSE X) for candidates who are expected to achieve a Grade C or above. In this report the content for the extended curriculum includes the content for the core curriculum plus any additional prescribed content.

- The General Certificate of Education (International) Advanced Level and Advanced Subsidiary Level:
  The Advanced Level Physics and Chemistry courses are separate stand-alone courses. These courses are flexible, and can be structured in a variety of ways:

  - Candidates may take all Advanced Level components (herein abbreviated as A) in the same examination session leading to the full A Level
  - Candidates may follow a staged route to the A Level by first completing the less extensive Advanced Subsidiary qualification (herein abbreviated as AS), and later completing the additional part of the course leading to the full A Level
  - Candidates may take the AS-Level qualification only.

International Baccalaureate (IB):

The Physics and Chemistry courses of the IB Diploma Programme are separate courses in the Group 4 category. Other Group 4 courses are Biology and Design Technology. Each of the Group 4 courses consists of two levels, namely Standard Level (herein abbreviated SL) and Higher Level (herein abbreviated HL). The SL and HL courses cover a common core curriculum, and the HL goes into greater depth in some topics, as well as incorporating additional topics which are more demanding than the common ones. SL candidates spend 40 hours on practical/investigative work, and HL candidates 60 hours. This includes 10 hours for the group 4 project. This project is an interdisciplinary activity that is compulsory for all science candidates for the Diploma Programme. As part of this project, students from the

different group 4 subjects collaboratively investigate a common topic or problem.

Namibian National Senior Secondary Certificate (NSCC):

The Senior Secondary phase of the Namibian education system is briefly considered in this report. In this phase, Physics and Chemistry have been combined into one single course, namely Physical Sciences. This course is offered at two levels: Ordinary Level (OL) and Higher Level (HL). The Namibian Physical Sciences curriculum is discussed in Section 9 of this report.

Specific aspects of the curricula
1.Content specification and coverage

The content prescribed in the NSC curriculum and in the curricula of the international qualification was compared with regard to specification, weighting and focus.

1.1 Content specification

The broad content topics covered in the various curricula have been listed in **Table 1** below.

Table 1: List of broad content topics covered in curricula

	NSC		CIE IGCSE		CIE A LEVEL		IB	
Content Topic	**Specified**	**Exam**	**C**	**X**	**AS**	**A**	**SL**	**HL**
Physical Quantities			Y	Y	Y		Y	Y
Measurements and techniques (Physics)					Y	Y	Y	Y
Density			Y	Y	Y	Y		
Pressure			Y	Y	Y	Y	Y	Y
Vectors				Y	Y	Y	Y	Y
Motion (1-D)	Y	E	Y	Y	Y	Y	Y	Y
Projectile motion (1-D)	Y	E			Y	Y	Y	Y
Momentum and impulse (1-D)	Y	E			Y	Y	Y	Y
Equilibrium	Y		Y	Y	Y	Y		
Torque	Y		Y	Y	Y	Y		
Motion (2-D)	(Y)							
Momentum and impulse (2-D)	(Y)							Y
Circular motion						Y	Y	Y
Orbital motion								Y
Mass vs weight	Y		Y	Y				Y
Newton's Gravitational Law	Y					Y	Y	Y
Concept and types of force	Y	E	Y	Y	Y	Y		
Force and Newton's Laws	Y	E			Y	Y	Y	Y
Work, power and energy	Y	E	Y	Y	Y	Y	Y	Y
Energy resources	Y		Y	Y			Y	Y
Transverse waves	Y		Y	Y	Y	Y	Y	Y
Longitudinal waves	Y		Y	Y	Y	Y	Y	Y
Sound and music	Y		Y	Y				
Physics of the ear and hearing	Y							
Ultrasound and applications	Y					Y		

X-rays						Y		
Magnetic resonance						Y		
	NSC		CIE IGCSE		CIE A LEVEL		IB	
Content Topic	**Specified**	**Exam**	**C**	**X**	**AS**	**A**	**SL**	**HL**
Geometrical optics	Y		Y	Y			Y	Y
Lenses and image formation	Y		Y	Y				
Resolution								Y
Polarisation								Y
EM Spectrum	Y	E	Y	Y			Y	Y
Doppler effect	Y	E						Y
Colour	Y	E						
Diffraction and interference	Y	E			Y	Y	Y	Y
Shockwaves and sonic boom	Y	E						
Simple Harmonic Motion						Y	Y	Y
Forced oscillations						Y	Y	Y
Quantum mechanics								Y
Wave nature of matter	(Y)							Y
Electrostatics	Y	E	Y	Y	Y	Y	Y	Y
Capacitance and capacitors (DC)	Y	E				Y		
Electric circuits	Y	E	Y	Y	Y	Y	Y	Y
Magnetism	Y		Y	Y		Y		
Electromagnetism	Y	E	Y	Y		Y	Y	Y
Cathode ray tubes			Y	Y				
Electrodynamics	Y	E				Y		Y
Alternating current	Y	E				Y		Y
Capacitance and inductance (AC)	(Y)							
Charged particles (Millikan)						Y		
Communicating information						Y		
Digital technology								Y
Electronics	(Y)			Y		Y		
Radioactivity	Y		Y	Y	Y	Y	Y	Y
Electronic properties of matter	Y							
Mechanical properties of matter	(Y)		Y	Y	Y	Y		
Optical phenomena and materials	Y	E						Y
Kinetic molecular theory	Y		Y	Y			Y	Y
Temperature			Y	Y		Y	Y	Y
Thermal properties			Y	Y		Y		
Phases of matter	Y		Y	Y	Y	Y	Y	Y
Energy transfer			Y	Y			Y	Y
Thermodynamics								Y
Ideal gases and thermal properties	Y		Y	Y		Y	Y	Y
Optional Topic 1 (Physics)							Y	Y
Optional Topic 2 (Physics)							Y	Y
Measurement and techniques (chemistry)			Y	Y	Y	Y	Y	Y
Phases of matter	Y		Y	Y				
Atoms, elements and compounds	Y		Y	Y	Y	Y	Y	Y
Gas laws	Y				Y	Y		
Solids and liquids					Y	Y		

Table 1: List of broad content topics covered in curricula (continued)

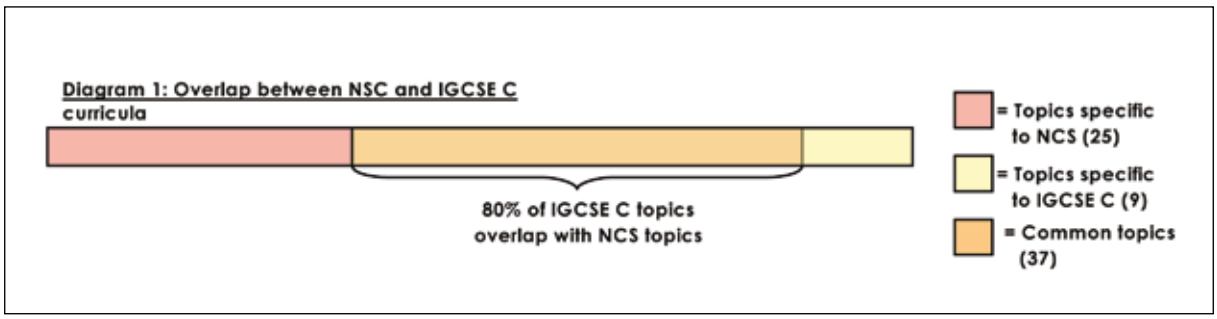
Bonding	Y		Y	Y	Y	Y	Y	Y
Macroscopic properties	Y		Y	Y				
	NSC		CIE IGCSE		CIE A LEVEL		IB	
Content Topic	**Specified**	**Exam**	**C**	**X**	**AS**	**A**	**SL**	**HG**
Quantitative aspects	Y		Y	Y	Y	Y	Y	Y
Electrochemistry	Y	E	Y	Y	Y	Y	Y	Y
Energy and chemical changes	Y		Y	Y	Y	Y	Y	Y
Rate and extent of reactions	Y	E	Y	Y	Y	Y	Y	Y
Acids and Bases	Y		Y	Y	Y	Y	Y	Y
Periodic table	Y		Y	Y			Y	Y
Metals	Y		Y	Y				
Industrial applications	Y	E	Y	Y				
Mining	Y	Y	Y					
Air and water	Y		Y	Y				
Inorganic Chemistry			Y	Y	Y	Y		
Organic molecules	Y	E	Y	Y	Y	Y	Y	Y
Organic macromolecules	(Y)			Y	Y	Y		
The nitrogen cycle	Y							
Atmospheric Chemistry	Y							
The fertilizer industry	Y	E						
Optional Topic 1 (Chemistry)							Y	Y
Optional Topic 2 (Chemistry)							Y	Y
TOTAL NUMBER OF TOPICS	**62**	**23**	**46**	**49**	**34**	**53**	**43**	**56**

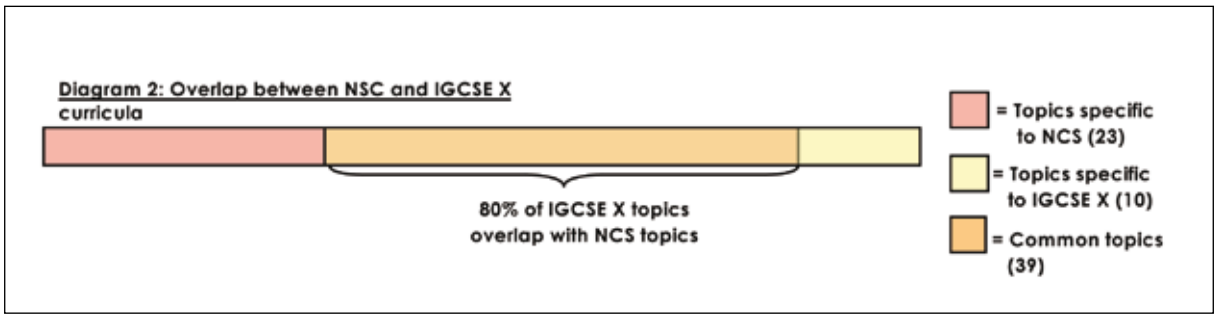
Some points are worth noting regarding the content in the various curricula:

a) The NSC curriculum is the only where not all of the specified topics are examinable in the final examination. Where topics are examinable in the final Grade 12 examination, an E has been entered in the "*Examinable" column. Some of the non-examinable topics are prescribed for the lower grades*, and are only examined at those levels. Where a topic is specified in the NSC curriculum a Y has been entered under the "*Specified*" column. An additional complication in the NSC curriculum is that some topics that are specified are currently not examinable at any level, and are hence not taught. These topics are indicated with parentheses, in other words (Y).

b) The topic coverage in each curriculum was considered in terms of any serious gaps in knowledge that candidates may have on completion of the course. In terms of specified content, it is the opinion of the evaluation team that there are no urgent gaps in any of the curricula in terms of core concepts. However, if one considers the examinable material, the NSC curriculum does have considerable gaps in key knowledge areas. The most notable gaps are quantitative aspects of chemistry (such as molar and stoichiometric calculations and volumetric analysis), acids and bases, gas laws, the periodic table and trends, and inorganic chemistry. Given that examinable content is given far more attention in the classroom than non-examinable content, this will lead to serious gaps for NSC candidates, particularly in chemistry topics.

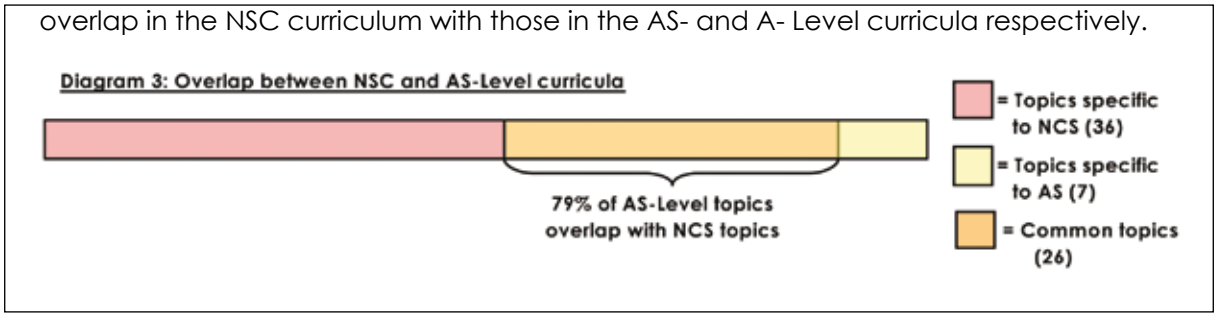
c) The IGCSE X curriculum contains the 46 core curriculum topics, and three additional advanced topics. The extended material also goes into greater depth in a number of the core curriculum topics. **Diagrams 1** and **2** on the next page show the extent to which the

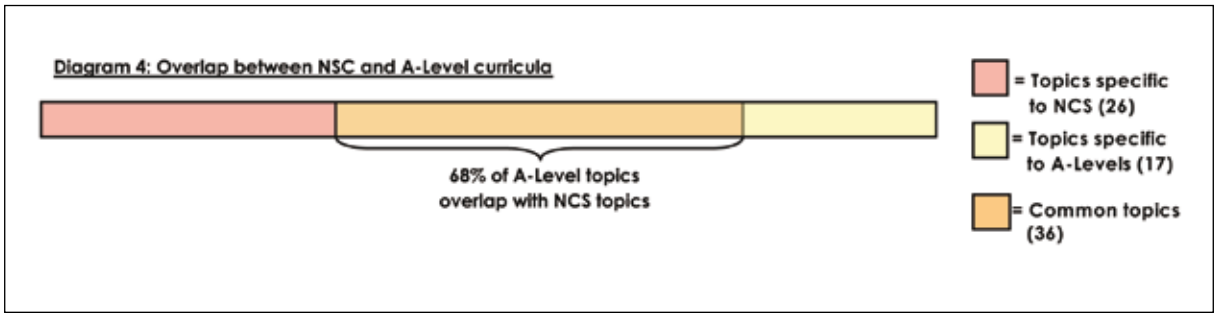




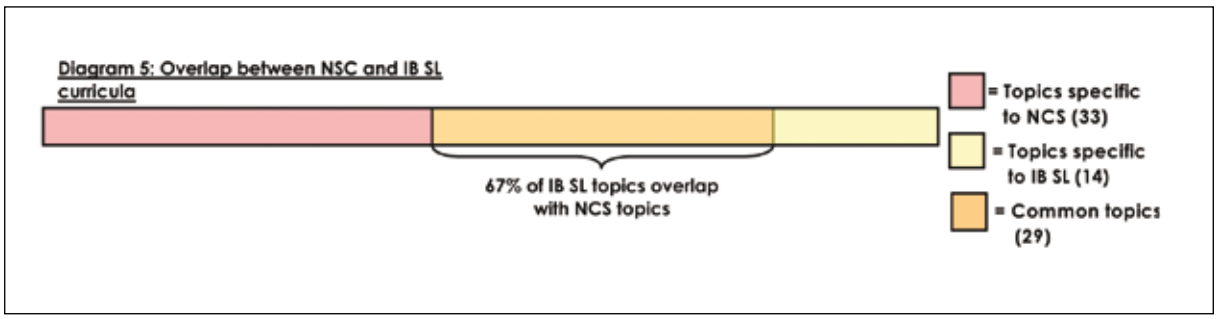
NCS topics overlap with those in the IGCSE C and IGCSE X curricula respectively. These diagrams are drawn to scale to represent the number of topics in each curriculum.

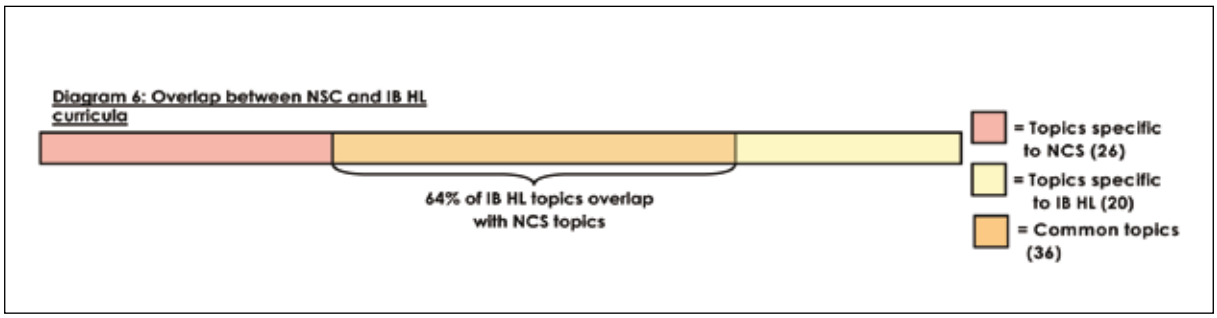
d) The full A-Level curriculum contains the 34 topics of the AS-Level curriculum and includes a further 18 topics as well as going into greater depth in some of the AS-Level topics. The additional topics are advanced specialised topics such as ultrasound, X-rays and magnetic resonance. **Diagrams 3** and **4** below show the extent to which the topics overlap in the NSC curriculum with those in the AS- and A- Level curricula respectively.





e) The IB HL curriculum contains the 39 topics of the SL curriculum and incorporates a further 13 topics, many of which are advanced specialised topics such as digital technology, resolution and polarization. In addition, in both the SL and HL courses, candidates are required to select two optional topics in Physics, and two in Chemistry. Some of these topics are advanced university-level topics, such as quantum physics, astrophysics and analytical chemistry. Others are applied topics such as human biochemistry and food

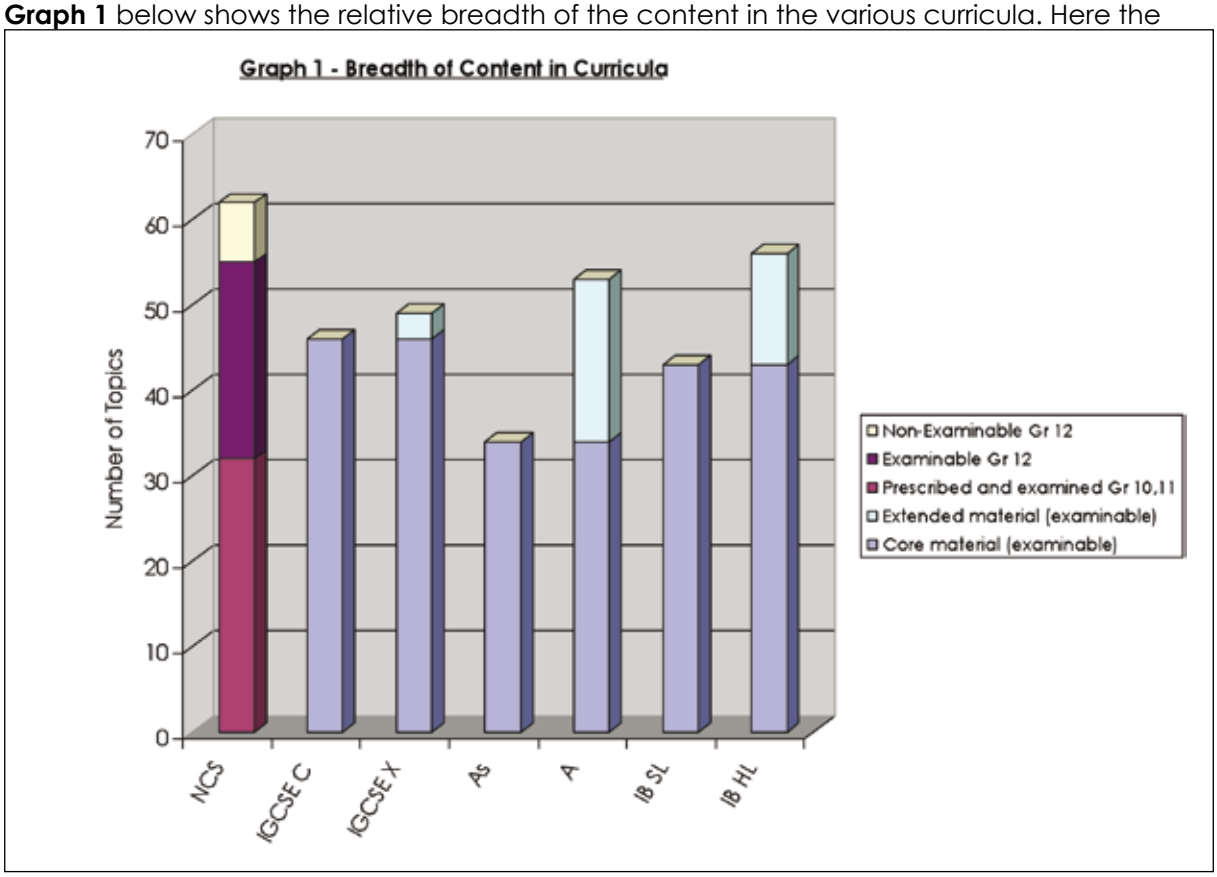




chemistry. **Diagrams 5** and **6** over the page show the extent to which the NSC curriculum topics overlap with those in the IB SL and IB HL curricula respectively.

