DP Country Alignment Studies: Alignment of the Mexican Bachillerato General (MBG)

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Ecctis

Acronyms

AA	mathematics: analysis and approaches
AHL	additional higher level
AI	mathematics: applications and interpretation
CAS	Creativity, activity, service
CP	Career-related Programme
DP	Diploma Programme
HL	higher level
IB	International Baccalaureate
IBO	International Baccalaureate Organisation
LA:LL	Language A: language and literature
MBG	Mexican Bachillerato General
MCCEMS	Marco Curricular Común de la Educación Media Superior (Common Curriculum Framework for Upper Secondary Education)
MT	Mathematical Thinking
MYP	Middle Years Programme
NEM	New Mexican School
PYP	Primary Years Programme
RfP	Request for Proposal
RQ	Research Question
SEP	Secretariat of Public Education
SL	standard level
STEM	Science, technology, engineering and mathematics
TOK	theory of knowledge
UAC	Curriculum Learning Units (*Unidades de Aprendizaje Curricular)*
WIAIBE	What is an IB education?

Contents

1. Executive Summary

Project Aims and Context

The International Baccalaureate (IB) Organization is a not-for-profit educational foundation offering four programmes across the world. One of them – the Diploma Programme (DP) – is a two-year upper secondary programme, primarily intended to prepare students for university matriculation and higher education.

Following previous studies focused on the education systems of Australia (Victoria), Canada (Ontario), the US, Singapore, South Korea, Finland, France and Spain,[1] Ecctis has been commissioned by the IB to deliver two critical and in-depth alignment studies to assess the level of alignment between the DP and comparison points within the upper secondary education systems of Brazil and Mexico.[2] More specifically, the studies aim to identify areas of similarity and difference between the DP and these educational systems by comparing philosophical underpinnings, structure, requirements, assessment methods, learning pathways, content, and specifically to determine how the DP compares to the selected benchmarks in terms of intended student learning outcomes at subject level. The studies include, for both countries, a focus on DP mathematics, DP sciences, and DP language A: language and literature, as well as an additional focus on DP history, DP philosophy, and DP Brazilian social studies for Brazil.

This report aims to specifically evaluate alignment between the DP and the upper-secondary programme of education in Mexico. The comparison qualification in question is the Mexican Bachillerato General (MBG).

Research Questions and Methods

All comparative studies in this series have been framed by responses to Research Questions (RQs), both at programme and subject levels. For this study, these RQs were the following:

RQ1: To what degree does the DP curriculum align with the Mexican upper secondary curriculum? In what way are the curricula similar and in what way are they different in demand and difficulty? To what degree are the curricula compatible?

RQ2: To what degree do the curricula align with regards to their:

2.1: Philosophical underpinnings

- Objectives
- Principles
- Values.

2.2: Structure

- Learning areas

[1] The full reports can be accessed at: www.ibo.org/research/curriculum-research/dp-studies/dp-country-alignment-studies-2023/

[2] The series of studies responds to the following Request for Proposals (RFP), issued by the IB: *The International Baccalaureate Diploma Programme: Alignment with Upper Secondary Education in Brazil and Mexico.*

- Subject offerings
- Degree of specialization
- Time allocation.

2.3: Requirements
- Programme entry requirements
- Time requirements (i.e. programme duration, teaching hours, study hours)
- Certificate requirements (i.e. credits, passing and failing conditions, compensation options).

2.4: Assessment
- Nature of assessment (i.e. number, type, duration, question types, availability of marks)
- Assessment model (i.e. relative weighting of assessments to overall grades).

2.5: Student learning pathways
- Degree of specialization
- Options in subject (area) choice (i.e. compulsory subjects, electives).

RQ3: To what degree do the subjects align with regards to:

3.1: Content
- Topics (i.e. scope of content area, breadth, depth)
- Learning activities (i.e. difficulty, demand).

3.2: Expected learning outcomes
- Knowledge
- Competences (i.e. subject-specific, 21st century competences).

To answer the above RQs, Ecctis developed and applied a bespoke methodology.

At programme-level, this involved the comparative analysis of key components of the DP and the MBG, including: philosophical underpinnings, structure, requirements and associated outcomes, student learning pathways, and assessment methods (where possible). At subject-level, it involved the comparative analysis of key components of the DP and the MBG subjects, including: learning outcomes, content, and demand.

Where appropriate, Ecctis complemented its standard comparative methodology with a comprehensive mapping method, extracting themes from the DP to evaluate their presence in the comparison point(s). Additionally, to assess demand at subject level, Ecctis designed and deployed an expert panel approach, scoring each individual subject against a common set of demand criteria.[3]

Key Findings

Programme-level

The philosophical underpinnings constitute the most significant point of similarity between the two programmes, while the programme structure and assessment types constitute the most significant points of difference. There are notable points of similarity and difference between

[3] Each individual subject was scored for: cognitive skills evidenced in the learning outcomes (based on the Revised Bloom's Taxonomy), depth of knowledge (adapted from Webb's Depth of Knowledge levels), volume of work (a tri-factor score considering breadth, depth and allocated timeframe), and outstanding areas of subject demand (stretch areas).

the two programmes with regards to how students will likely experience them in practice. Key similarities and differences include:

- **Philosophical underpinnings:** all the key themes within the IB's learner profile, approaches to teaching, approaches to learning, and philosophy of international-mindedness are present in the Base Document of the MBG, although there are some differences in the degree of emphasis on specific themes. For example, the MBG places comparatively less emphasis on the DP theme of conceptual thought and understanding, and specific emphasis on promoting non-violence and a culture of peace – an aspect not as explicitly emphasised in the DP. That said, students or teachers moving between the two programmes would find a high level of consistency between their philosophical underpinnings.

- **Programme structure**: there are some similarities between the two programmes' structures; for example, both take a baccalaureate-style approach to encourage breadth of study. Both also require students to study units/subjects from broadly similar subject areas. Additionally, both programmes allow students to specialise in particular subjects – the DP through SL and HL routes of study, and the MBG by providing a list of optional units which students can choose from. However, there are significant differences between the two programmes' structures, including their duration (the DP being two years, and the MBG being three), and the organisation of subject content. The DP organises content into single-subject disciplines (mathematics, biology, physics, etc.) whereas the MBG incorporates subject content into over-arching themes; each of which cover aspects of physics, chemistry and biology all in one unit. Moreover, whilst the DP contains the TOK, CAS and extended essay components, the MBG includes the Expanded Curriculum and the Work Experience component. These aspects of the MBG programme are unlike the TOK, CAS and extended essay of the DP as they focus on students' understanding of their personal physical health and emotional wellbeing, and skills required in professional careers.

- **Entry requirements**: the DP and MBG differ in their entry requirements. Indeed, the IB encourages students and teachers to consult subject guides around expected prior learning but does not provide fixed entry requirements. In contrast, entry to the MBG in Mexico depends on the successful completion of lower secondary education and, in the case of some schools, a standardised admissions test.

- **Student learning pathways**: both the MBG and DP prioritise breadth in their programmes and cover similar subject areas. Nevertheless, while DP students choose all the subjects they study, the majority of the MBG units are mandated, with the latter's compulsory units forming a large part of the programme. Additionally, DP students focus on single subject specialisation, whereas MBG student pathways consist of a combination of broad areas of study and single discipline study, with single discipline study largely commencing in the last year of the MBG. As such, DP students have more time to specialise in single subjects than MBG students.

- **Assessment methods**: external assessment makes up most of the assessment in each DP subject, whereas the MBG does not make use of external assessment and is

comprised entirely of flexible, internal assessment. Despite this crucial difference, from the limited information available on MBG assessments, there may be scope in the MBG for students to experience similar assessment activities to those in the DP (e.g. essays, projects, questionnaires).

Subject-level

In this study, Ecctis carried out subject-level comparative analysis between the DP and MBG in mathematics, physics, chemistry, biology and language and literature. The analysis focused on the following DP and MBG subjects:

Table: Subject areas for comparison of the DP and the MBG curricula

<table>
<tr><th>DP subjects (area)</th><th colspan="2">MBG subjects</th></tr>
<tr><td colspan="3">MATHEMATICS</td></tr>
<tr><td>mathematics: analysis and approaches (AA) SL and HL</td><td colspan="2" rowspan="2"><u>Mathematical Thinking</u>

Compulsory units
• Mathematical Thinking I, II, and III
• Selected Topics in Mathematics I and II

Optional units
• Probability and Statistics I and II
• Differential Calculus and Integral Calculus
• Financial Mathematics I and II
• Drawing I and II</td></tr>
<tr><td>mathematics: applications and interpretation (AI) SL and HL</td></tr>
<tr><td colspan="3">SCIENCES</td></tr>
<tr><td>physics SL and HL</td><td rowspan="3"><u>Natural Sciences, Experimental Sciences and Technology</u>

Compulsory units
• Natural Sciences, Experimental Sciences and Technology units (six)
• Science Workshop I

Optional units
• (see column to the right)</td><td>Selected Topics in Physics I & II</td></tr>
<tr><td>chemistry SL and HL</td><td>Selected Topics in Chemistry I & II</td></tr>
<tr><td>biology SL and HL</td><td>Selected Topics in Biology I & II</td></tr>
<tr><td colspan="3">STUDIES IN LANGUAGE AND LITERATURE</td></tr>
<tr><td>language A: language and literature SL and HL</td><td colspan="2"><u>Language and Communication</u>

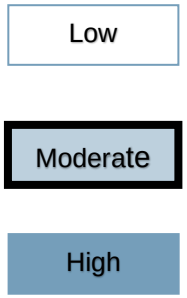
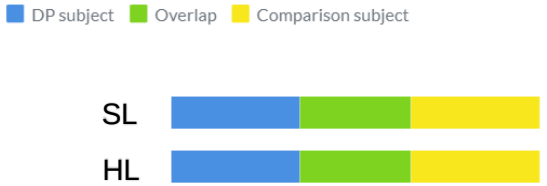
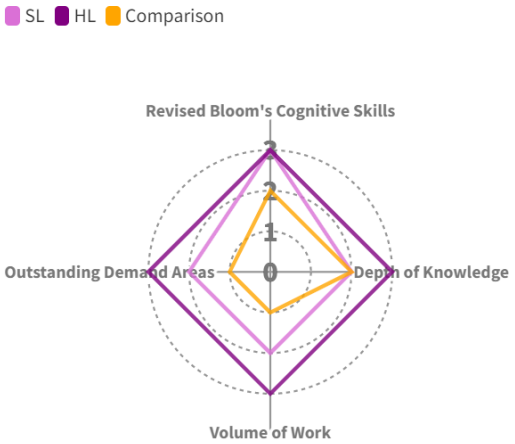
Compulsory units
• Language and Communication I, II, and III

Optional units
• Communication Sciences I and II</td></tr>
</table>

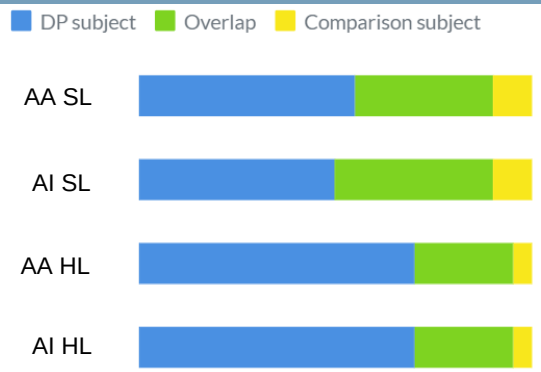
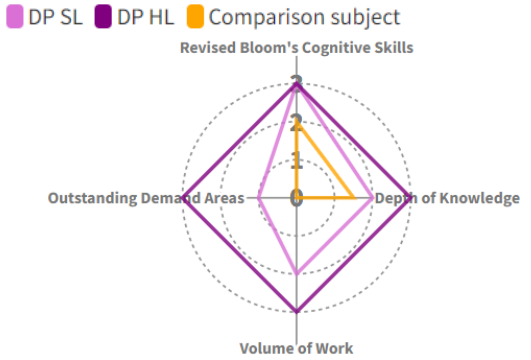
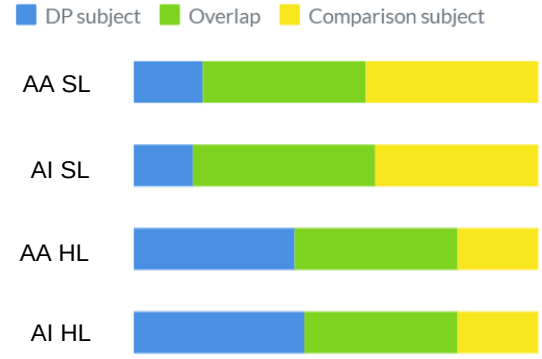
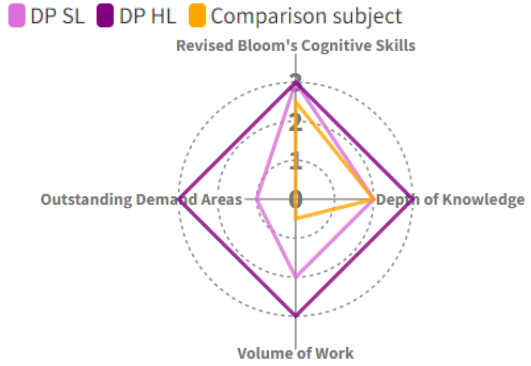
Visual and written summaries of the subject-level analysis between the DP and respective comparison points in the MBG are provided in this section. The summaries include key findings on learning outcomes alignment, content alignment and demand alignment.

Figures: Visual representation of alignment between DP subjects and comparison subjects

Key:

Subject name	Learning outcomes alignment	Content alignment	Demand alignment
Displays the name of the comparison subject	 This represents the learning outcome alignment between the DP subject and the comparison subject. A black border is placed around the selected judgement – 'Moderate' in this example.	 These bars represent the content alignment between the DP subject and the comparison. There is one bar showing alignment with SL content and another for HL content (inclusive of SL content). The **green** section of the bar represents the overlap of content between the subjects. The **blue** section represents content which was in the DP subject only. The **yellow** section represents content which was in the comparison subject only. Therefore, if, say, the blue section was longer than the yellow, this can be interpreted as DP subject having more content unique to itself than the comparison did. A large green bar would indicate that a substantial proportion of content overlaps between the DP and the comparison subject.	 This radar diagram displays the demand judgement scores for the comparison subject(s) and the DP subject – both SL and HL.

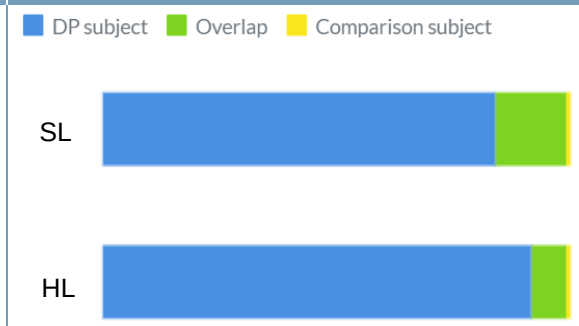
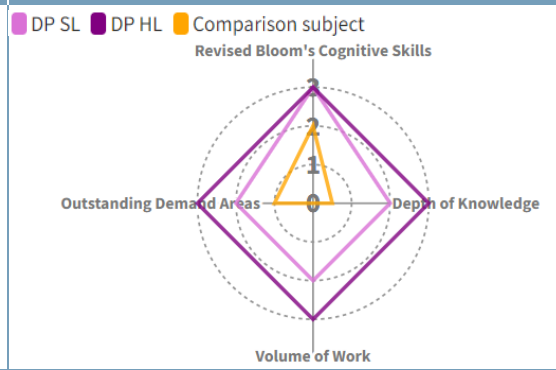
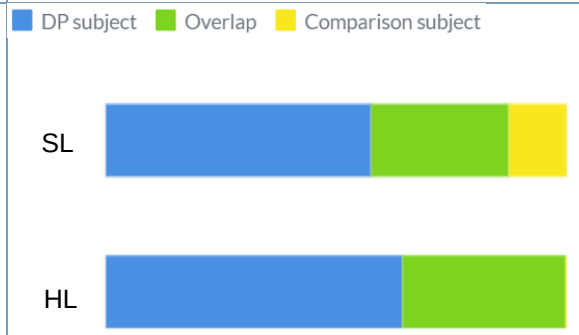
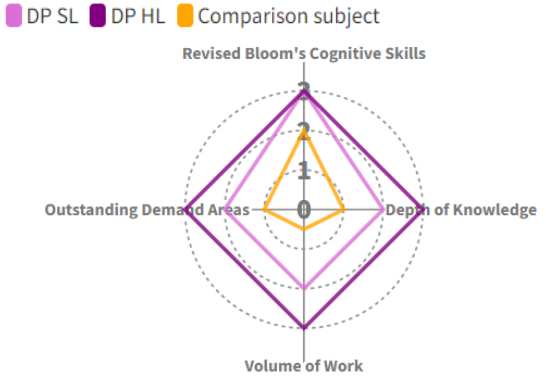
The subject level alignment between the DP **mathematics** subjects (AA and AI, SL and HL) and MBG Mathematical Thinking units is represented below:

Comparison subject	Learning outcomes alignment	Content alignment	Demand alignment
Compulsory Mathematical Thinking Units	Low Moderate **High**		
Compulsory and Optional Mathematical Thinking Units	Low Moderate **High**		

MBG Compulsory units: Mathematical Thinking I, II, and III and Selected Topics in Mathematics I and II.

MBG Optional units: Probability and Statistics I and II, Financial Mathematics I and II, Drawing I and II, Differential Calculus, and Integral Calculus.

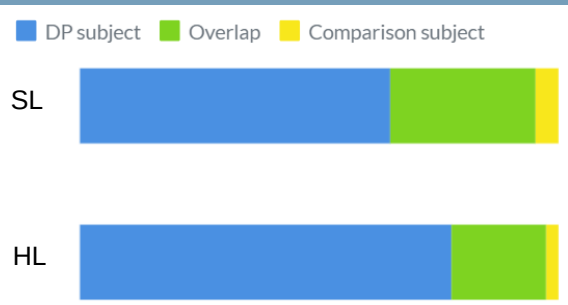
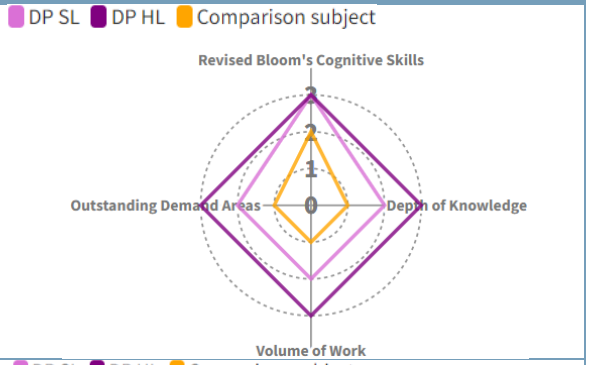
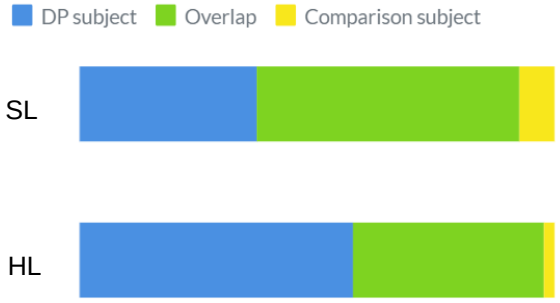
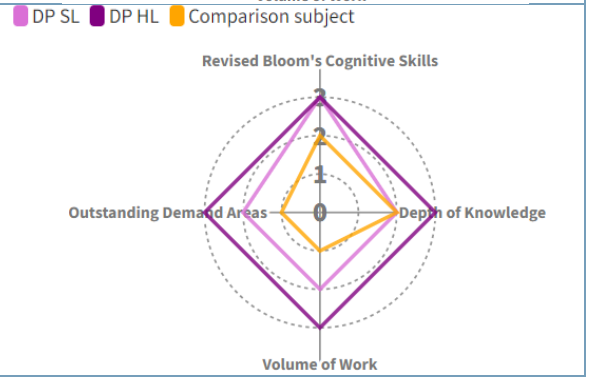
The subject level alignment between DP **physics** (SL and HL) and the MBG Natural Sciences, Experimental Sciences and Technology units (physics-focus) is represented below:

Comparison subject	Learning outcomes alignment	Content alignment	Demand alignment
Compulsory Natural Sciences, Experimental Sciences and Technology Units (Physics)	Low Moderate **High**		
Compulsory and Optional Natural Sciences, Experimental Sciences and Technology Units (Physics)	Low Moderate **High**		

MBG Compulsory units: Matter and its interactions, Conservation of energy and its interactions with matter, Ecosystems: interactions, energy and dynamics, Chemical reactions: conservation of matter in the formation of new substances, Energy in the processes of daily life, Organisms: structures and processes, Science workshop I.