1.1.1 Breadth of Content

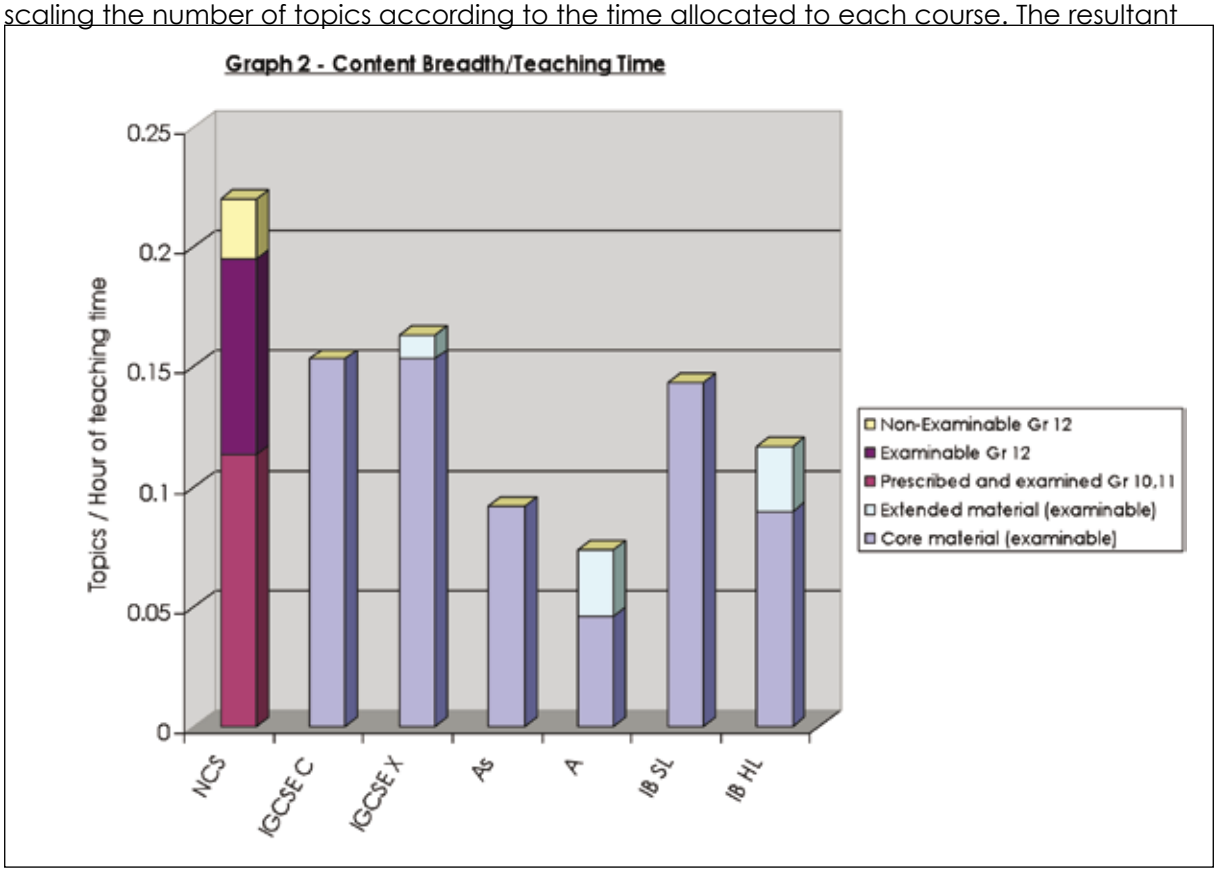
Graph 1 below shows the relative breadth of the content in the various curricula. Here the



bars represent the total number of content topics for each of the curricula.

From **Graph 1** it is clear that the number of topics covered in the NSC curriculum is most similar to the full A-Level and IB HL courses. However, this graph does not accurately represent the

full impact of the content breadth, since the time allocated to the various curricula is very different, some being one-year qualifications while others span three years. In addition, the South African Physical Sciences course consists of Chemistry and Physics as half-components of the course, while all of the other Chemistry and Physics courses are full stand-alone courses. A more realistic sense of the relative breadth of the curricula may be obtained by scaling the number of topics according to the time allocated to each course. The resultant



graph is shown below in **Graph 2**:

Some comments should be noted from this **Graph 2:**

- For the international qualifications all of the specified core and extended material is examined in the final examination paper, but for the NSC curriculum only 23 out of 62 of the total topics are examinable in the final paper (37%). This is problematic because the material that is not included in the final examination may be considered to be less important, and will hence get overlooked or forgotten by candidates. The unexamined material includes topics that are 'new' in the Grade 12 curriculum as well as those covered in Grades 10 and 11.
- The NSC curriculum has far greater breadth for the allocated teaching time than any of the other curricula. This is of serious concern since research has shown that less breadth of content covered in more depth leads to a greater chance of future success in the discipline (for example Schwartz *et al*, 2008). A more rationalised selection of content would be beneficial for the future success of students in physical science-related studies in South Africa.
- The CIE A-Level curriculum has the least breadth per allocated teaching time of all the curricula. This is consistent with the intention of the course to "*place greater emphasis on the understanding and application of scientific concepts and principles than on the recall of factual material*" (Document 7, p. 1; Document 8, p. 1).

1.1.2 Depth of Content

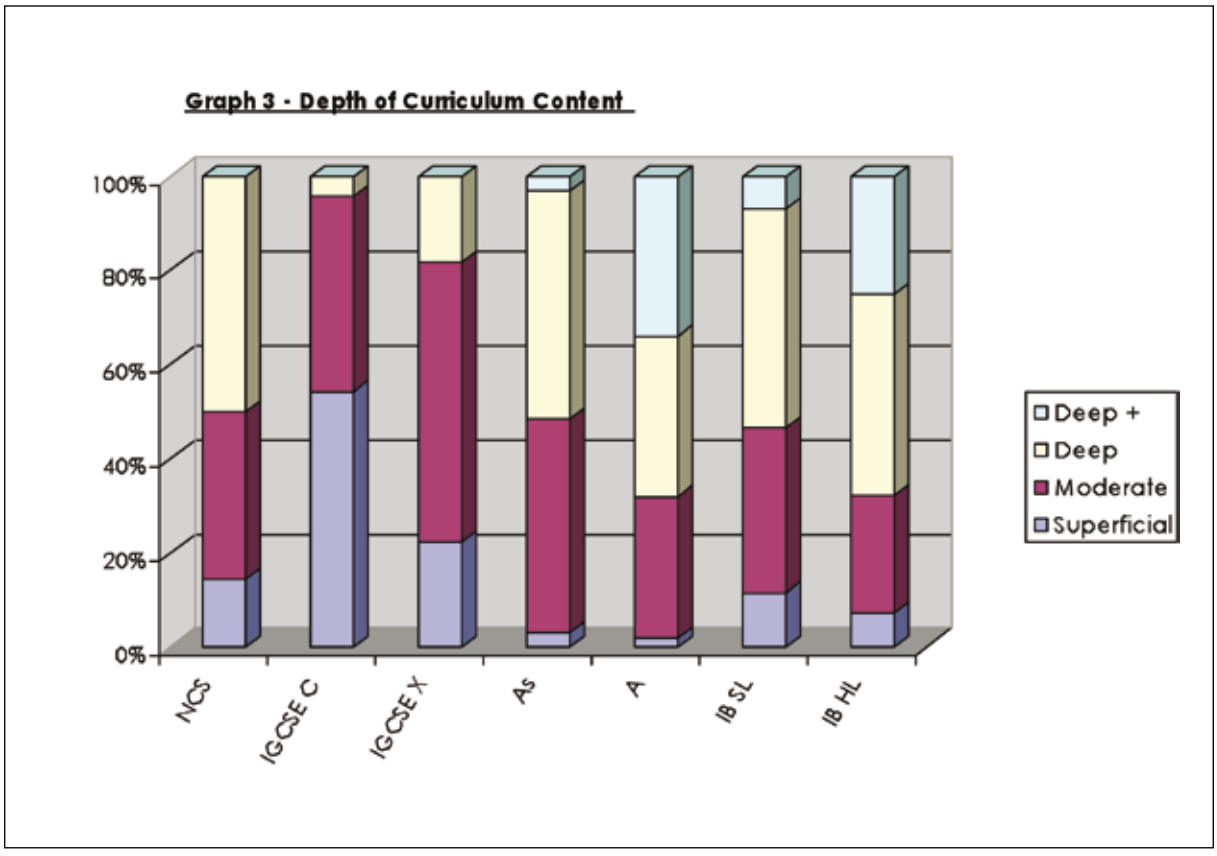
Each of the content topics in the curricula were analysed by the Umalusi evaluation team to ascertain the depth to which students are required to engage with the content topic. The following categories were used:

- "*Superficial*" = content covered at an introductory, superficial level
- "*Medium*" = content covered in somewhat more depth, with students required to engage with some advanced aspects of the topic
- "*Deep*" = content covered at an advanced and rigorous level, requiring depth of conceptual understanding
- "*Deep +*" = content covered at very advanced and demanding level (these topics are beyond secondary education level).

The following table shows the percentages of the levels of depth for the various curricula:

Table 2: Percentages of depth levels of content specified in curricula

Depth of Content	NCS	CIE IGCSE		CIE A LEVEL		IB	
		C	X	AS	A	SL	HL
Superficial	15%	54%	22%	3%	25	12%	7%
Moderate	35%	41%	59%	45%	39%	35%	25%
Deep	50%	4%	18%	48%	34%	47%	43%



Deep +	0%	0%	0%	3%	34%	7%	25%

These results are represented in the **Graph 3** below:
Some points are worth noting from **Graph 3:**

- The NSC curriculum is similar in depth to the CIE AS-Level and the IB SL courses, although these include a small percentage of topics at the "*Deep +*" level (3% and 7% respectively). The NSC curriculum has somewhat greater percentage of superficial content than the AS-Level curriculum, but this is expected since the NSC curriculum includes Grade 10 level content, whereas the AS curriculum is aimed at an older age group.
- The CIE A-Level and the IB HL curricula are similar in terms of depth of content, and go to a greater depth than any of the other curricula.
- From **Graphs 2** and **3** one can conclude that the CIE A-Level curriculum has the least relative breadth and greatest depth of all of the curricula.

1.2 Content Weighting

Only the IB documentation provided suggested classroom time per topic, so it is not possible to evaluate content weighting for the curricula included in this study.

1.3 Content focus

The focus of the content was determined for the various curricula. The content focus is described as "*discipline specific*" when the content is only relevant to the discipline of Physical Sciences. Content is described as "*generic*" when it is applicable to subjects outside of Physical Sciences. The percentages of "*discipline specific*" and "*generic*" content should add up to 100%. Content is described as "*everyday*" when it has application outside of the classroom, relevant to the candidates' everyday life – in other words, it can be described as "*everyday*" *in addition to being either discipline-specific or generic*. In Physical Sciences this "*everyday*" connection is expected to be high as it is a subject that has broad application to daily life. The estimated class time to be spent on content in these different focus areas was determined, and the results are shown in **Table 3**:

Table 3: Content focus of topics (as measured by number of topics)

Curriculum name	Content focus		Everyday knowledge content
	Discipline specific	Generic	
NCS	76%	24%	82%
IGCSE C	76%	24%	85%
IGCSE X	73%	27%	86%
AS	85%	15%	85%
A	77%	23%	81%
IB SL	90%	10%	72%
IB HL	90%	10%	69%

A few points can be noted from **Table 3**:

- 76% of the content in the NCS is discipline-specific, which is in line with that in the CIE IGCSE and A-Level courses. Similarly the percentage of everyday content (82%) is in line with that in the CIE IGCSE and A-Level courses.
- The IB courses stand out as having less generic content than the other courses, as well as less everyday content. However, only the core content topics were used to determine the content focus, since the optional topics are very varied in this regard, some being

1.4 Skills

In all of the curricula that were scrutinised the skills are presented in a way that forms part of the framing the curriculum, rather than being aspects that are separately taught as part of the learning programme. The table below shows a mapping of the skills for the various curricula.

Table 4: Mapping of broad skills across curricula

Skills specified	NCS	CIE IGCSE	CIE AS/A	IB
Conduct an investigation	Y	Y	Y	Y
Interpret data to draw conclusions	Y	Y	Y	Y
Present information and scientific arguments	Y	Y	Y	Y
Demonstrate knowledge and understanding of specified concepts	Y	Y	Y	Y
Solve problems	Y	Y	Y	Y
Explain relationships	Y	Y	Y	Y
Apply scientific knowledge	Y	Y	Y	Y
Evaluate knowledge claims	Y			
Evaluate the impact of science on human development	Y	Y	Y	
Evaluate the impact of science on the environment	Y	Y	Y	
Evaluate information and hypotheses			Y	
Demonstrate awareness of the limitations of physical theories and models			Y	
Evaluate experimental methods and suggest improvements			Y	
Personal skills (cooperation, perseverance and responsibility)				Y

Some of the skills that are explicitly listed in certain curricula have been excluded from this mapping if they are understood to be implicit in a broader category of skill. For example, where the use of apparatus and experimental techniques is explicitly listed for the CIE curricula, these are understood to be part of the broader skill of conducting a scientific investigation in other curricula.

This table shows that the skills are very similar across the various curricula, with the following exceptions:

- The NCS is the only curriculum where evaluation of knowledge claims is explicitly mentioned.
- The CIE A-Level curricula include the higher-order skills of demonstrating awareness of the limitations of physical theories and models, evaluating information and hypotheses, and evaluating experimental methods and suggesting improvement.
- The IB curricula do not include environmental or social awareness in the list of skills. However, the description of the Group 4 collaborative project indicates that the "*project allows students to appreciate the environmental, social and ethical implications of science and technology. It may also allow them to understand the limitations of scientific study*." (Document 9, p. 34, Document 10, p. 33). The IB curricula also include a description of personal skills. These are captured in the NCS in the Critical and Developmental Outcomes (Document 1, p. 2). In addition, some of the optional topics, for example "*Environmental chemistry*", involve environmental awareness, and some, for example "*Medicine and drugs*" are likely to develop a social awareness in candidates.

1.5 Skills weighting

NCS: The NCS documentation allocates a clear percentage of examination time to the various Learning Outcomes (Document 3, p. 15). This weighting is shown in **Table 5**.

Table 5: Weighting of Learning Outcomes in NCS

Learning Outcome	Weighting	
	Paper 1	Paper 2
LO1: Scientific Inquiry and Problem-solving Skills	40%	30%
LO2: Constructing and applying scientific knowledge	45%	45%
LO3: The nature of science and its relationship to technology, society and the environment	15%	25%

CIE IGCSE: In the In the AS- and A-Levels Physics IGCSE Physics and Chemistry curricula a specification grid is provided which allocates examination percentages to the various Objectives (Document 5, p. 3; Document 6, p. 3). This weighting is shown in **Table 6**.

Table 6: Weighting of Assessment Objectives in CIE IGCSE

Assesment Objective	Weighting
A Knowledge with Understanding	50%
B Handling Information and Problem Solving	30%
C Experimental Skills and Investigations	20%

CIE AS and A Levels: In the AS- and A-Levels Physics and Chemistry curricula an examination percentage weighting for each of the Assessment Objectives is given (Document 7, p. 4; Document 8, p. 6). This weighting is shown in **Table 7**.

Table 7: Weighting of Assessment Objectives in CIE AS/A Level

Assesment Objective	Weighting	
	AS	A
A Knowledge with understanding	38%	36%
B Handling, applying and evaluating information	39%	41%
C Experimental skills and investigations	23%	23%

IB: In the IB Physics and Chemistry curricula, an approximate percentage weighting of the objectives is provided (Document 9, p. 13, Document 10, p. 13). This weighting is shown in **Table 8**.

Table 8: Weighting of Objectives in IB

Objective	Weighting	
	SL	HL
1 Demonstrate an understanding of and 2 Apply and use	63%	63%
3 Construct, analyse and evaluate	37%	37%

1.6 Skills focus

NSC: The NCS documentation the skills are encapsulated in the Learning Outcomes (LO's) and Assessment Standards (AS's) of the course (Document 1, pp. 18-33). These skills are very generically described, and could apply to any science subject (for example LO1, AS1: "*Conducting an Investigation*"). It is in the context of the Physical Sciences content and classroom practice that these skills may take on a more discipline-specific nature, but this cannot be guaranteed. An educator who is not well inducted into the disciplines of Physics or Chemistry may therefore not interpret these skills in a way that is required in these disciplines, and this may disadvantage candidates who proceed into these disciplines at tertiary level.