MBG Optional units: Selected Topics in Physics I & II.

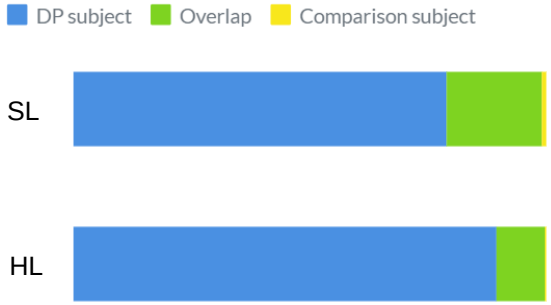
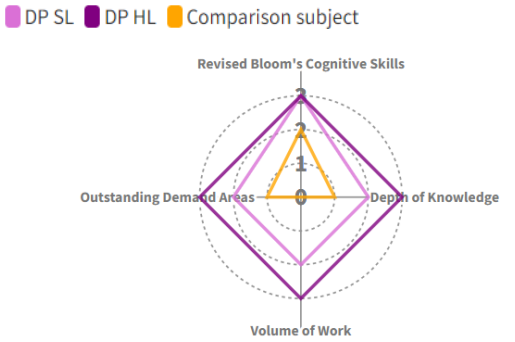
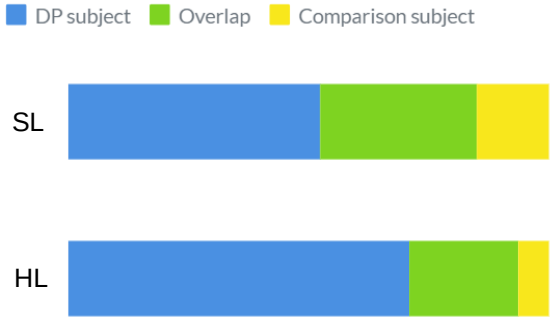
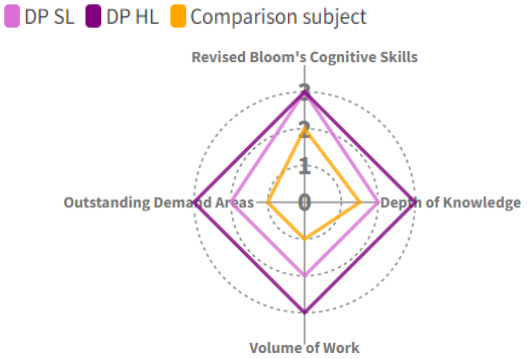
The subject level alignment between DP **chemistry** (SL and HL) and the MBG Natural Sciences, Experimental Sciences and Technology units (chemistry-focus) is represented below:

Comparison subject	Learning outcomes alignment	Content alignment	Demand alignment
Compulsory Natural Sciences, Experimental Sciences and Technology Units (Chemistry)	Low Moderate **High**		
Compulsory and Optional Natural Sciences, Experimental Sciences and Technology Units (Chemistry)	Low Moderate **High**		

MBG Compulsory units: Matter and its interactions, Conservation of energy and its interactions with matter, Ecosystems: interactions, energy and dynamics, Chemical reactions: conservation of matter in the formation of new substances, Energy in the processes of daily life, Organisms: structures and processes, Science workshop I.

MBG Optional units: Selected Topics in Chemistry I & II

The subject level alignment between DP **biology** (SL and HL) and the MBG Natural Sciences, Experimental Sciences and Technology units (biology-focus) is represented below:

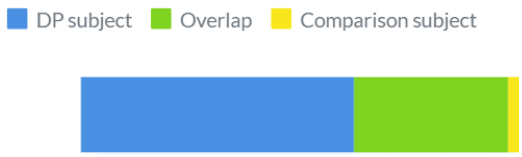
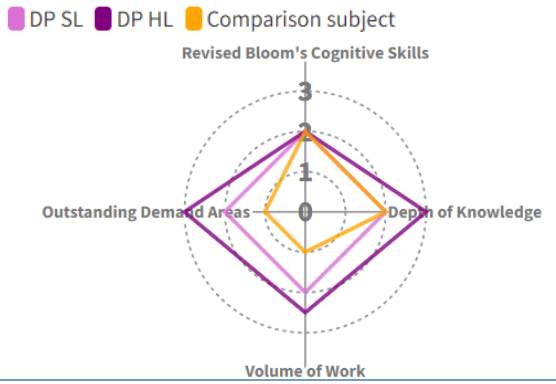
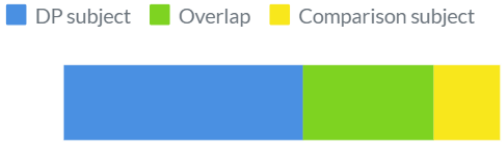
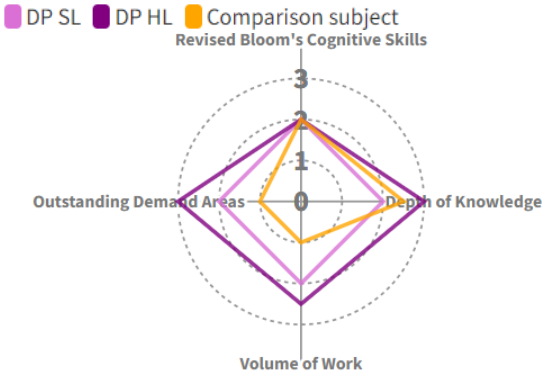
Comparison subject	Learning outcomes alignment	Content alignment*	Demand alignment
Compulsory Natural Sciences, Experimental Sciences and Technology Units (Biology)	Low Moderate **High**		
Compulsory and Optional Natural Sciences, Experimental Sciences and Technology Units (Biology)	Low Moderate **High**		

*The yellow bar for MBG Natural, Experimental Sciences and Technology units represents biology-only content, it does not represent health science topics

MBG Compulsory units: Matter and its interactions, Conservation of energy and its interactions with matter, Ecosystems: interactions, energy and dynamics, Chemical reactions: conservation of matter in the formation of new substances, Energy in the processes of daily life, Organisms: structures and processes, Science workshop I.

MBG Optional units: Selected Topics in Biology I & II.

The subject level alignment between DP **language A: language and literature** (SL and HL) and the MBG Language and Communication units is represented below:

Comparison subject	Learning outcomes alignment	Content alignment	Demand alignment
Compulsory Language and Communication Units	Low **Moderate** High	 The bar represents the overlap of the areas of exploration and conceptual questions that may be considered, rather than the number of texts studied - as this is not specified in the MBG documentation. The areas of exploration and conceptual questions are the same for DP SL and HL, hence only one bar is presented here.	
Compulsory and Optional Language and Communication Units	Low **Moderate** High	 The bar represents the overlap of the areas of exploration and conceptual questions that may be considered, rather than the number of texts studied, as this is not specified in the MBG documentation. The areas of exploration and conceptual questions are the same for DP SL and HL, hence only one bar is presented here.	

MBG Compulsory units: Language and Communication I, II, and III.

MBG Optional units: Communication Sciences I and II

Key highlights of the subject-level analysis are summarised below.

Mathematics

- **Learning outcomes alignment:** the level of alignment between the learning outcomes of both DP mathematics subjects, both at SL and HL, and those of the MBG subjects is high, with all DP themes being present in the MBG curricula.

- **Content alignment:** the level of content alignment between DP mathematics subjects and MBG subjects is generally low to moderate. The MBG compulsory units combined have less breadth and depth than both DP SL and HL and do not cover a significant amount of AA and AI content. The MBG's compulsory and optional units show a moderate level of content alignment to the DP mathematics subjects. Overall, the MBG's Mathematical Thinking units combined have somewhat greater breadth than DP SL and more depth in certain topics, though overall less breadth and depth than DP HL mathematics. No combination of units in the MBG presents a high level of content alignment with DP HL mathematics.

- **Demand alignment:** there is a low-moderate level of alignment between the demand scores of the MBG's Mathematical Thinking units and both DP SL mathematics subjects. The MBG compulsory Mathematical Thinking units score less than DP SL in all demand categories, and the combination of compulsory and optional units score similarly in some, though not all, categories. Both DP HL mathematics courses score higher in all demand categories than any MBG Mathematical Thinking units.

Physics, chemistry, and biology

All DP science subjects – physics, chemistry and biology – have been individually analysed and compared against the designated comparison subject. However, as they share a number of similarities – including similar learning outcomes, assessment objectives and assessment requirements – the findings for all courses were similar and are, thus, collectively presented below.

- **Learning outcomes alignment**: the level of alignment between the learning outcomes of the DP and MBG science subjects is significant, with all themes extracted from the DP learning outcomes being present, to some extent, in the MBG's Natural Sciences, Experimental Sciences and Technology units.

- **Content alignment**: there is limited content alignment between MBG science units and DP biology, chemistry and physics subjects. MBG science units show greater overall content alignment with the DP SL subjects than HL subjects. MBG compulsory units combine all sciences, rather than focus on single disciplines, which has consequences for their content alignment with the DP's single science subjects. However, the MBG compulsory and optional units combined do present stronger alignment than the compulsory units on their own, particularly with DP SL subjects. Though regardless of this, there remains a reasonable amount of DP SL and AHL content which is not covered by any of the MBG units.

- **Demand alignment**: there is an overall low level of alignment between the demand scores of the MBG Natural Sciences, Experimental Sciences and Technology units and the DP science subjects. The DP sciences subjects (both SL and HL) receive higher scores than MBG units in most categories. However, there is one exception to this; DP SL chemistry and the MBG compulsory and optional units combined receive the same depth of knowledge score. Overall, the MBG compulsory and optional units receive scores that are closer to DP SL demand scores than DP HL.

Language A: language and literature

- **Learning outcomes alignment**: the level of alignment between DP LA:LL and MBG Language and Communication units is moderate. While most of the DP learning outcome themes are strongly present, there are two significant themes that show little to no presence in the MBG learning outcomes, resulting in a moderate level of alignment overall.

- **Content alignment**: there is low to moderate content alignment between DP LA:LL and MBG Language and Communication units. The MBG units include content that aligns with some of the guiding conceptual questions in the DP LA:LL's areas of exploration. However, the alignment that Language and Communication units have with the 'intertextuality: connecting texts' and (to an extent) 'time and space' in DP LA:LL is very limited. The alignment with DP LA:LL is low to moderate regardless of whether the MBG optional units are studied in addition to the compulsory units.

- **Demand alignment**: the demand scores of DP LA:LL courses and MBG Language and Communication units do not align strongly overall. The level of alignment is moderate, as DP LA:LL courses score similarly to MBG units in some categories, but higher in others. While the MBG's Languages and Communication units show similarities in demand scores with DP SL and HL in the areas of Bloom's cognitive skills and depth of knowledge, DP SL and HL score higher for volume of work and outstanding demand areas than the MBG units.

Summary

The programme-level features of the DP and MBG are somewhat aligned. Whilst there are significant differences regarding entry requirements, duration, structure, and assessment, the philosophical underpinnings and the skills targeted in both programmes are similar. At subject level, alignment between the DP and MBG is generally low to moderate, with some variation across subjects. Significant learning outcome alignment is present for the mathematics and science subjects reviewed, although the language and literature subjects show only moderate alignment. Across all subjects, content alignment is low to moderate. Demand for languages and sciences subjects show low levels of alignment, whereas mathematics shows slightly greater alignment with a low-moderate overall judgement.

2. Introduction

2.1 Context and Scope

The International Baccalaureate (IB) Organization is a not-for-profit educational foundation offering four programmes across the world, including the Primary Years Programme (PYP), Middle Years Programme (MYP), Diploma Programme (DP) and the Career-related Programme (CP). The DP – the IB's two-year upper secondary Diploma Programme – is conceived as a preparatory programme for university matriculation and higher education, aimed at developing students with 'excellent breadth and depth of knowledge' who 'flourish physically, intellectually, emotionally and ethically'.[4]

Following previous studies focused on the education systems of Australia, Canada, the US, Singapore, South Korea, Finland, France and Spain,[5] Ecctis has been commissioned by the IB to deliver a series of critical and in-depth alignment studies to assess the level of alignment between the DP and comparison points within the upper secondary education systems of Brazil and Mexico.[6] More specifically, the studies aim to identify areas of similarity and difference between the DP and these educational systems by comparing philosophical underpinnings, structure, requirements, assessment methods, learning pathways, content, and specifically to determine how the DP compares to the selected benchmarks in terms of intended student learning outcomes at subject level. These studies include, for both countries, a focus on DP mathematics, DP sciences, and DP language A: language and literature, as well as an additional focus on DP history, DP philosophy, and DP Brazilian social studies for Brazil.

Ultimately, this series of comparative studies aims to inform the IB's development of tools and resources for IB teachers, helping them navigate between the IB and the local curriculum in the target countries where needed. In doing so, it also contributes to further supporting fair recognition of the DP by institutions, employers, and other key stakeholders, supporting progression and mobility for DP graduates.

This report constitutes one of the project's deliverables and aims to specifically answer the research questions pertaining to how the DP aligns with the Mexican upper-secondary programme of education, the Mexican Bachillerato General (MBG).

2.2 Research Questions

All comparative studies in this series have been framed by responses to Research Questions (RQs), both at programme level and subject level. For this study specifically, the RQs are as follows:

[4] International Baccalaureate. (2022). *Diploma Programme*. Available from : https://www.ibo.org/programmes/diploma-programme/

[5] The full reports can be accessed at: www.ibo.org/research/curriculum-research/dp-studies/dp-country-alignment-studies-2023/

[6] The series of studies responds to the following Request for Proposals (RFP), issued by the IB: *The International Baccalaureate Diploma Programme: Alignment With Upper Secondary Education In Brazil and Mexico*.

Table 1: Mexico research questions

RQ1: To what degree does the DP curriculum align with the Mexican upper secondary curriculum? In what way are the curricula similar and in what way are they different in demand and difficulty? To what degree are the curricula compatible?

RQ2: To what degree do the curricula align with regards to their:

2.1: Philosophical underpinnings
- Objectives
- Principles
- Values.

2.2: Structure
- Learning areas
- Subject offerings
- Degree of specialization
- Time allocation.

2.3: Requirements
- Programme entry requirements
- Time requirements (i.e. programme duration, teaching hours, study hours)
- Certificate requirements (i.e. credits, passing and failing conditions, compensation options).

2.4: Assessment
- Nature of assessment (i.e. number, type, duration, question types, availability of marks)
- Assessment model (i.e. relative weighting of assessments to overall grades).

2.5: Student learning pathways
- Degree of specialization
- Options in subject (area) choice (i.e. compulsory subjects, electives).

RQ3: To what degree do the subjects[7] align with regards to:

3.1: Content
- Topics (i.e. scope of content area, breadth, depth)
- Learning activities (i.e. difficulty, demand).

3.2: Expected learning outcomes
- Knowledge
- Competences (i.e. subject-specific, 21st century competences).

With regards to subjects to be compared in the subject-level comparative analysis, the following table indicates the agreed scope:

[7] With regards to subjects within scope, see Table 2.

Table 2: Subjects/courses for comparison of the DP and the MBG (per DP subject group)

<table>
<tr><th>DP subjects</th><th colspan="2">MBG subjects</th></tr>
<tr><td colspan="3">MATHEMATICS</td></tr>
<tr><td>mathematics: analysis and approaches (AA) SL & HL</td><td colspan="2"><u>Mathematical Thinking</u>

Compulsory units
• Mathematical Thinking I, II, and III
• Selected Topics in Mathematics I and II

Optional units
• Probability and Statistics I and II
• Differential Calculus and Integral Calculus
• Financial Mathematics I and II
• Drawing Mathematics I and II</td></tr>
<tr><td>mathematics: applications and interpretation (AI) SL & HL</td></tr>
<tr><td colspan="3">SCIENCES</td></tr>
<tr><td>physics SL & HL</td><td rowspan="3"><u>Natural Sciences, Experimental Sciences and Technology</u>

Compulsory units
• Natural Sciences, Experimental Sciences and Technology units (six)
• Science Workshop I

Optional units
• (see column to the right)</td><td>Selected Topics in Physics I & II</td></tr>
<tr><td>chemistry SL & HL</td><td>Selected Topics in Chemistry I & II</td></tr>
<tr><td>biology SL & HL</td><td>Selected Topics in Biology I & II</td></tr>
<tr><td colspan="2">LANGUAGES AND LITERATURE</td><td></td></tr>
<tr><td>language A: language and literature SL & HL</td><td colspan="2"><u>Language and Communication</u>

Compulsory units
• Language and Communication I, II, and III

Optional units
• Communication Sciences I and II</td></tr>
</table>

All DP curricula has been considered at both standard level (SL) and higher level (HL).

2.3 Report Structure

In responding to the above RQs, this report included the following sections:

- 3. Methodology: this section provides a brief overview of the methodology applied in this study. This includes details of how the document selection and identification of comparison points for the study took place; a definition of 'alignment'; an outline of the methodology used for comparisons at both programme and subject levels; and an outline of the methodology used to assess demand.

- 4. Programme-Level Alignment: this section presents the synthesised analysis from the programme-level comparisons between the DP and the MBG. In doing so, it includes brief programme overviews for both, followed by the comparative analysis on

their philosophical underpinnings, structure, requirements and associated outcomes, student learning pathways and the general nature of assessment practices.

- 5. Subject-Level Alignment: this section presents the synthesised analysis from the subject-level comparisons between DP and MBG subjects. For each comparison subject, this includes the comparative analysis of their learning outcomes, content, and demand.

- 6. Key Findings: this section outlines the key findings from both the programme- and subject-level comparisons undertaken in this study. In doing so, it provides a top-level conclusion on alignment at both programme and subject levels, and a succinct summary of key similarities and key differences.

- 7. Bibliography: this section references all sources cited in the study, including the documents used for both programme- and subject-level curriculum analyses.

3. Methodology

3.1 Document Selection and Identification of Comparison Points

To undertake these comparative analyses, the following core documentation was reviewed (supplemented by additional documentation – detailed in the Bibliography – where relevant and available):

DP Documentation

- What is an IB education? (WIAIBE)
- WIAIBE Teacher Support Material
- DP: From Principles into Practice
- Programme Standards and Practices
- DP subject guides:
    - mathematics: analysis and approaches
    - mathematics: applications and interpretation
    - physics
    - chemistry
    - biology
    - language A: language and literature

MBG Programme Documentation

- Base Document for the Bachillerato General
- Guidelines for the Preparation of Curriculum Maps
- Common Curriculum Framework for Upper Secondary Education (MCCEMS)
- Fundamentals of the Common Core Curriculum Framework for Upper Secondary Education (MCCEMS)

MBG Subject Documentation

- Learning Progressions for:
    - Mathematical Thinking
    - Natural Sciences, Experimental Sciences and Technology
    - Language and Communication
- Programmes of Study (Science):
    - Chemical Reactions – Conservation of Matter in the Formation of New Substances
    - Conservation of Energy and its Interaction with Matter
    - Ecosystems – Interactions, Energy and Dynamics
    - Energy in the Processes of Daily Life
    - Matter and its Interactions
    - Organisms, Structures and Processes. Heredity and Biological Evolution
    - Selected Topics in Physics I & II
    - Selected Topics in Chemistry I & II
    - Selected Topics in Biology I & II
- Programmes of Study (Mathematics)
    - Mathematical Thinking I, II & III

  - Selected Topics in Mathematics I & II
  - Differential Calculus
  - Drawing I & II
  - Financial Mathematics I & II
  - Integral Calculus
  - Probability and Statistics I & II
- Programmes of Study (Languages):
  - Language and Communication I, II & III
  - Communication Sciences I & II

Philosophical Underpinnings Comparison

For the programme-level comparisons between the philosophical underpinnings of each programme, Ecctis used the following elements of the curriculum documentation:

Table 3: Philosophical underpinnings for comparison of the DP and the MBG

Documentation containing philosophical underpinnings	
DP	**MBG**
'What is an IB Education', particularly the following sections: • IB learner profile • International-mindedness • Approaches to teaching and approaches to learning.[8]	Mexican Secretariat of Public Education (SEP)'s website, particularly the: • Base Document for the Bachillerato General.[9]

While the document 'What is an IB Education?' provides detailed information about the IB's educational philosophy, the philosophy and pedagogy of the MGB are articulated to a lesser extent in the curriculum documentation available. Nevertheless, the Mexican Secretariat of Public Education (SEP)'s Base Document was deemed to provide sufficient detail for a meaningful comparison between the two programmes' philosophical underpinnings and was used as such.

For more information on the mapping process, see the Measuring Alignment section.

Learning Outcomes Comparison

For the Learning Outcomes comparisons, as neither of the two qualifications explicitly defines 'learning outcomes' in their curriculum documentation, Ecctis used the following categories of the curriculum documentation for comparison:

Table 4: Learning outcomes for comparison of the DP and the MBG

DP subject (group)	Categories utilised as learning outcomes
MATHEMATICS	
mathematics: analysis and approaches	DP mathematics subject group – aims and assessment objectives

[8] International Baccalaureate. (2017). *What is an IB Education?*

[9] Mexican Secretariat of Public Education. (2024). *Base Document for the Bachillerato General*. Available from: Documento Base para el Bachillerato General

DP subject (group)	Categories utilised as learning outcomes
mathematics: applications and interpretation	
SCIENCES	
physics	DP sciences subject group – aims and assessment objectives
chemistry	
biology	
STUDIES IN LANGUAGE AND LITERATURE	
language A: language and literature	DP studies in language and literature subject group – aims and assessment objectives
MBG subjects	**Documentation and Sections**
MATHEMATICAL THINKING	
Compulsory units	Learning Progressions for Mathematical Thinking *(particularly categories, sub-categories, trajectory learning, and learning goals)*
Optional units	(From the Programmes of Study) Extended Disciplinary Competencies – Mathematics General Competencies
NATURAL SCIENCES, EXPERIMENTAL SCIENCES AND TECHNOLOGY	
Compulsory units	Learning Progressions for Natural Sciences, Experimental Sciences and Technology *(particularly Science and Engineering Practices and Transversality with Other Areas of Knowledge and Sociocognitive and Socioemotional Resources)* Learning Progressions for Science Workshop I
Optional units	(From the Programmes of Study) Extended Disciplinary Competences – Experimental Sciences General Competences
LANGUAGE AND COMMUNICATION	
Compulsory units	Learning Progressions for Language and Communication *(particularly learning goals)*
Optional units	(From the Programmes of Study) Extended Disciplinary Competences – Communication General Competences

Although not labelled as learning outcomes per se, the above categories were chosen as they were deemed to provide the most complete picture of the skills and knowledge that students should obtain upon completion of each subject.

For more information on the mapping process, see the Measuring Alignment section below.

3.2 Measuring Alignment (Similarities and Differences)

Alignment is a key concept for this series of studies. The aim of this study is to ascertain the level of alignment between the DP and the MBG. Although Ecctis has sought to represent the alignment findings as straightforwardly as possible in this report, alignment is not a simple concept, so it is important to establish Ecctis' approach in this regard.

Alignment, as a term, is often used in education circles to refer to *internal* coherence between learning outcomes, assessment methods, teaching practices and other features of teaching and learning. This report does not consider *internal* alignment, but what might appropriately be labelled *external* alignment. Alignment of this type looks at the extent to which a programme

(in this case, the DP) aligns with other educational programmes (in this case, the MBG). This form of external alignment is particularly key to understand for an organisation like the IB which operates in so many international contexts, often alongside national curricula, where teachers and students may seek to move back and forth between IB and national pathways of education.

Within this narrower definition of *external* alignment, the idea is still broad and could be viewed from any number of perspectives. In this series of studies, the IB has specifically asked Ecctis to consider alignment from the specific perspectives outlined by the RQs. The RQs thereby define the limits of the type of alignment that will be considered within the reports. Namely:

- At the programme level:
    - Alignment of philosophical underpinnings
    - Alignment of structure
    - Alignment of requirements and associated outcomes
    - Alignment of student learning pathways
    - Alignment of approaches to assessment.

- At the subject level (in selected subjects):
    - Alignment of learning outcomes
    - Alignment of content
    - Alignment of demand.

To form a comprehensive picture of alignment, Ecctis' approach has used multiple repeating steps within each report. For Mexico, it sought to:

- Analyse to what extent the MBG has similarities with the DP.
- Analyse to what extent the MBG lacks features contained within the DP.
- Analyse to what extent the DP lacks features contained within the MBG.

In this respect, **alignment is a measure of the extent to which there are similarities and differences between key selected criteria of two educational programmes**. High alignment indicates significant similarities, with few differences in key areas, whereas low alignment results from many differences in important aspects, with perhaps only few or non-impactful similarities. Alignment judgements in this study took a holistic view of similarities and differences and the likely impact these will have on what skills and knowledge students possess upon completion of a programme of study. As such, the study did not use fixed quantitative criteria to differentiate high from low alignment, but rather utilised the expert panels to produce informed, holistic judgements drawing on an outcomes-focused perspective.

Mapping

To accurately measure the alignment of the DP to the MBG, it is necessary to map the similarities and differences across the selected alignment criteria. This necessitates identification of the same structural features in the DP and in the MBG (the comparison programme) so that a mapping process can be undertaken.

Mapping, in this case, refers to detailed analysis of a feature of an education programme (generally as represented within that programme's documentation). Specifically, mapping applies the same analytical method to two separate sets of data (for example, the learning outcomes of two different curricula), enabling similarities and differences between those two data sets to be understood through the different results of applying the same mapping method to both. Another important feature of mapping is that there is a paper trail of the analysis, as the approach is methodical, testable, and repeatable.

For more information on how mapping has been applied in this study, see sections 3.2.1 and 3.2.2.

3.2.1 Method: Programme-Level Comparison

Each aspect of the programme-level comparison is achieved through slightly different approaches to mapping and assessing alignment, the results of which inform the overall alignment evaluation. Each method is described in the appropriate subsection below.

Philosophical Underpinnings

In the DP, the IB learner profile, approaches to teaching, approaches to learning, and framework of international-mindedness were used to represent the philosophical underpinnings. For the MBG, the 'Base Document for the Bachillerato General'[10] was used, with a focus on the following sections:

- Presentation
- Framework
- Study plan (including the general objective and specific objectives)
- Theoretical approaches

In order to carry out the comparative analysis, six themes were extracted from the DP's philosophical underpinnings:

Table 5: Philosophical underpinning themes

Philosophical underpinning themes
• International outlook, diversity, and intercultural understanding • Grounded in real world contexts • Principled and community-oriented • Independence/self-management, critical inquiry, and reasoning • Communicative and collaborative competence • Conceptual thought and understanding.

This list of themes was mapped against both the DP's philosophical underpinnings and the philosophical underpinnings of the MBG to identify what aspects of the DP's philosophical underpinnings are shared with the MBG and what aspects are unique to either the MBG's philosophical underpinnings or the DP's. The detail of this mapping was carried out in the mapping spreadsheets, while a visual summary and written explication of the findings can be found in the Philosophical Underpinnings section below (see section 4.2).

[10] Mexican Secretariat of Public Education. (2024). *Base Document for the Bachillerato General*.

Structure

Comparing the structures of the DP and a national programme does not require a mapping process. Instead, subject offerings, how duration interacts with subjects/progression, and the general structure of the qualification (including exit points) have been represented with visuals for each programme. These curriculum structure diagrams use block colours and simple box and arrow graphics to demonstrate structure and progression.

Curriculum structure diagrams have been placed next to each other in this report to show the similarities and differences at a glance. The visual presentation is followed by a short write-up of the key similarities and differences, to maintain analytical focus on the alignment of the two programmes.

Requirements and Associated Outcomes

The requirements and associated outcomes of each programme are, like the structure, also simple, core features which do not require a mapping process in order to be compared. Comparisons and contrasts are drawn between the different requirements (e.g. entry requirements, pass/fail requirements) linked to both programmes and the associated outcomes of both.

Student Learning Pathways

By ‘student learning pathways’, we refer to the learning route that each student can take through a programme – with focus on scope for subject-specific specialisation. As with the comparative analysis of structure, diagrams resembling flow charts have been used to visually demonstrate the core and optional subject choices, providing an example to indicate how students follow different potential learning pathways in both programmes. A short textual write-up has been included after the diagrams to highlight and discuss the key similarities and differences – maintaining analytical focus on the issue of alignment.

Assessment Methods

Although detailed comparative analysis of assessment is not a main component of the analysis of alignment, Ecctis has briefly considered the high-level assessment features within the programmes being compared.

A simple table has been used, followed by a short textual description of the key similarities and differences. The types/numbers of assessment used in the programme are a source of comparison, and the subjects analysed in the subject-level alignment analysis in each report have been used as examples to consider assessment in more detail (i.e. question types and marking approaches, where this information is available).

3.2.2 Method: Subject-Level Comparison

As previously described, a number of subjects has been selected by the IB for a closer look at alignment at the subject level. This includes a closer look at the learning outcomes for each subject, the subject content, and the demand level. Each approach is outlined below.

Learning Outcomes

To analyse the alignment of learning outcomes at the subject level, the process began by extracting six to eight themes from the DP's subject-level learning outcomes for each subject being analysed, encompassing both skills and knowledge areas. This thematic code was then mapped onto the learning outcomes of the DP subject and the comparison subject from the MBG.

The top-level results of the mapping process are represented with a table per subject area. Following the tables, a written commentary is provided regarding the presence of DP knowledge areas and skills (represented by themes) in the MBG and any knowledge areas and skills found in the MBG but not in the DP.

Content

To compare the content of the DP subject and the comparison MBG subject, both are first presented next to each other in the document in a simple tabular format. Additionally, content mapping took place through a simple process of establishing whether each content subtopic covered by the DP subject in question has 'clear alignment' with any content in the MBG comparison subject. The mapping spreadsheets demonstrate the full logic of all judgements.

A commentary is provided on DP subject content not found to have alignment points in the MBG subject and on MBG subject content topics not found to have alignment points in the DP subject.

Demand

Comparing the demand of subject curricula is perhaps the most complex mapping and alignment analysis within this report. Ecctis' approach views demand from multiple perspectives to capture its relationship to skills as well as to the detail and scope of content.

To allow for a comprehensive assessment of the level of demand of the DP selected subjects against the respective comparison points, Ecctis has created a Demand Profile for each subject in the study. Each Demand Profile comprises four criteria designed to judge complexity, depth, breadth, workload levels and potential for intellectual stretch. These criteria have been applied uniformly across all subjects in the study, using an expert panel-approach (as outlined below).

Demand Profile – Subject-level Judgement

The Demand Profile is comprised of four scores (each between zero and three) based on specific criteria. Each score within each category has a specific definition which is listed in Appendix A. A panel of subject, teaching, and curriculum design experts analysed each subject curriculum and arrived at a consensus on which score descriptor in each category best matched with the curriculum in question. The categories which comprise the Demand Profile are as follows:

- **Revised Bloom's Cognitive Skills** score (0-3): this is an overall score of course demand, based entirely on a review of learning outcomes. Levels have been defined

based on increasing emphasis of higher order cognitive skills taken from Bloom's Revised Taxonomy.[11]

- **Depth of Knowledge** (adapted from Webb's) score (0-3): this is an overall score evaluating the depth of knowledge or complexity of knowledge and skills required by curriculum standards and expectations. The score is focused on subject content and learning outcomes, complemented by assessment where relevant/possible. Levels have been defined based on the level of detail studied per topic, as well as the levels of thinking described in Webb's depth of knowledge framework.[12]

- **Volume of Work** score (0-3): this is a trifactor score, considering:
  a. breadth of content – i.e. how many topics and subtopics are covered
  b. depth of content – i.e. the extent to which the topics and subtopics are focused upon, amplified and explored.[13]
  c. specified timeframe – i.e. the time allocated for studying the subject.

  The three factors – breadth, depth, and time – were all considered in defining the levels.

- **Outstanding Areas of Subject Demand** score (0-3): this score reflects the number of content areas viewed as more challenging and/or conducive to intellectual stretching of students. Levels have been defined on a scale of increasing number of 'stretch areas'.

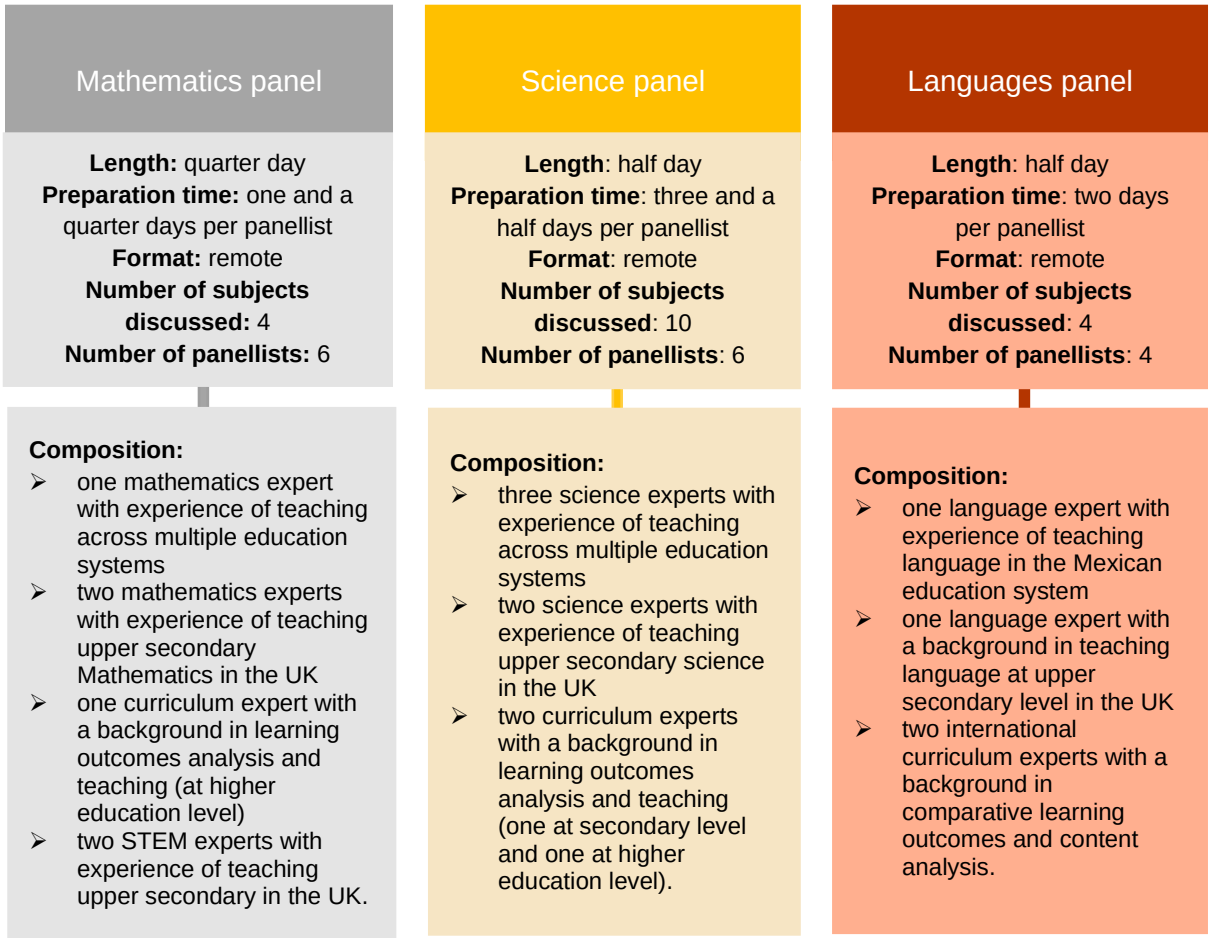
Demand Panel: Expert Judgement Procedure

Demand analysis and judgements against the above criteria rested with a panel of experts comprised of both curriculum and teaching experts – i.e. international education researchers experienced in comparative secondary curriculum evaluation – and subject experts – i.e. researchers and consultants with a subject specialism in the relevant subject areas. For both expert types, teaching experience, understanding of appropriate national/international teaching contexts, and experience of curriculum and learning outcomes comparisons were prioritised.[14]

For the panels discussing the demand level of the DP subjects and respective comparison subjects in the Mexico and Brazil programmes, the composition of each panel was as follows:

[11] Krathwohl, D. (2002). *A Revision of Bloom's taxonomy: An Overview. Theory Into Practice*, Vol 41(4). Available from: www.tandfonline.com/doi/abs/10.1207/s15430421tip4104_2?journalCode=htip20
[12] Webb, N. L. (2002). *Depth-of-knowledge levels for four content areas*. Available from: Microsoft Word - Webb DOK all content.doc (pbworks.com)
[13] Note: 'depth of content' primarily describes what is on the curriculum (i.e. the level of detail comprised in each topic), whereas 'depth of knowledge' describes what the students need to be able to do (i.e. how complex and extensive the thinking processes involved are).
[14] To minimise potential biases and subjectivity, Ecctis' recruitment procedure excluded candidates with experience of teaching any of the comparison qualifications in this study.

Figure 1: Demand panels details



All panellists were provided with the relevant extracts from the appropriate qualifications' specifications,[15] including (where available):

- Learning outcomes and aims of the qualification
- Assessment structure
- Information about guided learning hours or curriculum time
- Assessment objectives
- Content.

The experts were also provided with a document containing:

- An introduction to the comparative analysis task
- Descriptions of the demand taxonomies
- The demands instrument (used to record findings).

Panellists conducted between one and four days of panel preparation, reviewing the appropriate curriculum documentation in detail and scoring each subject against the demand criteria provided (the template utilised for this has been included in Appendix C). Following this preparation, participants then took part in their respective panels, which were all hosted

[15] The documents were shared both in their original languages and in English.

remotely on Microsoft Teams. Panel durations ranged between a couple of hours to half a day.

All judgements resulted in scores from 0-3 for each demand criterion mentioned above, with each score for each criterion being pulled into each course's demand profile. The panel approach was used to debate the findings and scores reached by each member of the panel and arrive at an evidence-based consensus on every demand score for every subject.[16]

Visually, each demand profile is represented by radar diagrams to facilitate demand comparison between subjects.

NB: all demand scores produced should be interpreted as approximate judgements given the varying degrees of documentation and detail available for each curriculum, as well as likely variation on how the curricula are implemented in practice.

[16] Note: each score was debated by the panel until a unanimous agreement was reached.

4. Programme-Level Alignment

This section focuses on answering RQ2 and the sub-questions associated with it, namely:

Table 6: Research question 2

RQ2: To what degree do the curricula align with regards to their: 2.1: Philosophical underpinnings • Objectives • Principles • Values? 2.2: Structure • Learning areas • Subject offerings • Degree of specialization • Time allocation? 2.3: Requirements • Programme entry requirements • Time requirements (i.e. programme duration, teaching hours, study hours) • Certificate requirements (i.e. credits, passing and failing conditions, compensation options)? 2.4: Assessment • Nature of assessment (i.e. number, type, duration, question types, availability of marks) • Assessment model (i.e. relative weighting of assessments to overall grades)? 2.5: Student learning pathways • Degree of specialization • Options in subject (area) choice (i.e. compulsory subjects, electives)?

It starts by offering top-level overviews of both the DP and the MBG, followed by presenting the results from the programme-level comparative analysis for each core aspect outlined above.

4.1 Programme Overviews

4.1.1 The International Baccalaureate Diploma Programme

The Diploma Programme (DP) was established in 1968 as a two-year pre-university programme for 16–19-year-old students.[17]

Students who aim to achieve the Diploma award must generally select one subject from each of the six subject groups:

- Studies in language and literature
- Language acquisition
- Individuals and societies
- Sciences
- Mathematics

[17] International Baccalaureate. (2015). *Diploma Programme: From principles into practice*. p. 5.

- The arts.[18]

Students who do not wish to take a subject from the arts subject group may opt to study an additional Sciences, Individuals and societies, or languages course instead.

All subjects are studied concurrently over the two-year duration of the programme and most subjects can be taken at either HL or SL. In terms of teaching hours, the DP's documentation recommends 150 teaching hours for individual subjects at SL and 240 teaching hours are at HL.[19]

In addition to the six subjects taken from these groups, DP students will also need to complete three further curriculum components. Theory of knowledge (TOK) allows students to reflect on the nature of knowledge by considering their subjects from a broader perspective.[20] The extended essay is a self-directed piece of research which results in a 4000-word essay.[21] Creativity, activity, service (CAS) is not formally assessed but requires that students undertake a creative endeavour, take part in something physically active, and participate in a voluntary or unpaid activity.[22] Together, these three components comprise the DP 'core'.

To achieve the IB Diploma a student must take at least three HL subjects.[23] The maximum number of subjects that can be taken at higher level is four. HL subjects are intended to prepare learners for the discipline specialisation of higher education, whilst the SL subjects balance this by broadening the range of subjects studied.[24]

The DP curriculum framework is based on a concentric circle model (see below), whereby the learner profile is positioned at the centre to represent its relevance to all aspects of the programme. The next circle comprises the core requirements of TOK, The extended essay, and CAS. The six subject groups are then encircled by international-mindedness and the programme title – indicating that everything students study is unified by the underpinning philosophy of encouraging thinking from a perspective that embraces points of view outside one's own frame of reference.

[18] International Baccalaureate. (2024). *DP curriculum*. Available from: https://ibo.org/programmes/diploma-programme/curriculum/
[19] Ibid.
[20] International Baccalaureate. (2021). *Theory of knowledge*. Available from: https://www.ibo.org/programmes/diploma-programme/curriculum/theory-of-knowledge/
[21] International Baccalaureate. (2023). *Extended Essay*. Available from: https://www.ibo.org/programmes/diploma-programme/curriculum/dp-core/extended-essay/
[22] International Baccalaureate. (2022). *CAS projects*. Available from:https://www.ibo.org/es/programmes/diploma-programme/curriculum/dp-core/creativity-activity-and-service/cas-projects/
[23] International Baccalaureate. (2024). *DP curriculum*.
[24] International Baccalaureate. (2015). *Diploma Programme: From principles into practice*. p. 6.