CIE IGCSE: In both the Physics and Chemistry curricula of the IGCSE the skills are presented as Assessment Objectives (Document 5, p. 3; Document 6, p. 3). These skills are also described in a generic way so as to be applicable to a range of scientific subjects. In fact this list is identical for the Chemistry and Physics curricula, which are offered as separate subjects. The more specific sections of the Physics and Chemistry content which are dedicated to the experimental techniques provide a more discipline-specific focus to the skills.

CIE AS Level and A Level: In both the Physics and Chemistry curricula of the CIE AS – and A-Level courses the skills are presented as Assessment Objectives (Document 7, p. 2, Document 8, pp. 2-3). These skills are also described in a generic way, but the additional practical skills listed in the Physics curriculum content outline (Document 7, p. 8) give a more discipline-specific focus to the skills. This focus is lacking in the Chemistry curriculum.

IB: In both the Physics and Chemistry curricula of the IB courses the skills are presented as Objectives (Document 9, p. 10; Document 10, p. 10). Because these skills apply to all of the experimental courses of the IB Diploma Programme, they are described in a generic way. Again the additional list of practical skills in the Physics curriculum content outline (Document 9, pp. 49-51) provides more of a discipline-specific focus. This focus is lacking in the Chemistry curriculum.

2. Organising principle and coherence

It is important that a curriculum have a clear organising principle to enable students to construct their knowledge meaningfully. Absence of an organising principle could therefore contribute to the level of difficulty of a curriculum.

NCS: The organising principle is clearly stated in the NCS documentation: "Knowledge in the Physical Sciences is organised around six core knowledge areas. These main knowledge areas are broad descriptors and ensure proper planning and clustering of concepts, skills and values to support achievement of learning outcomes" (Document 1, p. 10).

CIE IGCSE: No clear organising principle is given in the IGCSE curricula for the selection and organisation of content. However, in the Physics curriculum there is a guiding principle provided which gives some kind of coherence to the course: "*Throughout the course, attention should be paid to showing the relevance of concepts to the students' everyday life and to the natural and man-made world. In order to encourage such an approach and to allow flexibility in teaching programmes to meet the more generalised Aims, the specified content of the syllabus has been limited*" (Document 5, p. 5). In the Chemistry curriculum the following guiding principle is given: "*…throughout this course, attention should be drawn to: (i) the finite life of the world's resources and hence the need for recycling and conservation; (ii) economic considerations in the chemical industry, such as the availability and cost of raw materials and energy;*

(iii) *the importance of chemicals in industry and in everyday life*." (Document 6, p. 5) However, although it is clear that these are expected to be threaded through the whole course, they are not a substitute for a central organising principle.

CIE AS Level and A Level: No explicit organising principle is given in the AS-Level and A-Level curricula for the selection and organisation of content. However, in both the Physics and Chemistry curricula there is a guiding principle provided: "*This syllabus is designed to give flexibility both to teachers and to candidates and to place greater emphasis on the understanding and application of scientific concepts and principles than on the recall of factual material*" (Document 7, p. 1, Document 8, p 1).

IB: No explicit organising principle is given in the IB curricula for the selection and organisation of content. However, in both the Physics and Chemistry curricula there is a guiding principle provided: "*It is a broad-based two-year course that aims to encourage students to be knowledgeable and inquiring, but also caring and compassionate*" (Document 9, p. 1; Document 10, p. 1).

3. Sequence, progression and pacing

Progression is evident when the content and skills in a course increase in cognitive demand within a given grade or level, and from one level to the next. The sequencing and pacing of material in the course therefore needs to be appropriately structured to allow for this development. The various curricula were considered in this light.

3.1 Progression within each grade/level:

NCS: In the NCS there is a certain amount of evidence of progression within each grade, with the Learning Programme Guidelines (Document 2) giving a suggested work schedule for the year. However the ordering of the topics is different to that given in the National Curriculum Statement (Document 1). This suggests that the curriculum was not intentionally designed to allow for progression from one topic to the next. In addition, in all of the grades the Physics topics tend to precede the Chemistry ones, implying that Physics is conceptually easier than Chemistry. However this is a false assumption, as some topics in Physics are conceptually more demanding than those in Chemistry. This ordering also tends to lead to an overemphasis on Physics, with class time running out before the Chemistry topics can be covered in depth.

CIE IGCSE: There is no clear evidence of progression within the IGCSE curriculum. There is some progression evident in the sense that basic foundational skills and concepts are covered earlier in the course, for example measurements of basic physical quantities (Document 5, p. 5), but this is not evidence of progression in terms of cognitive complexity.

CIE AS Level and A Level: There is no clear evidence of progression within each level of the AS-Level and A-Level curricula. In a similar way to the IGCSE curriculum, there is some progression evident in the sense that basic foundational skills and concepts are covered earlier in the course, for example the topic "*Physical Quantities*" (Document 7, p. 5), but again this is not evidence of progression in terms of cognitive complexity.

A general comment about the CIE courses is that an explicit intention in their design of is for them to be flexible (Document 5, p. 5; Document 7, p. 1). This allows educators a lot of freedom in selecting the sequence in which the content is to be covered in the course. A good educator would therefore structure the learning program in a developmental way.

IB: There is no clear evidence of progression within the diploma level of the IB curriculum. In a similar way to the IGCSE and AS – and A-Levels curricula, there is evidence of some progression in the Physics course, with the first topic being an introductory and foundational one, namely "*Physics and physical measurement*" (Document 9, pp. 49-51). There is also evidence of some progression in the Chemistry course, with the first topic being "*Quantitative Chemistry*", but again this is not evidence of progression in terms of cognitive complexity.

3.2 Progression between levels:

NCS: In the NCS there is very clear evidence of progression in content over the three years, with each of the same knowledge themes being covered in greater complexity in the higher grades (Document 1, pp. 38-49). In addition, there is clear evidence of progression in terms of skills, with the description of the Assessment Standards gaining in complexity over the three grades (Document 1, pp. 18-33). For example at the Grade 10 level, LO1, AS1 is described as "*Plan and conduct a scientific investigation to collect data systematically with regard to accuracy, reliability and the need to control one variable*." (Document 1, p. 18) At the Grade 12 level this same assessment standard is described as "*Design, plan and conduct a scientific inquiry to collect data systematically with regard to accuracy, reliability and the need to control variables*." (Document 1, p. 19)

CIE: Within the CIE system one would look for progression from the IGCSE course to the AS-Level course, and then from the AS Level to the full A Level. Progression through these various levels is very clearly evident in terms of the content, with similar topics being dealt with in greater complexity at each subsequent level. For example, in the Physics course, at IGCSE level, candidates are asked to "*demonstrate some understanding that acceleration is related to changing speed*" (Document 5, p. 5), while in the AS-Level course they are required to "*derive, from the definitions of velocity and acceleration, equations which represent uniformly accelerated motion in a straight line*", and to solve problems using these equations (Document 7, p. 9). In the full A-Level course, candidates are required to understand and solve problems with circular motion (Document 7, p. 11), which is a further level of conceptual development in this topic. In the Chemistry AS-Level course, one of the content descriptors in the chemical properties of Group II compounds is: "*Interpret, and make predictions from, the trends in physical and chemical properties of the elements and their compounds*", while a content description in the full A-Level course is: "I*nterpret and explain qualitatively the trend in the thermal stability of the nitrates and carbonates in terms of the charge density of the cation and the polarisability of the large anion*" (Document 8, p. 18). Where different topics are dealt with in the various courses, the topics in the A- Level course are most comprehensive, for example "*condensation polymerisation*" (Document 8, p29), compared with those in the AS-Level course, for example "*addition polymerisation*" (Document 8, p. 29).

There is also some evidence of progression in the skills from the IGCSE level to the A Level of the CIE system. In addition to containing similar skills to those listed for the IGCSE level, the A Level has additional higher order skills such as evaluation of information and experimental methods.

IB: The IB diploma courses were considered in isolation from the remainder of the IB curriculum, so progression between different levels in the education system is not considered here.

4. Aims/purpose/vision/outcomes

The various curricula were examined with regard to the specified aims, purpose, vision and/or outcomes. The following points are noted:

NCS: The NCS contains a list of principles rather than aims (Document 1 Page 1), but these principles very clearly establish the purpose and vision of the curriculum in a broad sense. These principles are listed as: "social transformation; outcomes-based education; high knowledge and skills; integration and applied competence; progression; articulation and portability; human rights, inclusivity, environmental and social justice; valuing indigenous knowledge systems; and credibility, quality and efficiency" (Document 1, p. 1). Because these are expressed so broadly, they may not be very useful at a practical classroom level. However, the aims of each of the individual Learning Outcomes are also given (Document 1, pp. 10, 13, 18-33), which are more focused and therefore useful in practice. The Learning Programme Guidelines also contain a more discipline-specific description of the purpose of Physical Sciences (Document 2, p. 7).

CIE IGCSE: A very clear list of aims is given in the IGCSE curriculum documents, and the aims are identical for the Physics and Chemistry courses. These aims include providing "*a worthwhile educational experience for all students … to enable them to acquire sufficient understanding and knowledge*", to "*develop [relevant, useful and safe] abilities and skills*", to "*develop attitudes relevant to Physics*", to "*stimulate interest in, and care for, the environment*", and to promote an awareness of the process and impact of science (Document 5, pp. 1&2; Document 6, pp. 1&2).

CIE AS Level and A Level: A very clear list of aims is given in the A-level curriculum documentation, and these aims are very similar to those listed in the IGCSE curricula. Additional aims mentioned are to develop an awareness of the importance of the use of IT as a tool, and to "*stimulate students and create a sustained interest in Physics/Chemistry*" (Document 7, p. 1, Document 8, pp. 1&2). Again the aims are identical for the Physics and Chemistry courses.

IB: The aims for all of the Diploma-level experimental science courses are identical, and are very clearly stated. Thee aims include providing opportunities for scientific study and application of "*a body of knowledge, methods and techniques*", to "*develop an ability to analyse, evaluate and synthesize scientific information*", with "*effective collaboration and communication*" and "*experimental and investigative scientific skills*", to "*raise awareness of the moral, ethical, social, economic and environmental implications of using science and technology*" with "*appreciation of the possibilities and limitations associated with science and scientists*", and finally to "*encourage an understanding of the relationships between scientific disciplines and the overarching nature of the scientific method*" (Document 9, p. 9; Document 10, p. 9).

4.1 The following points relate to the amount of guidance given for achieving the aims of the curricula:

NCS: In Document 1, pages 2 to 4 there are clear explanations of how the principles of the NSC as qualification are achieved in the curriculum. The Learning Programme Guidelines contain a description of how Physical Sciences as subject links with the underlying principles of the NSC (Document 2, pp. 8-10). Additional guidance is provided throughout Document 1 which supports the aims of the curriculum (this guidance is too vast to include here).

CIE AS Level and A Level: In all of the CIE curricula considered, the aims are further developed in the Assessment Objectives, which give clearer guidance as to how these aims are to be achieved and assessed in the course (Document 5, p. 3; Document 6, p. 3; Document 7, p. 2; Document 8, pp. 3&4).

IB: In a similar way to the CIE courses, the objectives of the IB experimental courses further develop the aims and give guidance as to how these are to be assessed.

4.2 The following points relate to whether or not the context of the candidates is taken into account in the curricula:

NCS: In the NCS the context of social transformation in South Africa is clearly addressed (Document 1, pp. 2&4), as well as the various possible contexts of candidates. This is demonstrated in the extent to which indigenous knowledge systems are valued, and in an acknowledgement of human rights, inclusivity and socio-economic justice. In addition, in the Learning Program Guidelines document, educators are encouraged to adapt the activities in the learning program to suit their context, using "*any relevant equipment from the home*" (Document 2, pp. 19-31).

CIE and IB: The CIE and IB qualifications are international qualifications, and as such will be undertaken by students from a wide range of backgrounds and contexts. The curricula therefore do not explicitly mention specific candidate contexts. This is appropriate for international qualifications.

4.3 The following comments pertain to the description of articulation and portability in the curricula:

NCS: In the NCS there are numerous references to articulation and portability (Document 1, pp. 3&12), but these are not backed up with guidance as to how this takes place.

CIE IGCSE: Articulation and portability of the qualification are not mentioned in the IGCSE syllabus document. The only structural discussion provided relates to the relationship between the core and extended qualifications (Document 5, pp. 4&5; Document 6, pp. 4&5).

CIE AS Level and A Level: Articulation and portability of the qualifications are not mentioned in the CIE AS– and A-Levels curriculum documents. There is some discussion about the structure and flexibility of the possible A-Level courses (Document 7, p. 1; Document 8, p. 1).

IB: The overall structure of the Diploma Programme is clearly given in the documentation, giving a clear sense of the relationship between the various courses in the Programme (Document 9, pp. 1-5; Document 10, pp. 1-5). In terms of articulation with previous years of study, the documentation states that "*students will be able to study a group 4 science subject at SL successfully with no background in, or previous knowledge of, science*". However, for those candidates wishing to do courses at HL, it is stated that "*some previous exposure to the specific group 4 subject would be necessary*". Specific topic details are not specified but candidates who have undertaken the IB Middle Years Programme (MYP) or studied an international GCSE science subject would be well prepared. Other national science qualifications or a school-based science course would also be suitable preparation for study of a group 4 subject at HL (Document 9, p. 3, Document 10, p. 3). A more detailed description of the articulation with the IB Middle Years Programme is also given on page 3 of Documents 9 and 10.

5. Teaching approach and subject methodology

Since no particular teaching or learning approach is outlined in the international curricula, it is not possible to comment on this aspect.

6. Assessment guidance

6.1Guidance for internal assessment

The following comments can be made about the guidance given for internal assessment within the various curricula:

6.1.1 NCS: In the NCS there is a very clear document called Subject Assessment Guidelines (Document 3) which spells out in detail how internal assessment should be conducted.

CIE IGCSE: In the IGCSE documentation clear guidance is given for educators regarding internal assessment, including a description of how each skill could be assessed (Document 5, pp. 16-18; Document 6, pp.15-17). In addition, a full set of criteria is provided for assessment of practical skills (Document 5, p. 17; Document 6, p. 16). It is noted in the IGCSE documentation that only educators who have written approval from CIE may undertake school-based assessment (Document 5, p4; Document 6, p4).

CIE AS Level and A Level: There is no internal assessment specified in the AS- Level or A-Level documentation. All assessment tasks are external.

IB: In the IB curricula, clear guidance is given to the educators on how to carry out internal assessment (Document 9, pp. 16-20; Document 10, pp. 16-20). In addition, full descriptions and clarifications of the assessment criteria are provided, together with rubrics showing levels of attainment (Document 9, pp. 21-29; Document 10, pp. 21-29).

6.1.2 NCS: In the NCS the following internal assessment tasks are recommended for Grade 12: 2 Practical Investigations, 1 Research Project, 2 Control Tests, 1 Midyear Examination and 1 Trial examination. Each of these tasks is clearly described in Document 3, pp. 10 &11.

CIE IGCSE: In the IGCSE the internal assessment tasks are practical, and may only be undertaken at schools which have written permission for school-based assessment. The recommended tasks are: two assessments of each experimental skill for each candidate (the skills being C1: Using and organising techniques, apparatus and materials, C2: Observing, measuring and recording, C3: Handling experimental observations and data and C4: Planning investigations.)

CIE AS Level and A Level: There is no internal assessment specified in the AS – Level or A-Level documentation.

IB: In the IB curricula, the following internal assessment tasks are recommended: an interdisciplinary project, and a mixture of short- and long-term investigations (such as practicals and subject-specific projects). The number and weighting of these investigations is not stipulated.

6.2 Guidance for external assessment

The following comments can be made about the guidance given for external assessment within the various curricula:

6.2.1 NCS: In the NCS a clear description of the external assessment is given in Document 3, pages 15-16. In addition, a separate Examination Guidelines document has been drafted (Document 4) which very clearly describes the structure of the external assessment examinations.

CIE IGCSE: In the IGCSE documentation a full description of the nature and weighting of each of the external assessment tasks is given (Document 5, p. 4, Document 6, p. 4).

CIE AS Level and A Level: In the A/AS documentation a full description of each of the external assessment tasks is given, together with the weighting for each task (Document 7, p. 3; Document 8, p. 5). In addition, for the practical examinations a full set of instructions, mark scheme and list of criteria is provided (Document 7, pp. 29-37; Document 8, pp. 33-41). Although the practical examinations take place in the school laboratory, they are externally set and contribute to the external assessment mark.

IB: In the IB curriculum documentation a full description is given of each of the external assessment tasks, together with the weighting for each task (Document 9, pp. 13-15; Document 10, pp. 13-15).

6.2.2 NCS: The external assessment in the NCS consists of two external examinations, one on Physics content and one on Chemistry content. Each of these contributes 50% towards the total external assessment mark. The percentage weighting of internal to external assessment in the final mark is 25% and 75% respectively.

CIE IGCSE: The external assessment in the IGCSE course consists of three tasks: Paper 1 (multiple choice 20%), Paper 2 (short-answer and structured questions for core course 50%) OR Paper 3 (short-answer and structured questions for extended course 50%), and one from Papers 4, 5 or 6 (practical assessment 30%). Paper 4 is the internal assessment component, and may not be undertaken at schools without written permission for school-based assessment, in which case papers 5 or 6 should be selected.

CIE AS Level and A Level: The weighting of the external assessment tasks in AS and A Levels is shown in the following table:

Table 9: Weighting of external assessment tasks in A-Level courses

Paper Type	Weighting	
	AS	A
1 Multiple-choice	31%	15%
2 As structured questions	46%	23%
3 Advanced practical skills	23%	12%
4 A structured questions		38%
5 Planning, analysis and evaluation		12%
TOTAL	**100%**	**100%**

IB: The external assessment in the IB is shown in the following table:

Table 10: Weighting of external assessment tasks in IB courses

Paper Type	Weighting	
	AS	A
1 Multiple-choice	26%	26%
2 Short-answer and extended questions	42%	48%
3 Short-answer and extended questions (Options)	32%	26%
TOTAL	**100%**	**100%**

The percentage weighting of internal to external assessment in the final mark is 24% and 76% respectively.

7. Availability, user-friendliness and use of curriculum documents

The various curriculum documents were considered in terms of their user-friendliness and availability. The following points can be made:

7.1 NCS: A number of versions of the documents associated with the NCS have been released at different dates, and some of the information is inconsistent across the different versions. The documents are also very lengthy, which make them somewhat inaccessible to educators who have English as their second or third language. The Department of Education's website does not always provide the latest version of the documentation.