Figure 2: IB Diploma Programme curriculum model[25]

Both internal and external assessment methods are used in the DP. In most subjects, students take written examinations at the end of the programme that are marked by external IB examiners. Internally assessed tasks normally comprise between 20-30% of the total mark in each subject.[26]

Question types used in DP assessment vary from subject to subject. Essays, structured problems, short-response questions, data-response questions, case-study questions, and multiple-choice questions are some of the external assessment question types deployed.[27] Coursework forms part of the assessment for areas of the DP such as the extended essay and TOK.[28] This is normally carried out over an extended period under teacher supervision. Where students complete internally assessed tasks, these are marked by teachers and moderated by the IB.[29] Some of the internal assessment methods used include oral work in languages, fieldwork in geography, laboratory work in the sciences, and artistic performances in the arts.[30]

Each DP subject, whether taken at SL or HL, is graded from 1-7 (with 7 representing the highest achievement level).[31] If a student has taken enough subjects at the correct level to be in contention for the Diploma award, a minimum of 24 points is needed to achieve the

[25] International Baccalaureate. (2015). *Diploma Programme: From principles into practice*. p. 5.
[26] International Baccalaureate. (2021). *Understanding DP assessment*. Available from: https://www.ibo.org/programmes/diploma-programme/assessment-and-exams/understanding-ib-assessment/
[27] International Baccalaureate. (2021). *Assessment and Exams*. Available from: https://www.ibo.org/programmes/diploma-programme/assessment-and-exams/
[28] International Baccalaureate. (2021). *Understanding DP assessment*.
[29] Ibid.
[30] International Baccalaureate. (2021). *Assessment and Exams*.
[31] International Baccalaureate. (2021). *Understanding DP assessment*.

qualification. A minimum grade of 3 is also needed in at least four subjects to achieve the qualification.[32]

Additionally, 42 total points are available from the combination of the grades for six subjects and a further three points are available to students for successful completion of the core elements of TOK and The extended essay. The TOK and extended essay components of the DP are each marked on an A-E scale, where an A grade is the highest award, and an E grade the lowest.[33] Their combined results can contribute up to three additional numerical points to the overall DP score (see
Table below). CAS does not constitute a graded part of the DP, although its completion is mandatory to be awarded the Diploma.

HL and SL subjects are assessed against the same grade descriptors;[34] however, HL candidates are expected to demonstrate the various elements of the grade descriptors across a greater range of knowledge, skills, and understanding.

A bilingual Diploma is awarded to students who achieve:

- Grade 3 or higher in two language subjects from the Studies in language and literature group; or,
- Grade 3 or higher in a language subject from the Studies in language and literature group and a grade 3 or higher in a subject from the Individuals and societies group or Sciences group taken in a different language.

Certificates are awarded to students that have taken individual subjects but not enrolled on the full Diploma, or DP candidates who do not achieve the full DP.[35] Prospective candidates can enrol in as many individual subjects as permitted by their school; these are graded with the same 1-7 system used in the full DP.

Table 7: Letter-Grade: numerical score conversion matrix[36]

		Theory of knowledge (TOK)				
	Grade awarded	A	B	C	D	E
The extended essay	A	3	3	2	2	Failing condition
	B	3	2	2	1	
	C	2	2	1	0	
	D	2	1	0	0	
	E	Failing condition				

No formal entrance requirements are stipulated as the IB envisages numerous educational pathways leading to the DP.[37] However, the IB recommends consulting the subject guides prior to enrolment to ensure an adequate understanding of programme expectations.[38]

[32] International Baccalaureate. (2024). *DP passing criteria.* Available from: DP passing criteria - International Baccalaureate®
[33] Ibid.
[34] International Baccalaureate. (2021). *Understanding DP assessment*.
[35] International Baccalaureate. (2024). *DP passing criteria.*
[36] International Baccalaureate. (2018). *Assessment principles and practices-Quality assessments in a digital age*. p. 220.
[37] International Baccalaureate. (2015). *Diploma Programme: From principles into practice*. p. 22.
[38] Ibid.

4.1.2 Bachillerato General (MBG)

The education system in Mexico is overseen by the Secretariat of SEP and is compulsory from the age of three to 18. The school system is divided into primary school (from ages six to 11), and secondary school (from ages 11 to 18). Secondary education in Mexico is divided into lower- and upper-secondary, each lasting three years. Table 8 summarises the breakdown of each stage of compulsory education in Mexico.

Table 8: Outline of the primary and secondary stages of the Mexico education system[39]

Education Stage	School	Grades	Age	Years
Pre-primary	*Educación Preescolar*	-	3-5	3
Primary	*Educación Primaria*	1-6	6-11	6
Lower Secondary	*Educación Secundaria Básica*	7-9	11-14	3
Upper Secondary	*Educación Media Superior*	10-12	15-18	3

Upper secondary (*Educación Media Superior)* is offered across three main streams:

- *Bachillerato General*
- *Bachillerato Tecnológico*
- *Educación Profesional Técnica.*

The MBG is a traditional, academic stream designed to prepare students for higher education, as well as developing the competencies necessary for the world of work.[40] The *Bachillerato Tecnológico*, in turn, combines general and vocational education to enable students to pursue higher education or a more professional/technical route.[41] Finally, the *Educación Profesional Técnica* stream is purely vocational and provides access to the labour market and employment.[42] Within the *Educación Media Superior,* the MBG will be the focus of this report, as it is the qualification more closely aligned with the DP.

Structure

The MBG lasts for three years and is divided into six semesters, with each year consisting of two semesters. In the MBG, the first year is composed of semesters one and two, the second year consists of semesters three and four, and the final third year of study is comprised of semesters five and six.

Throughout their MBG, students complete five curriculum components, namely the:

- Core component (‘*Componente de Formación Fundamental’*)
- Mandatory Extended Core component *(‘Componente de Formación Fundamental Extendido Obligatorio’*)
- Extended Core component *(‘Componente de Formación Fundamental Extendido’*)
- Work Experience component *(‘Componente de Formación Laboral’*)

[39] Government of Mexico. (2015). *Get to know the National Educational System*. Available from: https://www.gob.mx/sep/articulos/conoce-el-sistema-educativo-nacional
[40] Government of Mexico. (n.d.) *Bachillerato General.* Available from: Bachillerato General (sep.gob.mx)
[41] Mexican Secretariat of Education, Science, Technology and Innovation. (2024). *Bachillerato Tecnológico*. Available from: Bachillerato Tecnológico | Secretaría de Educación, Ciencia, Tecnología e Innovación (edomex.gob.mx)
[42] Government of Mexico. (n.d.). *Servicios educativos*. Available from: Subsecretaría de Educación Media Superior: Servicios educativos (sep.gob.mx)

- Expanded Curriculum *('Currículum Ampliado')*.[43]

Each of these components is made up of curriculum learning units *('Unidades de Aprendizaje Curricular',* also known as UACs). Both the different components and the associated UACs are described in more detail below.

The **Core component** is the common core for all upper secondary education and is made up of four 'Socio-cognitive Resources' and three 'Areas of Knowledge', amounting to 27 UACs in total. All students in the MBG will study the entirety of the Core curriculum, further details of which can be found in Table 9.

Table 9: Core Component of the Bachillerato General

		Curriculum Learning Units (UAC)
Socio-cognitive resources	Language and Communication	Language and Communication I, II and III English I, II, III and IV
	Mathematical Thinking	Mathematical Thinking I, II and III
	Historical Consciousness	Historical Consciousness I, II and III
	Digital Culture	Digital Culture I & II
Areas of Knowledge	Natural Sciences, Experimental Sciences and Technology	Matter and its interactions Conservation of energy and its interactions with matter Ecosystems: interactions, energy and dynamics Chemical reactions: conservation of matter in the formation of new substances Energy in the processes of daily life Organisms: structures and processes.
	Social Sciences	Social Sciences I, II & III
	Humanities	Humanities I, II & III

The **Mandatory Extended Core component** is organised in a similar way to the Core component, although it is only constituted by eight UACs and these are organised differently within each socio-cognitive resource and/or area of knowledge. This component is compulsory for all students who are studying the MBG and further details can be found in Table 10.

Table 10: Mandatory Extended Core Component of the Bachillerato General

		Curriculum Learning Units (UAC)
Socio-cognitive resources	Mathematical Thinking	Selected Topics in Mathematics I & II
	Digital Culture	Digital Culture Workshop
Areas of Knowledge	Natural Sciences, Experimental Sciences and Technology	Science Workshop I & II Space and Society
	Social Sciences	Research Laboratory
	Humanities	Literary Thought

The **Extended Core component** is made up of UACs that may be chosen according to the needs of the specific institution delivering the MBG. This component takes place in the final

[43] Mexican Secretariat of Public Education. (2024). *Base Document for the Bachillerato General*. p. 42-45.

year of the MBG (i.e. during the fifth and sixth semesters) and students are able to choose up to eight units, generally in the format of four pairs of units that complement each other. The UACs within the Extended Core component are categorised under the same Socio-cognitive Resources and Areas of Knowledge. Further details of the Extended Core component can be found in Table 11.

Table 11: Extended Core Component of the Bachillerato General

		Fifth semester	Sixth semester
Socio-cognitive Resources	Languages and Communication	Communication Sciences I Greek & Latin Etymologies I Selected Topics in English I	Communication Sciences II Greek & Latin Etymologies II Selected Topics in English II
	Mathematical Thinking	Differential Calculus Drawing I Financial Mathematics I Probability and Statistics I	Integral Calculus Drawing II Financial Mathematics II Probability and Statistics II
Area of Knowledge	Natural Sciences, Experimental Sciences and Technology	Health Sciences I Selected Topics in Biology I Selected Topics in Chemistry I Selected Topics in Physics I	Health Sciences II Selected Topics in Biology II Selected Topics in Chemistry II Selected Topics in Physics II
	Social Sciences	Administration I Accounting I Law I Economy I Sociology I Psychology I	Administration II Accounting II Law II Economy II Sociology II Psychology II
	Humanities	Art History I Logic Selected Topics in Philosophy I	Art History II Aesthetics Selected Topics in Philosophy II

The **Work Experience component** of the MBG aims to prepare students for the world of work by enabling them to learn the skills associated with various professions. It is a non-compulsory component of the curriculum, organised into four modules taken between the third and the sixth semester, with a load of seven hours and 14 credits each, making up a total of 28 hours and 56 credits.[44] Students may select from a list of 18 UACs presented in the table below.

Table 12: Work Experience Component of the Bachillerato General

Work Experience UACs
• Administration • Accounting • Community Development • Tourism • Social Promotion • Customs Processing • Intervention in Compulsory Education • Child Assistance • Clinical Laboratory Specialist • Chemical Laboratory Technician • Dental Mechanics • Electronics • Hygiene and Community Health

[44] Government of Mexico. (n.d.). *Bachillerato General*. Available from: Bachillerato General (sep.gob.mx)

Work Experience UACs
• Communication • Graphic Design • Interpretation and Translation of the English Language • Information and Communication Technologies • Architectural and Construction Drawing.

Finally, the **Expanded Curriculum component** of the MBG consists of five areas focused on students' well-being and social skills, namely:

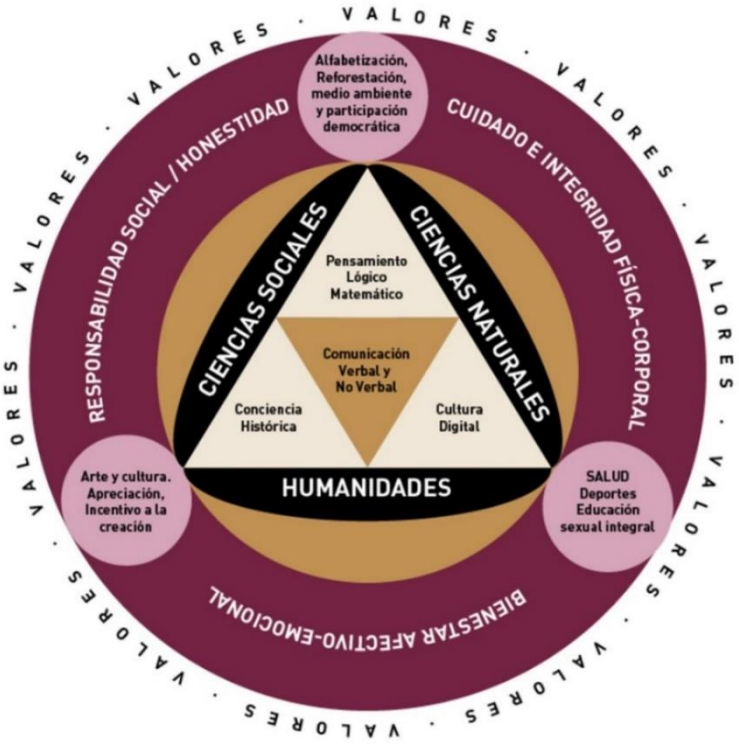
- Practice and Citizen Collaboration
- Education for health
- Physical and sports activities
- Comprehensive Education in Sexuality and Gender
- Artistic and Cultural Activities.

The Expanded Curriculum "involves actions in the classroom, school and community that are essential for the formation of a citizenship with identity, responsibility and capacity for social transformation".[45] This is done with the intention to develop students' knowledge, skills and ability for continuous learning, promoting "physical, mental, emotional and social well-being, as well as resolution of conflicts in an autonomous, collaborative and creative way".

Figure 3 presents the new Common Curricular Framework that was designed for high school and illustrates how the three curricula (Core, Expanded, and Work) will be combined to develop the students' profile.

[45] Mexican Secretariat of Public Education. (2024). *Base Document for the Bachillerato General*. p. 26-27.

Figure 3: Common Curriculum Framework for Higher Secondary Education[46]



Assessment

The SEP's 'Guidelines for the Evaluation of Learning'[47] offers guidance covering all assessment of learning within Mexican upper secondary education. Building on constructivist principles, the guidance poses, amongst other things, that:

- Assessment must be authentic and promote and consolidate learning, rather than simply assessing what has already been learnt.
- Assessment must assess competencies, which are in themselves made of knowledge, attitudes, skills and the ability to apply them.

When it comes to the MBG specifically, the guidelines state that assessment should:

- Be comprehensive, focusing on the evaluation of competencies and all their components (knowledge, skills and attitudes), rather than just one of them.
- Be an integral part of teaching and learning, with its main function being formative.
- Assess competencies through meaningful activities, which should be as similar as possible to those presented in real life.
- Provide information about student performance through authentic activities.
- Continuously promote evaluation, co-evaluation and self-evaluation.[48]

[46] Undersecretariat of Higher Secondary Education. (2022). *Common Curricular Framework, EMS 2022 Higher Secondary Education Transformation Project – The New Mexican School – Meeting June 23 and 24, 2022*. Available from: https://educacionmediasuperior.sep.gob.mx/work/models/sems/Resource/13516/1/images/MarcoCurricularComunEMS2022.pdf

[47] Mexican Secretariat of Public Education. (2022). *Guidelines for the Evaluation of Learning.* Available from: Lineamientos de evaluación del aprendizaje (sep.gob.mx)

[48] Mexican Secretariat of Public Education. (2022). *Guidelines for the Evaluation of Learning, p.11-13.*

Assessment is, thus, focused on the key competencies targeted by both the MBG and Mexican upper secondary education as a whole, which the guidance defines as follows:

- Generic competencies: transversal and transferable competencies which allow students to "understand and influence the world around them, continue learning autonomously throughout their lives, develop harmonious relationships with those around them, and participate effectively in social, professional and political life".
- Disciplinary and professional competencies: competencies that prepare students for post-secondary education, either with relation to disciplines or in relation with a vocation/profession and work.

Regarding assessment types, the guidance refers to internal assessment only and recommends the use of diagnostic, summative and formative forms of assessment. In terms of assessment methods, the following are explicitly mentioned in the guidance: mathematical problems, questionnaires, concept maps, essays, exhibitions, summaries, project development, simulations, case study analysis, presentations, and portfolios – although the guidance also states that other methods may be used, and some sources do mention internally-set oral and written exams.[49]

As to grading, the most common grading scale used goes from zero to 10 (or the equivalent in percentage form), with a six (or 60%) being typically considered as a 'pass' grade for each subject.[50] Students who successfully complete the MBG are awarded the Certificate of Completion of Education ('*Certificado de Terminación de Estudios'*),[51] also sometimes called the Bachillerato Certificate ('*Certificado de Bachillerato')*.

Overall, completion of the MBG does not require neither standardised nor terminal national assessments. However, examinations are often conducted for university admission purposes – see following section for more information.

Admission Examinations

In addition to the assessments administered by individual institutions, students are often required to complete university admission exams to secure a place in public universities in Mexico. The most common of such standardised admission tests is the *Examen Nacional de Ingreso a la Educación Superior* (EXANI-II) or the 'National Higher Education Entrance Exam'.[52] Administered by both public and private universities in Mexico for admission purposes, EXANI-II is a multiple-choice test that takes place over one single session and assesses reading comprehension, writing, mathematical thinking, English as a foreign language, and socio-emotional skills. Some institutions use different admission exams, however; examples of alternatives include the admission exams of EXHCOBA, the College

[49] See, for example: Instituto Motolinia. (n.d.). *Requisitos y Procedimientos de Evaluación en Bachillerato*. Available from: REQUISITOS Y PROCEDIMIENTOS DE EVALUACIÓN EN BACHILLERATO – Colegio Motolinía (motoliniavalles.edu.mx)

[50] See, for example: Government of the Mexican State. (n.d.). *Bachillerato General.* Available from: plan de estudios bachillerato general (edomex.gob.mx).; Universidad de Colima. (2016). *Evaluación del aprendizaje en Educación Media Superior Trayectoria escolar de Bachillerato.* Available from: documento_866.pdf (ucol.mx).; *Instituto Motolinia (n.d.) Requisitos y Procedimientos de Evaluación en Bachillerato.* Available from: REQUISITOS Y PROCEDIMIENTOS DE EVALUACIÓN EN BACHILLERATO – Colegio Motolinía (motoliniavalles.edu.mx).

[51] Government of Mexico. (n.d.). *Nuestro programa*. Available from: Certificado electrónico | Prepa en Línea - SEP

[52] CENEVAL. (n.d.). *EXANI-II*. Available from: Nivel Superior EXANI II - Ceneval

Board, Universidad Nacional Autónoma de México, Universidad Autónoma Metropolitana, and Instituto Politécnico Nacional.[53]

Curriculum Design Principles

The SEP is overseeing the ongoing reform of education in Mexico. The basis of the reform comes from a need to create a more cohesive and continuous learning route for students. Prior to the ongoing reforms, education in Mexico was seen as three unconnected cycles; preschool, primary and lower secondary formed the first cycle of basic education, taking 12 years to complete. Upper secondary, taking three years to complete, was the second cycle of education and finally higher levels of education, taking five years, formed the third cycle. At the transition point of each cycle, students would abandon education for multiple socioeconomic or family reasons or because education did not meet the expectations of students for their future aspirations. The New Mexican School (NEM) was formed from the idea that education should be a lifelong process, built on the concepts of learning to learn and adaptation.[54]

One of the commitments of the NEM is to improve the socio-emotional skills of students, empowering the population for employment by linking education and social development, and focusing on student well-being. The NEM integrates the community and aims to guarantee the same learning opportunities for every Mexican, regardless of socio-economic status.

In doing so, the NEM is based upon eight key principles:

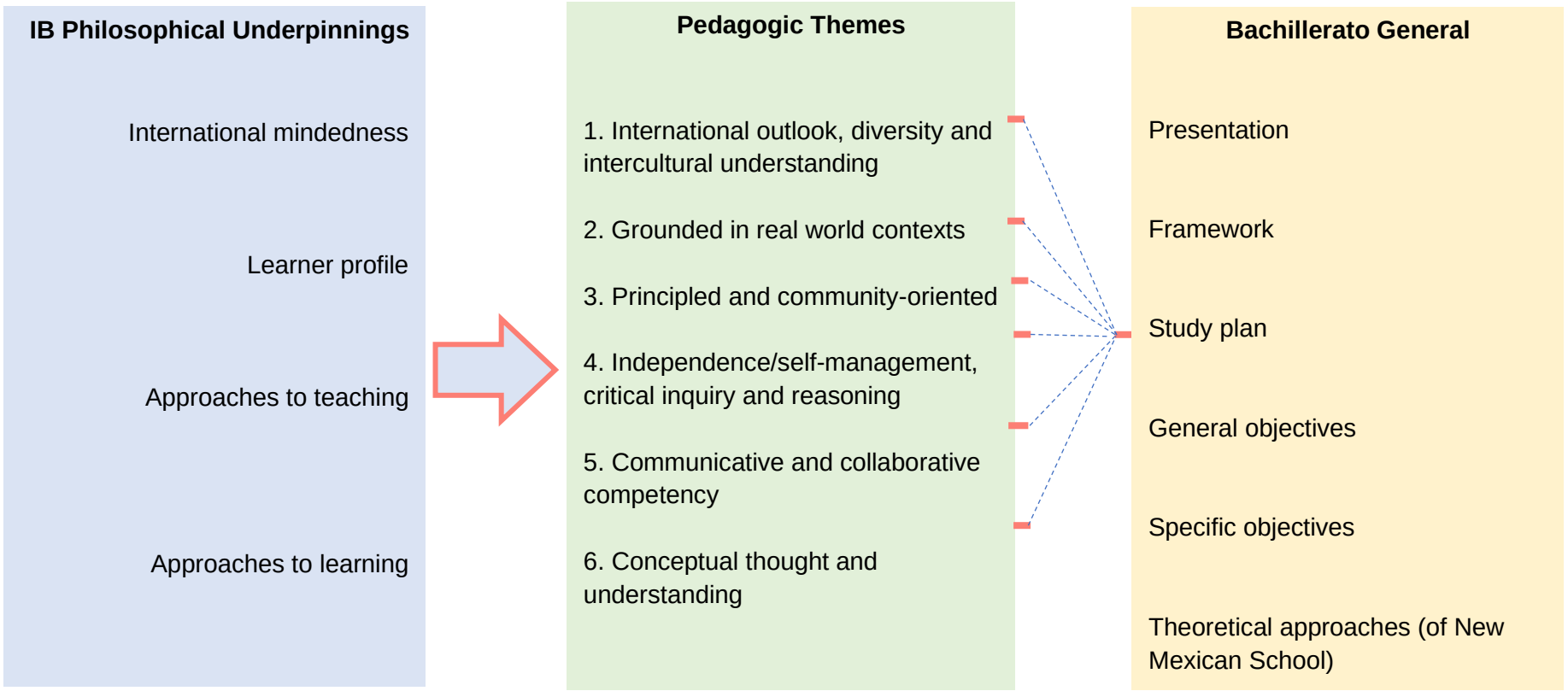
a) **Promotion of identity with Mexico;** appreciating the culture of Mexico and knowledge of its history.
b) **Citizen responsibility;** students respect the essential values of Mexico and understand their personal and common rights and duties.
c) **Honesty;** the fundamental behaviour of social responsibility, allowing a healthy relationship between citizens.
d) **Participation in society;** an ethical and political dimension of education, committing to building close, supportive organisations to overcome indifference and apathy.
e) **Respect for human dignity;** respecting the rights and equality of all people.
f) **Promotion of interculturality;** understanding and appreciating cultural and linguistic diversity
g) **Promotion of the culture of peace;** favouring constructive dialogue, solidarity and searching for non-violent resolution of conflicts.
h) **Respect for nature and care for the environment;** promoting environmental awareness that favours protection and conservation of the environment, preventing climate change and encouraging sustainable development.

Additionally, the Core component aims to develop a cultural base that allows students to "understand themselves as citizens with rights and responsibilities at the regional, national and global level",[55] placing significant emphasis on the notions of citizenship and community at various scales.

[53] Mextudia. (n.d.). *Exámenes de admisión e ingreso a universidades mexicanas 2024*. Available from: Exámenes de admisión e ingreso a universidades mexicanas 2024 | Mextudia
[54] Mexican Secretariat of Public Education. (2024). *Base Document for the Bachillerato General*. p.12.
[55] Undersecretary of Higher Secondary Education. (2019). *Redesign Of The Common Curricular Framework For Upper Secondary Education.* pg.22. Available from Rediseño del MCCEMS.pdf

4.2 Philosophical Underpinnings

Figure 4: Philosophical underpinnings comparative analysis diagram



The IB learner profile, which is used across all IB programmes including the DP, outlines 10 attributes that all students should strive towards.[56] Linked to these attributes, there are five categories of approaches to learning skills that all IB programmes aim to develop as well as six categories of approaches to teaching principles. The table in Appendix B presents these qualities of the IB's underpinning philosophies along with the overview used in IB documentation to describe the quality of international-mindedness that also encircles all IB teaching and learning.

The six themes identified within the IB literature have relatively consistent presence across all component parts (learner profile, approaches to teaching, approaches to learning, and international-mindedness). As a result, these themes present a 'boiled-down' version of the DP's philosophical underpinnings.

To identify the level of alignment in relation to the philosophical underpinnings between the DP and the MBG, the project team mapped the philosophical underpinnings of the MBG against six themes extracted from the DP's philosophical underpinnings.

Table 13: Philosophical underpinning themes

Philosophical underpinning themes
• International outlook, diversity, and intercultural understanding • Grounded in real world contexts • Principled and community-oriented • Independence/self-management, critical inquiry, and reasoning • Communicative and collaborative competence • Conceptual thought and understanding

When mapping the six DP themes onto the principles outlined in the SEP's Base Document for the Bachillerato General (in the context of the NEM), it is apparent that some themes have stronger presence in the Mexican context than others. The theme of 'International outlook, diversity, and intercultural understanding', for instance, is well evidenced, with the Base Document's 'framework' section making references to promoting 'freedom and dignity of the human being', 'inclusion of all' and 'valuing diverse cultures and contributions'. The Base Document's 'Bachillerato General study plan' section also includes this theme through mentions of students 'recognising diversity', being 'respectful of human rights' and having 'respect for differences between people'. Finally, the Base Document's 'theoretical approaches' section also emphasises the importance of this theme through the humanist approach adopted, described as having 'integrity and respect for other people', alongside 'honesty and non-discrimination'.

The DP theme 'Grounded in real-world contexts' also shows presence in the Base Document's 'framework' section, with the latter including references to 'forming citizens aware of global processes and problems'. The 'framework' also describes how the curriculum is built upon the 2030 Agenda for Sustainable Development, outlining a need to 'increase the number of young people and adults [with] the necessary skills…to access employment'. The 'study plan' section promotes the awareness of 'social, economic and political problems that afflict the country'.

[56] International Baccalaureate. (2017). *What is an IB education?*

The ’Principled and community-oriented’ DP theme is equally very evident in the ‘presentation’ section, where numerous references are made to students being ‘committed to their community’, ‘contributing to social transformation’, as well as ‘leading their community’ and acting as ‘agents of social transformation’. The ‘general objectives’ section of the Base Document also describes how the MBG aims to provide students with training that ‘promotes cognitive, emotional and social development’, whilst also raising awareness among young people of ‘the importance of their participation in the reconstruction of the social fabric of Mexico’.

While the DP philosophical underpinning theme of independence/self-management, critical inquiry, and reasoning is also present in the SEP’s Base Document, it is emphasised to a lesser extent than previous themes. The framework describes how students will act as agents of social transformation and, through this, be ‘willing to participate individually and as a community’. The ‘study plan’ section mentions how the qualification will ‘promote the development of critical thinking’ and how students will develop an ‘innovative and creative attitude’. In addition, the ‘general objectives’ section outlines how the MBG should promote ‘cognitive, emotional and social development’, allowing students to progress onto the next educational level or the world of work. The ‘specific objectives’ section, too, shows the presence of this theme by aiming to provide young people with ‘Socio-cognitive and socio-emotional resources that allow them to enter higher education and perform in it efficiently’.

The ‘Communicative and collaborative competency’ theme of the DP’s philosophical underpinnings is shown throughout the Base Document. The ‘presentation’ section discusses how the MBG will ‘promote collaborative work’, ‘encourage cooperation’ and enable students to participate in ‘collective activities’. The ‘specific objectives’ section also states that the MBG will promote ‘multicultural, collaborative and equitable learning’ and a ‘culture of peace that favours dialogue [and] the search for agreements’.

‘Conceptual thought and understanding’ is the DP theme which is least evident in the Base Document. There are hints to this theme in the ‘introduction’ and ‘framework’ sections, where it is stated that the curriculum should have a ‘conceptual structure’, including awareness of global problems and processes, as well as a description of how the curriculum should be ‘reviewed and adapted to current needs and challenges using innovative and relevant pedagogical methods’. The ‘specific objectives’ section also partially alludes to this theme by describing how the MBG covers ‘general culture…including aspects of the social, natural, experimental sciences, humanities and technology’. The overall humanist theoretical approach outlined in the Base Document states that students should be ‘able to participate in the various contexts in which they interact…facing the problems they experience’. In this sense, conceptual thought and understanding are alluded to, but not explicitly emphasised to the same extent as in the DP.

There are also themes that are more evidenced in the SEP’s Base Document than in the DP’s philosophical underpinning themes. There are multiple references to non-violence and a culture of peace, as well as schools being ‘safe spaces, free of discrimination and violence’. The ‘specific objectives’ section of the Base Document also describes the requirement for ‘educational guidance services, tutoring and attention to students, mainly those who are at risk of dropping out of school’. In addition to this, one specific objective describes that there should be ‘follow-up individual and group psycho-pedagogical support to students’. Although

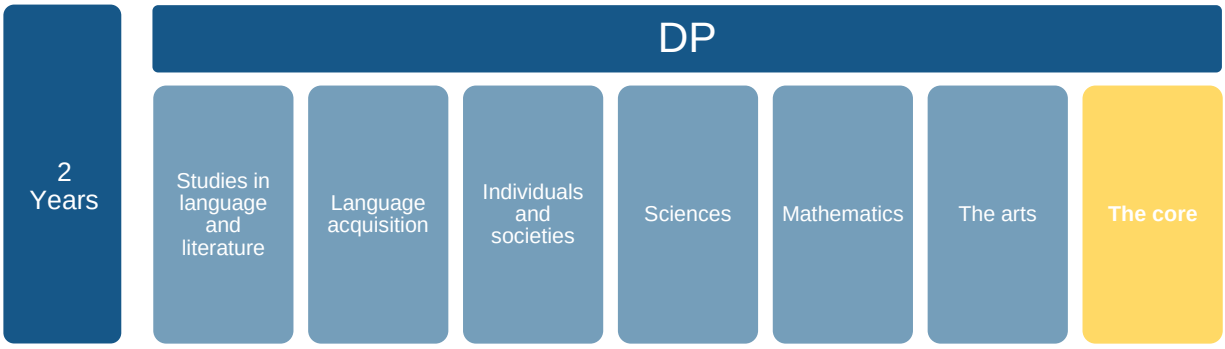
tutoring and psycho-pedagogical support will be common among many schools that offer the DP, the explicit emphasis on these aspects as part of the MBG curriculum is somewhat unique.

In summary, all the DP philosophical underpinning themes are present in the SEP's Base Document, although some are more heavily emphasised than others. The themes of international outlook, diversity and intercultural understanding and principled and community-oriented are very evident, whereas there is comparatively less emphasis on the DP themes of grounded in real-world contexts, communicative and collaborative competency and conceptual thought and understanding. Within the Base Document for the MBG, the inclusion of multiple references to peace and non-violence, as well as tutoring and psycho-pedagogical support for students at risk of dropping out of school, suggest that there are also some unique priorities in the Mexican system.

4.3 Structure

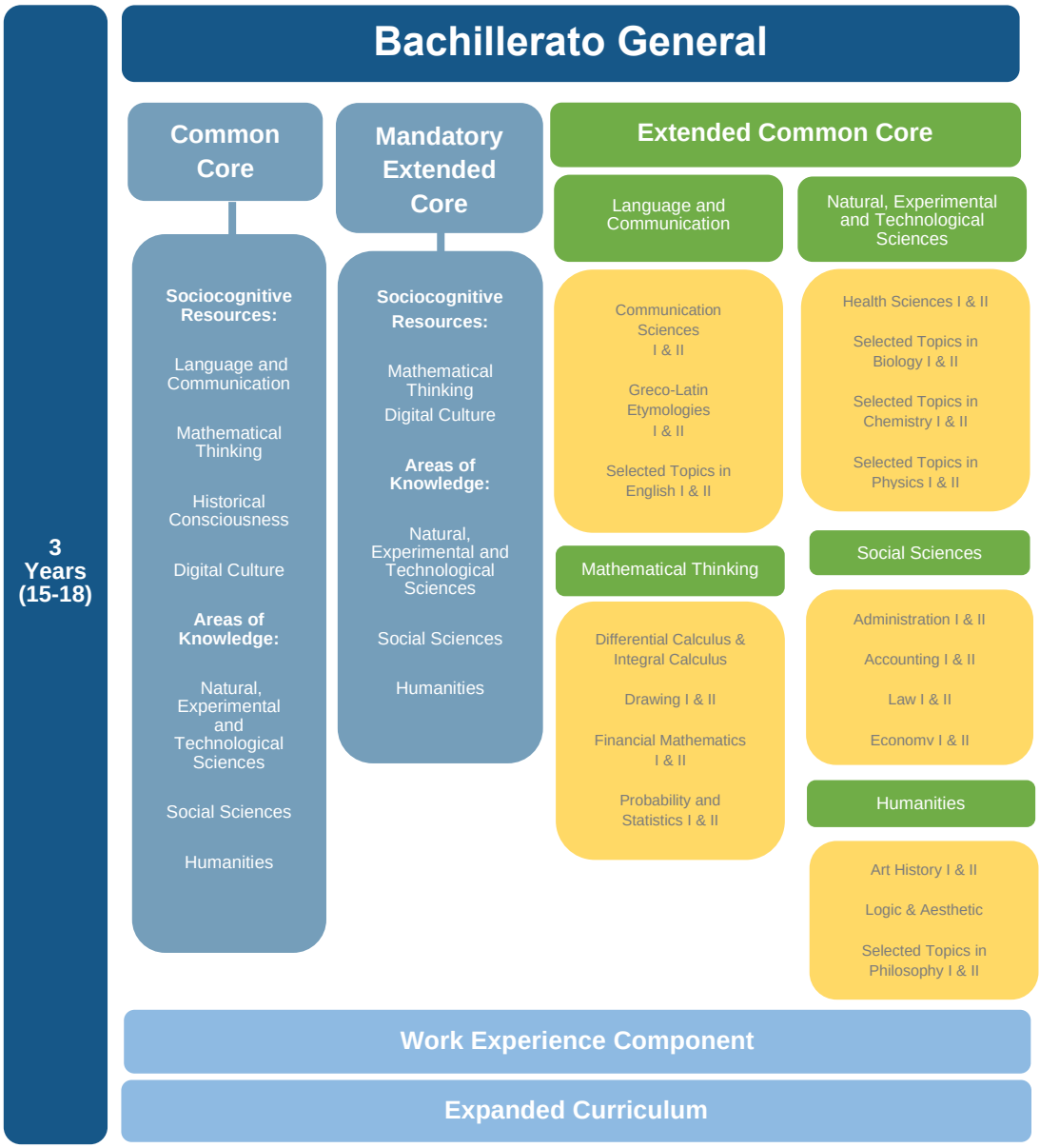
There are six subject groups comprising the DP and students pursuing the Diploma award are normally required to select one subject from each of the six groups.[57] The DP also has three core components which are compulsory and are carried out alongside subjects. The MBG contains a Core component and a Mandatory Extended Core component which all students are required to study. Each of these components are made up of 'Socio-cognitive Resources' and 'Areas of Knowledge', both of which are composed of units. The optional part of the MBG comes in the form of the non-mandatory Extended Core component, where students choose four 'pairs' of units (i.e. eight units in total) to take over the course of their two final semesters. The MBG also includes the Work Experience component and the Expanded Curriculum component. The figures below present the subject groups of the DP in comparison with the subjects that cover similar areas of learning in the MBG.

Figure 5: Structural overview of the DP



[57] International Baccalaureate. (2021). *How the Diploma Programme works*. Available from: https://www.ibo.org/programmes/diploma-programme/what-is-the-dp/how-the-diploma-programme-works/

Figure 6: Structural overview of the MBG



In terms of similarities in the programme structure and subjects taught, both programmes follow a baccalaureate-style approach, prioritising breadth; both include many similar subjects in their programmes of study; and both programmes include common core subjects and optional subjects, allowing students to choose to specialise in certain subject areas.

Subjects common to both the DP and the MBG include languages (including a variety of classical and modern languages), history, science, mathematics and arts. Additionally, both programmes include social and cultural components, philosophy and humanities subjects.

Regarding differences in programme structure, one obvious difference is the overall duration – while the DP spans over two years, the MBG takes three years to complete. Additionally, while DP subjects are offered at two levels – SL and HL – this division in levels is not offered in the MBG at the subject level; if students want to specialise, they can do so by selecting

these subjects as part of the non-mandatory Extended Core component. For example, a student wishing to pursue further study in physics would choose to take the Selected Topics in Physics I & II units which they would then complete in the fifth and sixth semesters (year 3).

Although both programmes outline the teaching hours for individual subjects, the number of subjects and hours of study per subject differ. In the DP, students must complete six subjects – up to four at HL. To receive the IB diploma, students must achieve a cumulative score of 24 points in all six subjects, with a minimum cumulative score of 12 in three HL subjects. The recommended teaching hours per subject, as outlined in the DP curriculum documentation, are 150 at standard level and 240 at higher level.[58] Subjects are typically studied over the course of the programme. Overall, depending on whether a student takes three or four HL courses, total recommended teaching hours for the six DP subjects studied vary between 1,170h and 1,260h.

In the MBG, students study 43 units over the course of three years, which span a higher number of subjects per year than in the DP. Unlike the DP, however, subjects are not studied over the course of the full programme, but over the course of a semester (16 weeks). Out of the 43 total units studied in the MBG, 27 units are from the Core component ('*Componente de formación fundamental'*), eight from the Mandatory Extended Core component ('*Componente de formación fundamental extendido [UAC obligatorias]*'), and eight from the Extended Core component (made up of four subject 'pairs') linked to their selected area of specialisation. The teaching time allocated varies significantly depending on the subject – for example, the Digital Culture Workshop in year two is allocated only 16 teaching hours for the entire semester, in contrast with Humanities III (also in year two), which is allocated a total of 80 teaching hours. Overall, students experience approximately 2,556 teaching hours across the subjects they study over the three years of their MBG – not counting the teaching hours allocated to the Work Experience component ('*Componente de formación laboral básico')* and the Expanded Curriculum component (*'Componente de formación ampliada'*). This is an average of 852 teaching hours per year for subjects studied, or 1,704h over two years – noticeably more than the total recommended teaching hours for the DP.

Another notable difference between the two programmes is that the TOK and extended essay core components are only evident in the DP. The MBG does not include any similar courses. However, the MBG does include the Work Experience component and the Expanded Curriculum. The Work Experience component is designed to enable students to become familiar with procedures, techniques and instruments which will prepare them for specific work processes. Some of the objectives for this component of the MBG programme include that students "develop procedural knowledge that enable [them] to perform activities related to a specific field of work", "acquire declarative knowledge that allow them to understand the fundamentals of work processes in order to apply them in specific situations".[59] These objectives are achieved within the context of 18 available UACs, from which each individual institution can choose the UACs that are most appropriate for them. These UACs include options such as Tourism, Electronics, Graphic Design and Accounting. The Expanded Curriculum consists of three aspects; social responsibility, physical body care and affective

[58] International Baccalaureate. (2024). *DP curriculum*.
[59] Mexican Secretariat of Public Education. (2024). *Curricular Structure*. Available from: General Baccalaureate (sep.gob.mx)

emotional wellbeing. Social responsibility focuses on students displaying ethical conduct and is linked to principles of citizenship, social rights and sensitivity to social problems. Physical body care promotes the learning and development of healthy habits and building a relationship of respect towards one's own body. This component of the MBG programme is designed to give students techniques to promote positive body image and prevent conditions and diseases such as obesity, anorexia etc. whilst enabling students to have power over decisions that affect their own bodies. The affective emotional wellbeing aspect of the Expanded Curriculum focuses on students developing resilience, but also understanding of their emotions and techniques to manage them. Students are encouraged to be empathetic and foster healthy, comforting relationships with others.

4.4 Requirements and Associated Outcomes

Regarding entry requirements, there are no formal entrance requirements stipulated for the DP as the IB envisages numerous educational pathways leading to upper secondary education.[60] However, the IB recommends consulting the subject guides prior to enrolment to ensure an adequate understanding of programme expectations.[61] In contrast, entry into the MBG is dependent on the successful completion of lower secondary education, with admission requiring the Certificate of Secondary Education (*'Certificado de Educación Secundaria')*. Additionally, admission by a number of institutions also requires a standardised admissions test, the most common being the *Examen Nacional de Ingreso a la Educación Media Superior* (EXANI-I), or the 'National Entrance Exam to Upper Secondary Education'[62] which is often sat upon completion of the final year of lower secondary. That said, this is not a national mandatory requirement for entry to all secondary schools.