7.2 CIE IGCSE: The curriculum documents for the IGCSE physics and chemistry courses are very clearly structured and the information is well presented. The document is not too lengthy and the language level used is not too complex. The documents therefore seem to be accessible and informative for the majority of educators. One area where the document is possibly lacking is some explanation that would situate this course in the context of the whole CIE system. The document is freely available on the CIE website.

7.3 CIE AS Level and A Level: The curriculum documents for the AS-Level and A-Level Physics and Chemistry courses are also very well structured, with clear presentation of information without being too lengthy or complex. The documents therefore appear accessible and informative for the majority of educators. These documents are also lacking in some explanation of the structure of the whole CIE system and where this course fits in. The documents are freely available on the CIE website.

7.4 IB: The curriculum documents for the IB Physics and Chemistry courses are very clearly structured, with a neat and presentable lay-out. The information provided is very complete and readable, and gives one a clear sense of the structure of the course and the diploma programme as a whole without being too lengthy or complex. The documents therefore appear accessible and informative for the majority of educators. Unfortunately the curriculum documents are not freely available on the internet, and have to be purchased. This may disadvantage some who need to access the information.

8. Comparison of Examination Papers

8.1 Methodology

The examination papers of each of the curricula were analysed to assess the comparative level of cognitive demand. Since the NSC does not have a practical examination, only the theoretical examinations were considered for the various courses.

To provide a guide for decisions made about type of cognitive demand and level of difficulty, the Physical Sciences team used a table that has been developed and used in previous Umalusi benchmarking research projects (Umalusi, 2008). This tool was used because it has proved to be appropriate and useful in the analysis of Physical Sciences examinations papers, and provides meaningful data.

Table 11: Types and levels of cognitive demand for Physical Sciences

Category	Level	Descriptions	Examples
Recall Factual knowledge (F)	**F1**	Very simple recall, State a simple law or equation; Recognize content in MCQ;	State term / simple definition eg velocity is rate of change of position; naming homologous series; structural formula for simple (1 or 2 carbon) organic compounds eg ethane, methane etc.
	F2	Medium content, learnt diagrams	State Newton's laws, Boyle's law, draw electric field patterns etc.; general formula for homologous series
	F3	Recall complex content	Process for lab preparation of chemical compounds; testing for presence of chemicals; inorganic chemical interactions
Understand Conceptual knowledge (C)	**C1**	Simple relationships; simple explanations; 1 step answers; derivation of units	Relationship between resultant and equilibrant; explain what is meant by … ;
	C2	Counter-intuitive relationships; Qualitative proportional reasoning; more complex relationships or explanations; 2 steps to arrive at answer, simple applications; interpretation of realistic diagrams	Direction of acceleration for free-fall; effects of changes in circuits; identifying acid-base conjugates, redox pairs etc; simple influences on dynamic equilibrium; diagrams of AC/ DC generators; naming type of reaction etc
	C3	Identify principles which apply in a novel context; explaining complex reasoning involving synthesis, critical argument; novel or abstract contexts etc.	Identify all influences on realistic motion; identify isomers of organic compounds; complex influences on dynamic equilibrium

Category	Level	Descriptions	Examples
Problem solving (P)	**P1**	Simple procedure; plug into formula with only one unknown; no extraneous information; known or practiced context; simple chemical equation	Given current and resistance, calculate voltage; simple conservation of momentum; reading values off a given graph;
	P2	Sketch graphs; construction or interpretation of schematic diagrams; problems with 2 or more steps; basic logic leaps; proportional reasoning; interpretation of table of data; acid-base or redox equation	Sketch graph of motion or get information form given graph; force or vector diagrams; diagrams of drip patterns; circuits diagrams; concentration or molar calculations; naming of organic compounds; writing and balancing equations for reactions; using redox table; writing structural formulae for organic reactions
	P3	Complex abstract representation; combination of concepts across sub-fields; complex problems involving insight and logic-leaps; formulating new equations (using all unknowns); problem solving in novel context	Interpret complex graphs; translate between various graphs of motion; combine equations for mechanical energy and motion; combine gravitational and electrostatic forces; complex circuit calculations; combination of various factors influencing equilibrium

8.2 Results

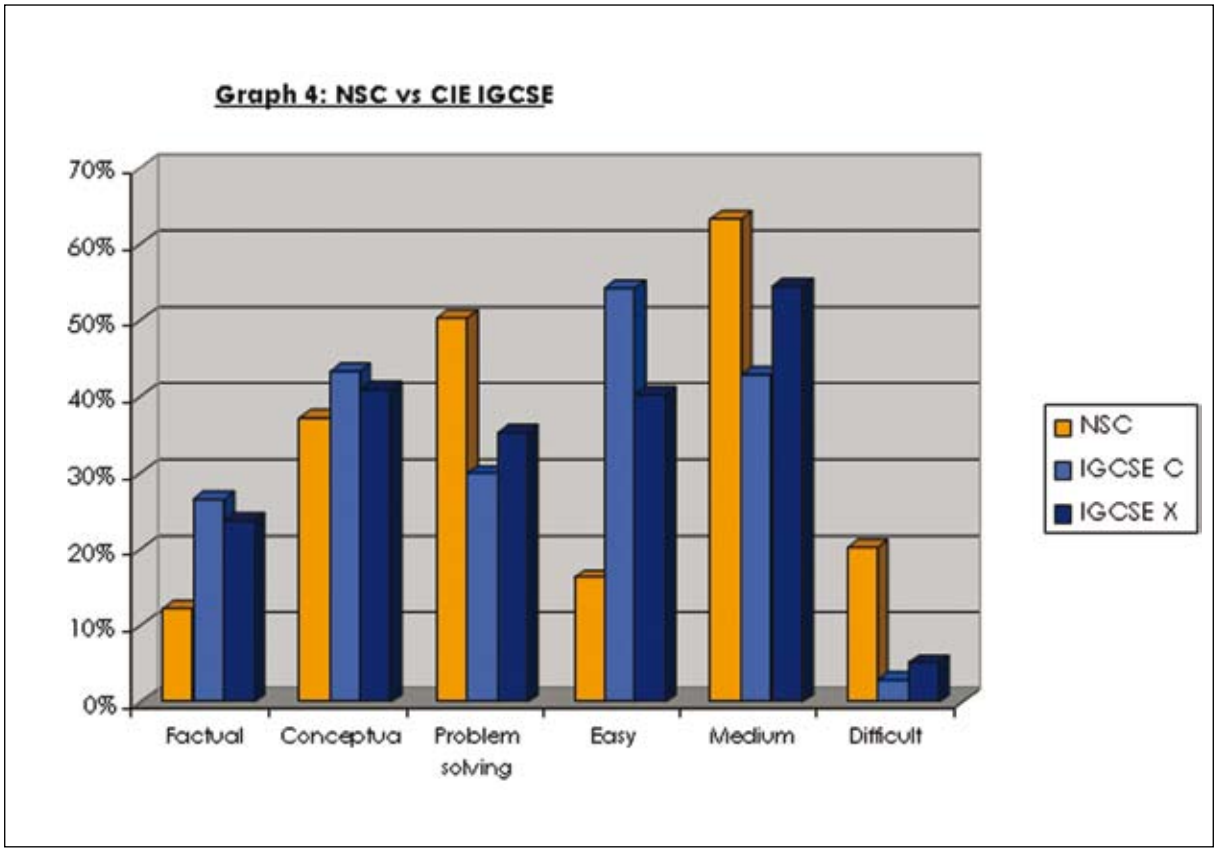
The number of marks associated with the various types of cognitive demand and levels of difficulty were combined for each exam paper analysed, and worked into a percentage according to the weighting of the various examination papers. The results of this analysis are presented in **Table 12** below:

Table 12: Results of analysis of examination papers

Qualification	Type of cognitive demand			Level of difficulty		
	Factual	Conceptual	Problem solving	Easy	Medium	Difficult
NSC	12%	37%	50%	16%	63%	20%
IGCSE C	27%	43%	30%	54%	43%	3%
IGCSE X	24%	41%	35%	40%	55%	5%
AS	13%	29%	58%	11%	84%	5%
A full	18%	25%	58%	9%	87%	4%
IB SL	14%	33%	53%	20%	76%	4%
IB HL	10%	35%	55%	9%	72%	19%

8.3 Discussion: The South African NSC compared with CIE IGCSE

Graph 4 below shows the comparison of the NSC with the IGCSE examinations.



From this graph, together with the data in **Table 12**, the following points can be made:

- The NSC examination has a lower percentage of factual recall questions (12%) than either the IGCSE core examination (27%), or the extended examination (24%)
- The NSC examination has a higher percentage of problem solving questions (50%) than the IGCSE core (30%), and the extended (35%).
- The NSC examination has a much lower percentage of easy questions (16%) than the IGCSE core (54%), and extended (40%).
- The NSC examination has a higher percentage of difficult questions (20%) than the IGCSE core (3%), and extended (5%).

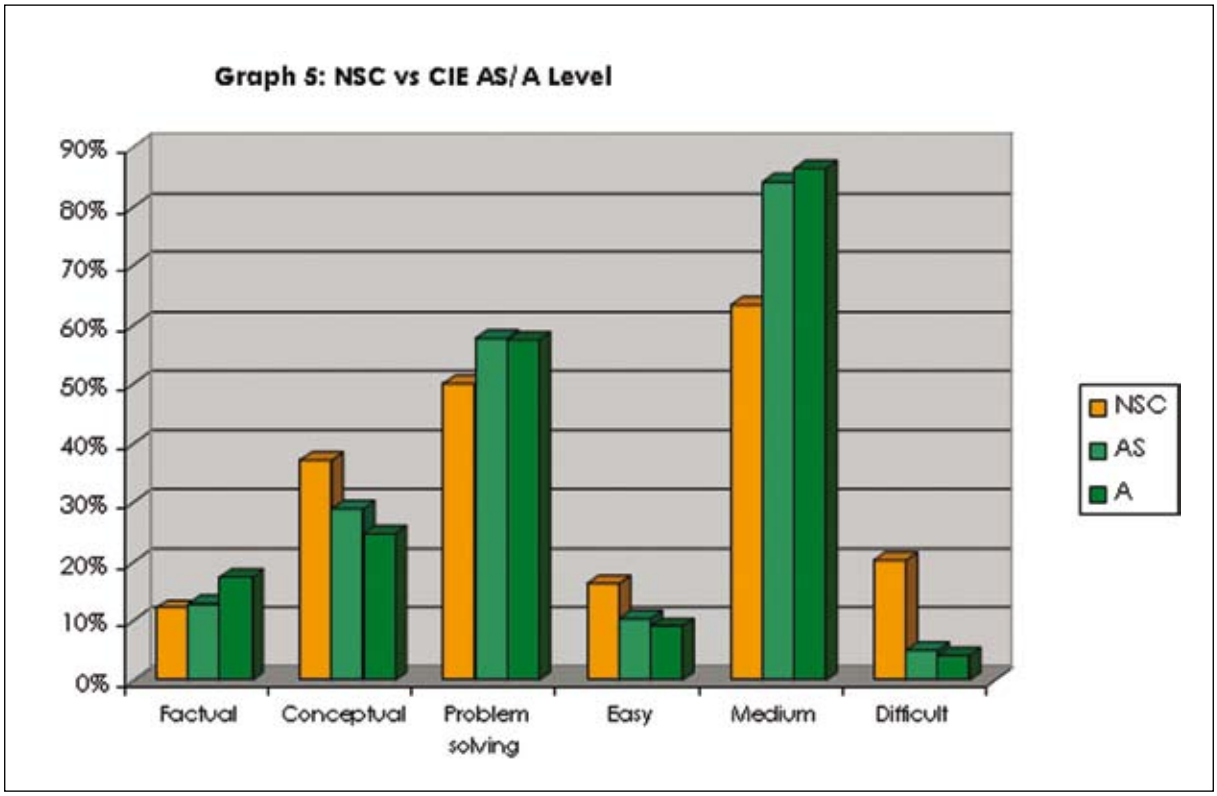
It can therefore be concluded that the NSC examination is of a considerably higher standard than the examinations for the IGCSE core and extended courses.

8.4 Discussion: The South African NSC compared with CIE AS-Level and A-Level examinations

Graph 5 on the next page shows the comparison of the NSC with the AS–Level and A-Level examinations.

From this graph together with the data in **Table 12** the following points can be made:

- The NSC examination has a similar percentage of factual recall questions (12%) to the AS-Level examination (13%), but slightly less than the full A-Level examination (18%)



- The NSC examination has a greater percentage of conceptual questions (37%) than the AS Level (29%), and the A Level (25%), but a lower percentage of problem solving questions (50%) than the AS Level (58%), and the A Level (58%).
- The NSC examination has a slightly higher percentage of easy questions (16%) than the AS Level (11%), and extended level (9%).
- The NSC examination has a higher percentage of difficult questions (20%) than the AS Level (5%), and A Level (4%).
- Most of the examination questions for AS Level and A Level lie in the moderately difficult category (84% and 87% respectively).

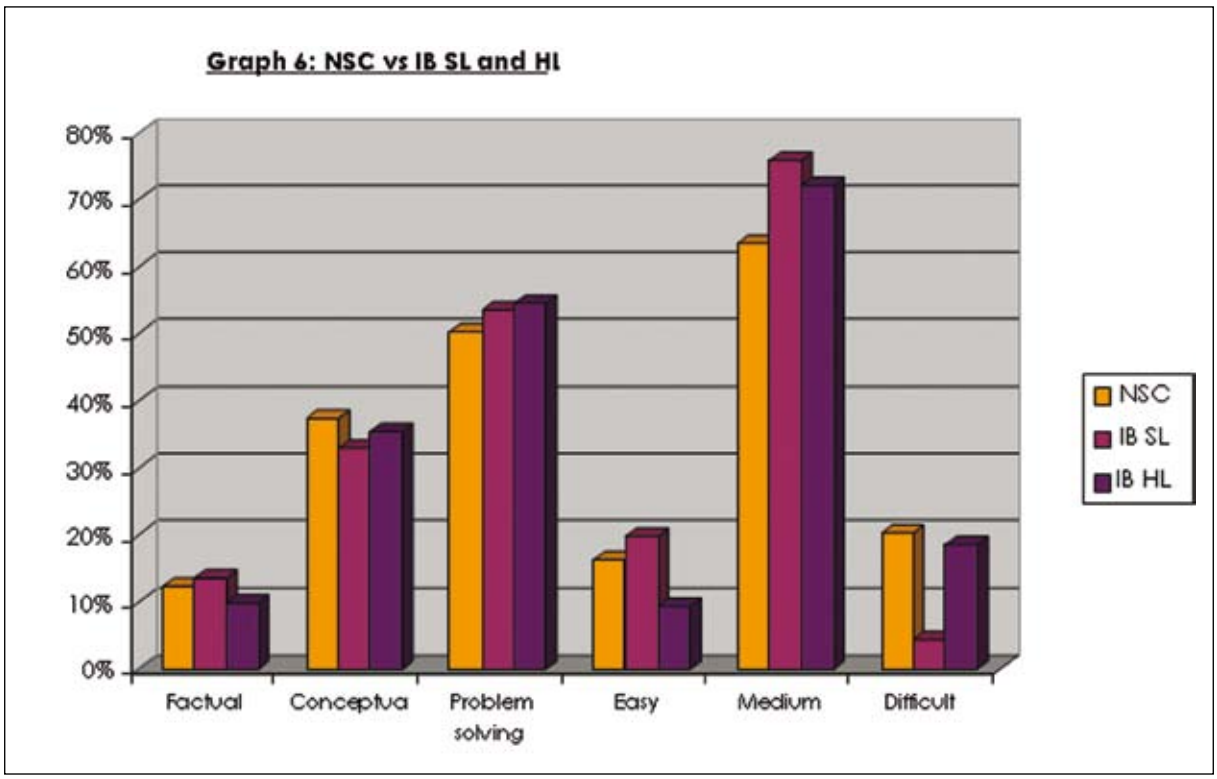
Taking all of these factors into consideration, the NSC examination is of a comparable standard to the AS-Level and A-Level examinations in most respects. However, it is more difficult for students to achieve high marks (A grades) on the NSC examination than on the other two examinations. On the whole, then, it can be concluded that the NSC examinations are more difficult than the AS-Level and A-Level examinations.

8.5 Discussion: The South African NSC compared with IB SL and HL

Graph 6 on the next page shows the comparison of the NSC with the IB examinations.

From **Graph 6** and the data in **Table 12** the following points can be made:

- The NSC examination has a similar percentage of factual recall questions (12%) to the SL examination (14%), and the HL examination (10%).
- The NSC has a similar percentage of conceptual questions (37%) to SL (33%), and HL (35%), but a similar percentage of problem solving questions (50%) to SL (53%), and HL (55%).
- The NSC examination has a similar percentage of easy questions (16%) to SL (20%), but slightly more than HL (9%).
- The NSC examination has a higher percentage of difficult questions (20%) than SL (4%), but this is similar to that for HL (19%).



Taking all of these factors into consideration, it can be concluded that the NSC examination is of a higher standard than the IB SL examinations, and of a comparable standard to the HL examinations.

9. Comments on the Namibian Senior Secondary Curricula

The evaluation team did an " ex post facto-check" on the Namibian NSSC OL (Ordinary Level) and NSSC HL (Higher Level) as contextualised examples of CIE qualifications. The following points are made in this regard:

- Physics and Chemistry are not offered as two separate courses, as they are for the CIE and IB international qualifications, but are combined into one Physical Sciences course, as in the NSC.
- In terms of breadth and depth of content, the **Namibian OL is almost identical to the IGCSE core curriculum**, and the **HL is almost identical to the IGCSE extended curriculum**. It seems that the Namibian system has fallen into a similar trap to the NSC, in that there is a vast breadth of content. This is due to the fact that the Physics and Chemistry courses have been combined into a single course, but the breadth of content in each of these areas is comparable to the breadth in the full IGCSE Physics course and the full IGCSE Chemistry course.
- The main difference between the OL and HL courses is that the HL course goes into greater depth in some topics, and includes a few more advanced topics (such as Quantum Theory). The distinction between OL and HL is more similar to the difference between the IGCSE core and extended courses than between the IGCSE and the AS-Level courses.
- There is not much evidence of attempts to contextualize the courses for an African context. The main difference between the IGCSE content and the Namibian content is the exclusion from the Namibian courses of inorganic chemistry and air-and-water chemistry, and the inclusion of environmental and industrial chemistry.
- The language level of the Namibian examinations is much more accessible than in the South African NSC examinations.

- Where in the NSC curriculum the Physics and Chemistry content topics are examined in separate papers, in the Namibian system they are combined in all examination papers, and the examination papers are not systematically laid out in terms of the Physics or Chemistry content, which may be confusing to the candidates.
- In this evaluation it was found that the NSC curriculum has **greater depth** than the IGCSE core or extended curricula. Since the Namibian curricula are very similar in depth to the IGCSE curricula, it can therefore be concluded that the NSC Physical Sciences curriculum has greater depth than the Namibian Physical Sciences curriculum, and these curricula therefore **cannot be considered to be comparable**. In fact the evaluation team members are of the opinion that both the OL and HL courses are equivalent to the South African Grades 10 and 11, both in terms of depth of content and in terms of cognitive demand of the examinations. A more detailed analysis would be required for a more definitive comparison to be made.