Notably, while not a requirement, the DP does recommend that, to study *some* subjects at HL, some prior study in the specific subject area is advisable. No similar subject-specific requirements were found within the MBG documentation.

In terms of associated outcomes, both programmes aim to prepare students for higher education and/or employment. According to the DP documentation, although the DP is conceived as a preparatory programme for university matriculation and higher education focusing primarily on rigorous academic study, the programme can also prepare students for employment. Similarly, the MBG describes its purpose as one of developing the 'knowledge, abilities, attitudes and skills' of students 'to become useful and active subjects in everyday life, higher education and the world of work'.[63]

The IB diploma can often be used to grant direct entry into higher education institutions. In Mexico, MBG students will likely need, in addition to the Certificate of Completion of Education (*'Certificado de Terminación de Estudios')*, to present their results from the EXANI-II or an alternative admissions test to access higher education institutions.

[60] International Baccalaureate. (2015). *Diploma Programme: From principles into practice*. p. 22.
[61] Ibid.
[62] CENEVAL. (n.d.). *EXANI-I*. Available from: Nivel Medio Superior EXANI I - Ceneval.
[63] Government of Mexico. (n.d.). *Bachillerato General – Profile of the Bachillerato*. Available from: Bachillerato General (sep.gob.mx)

Overall, the MBG has greater entrance requirements than the DP, as it specifies successful completion of the previous education stage. Both courses can serve as preparatory programmes for higher education and employment. However, whereas the DP grants direct entry to higher education, entry for upper secondary education graduates in Mexico is often also contingent on the scores they obtain in standardised admissions tests.

4.5 Student Learning Pathways

In terms of learning pathways, both programmes include compulsory and optional subjects. See the programme overviews in section 4.1 for further details on subject selection. To understand the levels of optionality and potential specialisation in each programme, it is instructive to look at what an individual student would be able to choose in practice. The following diagrams demonstrate the subject options available to an imagined student who knows that they would like to study physics at university after the completion of their upper secondary studies.

Figure 7: DP imagined pathway for a student wishing to study physics at university

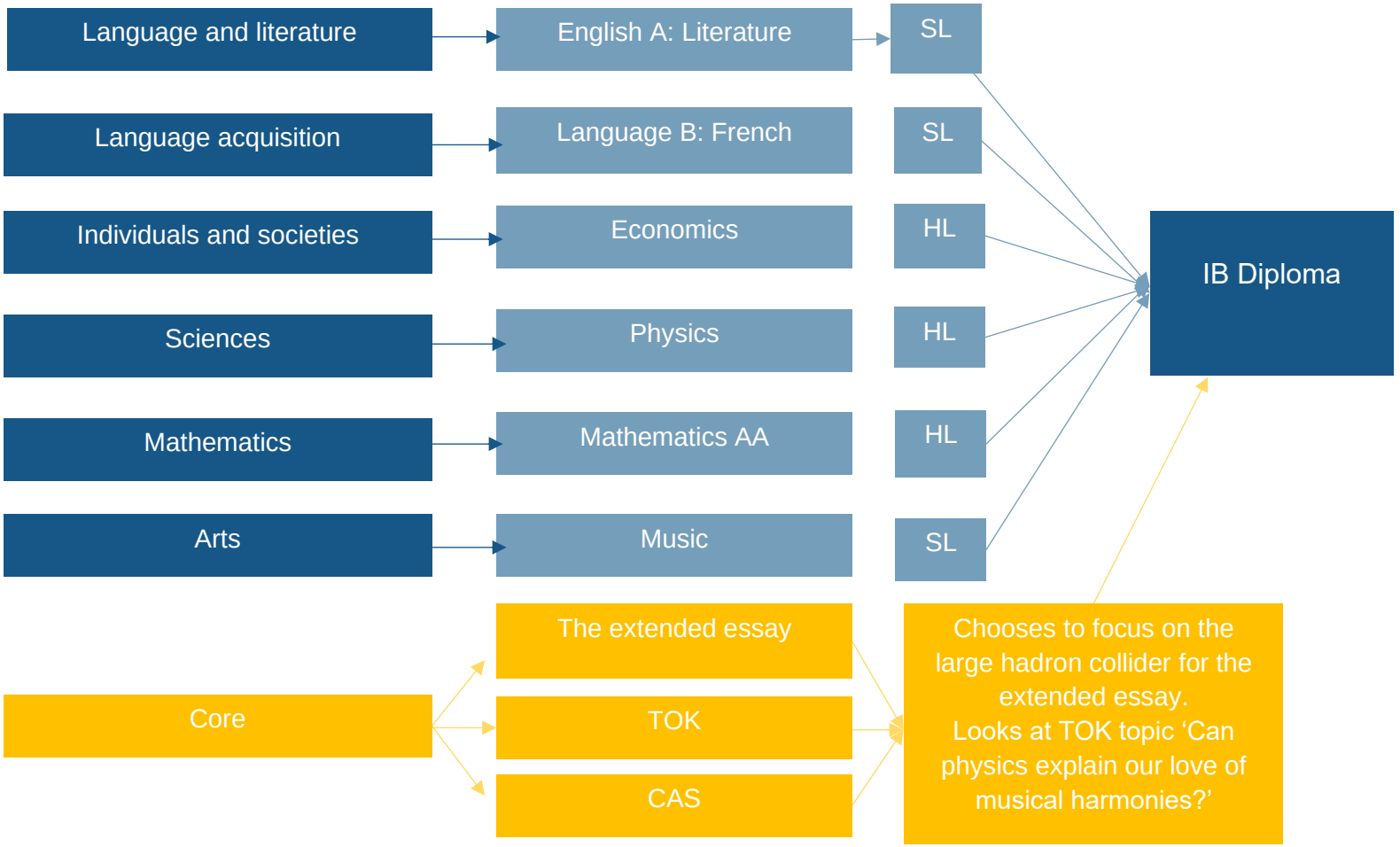
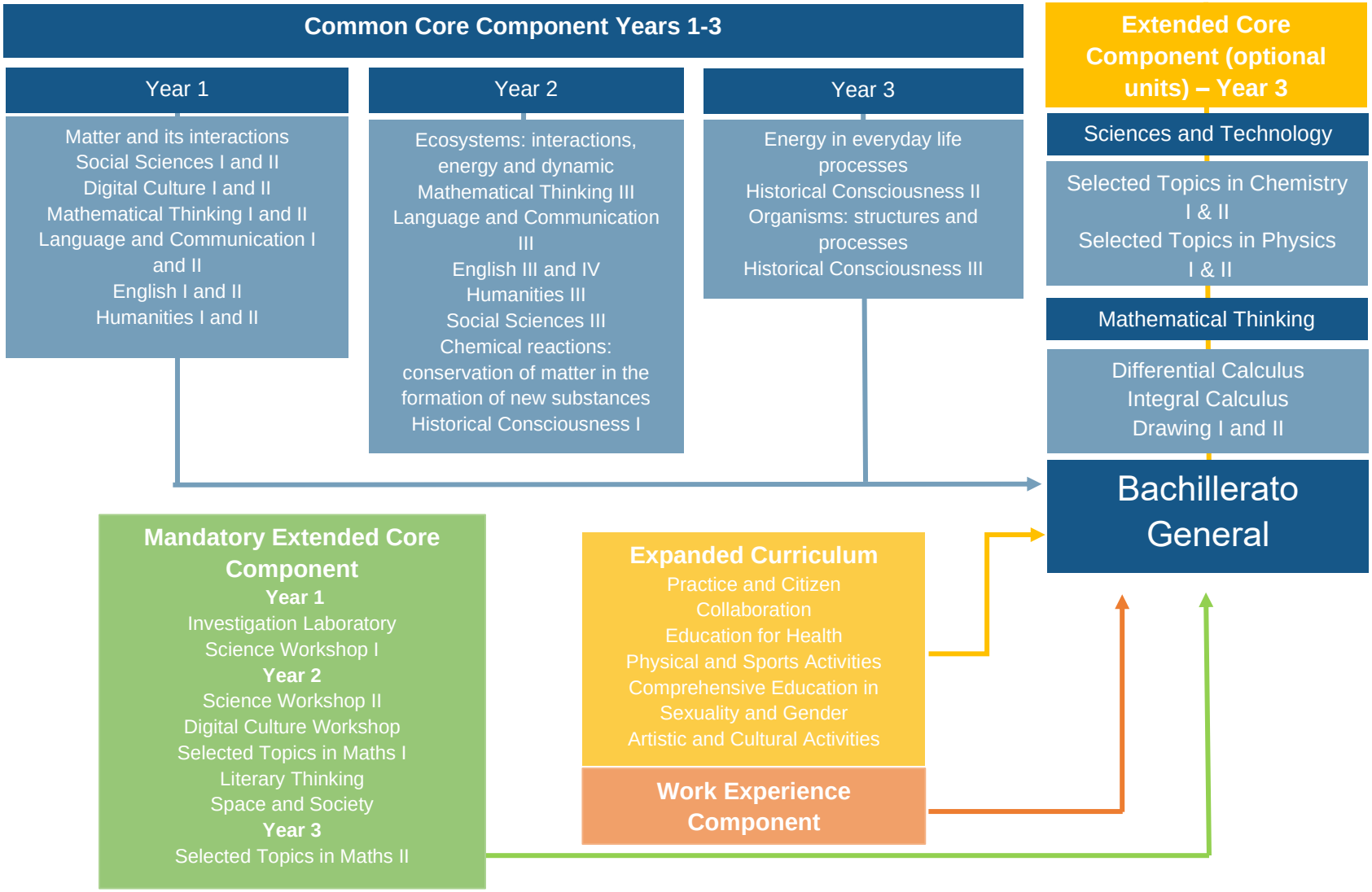


Figure 8: MBG imagined pathway for a student wishing to study physics at university



As can be seen from the diagrams, both MBG and DP students experience significant levels of breadth in their upper secondary studies. Both programmes allow for students to study subjects from various different areas – i.e. sciences, mathematics, humanities and languages. Additionally, both programmes give students the opportunity to specialise in certain subject areas. In the MBG, this is done through the selection of eight optional subjects in the final year (semesters five and six), while in the DP, it is achieved through studying specific subjects at HL.

Nonetheless, there are some notable differences in the pathways students follow in each programme. One key difference is that students in the MBG experience a considerably higher number of subjects than students in the DP. DP students are required to study a total of six subjects, typically one from each subject group; though the programme allows students to opt for additional sciences, individuals and societies or languages subjects instead of a subject in the arts group. In contrast, MBG students are required to study 35 UACs through the Core component and Mandatory Extended component, and eight optional UACs, which totals 43 units over three years.

The degree of optionality afforded to students also differs. DP students are required to select a subject from each of the six subject areas – thus, they choose all their subjects. In contrast, the MBG mandates a core curriculum for all students, with optionality only being available through the choice of units in year 3.

The number of subjects in which students are allowed to specialise also differs between the programmes, as do the hours dedicated to specialist subjects. Students in the DP will typically study three subjects at HL, though they can also choose to study four at this level. This represents a total of 720h (for three subjects at HL) or 960h (for four subjects at HL) dedicated to subjects that students want to specialise in. In contrast, students in the MBG will study eight specialty subjects in their final year. This represents a total of 480h dedicated to specialty subjects. As such, while the DP allows students to specialise in a lower number of subjects, students dedicate considerably more time to specialty subjects than in the MBG.

In summary, both programmes prioritise both breadth and depth, covering similar subject areas. Study in the MBG spans a greater number of subjects, but the DP allows for a greater degree of optionality. The DP likewise dedicates more time to subjects of specialisation. Both programmes intend for students to learn according to their interests and aspirations.

4.6 Assessment Methods

This section looks at the key features of assessment in both programmes by using a simple table followed by a short textual description of the key similarities and differences.

Table 14: Top level assessment comparisons

	DP	Mexican BG
External assessment	✓	✗
Weighting	Varies by subject	0%
Mathematics	**SL & HL**: 80%	N/A
Sciences	**SL & HL**: 80%	N/A
Methods	Exam (Typically, two-three exam papers per subject)	N/A
Mathematics	**SL**: 2 papers of 90 minutes in duration each, with 80 marks available in each. **HL**: 3 papers with durations of 120, 120, and 60 minutes. Marks available are 110, 110, and 55. **Question Types**: compulsory short-response and extended response questions, incorporating problem solving in HL paper 3.	N/A
Sciences	**SL**: 2 papers worth 36% and 44% of total assessment weighting, with duration of 1 hour and 30 minutes each. **HL**: 2 papers worth 36% and 44% of total assessment weighting, with duration of 2 hours and 2 hours and 30 minutes respectively. **Question Types**: multiple-choice, short and extended response, and data-based	N/A
Internal assessment	✓ (Often used)	✓
Weighting	Varies by subject	100%
Mathematics	**SL & HL**: 20%	100% of final grade determined by diverse assessment methodologies according to guidance, outlined in the national curriculum
Sciences	**SL & HL**: 20%	100% of final grade determined by diverse assessment methodologies according to guidance, outlined in the national curriculum
Methods	Vary by subject, but should follow IB guidance	Vary by subject but should be both formative and summative, designed around subject-specific competencies, skills and knowledge.
Mathematics	**SL & HL**: A 'mathematical exploration' involving a piece of written work for 20 marks.	Combination of approaches designed by schools and teachers.
Sciences	A practical, individual investigation with 10 hours duration and 3000-word write-up.	Combination of approaches designed by schools and teachers.

This table shows substantial differences in the two programmes' overall approach to assessment. The DP prioritises external assessment in the form of exams, whilst internal assessment only accounts for 20-30% of the final mark in each subject.[64] In contrast, assessment leading to the Certificate of Completion of Education ('*Certificado de Terminación de Estudios*') is centred around internal assessments which are delivered flexibly according to

[64] International Baccalaureate. (2021). *Understanding DP Assessment*.

the needs of each school. Assessment of the MBG is understood to be diagnostic, formative and summative, as well as continuous, aiming to provide feedback on and to facilitate the development of specific skills and competencies outlined for the MBG.

Although not compulsory for the Certificate of Completion of Education, students who wish to access higher education also often complete the EXANI-II or another standardised admissions test in order to demonstrate their readiness for higher education.

Despite a heavy emphasis on internal assessment, the assessment methods used in the MBG may share some similarities with those used by the DP. The MBG's Guidelines for the Evaluation of Learning mention multiple assessment methods and question types, including mathematical problems, questionnaires, concept maps, essays, exhibitions, summaries, project development, simulations, case study analysis, presentations, and portfolios – many of which can be used in the DP as part of internal assessment. Other sources on the MBG also mention internally-set written exams.[65] The DP also uses written exams, but as part of its external assessment component. Moreover, the MBG guidance is non-prescriptive when it comes to assessment methods and question types to be used per subject, therefore meaningful comparisons between the two programmes on this aspect are challenging.

Indeed, whilst the DP uses clear assessment objectives to demonstrate the nature and proportional importance of the skills assessed, the guidelines for assessment in the MBG simply specify a requirement to evaluate key subject-related skills and competences outlined in the MBG – specific assessment objectives are determined by each school. The table below presents a comparison of the DP assessment objectives and the MBG competencies per subject for the mathematics and sciences subjects compared in this study.

Table 15: Comparison of DP mathematics (AA and AI) subject's assessment objectives and the MBG mathematics learning goals and extended disciplinary competencies developed

DP mathematics assessment objectives	MBG mathematics[66]
AO1: Knowledge and understanding	*…expand [student's] network of mathematical knowledge…* *…Interprets, by integrating different perspectives and methods, the central concept of differential calculus…* *…using basic principles and properties of synthetic geometry…*
AO2: Problem solving	*Formulates and solves mathematical problems, applying different approaches…* *…Analyses the results obtained by applying algorithmic procedures typical of mathematical thinking in solving problems.*
AO3: Communication and interpretation	*…Organizes the procedures used to solve a problem through formal arguments to submit it to debate or evaluation…* *Develop perception and intuition to generate conjectures in situations that require explanation or interpretation…*

[65] See, for example: Instituto Motolinia. (n.d.). *Requisitos y Procedimientos de Evaluación en Bachillerato*. Available from: REQUISITOS Y PROCEDIMIENTOS DE EVALUACIÓN EN BACHILLERATO – Colegio Motolinía (motoliniavalles.edu.mx)

[66] Mexican Secretariat of Public Education. (2023). *Learning progressions for the socio-cognitive resource Mathematical Thinking.* Available from: Progresiones de Aprendizaje - Pensamiento Matematico.pdf (sep.gob.mx); Undersecretary of Higher Secondary Education. (2018). *Programs of Study for the Class of 2022 – 2025. Propaedeutic Training Component.* Available from: Programs of Study for the Generation 2023 - 2026 and Subsequent. (sep.gob.mx)

DP mathematics assessment objectives	MBG mathematics[66]
	Describe situations or phenomena using rigorous mathematical language and natural language.
AO4: Technology	*Check the procedures used in solving problems using various methods, technological resources…*
AO5: Reasoning	*Use an abstract, conceptual, graphic or symbolic representation to describe a phenomenon or a process…* *Adopts both intuitive and formal mathematical reasoning processes such as observing, intuiting, conjecturing and arguing, to relate information and obtain conclusions from problems…*
AO6: Inquiry approaches	*Develop perception and intuition to generate conjectures in situations that require explanation or interpretation…* *…verifying compliance with the necessary hypothesis…*

Table 16: Comparison of DP sciences subjects' assessment objectives and the MBG science and engineering practices and extended disciplinary competencies developed

DP sciences assessment objectives	MBG science[67]
AO1: demonstrate knowledge	*…confront preconceived ideas about natural phenomena with scientific knowledge to explain and acquire new knowledge…explain phenomena based on the evidence collected in their learning process…*
AO2: knowledge understanding and application	*…apply scientific and technological advances…apply the appropriate methodology…solve established or real problems in the environment…apply knowledge about the function of nutrients…*
AO3: analyse, evaluate, and synthesize	*…analyse and interpret data…analyse the composition, changes and interdependence between matter and energy in natural phenomena…evaluate information and its reliability…evaluate the implications of the use of science and technology…*
AO4: investigation skills	*…apply the appropriate methodology…use specialized tools and equipment…design prototypes or models…handling of substances, instruments and equipment…plan and conduct research…*

As can be seen from these tables, many of the same broad skills are seemingly targeted and assessed in both the DP and MBG mathematics and sciences subjects. The table demonstrates that both programmes recognise the importance of developing foundational knowledge and understanding but also seek to develop and assess how students can use, explore, and articulate that understanding. There is also similar focus on the ability of students to demonstrate analytical and evaluative skills, as well as capability in investigations and problem-solving. In this sense, the skills-based criteria for assessment show broad alignment.

[67] Mexican Secretariat of Public Education. (2023). *Learning Progressions in the area of Natural Sciences, Experimental Sciences and Technology. Science and Engineering Practices.* Available from: *educacionmediasuperior.sep.gob.mx/work/models/sems/Resource/13516/1/images/Ciencias naturales experimentales y tecnologia - sintetico.pdf;* Undersecretary of Higher Secondary Education. (2018). *Programs of Study for the Class of 2022 – 2025. Propaedeutic Training Component.* Available from: Programs of Study for the Generation 2023 - 2026 and Subsequent. (sep.gob.mx)

Overall, whilst both the DP and MBG feature internal assessment, only the DP uses external assessment. However, while external assessment is not required for the Certificate of Completion of Education, students will experience external assessment if they take the EXANI-II or another university admission test. Some similarities can be drawn with regards to some of the internal assessment methods that are used by the two programmes, although the MBG lacks specific information on this aspect. Finally, despite not featuring assessment objectives, the skills targeted in the MBG's competencies for each subject share similarities with those assessed by the DP subjects.

5. Subject-Level Alignment

This section focuses on answering RQ3 and the sub-questions associated to it, namely:

Table 17: Research question 3

RQ3: To what degree do the subjects align with regards to: 3.1: Content • Topics (i.e. scope of content area, breadth depth) • Learning activities (i.e. difficulty, demand). 3.2: Expected learning outcomes • Knowledge • Competences (i.e. subject-specific, 21st century competences).

For each subject area, there is a brief introduction to the subjects being compared, followed by an overview of the findings from the comparative analysis between the DP subjects and the Bachillerato General comparison points regarding learning outcomes, content, and demand.

5.1 Mathematics

The following is the list of subjects and units used in the mathematics comparison analysis.

Mathematics: analysis and approaches[68]
Mathematics: analysis and approaches (AA) is a subject option from the mathematics group in the DP curriculum – offered at both SL and HL. This subject is intended for students who are interested in both real and abstract applications of mathematical concepts and enjoy problem solving and generalisation. SL is suitable for students who want to study a good level of mathematics, but not at an advanced level. Therefore, SL prepares students for further study in areas involving mathematical elements, such as geography. HL is suitable for students who want an in-depth study of mathematics and enjoy solving challenging problems. Therefore, HL prepares students for further study in mathematics, as well as other areas with a strong mathematical focus, such as physics and engineering.

Mathematics: applications and interpretation[69]
Mathematics: applications and interpretation (AI) is a subject option from the mathematics group in the DP curriculum – offered at both SL and HL. This subject is intended for students who are interested in exploring more practical applications of mathematics and would enjoy using mathematical models and technology. SL is most suitable for those who want to obtain a good level of knowledge of mathematics, with a focus on real-world applications. Therefore, SL prepares students for further study in areas with some practical mathematics elements, such as biology and business. HL is suitable for students wishing to gain more in-depth knowledge of mathematics, with a focus on real-world situations and the applications of mathematics.

[68] International Baccalaureate. (2019). *Mathematics: analysis and approaches guide*.
[69] International Baccalaureate. (2019). *Mathematics: applications and interpretation guide.*

Mathematical Thinking[70]

Mathematical Thinking (MT) is one of the four Socio-cognitive Resources in the Common Curriculum Framework for Higher Secondary Education in Mexico and includes common learning for all high school students. Socio-cognitive Resources play transversal roles, designed to support and enhance learning in the knowledge areas and other Socio-cognitive Resources. The curriculum structure is such that all the Curricular Learning Units offered for mathematics come under the Socio-cognitive Resource of Mathematical Thinking. For the MBG, some of the Curricular Learning Units are compulsory and some are optional, as detailed below.

Compulsory *Mathematical Thinking units in the Bachillerato General:*

- **Mathematical Thinking I, II, and III**[71]
  Mathematical Thinking I, II, and III are part of the Core component, described by the Mexican Common Curriculum Framework for Higher Secondary Education and are common learning for all high school students. These first three curricular units in Mathematical Thinking place emphasis on developing the skills associated with mathematical thinking, such as problem-solving and reasoning, which will benefit students regardless of their future career path. Each curricular unit corresponds to the first three semesters of high school.

- **Selected Topics in Mathematics I and II**[72]
  Selected Topics in Mathematics I and II are part of the Mandatory Extended Core component and are compulsory units for all institutions offering the Bachillerato General. These units follow Mathematical Thinking I, II, and III and are designed to broaden and deepen knowledge mathematical knowledge through covering additional topics and concepts.

Optional *Mathematical Thinking units in the Bachillerato General:*[73]

- **Probability and Statistics I** and **Probability and Statistics II**
- **Differential Calculus** and **Integral Calculus**
- **Financial Mathematics I** and **Financial Mathematics II**
- **Drawing I** and **Drawing II**

The optional mathematics units listed above are part of the Extended Core curriculum component and, if chosen, are studied in the last two semesters of high school. Students of the Bachillerato General choose eight optional units, from a range of Areas of Knowledge and

[70] Mexican Secretariat of Public Education. (2023). *Learning progressions for the socio-cognitive resource Mathematical Thinking.* Available from: Progresiones de Aprendizaje - Pensamiento Matematico.pdf (sep.gob.mx)
[71] Ibid.
[72] Undersecretary of Higher Secondary Education. (2021). *Selected Topics in Mathematics I*. Available from: https://www.cobachbcs.edu.mx/Content/Files/Docentes/programas-de-asignatura/semestre-5/componente-propedeutico/03-ciencias-exactas-e-ingenierias/temas-selectos-de-matematicas.pdf; *Selected Topics in Mathematics II*. Available from: https://www.cobachbcs.edu.mx/Content/Files/Docentes/programas-de-asignatura/semestre-6/componente-propedeutico/03-ciencias-exactas-e-ingenierias/temas-selectos-de-matematicas-II.pdf
[73] Undersecretary of Higher Secondary Education. (2018). *Programs of Study for the Class of 2022 – 2025. Propaedeutic Training Component.* Available from: Programs of Study for the Generation 2023 - 2026 and Subsequent. (sep.gob.mx)

Socio-cognitive Resources, and therefore the number of above optional units studied will vary between students. Each unit deepens students' knowledge of a particular area of mathematics.

The analysis will consider, and distinguish between, MT units which are compulsory in the Bachillerato General, and those which are optional.

5.1.1 Learning Outcomes – Mathematics

This section compares and contrasts the learning outcomes of curricula falling within the category of mathematics. For its mathematics learning outcomes, the DP sets out aims and assessment objectives for all subjects within the mathematics subject group – hence the extracted themes are the same for mathematics: analysis and approaches and mathematics: applications and interpretation.

The mathematics learning outcomes for the Bachillerato General are drawn from the Learning Progressions for Mathematical Thinking and the Programmes of Study for the optional units. From Learning Progressions for Mathematical Thinking, the trajectory learnings, learning goals, and categories and sub-categories of Mathematical Thinking are the main sources for learning outcomes, though other areas in the learning progression document are also considered. From the Programmes of Study of optional subjects, the General Competencies, and the Extended Disciplinary Competencies (for Mathematics), are used as learning outcomes, and are the same across all optional mathematics units.

The following summary table presents the learning outcome themes extracted from DP mathematics and indicates if, and where, they are judged to have presence within the learning outcomes of the Bachillerato General.

Table 18: Presence of the DP mathematics subject group learning outcome themes in the Bachillerato General.

Themes extracted from the learning outcomes in the DP mathematics subject group	Presence in the Bachillerato General	
1. Be aware of, and engage with, mathematics in its wider context		Not strongly present in the Bachillerato General's learning outcomes for mathematics
2. Develop learning skills; having a positive and resilient attitude, working both independently and collaboratively, being reflective and evaluating work		These skills are intended to be developed in the compulsory units of Mathematical Thinking and in the optional units' General Competencies
3. Use inquiry-based approaches		Although there is not a strong emphasis on using inquiry-based approaches, the ability to observe and make conjectures is expected in Mathematical Thinking I, II, and III
4. Understand the concepts, principles and nature of mathematics and apply concepts and procedures to a range of contexts		Present in the trajectory learning, learning goals, and 'Procedural' category of Mathematical Thinking I, II, and III, as well as the Extended Disciplinary Competencies of the optional units
5. Make links and generalisations		This theme is evidenced by the focus on 'transversality' in the Bachillerato General. For example, Mathematical Thinking is expected to

Themes extracted from the learning outcomes in the DP mathematics subject group	Presence in the Bachillerato General	
		be integrated with Areas of Knowledge and other Socio-cognitive Resources
6. Develop critical/creative thinking skills e.g. problem-solving and reasoning		Present in the trajectory Learning, learning goals, and categories of Mathematical Thinking I, II, and III. Also present in the Extended Disciplinary Competencies of optional units
7. Communicate mathematics clearly and in various forms		Present in the trajectory learning for Mathematical Thinking I, II, and III
8. Know how technology and mathematics influence each other and use technology to develop ideas and solve problems		Use of technology is present, but not as strongly as in the DP

Key:

	This theme is well-evidenced in the learning outcomes of the Bachillerato General		*This theme is partially evidenced in the learning outcomes of the Bachillerato General*		*This theme is not evidenced in the learning outcomes of the Bachillerato General*

Presence of the DP's Learning Outcome Themes

There is reasonably strong alignment between the DP's and Bachillerato General's learning outcomes for mathematics, with most of the DP's themes being evidenced. The following discusses in more detail the presence of each DP theme in the Bachillerato General's learning outcomes.

1. Be aware of, and engage with, mathematics in its wider context

The DP's mathematics theme of awareness and engagement with wider contexts is not a strong focus of the Bachillerato General's mathematics learning outcomes. Indeed, there are no similar expectations to the DP, which include applying mathematics to developments in local and global communities, appreciating the moral, social, and ethical questions arising from mathematics, and appreciating multicultural and international perspectives. That said, teachers of the Bachillerato General could this involve this theme, as the Learning Progressions document for Mathematical Thinking I, II, and III contains suggestions for integrating mathematical thinking into Historical Awareness, including learning the history of how concepts were developed.

Furthermore, in the optional units' Programmes of Study there are references to using contexts from the real-world, such as sustainable development. Moreover, while not specifically for mathematics, it can be noted that the General Competencies somewhat reflect this theme through expectations that students engage with multiple perspectives and global issues regarding the environment.

2. Develop learning skills; having a positive and resilient attitude, working both independently and collaboratively, being reflective and evaluating work

The DP mathematics theme of developing transferable learning skills is well evidenced in the Bachillerato General. Indeed, within Learning Progressions for Mathematical Thinking it is expressed that, similarly to the DP, students should develop positive and curious attitudes to mathematics, perseverance in problem solving, and the ability to work independently and

collaboratively. Furthermore, while not specific to mathematics, the General Competencies for optional units include similar transferable learning skills, such as collaborative working and learning autonomously.

3. Use inquiry-based approaches

The DP mathematics theme of using inquiry-based approaches is somewhat evidenced in the learning outcomes of the Bachillerato General. Indeed, the expectation of performing investigations is not highlighted as a requirement in the mathematics units. However, students may use some skills related to inquiry-based approaches, as the Bachillerato General identifies the ability to observe and make conjectures as a sub-category of Mathematical Thinking.

4. Understand the concepts, principles and nature of mathematics and apply concepts and procedures to a range of contexts

The DP mathematics theme of understanding and applying mathematics is well-evidenced in the Bachillerato General. One of the four trajectory learnings of Mathematical Thinking focuses on the application of procedures to various contexts, such as knowledge areas and everyday life. Furthermore, several of the learning goals display this theme, as they include using algorithms and procedures, and establishing strategies and visualisations, to aid understanding. Furthermore, the Extended Disciplinary Competencies in the optional units also include the application of concepts to various contexts.

5. Make links and generalisations

The DP mathematics theme of making links and generalisations is well-evidenced in the Bachillerato General. Indeed, 'transversality' is a key focus in the curriculum and, as outlined in Learning Progressions for Mathematical Thinking, the area is designed as a Socio-cognitive Resource, which has the purpose of supporting learning in the Areas of Knowledge, which in turn deepens mathematical learning. Furthermore, the categories and sub-categories in Mathematical Thinking have been designed with the intention that connections are made within areas of mathematics, as well as for facilitating metacognition, reflection, and abstraction. Moreover, the Extended Disciplinary Competencies in optional units include transversal themes, namely social, environmental, health, and reading, which promote the application of mathematics in these contexts.

6. Develop critical/creative thinking skills e.g. problem-solving and reasoning

Similarly to the DP, developing critical and creative thinking skills is a strong focus in the Bachillerato General. Problem-solving and reasoning are particularly key skills in the Bachillerato General, and are the focus of several trajectory learnings, categories of MT, and subsequent learning goals. Specifically, the Bachillerato General expects students to develop processes of intuition and reasoning, which include making conjectures and approximations, and producing rigorous arguments. Furthermore, like the DP, the Bachillerato General learning outcomes expect students to propose solutions and models to problems set in a range of theoretical and practical contexts. This theme is also present in the Extended Disciplinary Competencies of the optional units, which include the skills of building models and using different approaches in solving problems.

7. Communicate mathematics clearly and in various forms

The DP theme of communicating mathematics is clearly evidenced in the mathematics learning outcomes of the Bachillerato General. Indeed, mathematical communication is the focus of one of the categories of MT, within which students are expected to use correct mathematical language, interpret and generate expressions and representations, and communicate ideas, concepts, and conjectures with others. Moreover, the learning goals also reflect this theme, as they expect students to use rigorous mathematical language, as well as to socialise and debate with peers. The theme is also present in the Extended Disciplinary Competencies of optional units, which expect students to interpret various representations and to communicate solutions using mathematical language, both verbally and in written form.

8. Know how technology and mathematics influence each other and use technology to develop ideas and solve problems

This DP theme involving the use of technology is not strongly represented in the Bachillerato General mathematics learning outcomes. Indeed, the use of technology is only referenced once within the learning goals, in the context of checking a procedure taken for solving a problem. Indeed, there is not the same emphasis as the DP, which strongly promotes the use of technology to solve problems and develop ideas.

Other Themes in the MBG

The skills described for mathematics in the Bachillerato General all relate to the DP's learning outcome themes. However, it can be noted one or two specific skills have a more explicit emphasis in the Bachillerato General. These include intuitive thinking and using heuristic strategies.

Summary

Overall, there is reasonably strong alignment between the DP and Bachillerato General with regards to mathematics learning outcomes. In particular, they have strong similarities with regards to developing critical thinking skills (such as problem solving and reasoning), making links with other areas of knowledge, communicating mathematics in various formats, and developing transferable learning skills. However, the use of technology receives a significantly lesser focus in the Bachillerato General compared to the DP, as does the use of inquiry-based approaches. Furthermore, engaging with wider contexts is not a present theme in mathematics units learning outcomes specifically, however it is an intended outcome for the Bachillerato General in general. Although no significantly different themes emerge from the Bachillerato General, it can be noted that there is more explicit emphasis on developing intuitive thinking and heuristics strategies as part of students' reasoning skills.

5.1.2 Content – Mathematics

This section compares the content of DP mathematics subjects with the mathematics content in the Bachillerato General. To support the visual comparison at-a-glance, the mathematics content from the DP and Bachillerato General are presented in the following diagrams.

Figure 9: DP mathematics: analysis and approaches content visualiser

	Standard level topics	Additional higher level topics
Topic 1 Number and algebra	1.1 Standard form; 1.2 Arithmetic sequences and series; 1.3 Geometric sequences and series; 1.4 Financial applications and geometric sequences and series; 1.5 Integer exponents and intro to logarithms; 1.6 Simple proof; 1.7 Rational exponents and laws of logarithms; 1.8 Sum of infinite convergent geometric sequences; 1.9 Binomial theorem (natural number)	1.10 Counting principles and extended binomial theorem; 1.11 Partial fractions; 1.12 Complex numbers intro; 1.13 Polar and Euler form; 1.14 Complex roots, De Moivre's theorem and powers/roots of complex numbers; 1.15 Proof by counter example, contradiction, and induction; 1.16 Solutions of systems of linear equations
Topic 2 Functions	2.1 Gradients and equations of straight lines; 2.2 Intro to functions; 2.3 Graphing functions; 2.4 Key features of graphs; 2.5 Composite, identity, and inverse functions; 2.6 Quadratic functions; 2.7 Solving quadratic equations and inequalities & the discriminant; 2.8 Reciprocal and rational functions; 2.9 Exponential and logarithmic functions; 2.10 Graphical and analytical solutions; 2.11 Transformations	2.12 Polynomial functions; 2.13 Harder rational functions; 2.14 Odd, even, and inverse functions; 2.15 Graphical and analytical solutions of inequalities; 2.16 Further graphs, including modulus and solutions
Topic 3 Geometry and trigonometry	3.1 Geometry recap; 3.2 Trigonometry recap; 3.3 Applications and diagrams; 3.4 Circles and radians; 3.5 Definitions, exact values, and sine rule for ambiguous case; 3.6 Identities and relationships; 3.7 Functions and transformations of sin, cos, and tan; 3.8 Solving trigonometric equations graphically and analytically	3.9 Reciprocal trigonometric ratios, identities, and inverse functions; 3.10 Compound angle identities and double angle for tan; 3.11 Symmetry properties; 3.12 Intro to vectors; 3.13 Scalar product and application; 3.14 Vector equation of a line and application; 3.15 Coincident, parallel, skew, and intersecting lines; 3.16 Cross product of vectors; 3.17 Planes; 3.18 Intersections and angles (planes)
Topic 4 Statistics and probability	4.1 Sampling; 4.2 Presenting data (tables, histograms, cumulative freq.); 4.3 Measures of central tendency and dispersion; 4.4 Correlation and regression line; 4.5 Intro to probability; 4.6 Diagrams, conditional probability, combined or independent events; 4.7 Discrete random variables; 4.8 Binomial distribution; 4.9 Normal distribution; 4.10 Equation of regression line of x on y; 4.11 Formulae for conditional probabilities and independent events; 4.12 Standardisation of normal variables (z-values)	4.13 Bayes' theorem; 4.14 Continuous random variables
Topic 5 Calculus	5.1 Intro to limits and derivatives; 5.2 Increasing and decreasing functions; 5.3 Derivative of $f(x)=ax^n$; 5.4 Tangents and normal; 5.5 Definite integrals; 5.6 More derivatives and use of product, chain, and quotient rules; 5.7 The second derivative; 5.8 Maximum, minimum and inflection points, and optimization; 5.9 Kinematic problems; 5.10 Indefinite integrals and integration by inspection and substitution; 5.11 Definite integrals and area under and between curves	5.12 Continuity, differentiability, limits, and higher derivatives; 5.13 Evaluation of limits and L'hopitals rule; 5.14 Implicit differentiation; 5.15 Further derivatives and indefinite integrals; 5.16 Integration by substitution and by parts; 5.17 Volumes of revolution; 5.18 First order differential equations; 5.19 Maclaurin series
The toolkit and mathematical exploration	The exploration is a piece of written work that involves investigating an area of mathematics.	

Figure 10: DP mathematics: applications and interpretation content visualiser

	Standard level topics	Additional higher level topics
Topic 1 Number and algebra	1.1 Standard form; 1.2 Arithmetic sequences and series; 1.3 Geometric sequences and series; 1.4 Financial applications of geometric sequences and series; 1.5 Integer exponents and intro to logarithms; 1.6 Approximation, estimation, bounds and errors; 1.7 Amortization and annuities using technology; 1.8 Using technology to solve systems of equations and polynomials	1.9 Laws of logarithms; 1.10 Rational exponents; 1.11 The sum of infinite geometric sequences; 1.12 Complex numbers; 1.13 Euler and Polar form; 1.14 Matrices; 1.15 Eigenvalues and eigenvectors
Topic 2 Functions	2.1 Gradients and equations of straight lines; 2.2 Intro to functions; 2.3 Graphing functions; 2.4 Key features of graphs; 2.5 Modelling with functions; 2.6 Modelling skills	2.7 Composite and inverse functions; 2.8 Transformations; 2.9 Modelling further functions; 2.10 Using logarithms to scale numbers and linearize data
Topic 3 Geometry and trigonometry	3.1 Geometry recap; 3.2 Trigonometry recap; 3.3 Applications and diagrams; 3.4 Circles, sectors, and arcs; 3.5 Equations of perpendicular bisectors; 3.6 Voronoi diagrams	3.7 Radians; 3.8 Sin, Cos, Tan definitions, and Pythagorean identity; 3.9 Matrix transformations; 3.10 Vectors introduction and notation; 3.11 Vector equation of a line; 3.12 Vector application to kinematics; 3.13 Scalar and cross product; 3.14 Graph theory, simple graphs, directed graphs, and subgraphs; 3.15 Adjacency matrices and weighted adjacency tables; 3.16 Decision math
Topic 4 Statistics and probability	4.1 Sampling; 4.2 Presenting data (tables, histograms, cumulative freq.); 4.3 Measures of central tendency and dispersion; 4.4 Correlation and regression line; 4.5 Intro to probability; 4.6 Diagrams, conditional probability, combined or independent events; 4.7 Discrete random variables; 4.8 Binomial distribution; 4.9 Normal distribution; 4.10 Spearman's rank; 4.11 Hypothesis testing, chi-squared and t-tests	4.12 Collecting and organising data and testing for reliability and validity; 4.13 Regression, residuals, coefficient of determination; 4.14 Linear transformations, linear combinations, unbiased estimations; 4.15 Central Limit theorem; 4.16 Confidence Intervals; 4.17 Poisson Distribution; 4.18 Further hypothesis testing; 4.19 Transition matrices and Markov chains
Topic 5 Calculus	5.1 Intro to limits and derivatives; 5.2 Increasing and decreasing functions; 5.3 Derivative of $f(x)=ax^n$; 5.4 Tangents and normal; 5.5 Definite integrals; 5.6 Maximum and minimum points; 5.7 Optimisation; 5.8 Area using trapezoidal rule	5.9 More derivatives and the chain, product, and quotient rule; 5.10 Second derivatives; 5.11 Finding further integrals and integration by inspection and substitution; 5.12 Area of a region and volumes of revolution; 5.13 Kinematic problems; 5.14 Differential equations; 5.15 Slope fields and their diagrams; 5.16 Euler's method and numerical solutions to differential equations and coupled systems; 5.17 Phase portraits; 5.18 Simple second order differential equations
The toolkit and mathematical exploration	The exploration is a piece of written work that involves investigating an area of mathematics.	

Figure 11: Visualiser of Mathematical Thinking units in the Bachillerato General.