10. Conclusion

10.1 Comparability of the international qualifications with the South African NSC

An attempt was made to ascertain the level of comparability of the various international qualifications with the NSC. The following points address this question:

10.1.1 To compare breadth of content coverage:

From Graph 2 the following conclusion can be drawn about the breadth of content covered in the various curricula:

- The NSC curriculum has far greater breadth for the allocated teaching time than any of the other curricula. One can therefore conclude that the NSC is not at all comparable with any of the international qualifications in terms of breadth, but is over-reaching in this regard.
- This is likely to lead to a very superficial level of engagement with the concepts in the NSC curriculum. Since research has shown that less breadth of content covered in more depth ensures greater chance of future success in the discipline (Schwartz et al, 2008), the breadth of content in the NSC curriculum is likely to lead to candidates who have less chance of success in the related disciplines at a tertiary level.

10.1.2 To compare depth of content coverage:

From Graph 3, together with the data in Table 2, the following conclusions can be drawn about the depth of content covered in the various curricula:

- **NSC compared with IGCSE:**
  - The NSC curriculum has a much lower percentage of superficial content (15%) than the IGCSE core curriculum (54%), and a lower percentage than the extended curriculum (22%).
  - The NSC curriculum has a much higher percentage of deep content (50%) than the IGCSE core (4%) and extended (18%).

  It can therefore be concluded that the NSC curriculum has greater depth than the IGCSE core or extended curricula.
- **NSC compared with CIE AS Level and A Level:**
  - The NSC curriculum has a higher percentage of superficial content (15%) than the AS-

Level curriculum (3%), and the full A-Level curriculum (2%). (This is expected since the NSC includes Grade 10 level content, whereas the A-Level curricula are aimed at a higher education level.)
- The NSC curriculum has a similar percentage of deep content (50%) to AS Level (48%), but no content at the very deep level (while AS Level has 3% at this level). The full A Level has 34% content at the deep level, and 34% at the "deep +" level.

It can therefore be concluded that the NSC curriculum has similar depth to the AS-Level curriculum, but less depth than the full A-Level course.

- **NSC compared with IB:**

  - The NSC curriculum has a comparable percentage of superficial content (15%) to the IB SL curriculum (12%), but slightly more than the IB HL curriculum (7%).
  - The NSC curriculum has a similar percentage of deep content (50%) to IB SL (47%), and no content at the very deep level (while IB SL has 7% at this level). The IB HL has 43% content at the deep level, and 25% at the "deep +" level.

  It can therefore be concluded that the NSC curriculum has similar depth to the IB SL course, but less depth than the IB HL course.

Overall, it can be concluded that the NSC curriculum is most similar in depth to the CIE AS-Level and IB SL courses.

10.1.3 To compare skills coverage:

From the mapping of the skills shown in Table 4 it is clear that, although the skills are described in different ways in the curriculum documents, the skills covered in the various curricula are very similar.

An attempt was made to assign relative values to the various curricula on the basis of this depth of content. This was done by assigning superficial content a weight of 1, moderate content a weight of 2, deep content a weight of 3 and deep+ content a weight of 4, then scaling the total using the NSC as a benchmark score of 100. The relative values found in this way are:

- NSC = 100
- IGCSE core = 64
- IGCSE extended = 83
- AS = 107
- A = 127
- IB SL = 106
- IB HL = 121

10.1.4 To compare examinations:

From the analysis of the examination papers, the following conclusions were drawn:
- The NSC examination is of a considerably higher standard than the examinations for the IGCSE core and extended courses.

- The NSC examinations are more difficult than the AS-Level and A-Level examinations.
- The NSC examination is of a higher standard than the IB SL examinations, and of a comparable standard to the HL examinations.

An attempt was made to assign relative values to the various curricula on the basis of the examinations. This was done by giving a weight to the relative discrepancies in these totals of easy and difficult questions in the various curricula, using NSC as a benchmark. The relative values found in this way are:

- NSC = 100
- IGCSE core = 47
- IGCSE extended = 63
- AS = 90
- A = 91
- IB SL = 81
- IB HL = 106

10.1.5 Overall comparisons:

The curriculum depth and examination values assigned for the courses above were averaged to give a very rough overall value to the respective courses. These values are:

- NSC = 100
- IGCSE core = 55
- IGCSE extended = 73
- AS = 99
- A = 109
- IB SL = 93
- IB HL = 114

10.2 Mapping of the international qualifications to the NSC

The evaluation teams were asked to consider whether the international qualifications can be mapped in relation to the NSC in order to enable HESA to determine appropriate minimum admission requirements at higher educational institutions. From the above analysis the following points can be made:

- It is clear that the CIE AS-Level and IB SL courses can be considered to be comparable to the NSC in terms of admission criteria to South African tertiary institutions both in terms of the depth of content in the curricula, and in terms of the cognitive demand of the examinations.

- The IB HL and full A-Level courses are overall the most demanding if one takes examination difficulty and depth of curriculum content into account, and as a result candidates with lower results than the usual entry requirements could be considered from these courses.

- The IGCSE can in no way be considered comparable to the NSC, and it would not be possible to set appropriate entrance criteria for these candidates as their education level is not equivalent to that of the other courses.

Comparison of the English First Additional Language curricula of the NSC with International Qualifications (IQs)

Subject: English First Additional Language

Qualifications: NSC, CIE –IGCSE, CIE – AS Level and A Level, IBO (SL & HL), Namibia (NSSC) examination papers

Evaluators: Mr Matthys de Jager, Team Leader (English First Additional Language), Mss Nandipha Nonkwelo, Michelle Mathey, Patience Voller

Documents:
The following documents were used in the compilation of this report:

Document name:	In this report referred to as:
National Curriculum Statement for Grades 10–12 (General) Languages, English First Additional Language 2003	Document 1
National Curriculum Statement for Grades 10–12 (General) Subject Assessment Guidelines (SAG), Languages 2008	Document 2
International General Certificate of Secondary Education Syllabus English as a second language 0510 2009	Document 3.1
IGCSE English as a second Language Paper 1: Reading and Writing	Document 3.2
IGCSE English as a second Language Paper 2: Listening	Document 3.3
General Certificate of Education (International) Advanced (A) Level and Advanced Subsidiary (As) Level Syllabus English Language 8693, Language and Literature in English 8695, Literature in English 9695, 2009	Document 4
International Baccalaureate Organization Diploma Programme Language A2	Document 5.1
IBO Diploma Qualifications Design	Document 5.2
IBO Diploma Programme Assessment Principles and Practice	Document 5.3
IBO Programme Description Extended Essay Extract	Document 5.4
IBO Diploma CAS	Document 5.5
English B Higher Level Paper 2	Document 5.6
English B Standard Level Paper 2	Document 5.7
Namibia Senior Secondary Certificate (NSSC) English Second Language Syllabus Ordinary Level 4116 Grades 11-12	Document 6.1
Namibia Senior Secondary Certificate (NSSC) English Second Language Syllabus Higher Level 8315 Grades 11-12	Document 6.2
NSSC English as a Second Language Ordinary Level 2007 Paper 1 (Core)	Document 6.3
NSSC English as a Second Language Ordinary Level 2007 Paper 2 (Extended)	Document 6.4
NSSC English as a Second Language Ordinary Level 2008 Paper 1 (Core)	Document 6.5
NSSC English as a Second Language Ordinary Level 2008 Paper 2 (Extended)	Document 6.6
NSSC English as a Second Language Ordinary Level 2008 Paper 3	Document 6.7
Various other NSSC examination papers not specifically referred to in this report	

Introduction

As part of the equivalence setting project, this report covers a comparable analysis of the South African National Senior Certificate (NSC) for English First Additional Language, with English as a second language in qualifications of the CIE (IGSCE, AS Level and A level) as well as the Advanced Level and Advanced Subsidiary Level linked to the International Baccalaureate Organization (IBO). Curriculum documents of the NSSC (Namibian Senior Secondary certificate) and a number of examination papers are also briefly considered in this report.

Structure of the Qualifications

NSC:
The education level considered in the NSC is the Further Education and Training band (FET), which covers the last three years of secondary education, namely Grades 10, 11 and 12.

CIE qualifications (IGSCE, AS Level and A Level):
Two education levels were considered in the CIE:

- The International General Certificate of Secondary Education (IGCSE):
  This is designed as a two-year course for students from the age of 16. It consists of a Core curriculum and an Extended curriculum. In this report the content for the extended curriculum includes the content for the core curriculum plus any additional prescribed content.
- The General Certificate of Education (International) Advanced Level and Advanced Subsidiary Level:
  The Advanced Level course is flexible, and can be structured in a variety of ways:
  - Candidates may take all Advanced Level components (herein abbreviated as A Level) in the same examination session leading to the full A Level.
  - Candidates may follow a staged route to the A Level by first completing the less extensive Advanced Subsidiary qualification (herein abbreviated as AS Level), and later completing the additional part of the course leading to the full A Level.
  - Candidates may complete the AS-Level qualification only.

IBO qualifications (IB SL and HL):
The level considered in the IB is the Diploma Programme, which is a two-year pre-university course for students in the 16 to 19 year age range. This course consists of two levels, namely Standard Level (herein abbreviated as SL) and Higher Level (herein abbreviated as HL). Although the SL and HL cover a common core curriculum, the HL goes into greater depth in some topics and incorporates additional more demanding topics that are more demanding.

Namibia (NSSC):
A number of Senior Secondary Certificate examination papers of the Namibian education system are also briefly considered in this report. The NSSC includes an Ordinary Level (OL) and a Higher Level (HL) qualification. The Namibian curriculum and examination papers are referred to throughout, but specifically in Section 7 of this report.

1. Content specification and coverage

As content and skills are always interlinked in languages it is difficult to specify content and skills or to link this directly to tuition time and content focus. The team used weighting in assessment to determine the main focus of the particular qualification. In order to make a final decision on weighting and focus the team used the curriculum outlines (also referred

to in some of the qualifications as syllabus outlines), assessment guidelines and curriculum statements of the different qualifications to make a final decision on weighting and focus.

1.1 Content specification, weighting and focus

1.1.1 NSC

In this report the curriculum for English First Additional Language (EFAL) in the Further Education and Training Band (Grades 10-12) (FET), the last three years of schooling, is considered. The NSC curriculum is based on critical and developmental outcomes, which are derived from the Constitution of the Republic of South Africa. The critical and developmental outcomes are general, overall outcomes that each candidate should achieve by the end of his or her years of schooling. These general outcomes apply to all learning areas and subjects in all school grades (Document 1, p. 2).

The content of the NSC curriculum is presented in the National Curriculum Statement (NCS) for each learning area and subject under a number of learning outcomes and related assessment standards derived from the general critical and developmental outcomes. The curriculum for NSC English First Additional Language (EFAL) is presented under four learning outcomes and related assessment standards.

The learning outcomes are:

- Learning Outcome 1: Listening and Speaking
- Learning Outcome 2: Reading and Viewing
- Learning Outcome 3: Writing and Presenting
- Learning Outcome 4: Language

A learning outcome is described as "a statement of an intended result of learning and teaching. *It describes knowledge, skills and values that learners should acquire by the end*" of a specific band of schooling (Document 1, p. 6). An example of such an outcome is learning outcome 1 for EFAL in the FET band: "The candidate is able to listen and speak for a variety of purposes, audiences and contexts" (Document 1, pp. 12, 14-20).

For each learning outcome a number of assessment standards have been formulated. Assessment standards are described as "*criteria that collectively describe what a candidate should know and be able to demonstrate at a specific grade. They embody the knowledge, skills and values required to achieve the Learning Outcomes. Assessment standards within each learning outcome collectively show how conceptual progression occurs from grade to grade*" (Document 1, p. 7). An example of a related assessment standard of Learning Outcome 1 for Grade 12 EFAL is: "*identify and choose appropriate formats, vocabulary and language structures and conventions*" in planning and research skills for oral presentations (Document 1, p. 17).

Because of the integrated approach followed in the NSC there is no clear indication of content weighting as such. From the Subject Assessment Guidelines (SAG) (Document 2, pp. 21&22) the team found that there seems to be a greater emphasis or focus on writing (Learning Outcome 3) as writing carries a total of 100 marks out of a total of 150 marks (oral excluded), whereas the mark allocation for the other Learning Outcomes is as follows:
Learning Outcomes 1 & 2: 50 marks (reading as an oral task)
Learning Outcome 2: 70 marks (reading and writing)
Learning Outcome 4: 80 marks (language in context).

As Learning Outcome 3 is linked to creative writing as well as presenting the assumption is then that the candidate should not only be able to write creatively and as form of communication, but also for specific purposes, for instance to present language ability.

Candidates should be able to write a narrative, descriptive, reflective, argumentative or discursive essay of 250–300 words (Document 2, p. 22).

Apart from creative writing, candidates should also be able to write longer (curriculum vitae, editorial, brochure, formal and informal letter, etc.) as well as shorter (advertisement, diary entry, postcard, etc.) transactional texts. The longer text carries a total of 30 marks while the shorter text carries a total of 20 marks.

When the team looked more closely at weighting in the Subject Assessment Guidelines, the following became evident:

Paper 1 includes comprehension exercises (Reading –LO 2, 30 marks), a summary (Writing – LO 3, 10 marks) and Language (LO 4, 40). **Paper 2** consists entirely of Literature (Reading – LO 2 and Writing – LO 3), while **Paper 3** consists entirely of writing (LO 3, 100 marks). Oral tasks (LO 1) are contained in Paper 4 which carries a total of 50 marks) (Document 2, pp. 21&22).

Although the curriculum does not contain specific mention of weighting of content, it is clear from the focus in the SAG that more focus is placed on writing than on any of the other learning outcomes.

It should also be mentioned here that from the links between the learning outcomes, SAG and examination papers, the team found that in the NSC curriculum there is a proper link between the intended, enacted and assessed curriculum.

1.1.2 CIE qualifications

1.1.2.1 IGCSE

International General Certificate of Secondary Education (IGCSE) curricula are designed as two-year courses for examination at age 16-plus.

All IGCSE curricula follow a general pattern. The main sections are:

- Aims
- Assessment Objectives
- Assessment
- Curriculum Content

The IGCSE subjects have been categorized into groups with subjects within each group having similar aims and assessment objectives.

English as a Second Language (E2L) falls into Group I, Languages, of the International Certificate of Education (ICE) subjects.

It is presumed that most candidates for English as a Second Language will have a primarily instrumental motivation – that is they will be studying the language in order to promote their educational or employment prospects. The rationale for English as a Second Language is based on the widespread use of English as the medium of instruction and as the language of commerce or entertainment. The subject matter of the examination material will reflect this

international perspective. However, it will strive to be 'culture-fair' rather than 'culture-free', and will use authentic or 'semi-authentic' material from a range of sources.

"Candidates will be expected to understand a wider range of social registers and styles than they can produce and to communicate appropriately".

"The topics selected will relate to the interests and needs of the candidates in using English as a Second Language e.g. education, the world of work, current affairs, health and welfare, travel, school affairs".

"The kinds of settings to be used will be the ones that candidates are likely to encounter e.g. in dealings with official and semi-official bodies, in studying for academic or occupational purposes, in places of work or in using public services" (Document 3.1, p. 1).

Where the NSC is structured according to learning outcomes and assessment standards, the IGCSE curriculum is structured according to assessment objectives which include reading, writing, listening and speaking.

As in the case of the NSC, content and skills are interlinked in each objective, for example, candidates should be able *"to recognise information from various texts like public notices, timetables and advertisements"* (Document 3.1, p. 16). Each objective indicates a core and supplement tier and candidates aiming for grades A to C should follow the supplement or extended tier.

The team found that the difference between the core and extended tiers lies in a deepening or extension of the ability required of the candidate. In the core tier the candidate should be able to recognise information from certain texts, while in the supplement or extended tier the student should be able to extract information from a wider range of texts (Document 3.1, p. 16).

As content and skills are interlinked and content is used to demonstrate skills, the team could find no weighting of particular content. However, from the assessment summary (Document 3.1, p. 5), the team found that reading and writing (Paper 1) for both core and extended tiers carry a weighting of 70%, while listening carries a weighting of 30%. There is thus a heavy focus on listening which was not found in the NSC.

From the description of the different components in the IGCSE curriculum, it is clear that candidates also sit for a listening examination in which candidates must answer a number of questions on *"recorded texts (e.g. dialogues, announcements, conversations, talks) on a compact disk (CD) played in the examination room"* (Document 3.1, pp. 12&13).

In **Part 2 of Paper 2** (Listening) (IGCSE, 2007) (Document 3.3, p. 3–4), the candidates listen to an interview with a champion rower after which they have to answer 10 questions based on the recorded interview.

The team also found this in the Namibian NSSC as contextualised version of the qualification. For example, in **Question 8 of Paper 3** (Listening Comprehension) (NSSC, OL, 2008) (Document 6.7, p. 4), candidates listen to an interview on the Yellow-billed Kite and are then asked to indicate whether 12 statements based on the interview are true or false.

1.1.2.2 AS-Level and A-Level qualifications

In the AS- and A-Level curricula the following are presented:

- English Language (AS Level)
- Literature in English (AS Level and A Level)
- Language and Literature in English (AS Level)

"Candidates may

- take English Language/Language and Literature in English/Literature in English as Advanced Subsidiary qualifications only (Candidates offering Language and Literature in English may **not** also offer either of the separate syllabuses Literature in English and English Language)

- take a **staged** assessment route to A Level Literature in English by achieving Advanced Subsidiary Literature in English in an earlier examination session

- take all components of A Level Literature in English in the same examination session

Candidates may also take half credit syllabus, but these may not be used towards any other qualification" (Document 4, p. 1).

The curriculum documents for the CIE AS Level and A Level seem to include the aims of the syllabus, the assessment objectives as well as a detailed description of the different examination papers. As with the NSC and IGCSE qualifications, content and skills are interlinked and are presented in the assessment objectives. As no specific content or skills specifications are provided, these must be extracted from the assessment objectives. As a result of the fact that no specific content and skills specifications are provided, the team used the assessment guidelines provided to determine content and skill weighting.

English Language (AS Level)

For English Language, a candidate must present Paper1 and 2 which are of equal weighting.

Paper 1 includes passages for comment on which candidates must answer two of three questions which involve a commentary on use of language in the passage followed by a directed writing task based on the passage.

Paper 2 focuses on writing: Section 1 includes narrative/descriptive/imaginative writing, while Section B includes discursive or argumentative writing for which candidates do not receive any guidance. The emphasis in this paper is on the use of style and language. This differs from the NSC where candidates may choose any of a number of essays. In the NSC a candidate may choose to write a narrative essay, where candidates in the AS Level must write both narrative and discursive pieces.

Both papers are of equal weighting and although there is no weighting of content, it is obvious that candidates are expected to show a variety of writing skills.

Literature in English (AS Level and A Level)

Candidates taking the AS Level also present Paper 3 (Poetry and Prose) and Paper 4 (Drama). Both papers carry an equal weighting.

Candidates doing the the A Level, present Paper 3 (Poetry and Prose), 4 (Drama) and 5 (Shakespeare and other pre-20th century texts) as well as either Paper 6 (20th Century texts), Paper 7 (Comment and Application), or Paper 8 (Coursework). All the papers carry an equal weighting.

Three anthologies with a varying number of poems are prescribed for Paper 3 and, therefore, it is not possible to state the actual number of recommended poems.

For Paper 4 six drama titles from various international authors are recommended (for both AS Level and A Level).

Texts from different eras and authors are prescribed for all papers. Some of the works are modern, some classical and no bias towards type or time frame was evident. As many poems are prescribed, candidates do not learn specific poems, but learn how to work with poetry. Candidates should be able to analyse and comment on literary works and provide informed and critical personal responses (critique) to these texts.

In Papers 5, 6, 7 and 8 A Level candidates are expected to comment on previously unseen passages of at least two of the categories of prose, poetry or drama set for study.

The team is of the opinion that AS- and A Level candidates are expected to interpret and analyse literary texts and to give unguided critical personal responses to literature.

This differs from the NSC where assessment standards indicate in detail which aspects of literary works candidates should be able discuss (LO 2, Assessment Standard 2.4.2.1 – "explain and interpret the development of plot, subplot, conflict, character, and role of narrator where relevant;" (Document 1, p. 29).

With regard to Paper 8 (Coursework), the following: this paper is optional and schools must apply to present Paper 8. Guidelines on presenting this paper are provided in the *Handbook for Centres*. From this the team can assume that assessment of Paper 8 is strictly regulated. In Paper 8 coursework or school-based assessment is done of two texts from two different forms (poetry, prose and drama). The team is of the opinion that this is equivalent to CASS in the NSC curriculum. In Paper 8 candidates must present two essays on two text not prescribed in the syllabus (whole works originally written in English (Document 4, p. 10). In the CIE qualification Paper 8 is optional, while school-based assessment in the NSC is compulsory and carries a weighting of 25%.

Language and Literature in English (AS Level)

Language and Literature in English is for Advanced Subsidiary only and cannot be combined with Advanced Level Papers 5, 6, 7 and 8.

For Language and Literature in English, candidates should present two papers: Paper 2 (the same as for English Language above), and Paper 9 in which an essay-type and a passage-based question will be set on each text (poetry – 3 anthologies, prose – 3 texts and drama – 3 texts). Candidates must answer two questions – one question on each of two different texts from two sections. No texts or dictionaries are allowed in the classroom.

Candidates must be able to comment on the effective use of narrative methods, style and language of texts, the ways in which writers' choices of form, structure and language shape

meaning, and candidates should comment on the appreciation of dramatic qualities of play texts.

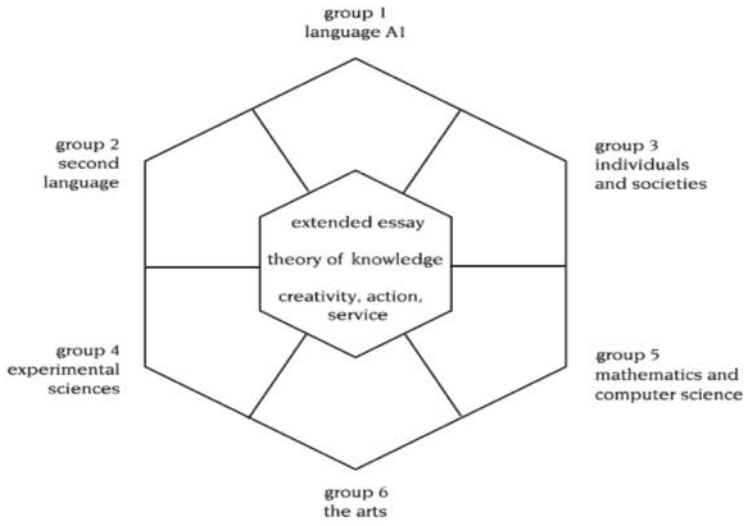
While the NSC focuses more on writing, the focus in the AS- and A Level qualifications is more on reading which culminates in writing as candidates are expected to give personal responses on texts in writing: *"… questions require candidates to demonstrate a response showing understanding of the text and an informed independent opinion, and to communicate these clearly and appropriately"* (Document 4, p. 7).

The skills required in the AS Level and A Level are at the same level except that a wider variety of text are prescribed for A-Level candidates in the extension of Papers 5, 6, 7 and 8.

The team could not find proof of any assessment of oral or listening skills as was found in the IGCSE and NSC qualifications.

1.1.3 IBO Diploma Programme Language A2 HL and SL

The IBO Diploma Programme is a two-year pre-university course *"that allows graduates to fulfil requirements of various national education systems"* (Document 5.1, p. 1). Diploma candidates are required to select one subject from each of the following groups: Language A1, Language A2, Individuals and society, Experimental sciences, Mathematics and computer science and the arts. At least three, but no more than four subjects are taken at higher level and the others at standard level. In addition to the six subjects candidates also meet three requirements, namely the extended essay, theory of knowledge (TOK) and creativity, action, service (CAS) (Document 5.1, p. 1). The above structure can be presented as follows:



*"The **extended essay** is an in-depth study of a focused topic chosen from the list of approved Diploma Programme subjects—normally one of the student's six chosen subjects for the IBO diploma. It is intended to promote high-level research and writing skills, intellectual discovery and creativity. It provides students with an opportunity to engage in personal research in a topic of their own choice, under the guidance of a supervisor (a teacher in the school). This leads to a major piece of formally presented, structured writing, in which ideas and findings are communicated in a reasoned and coherent manner, appropriate to the subject chosen. It is recommended that completion of the written essay is followed by a short, concluding interview, or viva voce, with the supervisor"* (Document 5.4, p. 3).

"The **TOK course** *… encourages critical thinking about knowledge itself, to try to help young people make sense of what they encounter"* (Document 5.4 p. 3). *Core questions in the TOK are questions like: What counts as …? How does it … ? What is the value of …? What are the implications of … ?*

"TOK activities and discussions aim to help candidates discover and express their views on knowledge issues. It encourages candidates to share ideas and learn from others". Due to the nature of possible questions to be asked, there is virtually no limit to the questions that may be asked in the TOK course (Document 5.4, p. 3).
*"**CAS** is a framework for experiential learning" aimed at involving students (candidates) in new roles and in learning through doing "tasks that have real consequences and then reflecting on these experiences". Reflection provides opportunities for candidates to apply "what is learned in the classroom to a form of service", for example to the environment, society or humanity. "The most meaningful CAS experience comes from spending time with others to build relationships and develop the self-worth of both server and served. In the design and construction of their CAS schedules, coordinators are strongly encouraged to emphasize these aspects as much as possible"* (Document 5.5, p. 4).

From the above descriptions it is clear that the skills required in the IB curriculum are higher-order cognitive skills. The emphasis is not on the acquisition and retention of knowledge, but rather on the synthesis, evaluation and construction of knowledge.

The required skills and content with regard to the language A2 curriculum are not as explicitly stated as in the NSC First Additional Language curriculum (see tables and Document 5.1, pp. 13&14). However, as the skills required for the IB lie mainly on the higher-order cognitive skills level one would assume that candidates who have achieved these would be able to cope with the requirements set in higher education.

In order to ascertain the validity of this assumption, the entire curriculum (NSC as well as IB), not only that of additional language (NSC) or language A2 (IB), should be researched.

According to candidates' proficiency in the target language they may choose an appropriate group 2 language course. The courses to choose from are:

Ab *Initio* SL – for beginners who have little or no previous experience of the target language
Language B SL – for language candidates who may not intend continuing study of the language beyond the Diploma Programme
Language B HL – for language candidates who intend to study the language at this level for future career requirements
Language A2 SL – for fluent users who may not intend continuing study of the language beyond the Diploma Programme
Language A2 HL – for fluent language users who intend to study the language at this level for future career requirements
Classical Languages HL & SL – for candidates who wish to study either Latin or Classical Greek (Document 5.1, p. 6).

In this report the focus is on Language A2 HL and SL

As with the CIE qualifications, content in the IB curriculum is not specified in lists. However, particular content for both IB HL and IB SL can be identified from the skills embedded in the aims of the curriculum and the syllabus outlines, for example *"to communicate clearly, fluently and effectively in a wide range of situation, to assimilate and make use of complex written and spoken texts"* (Document 5.1, p. 9).

The curriculum (syllabus) outline is structured under the following headings:

- Language
- Texts
- Cultural awareness
- Options
  - Cultural options
  - Literary options

Candidates in the higher level must study four options, of which atleast one must be a literary option and at least one must be a cultural option. One of the cultural options must be either language and culture or media and culture.

Candidates in the standard level must study three options, of which at least one must be a literary option and at least one must be a cultural option. One of the cultural options must be either language and culture or media and culture (Document 5.1, pp. 11&12).

Although weighting of content is not specified in the syllabus, it may be deduced from the assessment outlines (Document 5.1, pp. 27&28).
In both the HL and SL programmes the assessment weighting is the same – external (Papers 1 and 2) 70%, and internal 30%.

As in the CIE qualifications and the NSC, the focus is mainly on writing. This is evident from Paper 1 of the IB HL in which the candidates must write a comparative commentary on one of two pairs of unseen texts which are linked by a theme. The candidates should be able to comprehend, interpret and analyse a particular text in order to give an opinion and to compile a commentary. This skill is of a high cognitive demand.
SL candidates are provided with optional guiding questions in the writing of the comparative commentary, which is a scaffolded way of assessment (Document 5.1, pp. 27&28).
In Paper 2 candidates must write one essay chosen from ten essay questions. Both Papers 1 and 2 carry a weighting of 25%.

Apart from Paper 1 and 2 candidates must also complete two written tasks – one based on the literary option and one on the cultural option. These two written tasks carry a weighting of 20%.

The internal assessment consists of an individual oral and an interactive oral activity which both carry a weighting of 15%. The internal assessment is internally assessed by educatorss but externally moderated by the IBO.

Other than in the CIE and NSC qualifications, the team couldn't find any prescribed literary works for the IB programme. The assumption is thus that literature is linked to the options. From looking more closely at what is incorporated in the literary option, candidates should consider how language and style are used to present ideas, themes, feelings and attitudes. They explore which aspects of literary texts are specific to the target language and its associated cultures and which aspects cut across cultural and linguistic boundaries – clearly promoting multiculturalism and multilingualism, but not an awareness of poetry, novel or drama. It seems as though a wide variety of oral or written texts are only used for assessment purposes – for linguistic and analytic skills but not for literary enrichment.

The list containing types of suggested texts to be used (Document 5.1, p. 16) suggest a wide variety of text. Reference to these texts does not imply any reference to literature but is only an indication that a candidate should be able to recognise and analyse aspects of style and

register and to incorporate these aspects into their own writing (Document 5.1, p. 12).

The main purpose of the IB programme is for candidates to be able to use language for communication in written and spoken language and the general focus of the IB programme is for a candidate to be able to understand and use the target language accurately (Document 5.1, p. 8).

1.2 Skills specification, weighting and focus

1.2.1 NSC

The skills of the NSC curriculum is presented in the National Curriculum Statement (NCS) for each learning area and subject under a number of learning outcomes and related assessment standards derived from the general critical and developmental outcomes. The English FAL curriculum is presented under four learning outcomes and related assessment standards.

The learning outcomes are:

- Learning Outcome 1: Listening and Speaking
- Learning Outcome 2: Reading and Viewing
- Learning Outcome 3: Writing and Presenting
- Learning Outcome 4: Language

As previously mentioned, a learning outcome is described as "*a statement of an intended result of learning and teaching. It describes knowledge, skills and values that candidates should acquire by the end*" of a specific band of schooling (Document 1, p. 6). An example of such an outcome is Learning Outcome 1 for EFAL in the FET band: "*The candidate is able to listen and speak for a variety of purposes, audiences and contexts*" (Document 1, pp. 12, 14–20).

For each learning outcome a number of assessment standards have been formulated. They embody the knowledge, skills and values required to achieve the learning outcomes. Assessment standards within each learning outcome collectively show how conceptual progression occurs from grade to grade (Document 1, p. 7). An example of a related assessment standard of Learning Outcome 1 for Grade 12 EFAL is "*identify and choose appropriate formats, vocabulary and language structures and conventions*" in planning and research skills for oral presentations (Document 1, p. 17).

A breakdown of the skills extracted from the curriculum is presented in Tables 1 and 2 accompanying this report.

Because of the integrated approach followed in the NSC there is no clear indication of skills weighting as such. From the Subject Assessment Guidelines (SAG) (Document 2, pp. 21&22) the team found that there seems to be a greater emphasis or focus on writing (Learning Outcome 3) as writing carries a total of 100 marks out of a total of 150 marks (oral excluded), whereas the mark allocation for the other Learning Outcomes is as follows:
Learning Outcomes 1 & 2: 50 marks (reading as an oral task)
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As Learning Outcome 3 is linked to creative writing as well as presenting, the assumption

is that the candidate should not only be able to write creatively and as form of communication, but also for specific purpose and to present language ability.

Candidates should be able to write a narrative, descriptive, reflective, argumentative or discursive essay of 250–300 words (Document 2, p. 22).

Apart from creative writing, candidates should also be able to write longer (curriculum vitae, editorial, brochure, formal and informal letter, etc.) as well as shorter (advertisement, diary entry, postcard, etc.) transactional texts. The longer text carries a total of 30 marks while the shorter text carries a total of 20 marks.

When the team looked more closely at weighting in the Subject Assessment Guidelines, the following became evident:

Paper 1 includes comprehension exercises (Reading –LO 2, 30 marks), a summary (Writing – LO 3, 10 marks) and Language (LO 4, 40). **Paper 2** consists entirely of Literature (Reading – LO 2 and Writing – LO 3), while **Paper 3** consists entirely of writing (LO 3, 100 marks). Oral tasks (LO 1) are contained in Paper 4 which carries a total of 50 marks) (Document 2, pp. 21&22).

Although the curriculum does not specifically mention weighting of skills, it is clear from the focus in the SAG that more focus is placed on writing than on any of the other skills.

1.2.2 CIE qualifications

1.2.2.1 IGCSE

As with the content, the skills to be acquired are not presented in a list, but can be deducted from the assessment objectives as well as the assessment weighting (Document 3.1 pp. 2&5). The skills to be mastered are reading, writing, listening and speaking. Reading and writing carries a weighting of 70% while listening carries as weighting of 30%. Listening as individual skill carries more weight than the other skills, as listening is assessed on its own in Paper 3 for both the core and extended tiers.

1.2.2.2 AS-Level and A-Level qualifications

As is the case with the contents, the skills to be acquired are not specified in lists. However, the skills to be acquired can be deduced from the assessment objectives provided in the syllabus (Document 4, pp. 2, 4, 6 and 11).

1.2.3 IB qualifications

Different from the CIE qualifications, the language skills to be acquired in the IB qualifications are presented in a limited list under the syllabus detail (Document 5.1, pp. 13&14).

These skills are the following:

Listening
At the end of the Language A2 course, candidates are expected to:

- understand the target language spoken at native pace
- understand the oral forms of the language
- understand a range of vocabulary and idiom
- recognize structural elements of a spoken text
- recognize the subtleties of technique and style by speakers o fhte langauge

Speaking
At the end of the Language A2 course, candidates are expected to:

- communicate clearly, fluently and effectively
- use accurately the oral forms of the language
- use a range of vocabulary and idiom
- use appropriate register and style
- express ideas with clarity and fluency
- state argumetns and support them with examples
- engage in critical examination of texts in different forms, style and registers
- show an appreciation of the subtleties of technique and style

Reading
At the end of the Language A2 course, candidates are expected to:

- understand the written forms of the language
- understand a range of vocabulary and idiom
- recognize the structural elements of a written text
- recognize the subtleties of technique and style employed by writers

Writing
At the end of the Language A2 course, candidates are expected to:

- communicate clearly, fluently and effectively
- use accurately the written forms of the language
- use a range of vocabulary and style
- express ideas with clarity and fluency
- structure arguments and support them
- engage in critical examination of a wide range of texts
- show an appreciation of technique and style employed by writers

Apart from the above list, other skills to be acquired, can be deduced from the aims for Group 2 (Document 5.1, p. 7), which are:

- understand and use the language in a range of contexts and for a variety of purposes
- use the language appropriately
- encourage an awareness and appreciation of different perspectives of people from different cultures
- deveolop an awareness of the role of language in relation to other areas of knowledge
- experience enjoyment, creativity and intellectual stimulation through knowledge of a language
- develop a basis for further study, work and leisure through language
- develop an awareness of the relationship between the language and cultures with which they are familiar (Document 5.1, p. 7).

2. Organising principle and coherence

2.1 NSC

The NSC curriculum is organised according to nine principles which frame the NSC across all subjects and learning areas. These are: social transformation, outcomes-based education, high knowledge and high skills, integration and applied competence, progression, articulation and portability, human rights, inclusivity, environmental and social justice, valuing indigenous knowledge systems, credibility, quality and efficiency. However, the principle of outcomes-based education is the main fundamental principle for the NSC, striving to allow candidates to reach their maximum potential through the setting of learning outcomes and related assessment standards to be achieved at the end of each grade. Outcomes-based education also includes critical and developmental outcomes on which the learning outcomes are based. These critical and developmental outcomes are derived from the Constitution of the Republic of South Africa.

The coherence of the EFAL curriculum is ensured by the fact that the curriculum is organised around four learning outcomes (which are the same for all grades throughout the FET band) and related assessment standards which increase in depth and difficulty from one grade to the next.

2.2 CIE qualifications

2.2.1 IGCSE

As the organising principle of the NSC is based on learning outcomes and related assessment criteria, the IGCSE is organised around objectives, especially assessment objectives. These assessment objectives are reading, writing, listening and speaking. The refined objectives for reading and listening for both the core and extended tiers are exactly the same. Apart from the following differences, the refined outcomes for writing and speaking are also very similar:

Writing:
Candidates will be assessed on their ability to:

W4 demonstrate knowledge and understanding of a range of appropriate vocabulary
W5 observe conventions of paragraphing, punctuation and spelling
W 6 employ appropriate register/style

Speaking:
Candidates will be assessed on their ability to:

S4 demonstrate knowledge of a range of appropriate vocabulary
S5 engage in and influence the direction of conversation
S6 employ suitable pronunciation and stress patterns

2.2.2 AS-Level and A-Level qualifications

The AS-Level and A-Level curricula are organised according to assessment objectives.

The objectives for English language (AS Level) are:

- reading and understanding of a variety of written material
- knowledge and understanding of the English language
- the ability to write clearly, accurately and effectively

The objectives for Literature in English are:

- the ability to respond to texts
- understanding of the ways in which writers shape meaning
- the ability to produce informed, independent opinions on literary texts
- the ability to communicate the knowledge and insight appropriate to literary study
- the ability to appreciate and discuss opinions of literary works (A Level only)

The objectives for Language and Literature in English are:

- knowledge and understanding of features of the English language
- the ability to write clearly, accurately and effectively
- the ability to respond to texts
- understanding of the ways in which writers shape meaning
- the ability to produces opinions and judgements on literary texts
- the ability to communicate knowledge, understanding and insight appropriate to literary study" (Document 4, p. 11)

The distinction between the AS Level and A Level lies in the depth of the objectives to be achieved and the fact that the A Level curriculum provides for an extension of two (and in some instances three) additional examination papers (a choice between Paper 6 [20th Century writing] and Paper 7 [comment and appreciation], and in some instances, Paper 8 [Coursework or school-based assessment]).

Cohesion in the CIE AS- and A-Level curricula is ensured as the objectives to be achieved are all assessed in the different papers.

2.3 IB qualifications

The team could not find a single organising principle of the IB curricula, but we found that the main focus of the curricula (SL and HL) is on linguistic ability and we can say that this particular qualification is organised around language abilities. Language provision seems to be an essential component of the programme which is designed to achieve a high level of competence in the target language (Document 5.1, p. 8). The curriculum is structured in such a manner to provide candidates the opportunity to study language texts and culture, to develop personal analytical skills and even to develop and refine vocabulary and complex grammatical structures. The different types of texts suggested in the curriculum are used purely to work with register, style, ideas, themes, feelings and attitudes. The team could therefore assume that the organising principle around language is especially to achieve language skills across cultural and linguistic boundaries – in other words, linguistic abilities.

3. Sequence, progression and pacing

3.1 NSC

In Document 1 (pp. 14–45) and Document 2 (pp. 42–52) progression of skills and content for listening and speaking, reading and viewing, writing and presenting and language outcomes within each year is clearly defined through layout and descriptors identifying the gradual increase in level of complexity of each assessment standard from Grade 10 to 12.
The skills and content for listening and speaking, reading and viewing, writing and presenting and language outcomes are basically the same for all grades (Document 1, pp. 14–45; Document 2, pp. 42–52). Progression is identified by use of adjectives such as familiar / some (Grade 10), variety / range (Grade 11) and wide range (Grade 12).

The cognitive demand of skills and content for listening and speaking, reading and viewing, writing and presenting and language outcomes gradually increases from one grade to the next and is indicated through the use of various descriptors for the different grades, such as apply knowledge of (**basic** – Gr. 10) (**important** – Gr. 11) (**a range of** – Gr. 12) or recognize (Gr. 10) (**identify** – Gr. 11) (**explain** – Gr. 12) (Document 2, p. 51). Even though the difference is minimal, there is a clear demand for increased complexity in the choice of content to be selected and gradual exposure to higher order skills as candidates progress from one grade to the next.

At the end of each year of study the candidates should have been exposed to the learning outcomes listening and speaking, reading and viewing, writing and presenting and language and they should have achieved the related assessment standards for each learning outcome as described in Document 1 (pp. 14–45) and Document 2 (pp. 42–52).

3.2 CIE qualifications

3.2.1 IGCSE

The IGCSE curriculum is structured in such a way that candidates can either take the core tier or the extended tier. Candidates in the core tier are eligible for grades C to G, while candidates in the extended tier are eligible for the award of grades A to E (Document 3, p. 5) and thus the extended curriculum is more advanced.

Curriculum content is scaffolded from basic to more difficult within each tier, for example the reading objective begins with simple understanding and response to texts and progresses to recognising and distinguishing between facts, ideas and opinions (Document 3, p. 2). Progression from one year to the next and the increase in cognitive demand is not indicated in the curriculum.

In order to achieve the different objectives set out in the curriculum the following should be covered by the end of the year of study. In order to achieve the reading objective, candidates must be able to

- "understand and respond to information presented in a variety of forms
- select and organise material relevant to specific purposes
- recognise, understand and distinguish between facts, ideas and opinions
- infer information from texts (extended tier only)" (Document 3.1, p. 2)

In order to achieve the writing objective a candidate must be able to

- "communicate clearly, accurately and appropriately
- convey information and express opinions effectively
- employ and control a variety of grammatical structures
- demonstrate knowledge and understanding of a range of appropriate vocabulary
- observe conventions of paragraphing, punctuation and spelling
- employ appropriate register/style" (Document 3.1, p.2)

In order to achieve the listening objective a candidate must be able to

- "understand and respond to information presents in a variety of forms
- recognise, understand and distinguish between facts, ideas and opinions
- select and organise material relevant to specific purposes
- infer information from texts (extended tier only)" (Document 3.1, p.2)

In order to achieve the speaking objective a candidate must be able to

- communicate clearly, accurately and appropriately
- convey information and express opinions effectively
- employ and control a variety of grammatical structures
- demonstrate knowledge of a range of appropriate vocabulary
- engage and influence the direction of conversation
- employ suitable pronunciation and stress patterns (Document 3.2, p.2)

3.2.2 AS-Level and A-Level qualifications

No guidance on progression is provided in AS- and A-Level curriculum documents. In Document 4 (p. 2) the difference between the two levels is indicated by the fact that English Language is compulsory for AS-Level and not for A-Level examinations.

No indication of increase in cognitive demand is provided in AS-Level or A-Level curriculum documents.

The content to be covered at the end of the year of study is indicated as follows.
The AS Level curriculum consists of English Language, which comprises passages for comment (Paper 1) and composition (Paper 2). Candidates are required to comment on the use of the language in the selected texts and to complete a directed writing task. For composition candidates will be assessed on narrative / descriptive / imaginative writing and discursive / argumentative writing.

In addition, candidates will be assessed on English Literature which comprises poetry, prose and drama (Documents 4, pp. 11–15).

The A Level curriculum only consists of English Literature which comprises prescribed poetry, prose, drama, Shakespeare texts, 20th Century texts and comment and appreciation of previously unseen passages from poetry, prose or drama (Documents 4, pp. 4–10).

3.3 IB qualifications

Both in the objectives of IB Language A2 and the curriculum documents, detailed progression of skills are clearly stated. In each case the skills develop from communicating clearly; understanding and using the language, to appreciating the subtleties of technique and style and showing sensitivity to the culture related to the language studied (Document 5.1, pp. 9, 13).

The increase in cognitive demand is not very clear from the IB curriculum as no content is prescribed. The increase in the demand can, however, be deduced from the progression of skills. Skills develop from simple communication and understanding of the language, to the appreciation of the subtleties and critical examination of various texts in different forms, styles and registers (Document 5.1, pp. 9, 13).

By the end of the Language A2 course, the candidates are expected to have achieved various forms of listening, speaking, reading and writing in the target language (Document 5.1, pp. 9, 10, 13, 14).

4. Aims/purpose/vision/outcomes

4.1 NSC

The aim of the NSC Grades 10–12 is to lay a foundation for social transformation and development in line with the Constitution of the Republic of South Africa (Document 1, p. 1). The purpose of NSC Languages is to produce "citizens who are able to communicate across language barriers and foster cultural and linguistic respect and understanding" (Document 1, p. 9). The learning outcomes of speaking and listening, reading and viewing, writing and presenting and language are quite explicit.

Progression is clearly indicated in the National Curriculum Statement (Document 1), Learning programme guidelines (Document 2) and subject assessment guidelines (Document 3) are also provided to enable educators to develop learning programmes and to apply appropriate assessment practices.

The content and contexts for the attainment of assessment standards are clearly listed (Document 1, pp. 46–49). A wide range of simple and complex oral, written, visual, audio and audio-visual and multi-media texts are recommended to enable meaningful teaching and learning of language. Text-based and communicative approaches are recommended for integrated teaching and learning of languages.

Integration of knowledge and skills across subjects and applied competence which aims at integrating practical, reflective and foundational competences as defined in the National Qualifications Framework, are referred to in Document 1 (p. 3).

Articulation and portability of skills in FET in relation to exit and entrance levels at GET and HE formed the basis of the development of the subject statement (Document 1, p. 3). Further mediation of articulation is found in Document 2 (pp. 11, 12) as well as the following documents:
- *Into Higher Education – A Guide for Schools (pp. 34–36, 63–65)*
- *The National Senior Certificate: A Qualification At Level 4 On The National Qualifications Framework (NQF) (p. 3)*

4.2 CIE qualifications

4.2.1 IGCSE

The aims of the IGCSE curriculum can be found on page 1 of Document 3. The four aims are to

- "develop the ability to use English effectively for the purpose of practical communication
- form a sound base for the skills required for further study or employment using English as the medium
- develop an awareness of the nature of language and language-learning skills, along with skills of a more general application
- promote students' personal development"

Some sample activities suggested in the writing and speaking components do however include role plays and enactment of life situations.

No articulation with other parts of the education system is described.

4.2.2 AS-Level and A-Level qualifications

The aim of the AS Level (Documents 4, pp. 2, 4 and 11) is to encourage
- a critical and informed response to writing in a range of forms, styles and contexts

The aims of the A Level and also further aims of the AS Level are to encourage
- the interdependent skills of reading, analysis and communication
- effective and appropriate communication
- an appreciation of and an informed personal response to literature in English in a range of texts in different forms, and from different periods and cultures
- wider reading and an understanding of how it may contribute to personal development

In the AS-Level and A-Level qualifications guidance for the achievement of the above aims is given in the form of assessment objectives and the format of examination papers (Document 4, pp. 2–12).

No particular contexts are specified for AS- and A-Level qualifications even though reference to the use of texts from different cultures is made (Document 4, p. 4). Language is assessed in the context of a variety of forms of writing or texts.
Articulation with other parts of the education system are indicated in that the AS and A Level curricula are designed to allow progression from CIE O-Level or IGCSE curricula in English language and English Literature (Document 4, p. 1).

4.3 IB qualifications

The aims of the IB (SL and HL) curricula are to enable candidates to understand and use the target language appropriately in a range of contexts in order to

- develop an appreciation of different perspectives of people from other cultures
- to develop an awareness of the role of languages in relation to other areas of knowledge
- to provide opportunity for enjoyment and creativity
- to provide candidates with a basis for further study, work and leisure
- to develop candidates' awareness of the relationship between languages and cultures with which they are familiar (Document 5.1, p. 7)

These aims remind of the critical outcomes of the NSC curriculum which are developmental and provide a broader perspective than only that of a particular subject field.

In the IB (SL and HL) curricula little specific guidance for achieving the aims is evident. Within the description of the nature of Language A2 a broad framework of how the aims could be achieved is implied, but no specifics are given, e.g. "*In the language A2 course candidates develop and refine their language skills. To do this they need to become familiar with a wide range of vocabulary and complex grammatical structures*" (Document 5.1, p. 8).

The principles of the course design (Document 5.1, pp. 21, 22) provide educators with a number of issues to be considered in the design of their own courses. Among others, these include issues like flexibility, integration and variety. For each of these issues the curriculum describes what the educators should provide in order to allow the candidates to achieve the intended outcome.

Throughout the curriculum reference is constantly made to "… a range of contexts …" (Document 5.1, p. 7), "… *language appropriate in particular contexts …" (Document 5.1, p. 8), "… in a wide range of situations …" (Document 5.1, p. 9) "… how cultural contexts*

influence language use" (Document 5.1, p. 11). However, no direct indication of specific contexts to be used is evident.

The articulation of the language curriculum with other parts of the IB qualification is described as follows: *"The course is presented as six academic areas enclosing a central core. It encourages the concurrent study of a broad range of academic areas. Students study: two modern languages (or a modern language and a classical language); a humanities or social science subject; an experimental science; mathematics; one of the creative arts. It is this comprehensive range of subjects that makes the Diploma Programme a demanding course of study designed to prepare students effectively for university entrance. In each of the academic areas students have flexibility in making their choices, which means they can choose subjects that particularly interest them and that they may wish to study further at university"* (Document 5.2, p. 1).

5. Teaching approach and subject methodology

5.1 General teaching/ learning approach (pedagogy)

5.1.1 NSC

Outcomes-based education (OBE) is advocated as the suitable approach to teaching the South African national curriculum (Document 1, p. 47 and Document 2, p. 9, 10).

Outcomes-based education (OBE) forms the basis of the NSC. A learner-centred and activity-based approach (Document 1, p. 2) is encouraged for the realization of the outcomes (Document 2, p. 9). The developmental and critical outcomes on which the learning outcomes are based indicate alignment of the approach with the curriculum aim of producing citizens who are able to compete in the global community.

The NSC curriculum documentation provides educators with Learning Programme Guidelines to enable them to implement the methodologies suggested. A subject framework, templates of work schedules and lesson plans as well as guidance on the stages of planning and development of rubrics are provided in Document 2, pp. 33–35, 38–40, 42–54.

One of the principles of the NSC is to promote high knowledge and high skills in candidates (Document 1, pp. 2, 3). The critical and developmental outcomes which form the basis of Outcomes-based education (OBE) are aimed at enabling candidates to compete in the global economy. On the other hand heavy reliance on the OBE approach could result in poor learning if educators do not attempt to balance the teaching of everyday knowledge with academic knowledge.

The wide range of texts recommended for the implementation of the text-based approach cater for the varied interests of candidates in the FET phase. The articulation of progression takes into account the learning capacities of candidates in different grades. Reference is made to White Paper No. 6 on Special Needs Education to accommodate candidates experiencing barriers to learning (Document 1, p. 58), while guidance on inclusivity and diversity is provided in Document 1 (pp. 31–33).

5.1.2 CIE qualifications

Not in one of the CIE qualifications, whether for the IGCSE curriculum documents or the AS- and A-Level qualifications is any mention of information or guidance about pedagogic approaches.

5.1.3 IB qualifications

As in the CIE qualifications, no IB (SL and HL) curriculum document provides any information about pedagogic approaches but educators can use the assessment criteria as guidelines. The team found that a lot regarding planning, scheduling, sequencing and teaching approaches are assumed in these qualifications.

5.2 Subject-specific methodology

5.2.1 NSC

In Document 1 (p. 47) and Document 2 (pp. 9, 10) Outcomes-Based Education through text-based and communicative approaches is recommended for integrated teaching and learning of languages.

Document 1 (pp. 46, 47) and Document 2 (p. 33) recommend the use of texts as the source of content and context for communicative, integrated learning and teaching of languages through the communicative and text-based approach and process writing.

The NSC curriculum documents provides educators with guidelines to enable them to implement the methodologies suggested. A subject framework, templates of work schedules and lesson plans as well as guidance on the stages of planning and development of rubrics are provided in the learning programme guidelines (Document 2, pp. 33–35, 38–40, 42–45).

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The wide range of texts recommended for the implementation of the text-based approach cater for the varied interests of candidates in the FET phase. The articulation of progression takes into account the learning capacities of candidates in different grades. Reference is made to White Paper No. 6 on Special Needs Education to accommodate candidates experiencing barriers to learning (Document 1, p. 58) and provides guidance on inclusivity and diversity (Document 2, pp. 31–33).

5.2.2 CIE qualifications

As mentioned before regarding the teaching methodology, the same is applicable regarding subject-specific methodoly. None of the CIE qualifications, IGCSE , AS- and A-Level qualifications mention any subject -specific methodology.

5.2.3 IB qualifications

As is the case regarding teaching methodology in the IB (SL and HL) curriculum documents, no mention is made of any information about subject-specific approaches. Educators can use the assessment criteria as guidelines in their planning. The team once again found that a lot is assumed regarding planning, scheduling, sequencing and the choice of teaching approaches.

6. Assessment guidance

6.1 Internal assessment

6.1.1. NSC

Clear and specific internal assessment guidelines are outlined in Document 2 (pp. 19–21). Tasks 1–14 which comprise writing, reading, listening and speaking, tests and examinations are outlined in tabular form with mark allocation.

6.1.2 CIE qualifications

i) IGCSE

Internal assessment will be conducted by an educator/examiner at the Centre using the Oral Assessment Criteria grid and marks awarded to all candidates will be brought to a common standard by the educator responsible for the internal assessment (i.e. internal moderator). A recorded sample of candidates' performance will be submitted for external moderation by the CIE (Document 3.1, p. 15).

ii) AS-Level and A-Level qualifications

There is no internal assessment specified for AS Level.
Internal assessment is optional for the A Level and is offered on special application only (Documents 4.1, p. 10).

6.1.3 IB qualifications

Assessment in the IB programmes is discussed in Document 5.3. In this particular document the principles, aims and approaches, structures and processes of assessment are described in detail (pp. 1–55).

Assessment of the Diploma Programme (DP) is high-stakes, criterion-related performance assessment. It is based on the following aims:

- DP assessment should support the curricular and philosophical goals of the programme, through the encouragement of good classroom practice and appropriate student learning
- The published results of DP assessment (that is, subject grades) must have a sufficiently high level of reliability, appropriate to a high-stakes university entrance qualification
- DP assessment must reflect the international-mindedness of the programme wherever possible, must avoid cultural bias, and must make appropriate allowance for students working in their second language
- DP assessment must pay appropriate attention to the higher-order cognitive skills (synthesis, reflection, evaluation, critical thinking) as well as the more fundamental cognitive skills (knowledge, understanding and application)
- Assessment for each subject must include a suitable range of tasks and instruments/ components that ensure all objectives for the subject are assessed
- The principal means of assessing student achievement and determining subject grades should be the professional judgment of experienced senior examiners, supported by statistical information (Document 5.3, p. 12). (Also refer to Section 1.1.3 above.)

Clear detailed guidelines for **internal assessment** are provided. In the first instance a detailed assessment outline which reflects all tasks to be completed in the assessment is provided (Document 5.1, pp. 27&28). Apart from the assessment outline, clear and detailed guidelines on the tasks to be assessed for internal as well as external assessment are provided. These include descriptions of questions candidates can expect; requirements of the different papers/tasks; information on educator supervision as well as various examples of possible tasks that might be included in the papers. For standard level, detailed information is also

provided on, and some examples given of guiding questions that may be included in the tasks (Document 5.1, pp. 27–37).

As discussed under 1.1.3, in both the HL and SL IB programmes the assessment weighting is the same – external (Papers 1 and 2) 70%, and internal 30%.
The focus of the internal assessment is n oral. The internal assessment consists of and individual oral and an interactive oral activity which both carry a weighting of 15%. The internal assessment is internally assessed by educators but externally moderated by the IBO.

Assessment is conducted according to extensive assessment criteria for both HL and SL, as well as for internal and external assessment. For each examination paper certain criteria are set. The achievement of each criterion is guided by certain leading questions, while the level of achievement of each criterion is determined by 6 levels of level descriptors ranging from 0 (indicating that the level is not achieved) to 9–10 (indicating that the level has been excellently achieved.

An example of an assessment criterion with its related achievement descriptors is as follows:

Assessment Criterion B (Presentation) for the Oral component:

Leading questions:

- *How effective is the organization of the oral task?*
- *How coherent is the structure?*
- *Are examples and illustrations well integrated into the oral task?*

Achievement
Level

0 Level 1 is not achieved.

1–2 Little organization is apparent.
- The oral task has little structure.
- Supporting examples and illustrations are not integrated into the commentary.

3–4 Some organization is apparent.
- The oral task has some structure.
- Supporting examples and illustrations are sometimes integrated into the oral task.

5–6 The oral task is generally organized.
- The structure of the oral task is mostly coherent.
- Supporting examples and illustrations are generally well integrated into the oral task.

7–9 The oral task is organized.
- The structure of the oral task is mostly coherent.
- Supporting examples and illustration are mostly well integrated into the oral task.

9–10 The oral task is well organized.
- The structure of the oral task is mostly coherent and effective.
- Supporting examples and illustrations are mostly well integrated into the oral task" (Document 5.1, p. 62).

6.2 Tasks for internal assessment

6.2.1 NSC

Clear and specific internal assessment guidelines are outlined in Document 2 (pp. 19–21). Tasks 1–14 which comprise writing, reading, listening and speaking, tests and examinations are outlined in tabular form with mark allocation.

6.2.2 CIE qualifications

i) IGCSE
Candidates will complete:
Reading and writing (Core [Paper 1]) or (Extended [Paper 2]) (both carrying a weighting of 70%) and either Listening (Core [Paper 3]) or (Extended [Paper 4]) (both carrying a weighting of 30%).

In addition candidates will offer:

Component 5 Oral or

Component 6 Oral (Coursework), however, certain categories of Centres are excluded from the requirement. Marks for the oral component do not contribute to the overall grade candidates receive for the written components. Where candidates perform to an appropriate standard, certificates record separately the achievement of grades 1 (high) to 5 (low) for Speaking (Document 4, p. 5).

ii) AS-Level and A-Level qualifications
Candidates doing the A Level may opt to do coursework which is a school-based assessment task consisting of two essays on two texts as an alternative to Paper 6 (20th Century Texts) and Paper 7 (Comment and Appreciation). The types of texts to be used (prose, poetry and drama) and the length (2000-3000 words) of the tasks are specified. Detailed guidelines and requirements for coursework are contained in the CIE's Handbook for Centres (Document 4, p.10).

6.2.3 IB qualifications

In the IB (SL and HL) curricula internal assessment carries a weighting of 30% and consists of two oral activities that are internally assessed by the educator and externally moderated by the International Baccalaureate Organisation (IBO).

The two oral activities are an individual oral based on a text taken from a cultural or a literary option studied (weighting of 15%) and an interactive activity based on either a cultural or a literary option studied, whichever was not the focus of the individual oral (weighting of 15%).

6.3 External assessment

6.3.1 Guidelines for external assessment

6.3.1.1 NSC

Guidelines for external assessment in the NSC are outlined on pages 21–22 of Document 3. The contents, mark allocation and duration of Paper 1, 2, 3 and 4 are clearly specified.

6.3.1.2 CIE qualifications

The team could find no guidelines for external assessment in the IGCSE qualification, whereas external assessment guidelines for the AS Level and A Level specify the examination format with details of the focus of each paper. Candidates doing the AS Level are assessed in English Language and Literature (Documents 4, pp. 2–4), and A-Level candidates are assessed in Literature only (Documents 4, pp. 4–13).

6.3.1.3 IB qualifications

Assessment in the IB programmes is discussed in Document 5.3. In this document the principles, aims and approaches, structures and processes of assessment are described in detail (pp. 1–55). (Also refer to Section 6.1.1.3 above.)

Clear detailed guidelines for external assessment are provided. In the first instance a detailed assessment outline which reflects all tasks to be completed in the assessment is provided (Document 5.1, pp. 27&28). Apart from the assessment outline, clear and detailed guidelines on the tasks to be assessed for internal as well as external assessment are provided. These include descriptions of questions candidates can expect; requirements of the different papers/tasks; information on educator supervision as well as various examples of possible tasks that might be included in the papers. For standard level, detailed information is also provided on, and some examples given of guiding questions that may be included in the tasks (Document 5.1, pp. 27–37).

As discussed under 1.1.4, in both the HL and SL IB programmes the assessment weighting is the same – external (Papers 1 and 2) 70%, and internal 30%.

The focus is mainly on writing. This is evident from Paper 1 of the IB HL in which the candidates must write a comparative commentary on one of two pairs of unseen texts which are linked by a theme. The candidates should be able to comprehend, interpret and analyse a particular text in order to give an opinion and to compile a commentary. This skill is of a high cognitive demand.

SL candidates are provided with optional guiding questions in the writing of the comparative commentary, which is a scaffolded way of assessment (Document 5.1, p. 27&28).
In Paper 2 candidates must write one essay chosen from ten essay questions. Both Papers 1 and 2 carry a weighting of 25%.

Apart from Paper 1 and 2 candidates must also complete two written tasks – one based on the literary option and one on the cultural option. These two written tasks carry a weighting of 20%.

Assessment is conducted according to extensive assessment criteria for both HL and SL, as well as for internal and external assessment. For each examination paper certain criteria are set. The achievement of each criterion is guided by certain leading questions, while the level of achievement of each criterion is determined by six levels of level descriptors ranging from 0 (indicating that the level is not achieved) to 9–10 (indicating that the level has been excellently achieved.

An example of an assessment criterion with its related achievement descriptors is as follows:

Assessment Criterion B (Presentation) for Paper 1 HL:

Leading questions:

- *"How effective is the organization of the commentary?*
- *How coherent is the structure?*
- *How balanced is the commentary?*
  (Balance here means equal treatment of the two texts.)
- *Are examples well integrated into the commentary?*

Achievement
Level

0 Level 1 is not achieved.

1–2 Little organization is apparent.
- The commentary has little structure.
- Supporting examples are not integrated into the commentary.

3–4 Some organization is apparent.
- The commentary has some structure, although there is little sense of balance.
- Supporting examples are sometimes integrated into the commentary.

5–6 The commentary is organized.
- The structure of the commentary is mostly coherent; there is a sense of balance.
- Supporting examples are generally well integrated into the commentary.

7–9 The commentary is well organized.
- The structure of the commentary is mostly coherent, effective and well balanced.
- Supporting examples are mostly well integrated into the commentary.

9–10 The commentary is effectively organized.
- The structure is coherent, effective and well balanced.
- Supporting examples are well integrated into the commentary"
  (Document 5.1, p. 41).

6.3.2. Tasks for external assessment

6.3.2.1 NSC

Tasks for external assessment in the NSC are clearly indicated in Document 3 (pp. 21& 22).
Paper 1: Language in context – 80 marks
Paper 2: Literature – 70 marks
Paper 3: Writing – 100 marks
Paper 4: Oral Tasks – 50 marks
Total: 300 marks

The breakdown of each is outlined in Document 3 (pp. 21&22). The number of words for different pieces of writing is specified for disjunctive and conjunctive orthographies.

6.3.2.2 CIE qualifications

i) IGCSE
The team could find no tasks for external assessment in the IGCSE qualification. Although the candidates are assessed internally, the marks are externally moderated.

ii) AS-Level- and A-Level qualifications
Tasks for the AS-Level and A-Level qualifications are specified as follows (Documents 4, pp. 2, 5):

English Language (AS Level)
Paper 1 (Passages for comment) = 50%;
Paper 2 (Composition) = 50%;
Literature in English (AS Level)
Paper 3 (Poetry and prose) = 50%;
Paper 4 (Drama) = 50%

Tasks for the A-Level qualification are specified as follows (Document 4, p. 5):
Literature in English (A Level)
Paper 3 (Poetry and Prose) = 25%;
Paper 4 (Drama) = 25%;
Paper 5 (Shakespeare and other 20th Century Texts) = 25% and either
Paper 6 (20th century Texts) = 25%
OR Paper 7 (Comment and Appreciation) = 25%
OR Paper 8 (Coursework) 25%

Tasks for the AS-Level qualifications are specified as follows (Document 4, p. 12):
Language and Literature in English (AS Level)
Paper 2 (Composition) = 50%
Paper 9 (Poetry, Prose and Drama = (5)%

6.3.2.3 IB qualifications

In the IB (SL and HL) curricula external assessment carries a weighting of 70%. The external assessment consists of 2 written papers that are externally set and externally assessed, as well as two written tasks.

Paper 1 is a comparative commentary in which candidates must write one comparative commentary on one of two pairs of unseen texts which are linked by a theme. This paper carries a weighting of 25%.

Paper 2 is an essay which consists of 10 essay questions of which the candidate must answer one question. This paper carries a weighting of 25%.

Apart from the two papers candidates must also complete two written tasks. One is based on a literary option while the other is based on a cultural option. The combined limit for both tasks is 1500 words. The combined weighting of these written tasks is 20%.

7. Namibian Senior Secondary Certificate (NSSC)

After a cursory look at the 2007 and 2008 Namibian Senior Secondary Certificate examinations, the team found the following:

Higher level
Paper 1 consists of reading and directed writing, which includes comprehension questions that carry a weighting of 40% and writing questions that carry a weighting of 60%. This paper contains no questions on language structures.

It was found that the comprehension questions were mainly easy questions testing basic

conceptual knowledge and comprehension. On the other hand, the writing questions were all at the level of evaluation and synthesis and these questions were mostly difficult.

Paper 2 consists of continuous writing, which includes essay questions on the level of evaluation and synthesis and all the questions are difficult. In this paper writing carries a weighting of 100%.

Paper 3 consists of writing, speaking and listening on literary topics. Like in the IGCSE curriculum candidates listen to recorded texts on which to answer various questions. In the literature section of the paper all questions are essay-type questions. Some of the questions are context-based questions based on an extract from a drama or a novel, in answer to direct questions about the text, or based on a short quotation from the literary text.

All poetry answers are in the form of essay-type questions – no contextual questions are set.

Paper	Marks	Weighting
1 Reading and Directed Writing	50	50%
2 Continuous Writing	20	20%
3 Writing, Speaking and Listening on Literary	30	30%
Total	100	100%

Ordinary level

Paper 1 for the core and extended levels is the reading and directed writing paper. In Paper 1comprehension carries a weighting of 25%, writing carries a weighting of 62% and the few language questions carry a weighting of only 13% of the total marks of the paper.

The level of difficulty of the questions is varied and the questions are set on all levels of cognitive demand.

In the 2007 paper the language questions are set on the correct form of words, direct and indirect speech, active and passive voice and joining of sentences (thus with a focus on the communicative aspect of language). In the 2008 paper the language questions are set on direct and indirect speech, negatives, active and passive voice, correct form of words, fill in missing words and expressions (also a focus on the communicative aspect of language.

In the writing section of the paper questions were set on the completion of forms, short notes, articles, letters and a summary. A summary was not included in the 2008 paper.

In the extended level (Paper 2) comprehension carries a weighting of 32%, writing carries a weighting of 57% and language carries a weighting of only 11%.

In the 2007 paper language questions are set on the correct form of words, direct and indirect speech, active and passive voice, joining of sentences and the meaning of words. In the 2008 paper questions are set on direct and indirect speech, negatives, active and passive voice, correct form of words, fill in missing words and expressions. As in the core level paper, the main focus here is on the communicative aspects of language.

In the writing section of the paper candidates were asked to make a summary, write 2 articles and a letter (report in the 2008 paper).

Paper 3 (core and extended levels) consists of listening comprehension and in Paper 4 oral communication is assessed.

The weighting of the papers for the core and extended levels is as follows:

Core Level		
Paper	**Marks**	**Weighting**
1 Reading and Directed Writing	60	60%
3 Listening Comprehension	30	20%
4 Oral assessment	10	30%
Total	100	100%

Extended Level		
Paper	**Marks**	**Weighting**
2* Reading and Directed Writing	90÷3x2=60	60%
3 Listening Comprehension	30	20%
4 Oral assessment	10	30%
Total	100	100%

* The actual paper will carry 90 (maximum) marks, but to achieve the correct weighting, it will be reduced to 60 (Maximum) marks (Document 6.1, p. 14 and Document 6.2, p. 15).

Other findings

- The NSSC focuses mainly on writing.
- Although the study of certain language structures is prescribed, assessment of these structures carries very little weight.
- The literature assessment (HL Paper 3) differs vastly from that in the NSC and the team found that it is more demanding. In the NSC candidates can choose to answer two questions from four genres. Due to the wide choice, candidates will answer questions on only two genres and may also choose to answer only contextual questions and no essay-type questions. Due to the wide choice, candidates may also choose not to answer any questions on poetry.

The NSSC literature paper (HL Paper 3) consists of six essay-type questions in three sections. Candidates must answer either a context- based question or an essay question on both novel and drama and one of two essay-type questions on poetry.

- It was the team's opinion that the language level used in the NSSC questions papers was somewhat lower than that in the NSC papers and that the level of cognitive demand in the NSSC papers was also somewhat lower as most questions are on the level of basic conceptual knowledge or comprehension.
- On the other hand, the level of cognitive demand of the questions in the continuous writing and literature section of the papers was consistently higher than that in the NSC papers.

8. Conclusion

Through an analysis of the NSC and the different international qualifications an attempt was made at determining the comparability of the different qualifications. As was mentioned earlier, in most of the international qualifications studied (CIE and IB), specific content was not indicated. Although the four primary language skills (listening, reading, writing and speaking) are prescribed in all the qualifications studied, the team could not find comprehensive lists of

content and skills in the international qualifications (CIE and IB). Although the Namibian SSC was not analysed in detail, the team found that, as in the NSC curriculum, a list of learning content and skills is prescribed (Document 6.1, pp. 4–13 and Document 6.2, pp. 4–14).

The international qualifications provide a broad overview of what is to be achieved at the end of the period of study, as well as an indication of the types of texts to be used in achieving these outcomes. It seems as though the detailed content and skills to be taught are left up to the educators' discretion. This differs from the NSC curriculum where the content and skills to be achieved are prescribed, but that the specific texts and materials used to achieve these outcomes are left to the educators' discretion.

8.1 NSC

The team found that the NSC curriculum strives towards a balanced language approach in which an extensive list of specific content and skills are prescribed. There is also an attempt at integration of the four primary language skills as well as the teaching of grammar structures and literary devices. From the assessment guidelines (Document 3, p. 22) it seems as though there is an emphasis on writing (33%), but other than in the international qualifications, the testing of language in context (which includes the testing of language structures) carries a weighting of 26%.

There is also a strong emphasis on the study of literature texts (23% weighting) from varied literary periods and the assessment approach, which requires comment and critical appreciation, demands mature thinking and advanced reading and writing skills that may be specified in the intended curriculum but is lacking in the examined curriculum. Evaluation reports from the marking process of NSC examinations indicate that NSC EFAL candidates have limited capabilities of essay writing whereby there is a tendency to narrate instead of a critical analysis of texts in response to the question.

8.2 CIE

8.2.1 IGCSE

In the IGCSE qualification the four primary language skills (reading, writing, listening and speaking) are prescribed, but from the analysis the team found that the emphasis seems to be on speaking. Although the weighting of the reading and writing paper (core and extended) is 70% and the weighting of the listening paper (core and extended) is only 30%, candidates must also offer Components 5 and 6, which are both oral components, and this clearly emphasises speaking.

8.2.2 AS-Level and A-Level qualifications

In the AS- and A-Level qualifications general focus is on effective and appropriate communication, but the main focus is on writing. Candidates must be able to give informed responses to a variety of texts, but mainly to literary texts.

Apart from some mention to language usage in the section, English Language (AS Level), no language content or skills are prescribed in the AS- and A-Level qualifications.

8.3 IB qualifications

In the IB qualification the four primary language skills, listening, speaking, reading and writing form part of the curriculum and central to the language section in both IB HL and IB SL, is the acquisition of a wide range of vocabulary and idiom. A number of general language skills are prescribed, but no specific language content is prescribed in the IB curriculum.

Taking assessment into account, the team found that the main focus of the IB curriculum is on writing (weighting of 70%) and oral (weighting of 30%) activities in which language skills are incorporated. Like in the AS-Level and A-Level curricula, candidates must comment on texts or write essays based on a variety of literary or cultural texts. Assessment in the oral component is also based on literary or cultural texts.

8.4 Namibian qualification: NSSC (OL and HL)

In the NSSC the main focus is also on reading and oral (see point 7 above). Like in the NSC, specific language content is prescribed, but from the examination papers analysed, the team found that the assessment of language structures carries very little weighting (11% [OL Extended 2007, 2008] and 13% [OL Core, 2007, 2008]). From this it can be deduced that, as in the other international qualifications, the emphasis in the NSSC is on practical communicative language skills rather than on knowledge of specific content.

8.5 Mapping of the NSC to international qualifications

Although it seems that the ultimate goal in all the curricula described in this report is for the candidates studying English as a second language to be able to communicate clearly, fluently and effectively in the target language in a wide range of situations, the curricula differ extensively with regard to prescribed content, skills and weighting.

- The NSC and the NSSC are the only curricula in which language structures to be taught are listed extensively.
- The NSC curriculum is the only in which literary devices to be taught are prescribed.
- The NSC aims at an integration of the four primary language skills, grammatical structures and literary devices.
- The IGCSE focuses on the four primary language skills, but there seems to be a greater focus on listening and oral assessment.
- In the AS Level and A Level the focus is clearly on writing. Of all the qualifications studied the AS Level and especially the A Level seems to be the most demanding as the candidates are expected to write critical analyses of various texts (mainly literary texts from various genres and time frames).
- In the IB (SL and HL) qualifications the focus is also on writing. This curriculum, especially higher level, is also very demanding as candidates must write essays and comparative commentaries on unseen texts from various fields.

From the above analysis of the NSC, CIE (IGCSE and AS Level and A Level) and IB (SL and HL) qualifications, as well as an ex post facto-check of the NSSC examination papers, the team is of the opinion that the qualifications are not comparable as the curricula are widely divergent and focus on different aspects of the four primary language skills.

However, if the team should venture an opinion as to which curricula would provide adequate qualifications for students to enter South African higher education, it would be the NSC, CIE A-Level and IB qualifications, but not the AS Level and IGCSE qualifications. In this regard the team cannot comment on the adequacy of the NSSC, as the curriculum was not analysed in its entirety.

Notes

Notes

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