	Component of the Bachillerato General	Curricular Learning Units			
Mathematical Thinking	Core curriculum component (Compulsory Units)	**Mathematical Thinking I** (Statistical and probabilistic thinking) Learning Progressions 1-15	**Mathematical Thinking II** (Arithmetic, algebraic, and geometric thinking) Learning Progressions 1-14	**Mathematical Thinking III** (Variational thinking) Learning Progressions 1-15	
	Mandatory Extended Core curriculum component (Compulsory Units)	**Selected Topics in Mathematics I** Block I: Strategies to solve algebraic problems Block II: Linear equations I Block III: Linear equations II Block IV: Quadratic equations Block V: System of inequalities	**Selected Topics in Mathematics II** Block I: Properties of polygons Block II: Theorems of Thales and Pythagoras Block III: Trigonometric functions Block IV: Laws of sines and cosines Block V: Rectilinear segments and equations of lines		
	Extended Core curriculum component (Optional Units)	**Drawing Mathematics I** Block I: Historical background Technical Drawing Block II: Two-dimensional representation techniques Block III: Three-dimensional applications of Technical Drawing	**Financial Mathematics I** Block I: Basic foundation of Financial Mathematics and its application Block II: Sequences and series Block III: Simple interest Block IV: Personal finances	**Probability and Statistics I** Block I: Statistical elements Block II: Graphic description of a data set Block III: Statistical measurements Block IV: Behaviour of two variables	**Differential Calculus** Block I: Limits Block II: The derivative Block III: Applications of the derivative
		Drawing Mathematics II Block I: Application of Technical Drawing in mechanics Block II: Application of technical drawing in electrical systems Applications of technical drawing in construction	**Financial Mathematics II** Block I: Compound interest and inflation Block II: Annuities Block III: Amortization of credits Block IV: Depreciation of fixed assets	**Probability and Statistics II** Block I: Probability Block II: Probability distributions Block III: Probabilistic models	**Integral Calculus** Block I: Differentials Block II: Indefinite integrals Block III: Integration methods Block IV: Definite integrals and applications

Structure

The MBG organises mathematics into units, with some in each of the curriculum components (Core, Mandatory Extended Core, and Extended Core). In contrast, DP mathematics is structured into subjects rather than units, namely mathematics: analysis and its approaches (AA) and mathematics: applications and interpretation (AI). Each unit in the MBG lasts one semester, whereas the subjects in the DP are studied for the duration of the programme (two years).

Students of both the DP and MBG are required to study mathematics content as part of their respective programmes. Indeed, all DP students must take at least a SL course in mathematics (either AA or AI) and MBG students must study the compulsory units (Mathematical Thinking I, II, and III and Selected Topics in Mathematics I and II). In addition, both the DP and MBG allow students to specialise in mathematics, with the offer of doing a HL course in either AA or AI in the DP and the choice of optional units from the Extended Core curriculum component of the MBG.

Regardless of the chosen subject and level, all DP students study the same mathematics topics, namely Number and algebra, Functions, Geometry and trigonometry, Statistics and probability, and Calculus. For HL courses, the additional high level (AHL) content extends and adds to the SL content in each topic. In contrast, while all students of the MBG will study all the same topics as part of Mathematical Thinking and Selected Topics in Mathematics units, students wanting to specialise further in mathematics can choose the areas (and thus topics) of mathematics they study. Hence, at the specialisation level, students in the MBG have more flexibility than the DP with regards to the amount and type of mathematics topics that they continue to study.

Lastly, while the DP is flexible with regards to the sequencing of content in teaching, the learning progressions of MT units are given in the order that they should be taught in. Instead, autonomy is given to MBG teachers with regards to the amount of time allocated to each progression and the depth to which it is covered.

Content Alignment

This section will compare the alignment of mathematics content in the DP and MBG. The following tables present a simplified summary of the content alignment that MBG units have with each DP topic. The MBG Mathematical Thinking units are organised into those that are compulsory and those that are optional.

Table 19: Summary of the content alignment the Bachillerato General has with the main topics in AA.

	AA topics	Presence in compulsory units	Presence in compulsory and optional units
SL	1. Number and algebra		
	2. Functions		
	3. Geometry and trigonometry		
	4. Statistics and probability		
	5. Calculus		
AHL	1. Number and algebra		
	2. Functions		
	3. Geometry and trigonometry		
	4. Statistics and probability		
	5. Calculus		

Table 20: Summary of the content alignment the Bachillerato General has with the main topics in AI.

	AI topics	Presence in compulsory units	Presence in compulsory and optional units
SL	1. Number and algebra		
	2. Functions		
	3. Geometry and trigonometry		
	4. Statistics and probability		
	5. Calculus		
AHL	1. Number and algebra		
	2. Functions		
	3. Geometry and trigonometry		
	4. Statistics and probability		
	5. Calculus		

Key:

	Strong presence of this topic in the MBG		*Partial presence of this topic in the MBG*		*Little or no presence of this topic in the MBG*

Compulsory units:
Mathematical Thinking I, II, and III and Selected Topics in Mathematics I and II
Optional units:
Probability and Statistics I and II, Differential Calculus, Integral Calculus, Financial Mathematics I and II, and Drawing Mathematics I and II.

In the last columns, the alignments found in the compulsory units are carried over and combined with those in the optional units, to represent the cumulative mathematics content offered in the Bachillerato General
It should be noted that the programmes of study are currently being updated and new versions were only available for Mathematical Thinking I, II and III.

Compulsory Mathematical Thinking Units in the Bachillerato General
(Mathematical Thinking I, II, and III and Selected Topics in Mathematics I and II)

As shown in Table 19 and 20, the compulsory units combined generally have partial alignment with DP SL content and no alignment with DP AHL content. Indeed, except for Number and

algebra, the compulsory units have partial alignment with SL content in all topics. That said, it can be noted that the partial alignment with Statistics and probability and Calculus content is stronger compared to Functions and Geometry and Trigonometry content. Most of the DP SL content that is covered by the compulsory units are sub-topics which are common to both AA and AI. The following discusses the alignment the units have with each DP topic in more detail, identifying differences that arise for alignment with AA and AI.

Number and algebra

The MBG's compulsory units do not align with the DP SL or AHL content in Number and algebra. Aside from rational exponents and some counting principles, the concepts in this DP topic are not covered by the units. This includes sub-topics that are common to AA and AI, such as arithmetic and geometric sequences and series, financial applications, laws of logarithms, and complex numbers, as well as content specific to each DP subject, such as binomial theorem and proof (AA) and amortization and annuities, matrices, and eigenvectors (AI).

Functions

With regards to Functions content, the compulsory units cover linear, quadratic, exponential, and logarithmic functions, including the key features of their graphs. However, it is not explicit that concepts such as domain, range and inverse functions are covered. With regards to AA-specific content, the compulsory units do not include other SL concepts such as composite functions, inverse functions, quadratic inequalities, rational functions, and transformations, nor any AHL content involving more complex functions and analytical solutions. With regards to AI-specific content, the compulsory units cover modelling, but with fewer functions than both SL and AHL. Indeed, the compulsory units include modelling of linear and quadratics functions, but not others, such as sinusoidal and exponential growth and decay. Furthermore, the units do not explicitly outline the range of modelling skills that DP AI does. As noted for AA, transformations, composite, and inverse functions, which are AHL content in AI, are not covered by the compulsory units.

Geometry and trigonometry

With regards to Geometry and trigonometry content, the compulsory units only cover some DP SL content, which is common to both AA and AI. This includes some of the more basic geometry and trigonometry content such as solving problems regarding area and volume, right-angled triangles, and Pythagoras Theorem. Furthermore, sine and cosine functions are also considered, but in less depth, with transformations also not covered. Rather, a large proportion of content is not covered from AA and AI. Indeed, AA SL content of radians, circles, and trigonometric equations and identities is not covered, nor is any AHL content such as reciprocal functions and vectors. Furthermore, other AI SL content is not covered either, such as Voronoi diagrams, or any AHL content such as radians, matrix transformations, vectors, graph theory, adjacency matrices, or decision mathematics.

Statistics and probability

With regards to Statistics and probability content, the compulsory units cover a good amount of the DP SL content which is shared by AA and AI. This includes sampling, presenting data, measures of central tendency and dispersion, correlation, probability, and the normal distribution. However, linear regression, discrete random variables, and the binomial distribution are not covered. The compulsory units also cover a few concepts that are not

common to AA and AI, such as Bayes Theorem (AA) and hypothesis testing (AI SL). However, Bayes Theorem is a suggested extension in the compulsory units, and the coverage of hypothesis testing is significantly less in-depth than DP AI SL and AHL content (for example, it does not include chi-squared tests, t-tests, critical regions, or testing for proportion and population mean). Other AHL content from AA and AI is not covered, such as continuous random variables in AA HL and non-linear regression, Poisson distribution, Central Limit Theorem, transition matrices, and Markov chains in AI HL.

Calculus

With regards to Calculus content, the compulsory units cover a reasonable amount of DP SL content. As AI SL has less calculus content than AA SL, the compulsory units align more closely with AI SL. The units cover the concept of limits, increasing and decreasing functions, derivatives of polynomials, differentiation rules, maximum, minimum and inflexion points, and optimisation problems. However, the units do not cover any integration content, which particularly impacts alignment with AA SL. Other SL content which is not covered is the second derivative and kinematic problems (AA) and the use of the trapezoidal rule (AI SL).

In terms of AHL content, the compulsory units cover concepts of continuity and differentiability (AA), but no other AA AHL content, including further derivatives, evaluation of limits, implicit differentiation, further integration methods, and differential equations. The units also do not cover AI AHL content such as second derivatives, integration methods, differential equations, slope fields, Euler's method, phase portraits, and second order differential equations. However, it can be noted that students may set up for differential equations to represent contexts, but not solve them.

Other content in the MBG compulsory units

Most content in the compulsory units is covered by DP mathematics or is outlined as prior learning for the DP. However, linear programming is covered in Mathematical Thinking II, which is not an area focused on by either DP mathematics subject.

*Table 21: Content in the compulsory mathematics units of the MBG that is not covered in DP mathematics subjects.**

Significant content not in AA (only)	Significant content not in AI (only)
• Modelling with linear and quadratic functions • Some hypothesis testing content	• Counting principles • Continuity and differentiability
Significant content not in either DP mathematics subject	
• Linear programming	

* Significant content does not include topics which are typically studied *prior* to upper secondary.

Summary

Overall, the compulsory units have partial alignment with DP SL mathematics content, though overall represent less breadth and depth. It can be noted that the compulsory units generally have the same degree of alignment with DP AA and with DP AI, as they often cover content which is common to both. The compulsory units contain very little DP mathematics AHL content, and do not cover many other significant areas, they therefore have significantly less breadth and depth than DP HL mathematics.

Optional Mathematical Thinking Units in the Bachillerato General
(Statistics and Probability I and II, Differential Calculus, Integral Calculus, Financial Mathematics I and II, and Drawing Mathematics I and II)

This section will focus on how the inclusion of optional units impacts the alignment with DP mathematics content. As shown in Table 19 and 20, the optional units increase alignment with DP SL content in Number and algebra, Statistics and probability, and Calculus, as well as DP AHL content in Calculus. With certain topics, there is occasionally stronger alignment with one DP mathematics subject compared to another. Indeed, the optional units align more strongly with AI SL content for Number and algebra, but more strongly with AA (SL and AHL) content for Calculus. The optional units do not contain any DP Functions or Geometry and trigonometry content, therefore the alignment is the same as the compulsory units in these topics. The below discusses in the detail how the optional units align with each DP topic.

Number and algebra
With regards to Number and algebra content, the optional units Financial Mathematics I and II, increase the alignment with DP SL in this topic. Indeed, Financial Mathematics I includes concepts which are covered in both DP AA and AI, such as arithmetic and geometric sequences and series and financial applications. Furthermore, Financial Mathematics II presents further alignment with DP AI SL, as it includes an in-depth coverage of amortization and annuities. However, it can be noted that the optional units did not include DP AHL content such as proof, complex numbers, and matrices.

Functions and Geometry and trigonometry
As mentioned above, the optional units did not contain any further DP sub-topics from Functions and Geometry and trigonometry. Therefore, the Bachillerato General overall includes fewer types of functions than those covered in AA and modelled in AI. Furthermore, a significant amount of trigonometry content which is in AA is not covered, such as trigonometric equations and identities, and reciprocal trigonometry. Moreover, no vectors content is covered from AA or AI AHL, as is none of the graph theory and decision maths from AI AHL content.

Statistics and probability
With regards to Statistics and probability content, alignment with DP SL increases with the optional units. Indeed, Statistics and Probability I includes linear regression, which appears in both DP AA and AI. The same unit also references chi-squared tests, suggesting some further hypothesis testing content is covered from DP AI SL. Statistics and Probability II covers the binomial and normal probability distributions, as well as a small amount of AHL content involving Bayes Theorem (AA only) and the Poisson distribution (AI only). Other AHL content is not covered from either AA or AI.

Calculus
With regards to Calculus, the optional units Differential Calculus and Integral Calculus increase the alignment with DP SL and AHL content in this topic for both DP mathematics subjects. Differential Calculus covers concepts that are in both AA and AI, such as derivatives of transcendental functions, differentiation rules, higher order derivatives, and kinematic applications. The unit also presents further alignment with AA as it covers evaluating limits and the use of L'Hopital's rule. The Integral Calculus unit introduces integration, covering

concepts common to AA and AI such as indefinite and definite integrals, area under a curve, integration methods, and volumes of revolution. Again, the unit displays some stronger alignment with AA than AI by including integration by parts and the use of partial fractions. However, it can be noted that the optional units do not cover as many derivatives and integrals as AA, nor do they cover implicit differentiation, solving differential equations, and Maclaurin series. Moreover, they also do not cover AI AHL content such as slope fields, Euler's method, phase portraits, and second order differential equations.

Other content in the MBG optional units

The Bachillerato General also offers two further optional units - Drawing I and II. These units focus on technical drawing, which is not an area covered by either DP mathematics subject. Drawing I involves the learning of theoretical, practical and regulatory elements of technical drawing, as well as the techniques and different representations. Drawing II focuses on the applications of technical drawing, such as for mechanics, electrical systems and constructure. Students use traditional and digital instruments, including CAD software.

Table 22: *Content in the optional mathematics units of the MBG that is not covered in DP mathematics subjects.*

Significant content not in AA (only)	Significant content not in AI (only)
• Poisson distribution • Hypothesis testing and chi-squared tests • Amortization • Annuities	• Counting principles • Bayes Theorem • Further integration methods • Evaluation of limits and L'Hôpital's rule
Significant content not in either DP mathematics subject	

• Bernoulli distribution
• The content of Drawing I and II, which includes:
  ○ Theoretical, practical and regulatory elements of technical drawing
  ○ Two-dimensional representation techniques
  ○ Three-dimensional applications of technical drawing
  ○ Applications of technical drawing in mechanics
  ○ Applications of technical drawing in electrical systems
  ○ Applications of technical drawing in construction	

Summary

Combined, the mathematics units offered in the Bachillerato General have somewhat greater breadth and depth than DP SL mathematics, but less than DP HL mathematics. However, it should be noted that students choosing to specialise in mathematics need not take all the optional units, therefore, the breadth and depth of actual mathematics study is variable. For example, a student who studies the Statistics and Probability and Financial Mathematics units, without the Differential and Integral Calculus units, will experience a breadth and depth that is more akin to DP SL mathematics.

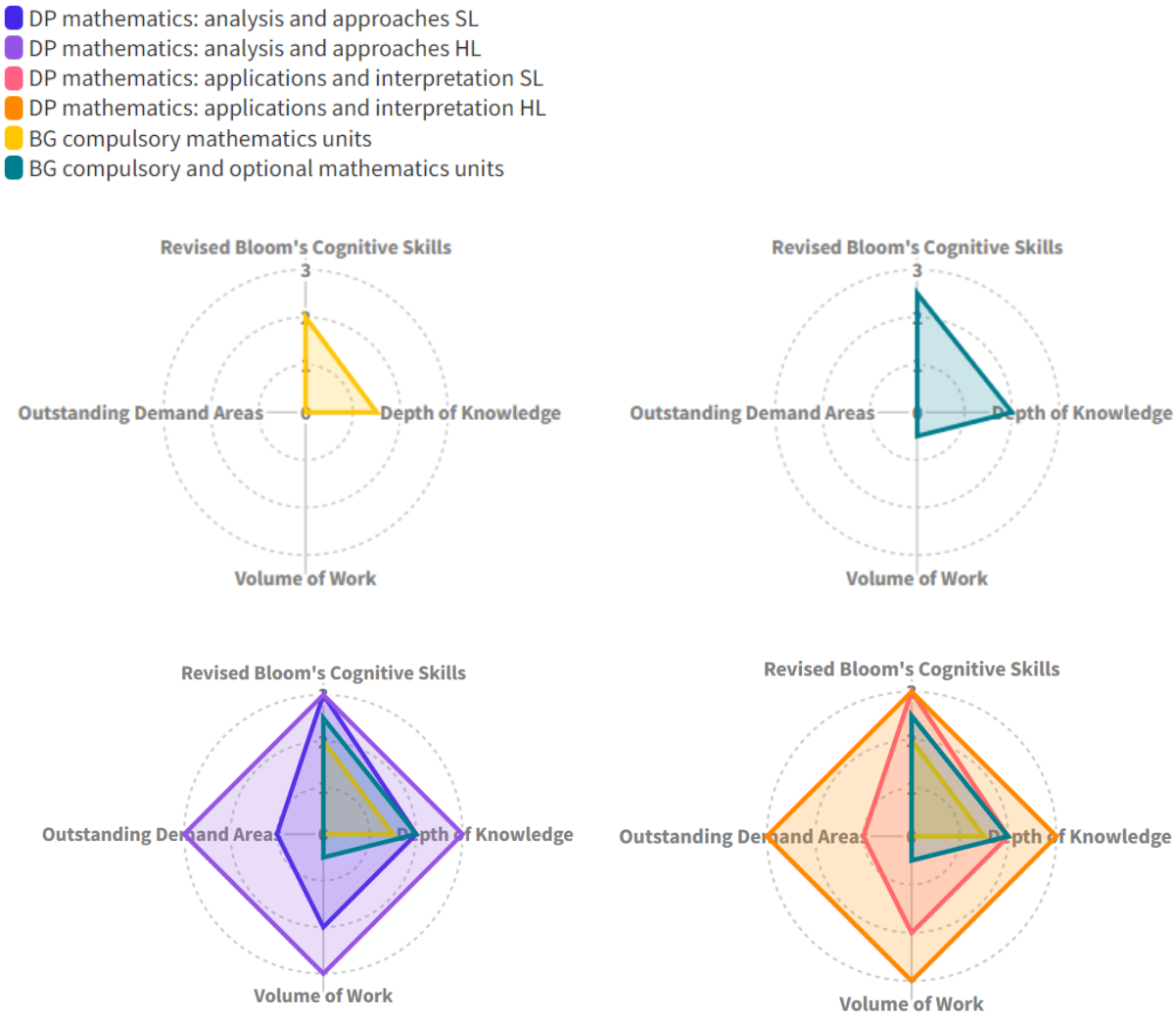
At the topic level, alignment is most strong with DP Calculus content, as the optional units of Differential Calculus and Integral Calculus include a significant proportion of SL and AHL content. Following this, alignment is most strong with SL Statistics and probability content, and there is also good alignment with SL Number and algebra content (particularly from AI) and SL Functions content. Apart from for Calculus, very little DP AHL content is covered in the Bachillerato General. Furthermore, Geometry and trigonometry is by far the Bachillerato General's weakest area of alignment with the DP, with very few SL and AHL topics covered.

Instead, it can be noted that the Bachillerato General offers Drawing Mathematics I and II which focus on technical drawing, using traditional and digital instruments and applying to a range of different areas. Finally, the units mostly include content that is common to AA and AI, though occasionally align more strongly with one of these subjects for certain topics.

5.1.3 Demand – Mathematics

This section considers the alignment between the DP and MBG mathematics in terms of demand. The DP and MBG curricula were analysed using the same demand tool in order to create a demand profile for DP AA (SL and HL), DP AI (SL and HL), MBG compulsory mathematics units, and MBG compulsory and optional units. These demand profiles are presented below in the form of radar diagrams, with a superimposed diagram at the end also being featured to enable immediate visual comparison.

Figure 12: Visual representations of subject demand



The panel of experts carried out a detailed analysis of each course and reached a consensus on the scores shown in the profiles above. The following points were particularly important within the panel discussion:

- Regarding the scores for **Bloom's Cognitive Skills**:
  - The DP mathematics subject group learning outcomes apply to all subjects hence the scores are the same for AA (SL and HL) and AI (SL and HL). These outcomes were given a score of 3 on the basis that they strongly evidence the development of critical and creative thinking skills through their focus on reasoning, inquiry-based approaches, reflection, generalisation, unfamiliar contexts, and consideration of wider implications.
  - The MBG compulsory units and optional units currently differ in the learning outcomes that they describe, and therefore there is a slight difference in scores. The compulsory units' outcomes focus on problem-solving and reasoning, with some evidence of higher-order thinking skills through defending reasoning and proposing conjectures. However, overall, the skills were deemed to be at the analysis level and a score of 2 was awarded. The optional units, building on similar skills in the compulsory units, contain further competencies which offer some more evidence of higher-order thinking, such as using critical thinking in Drawing

Mathematics and decision-making in Financial Mathematics, therefore, a slightly higher score of 2.5 was awarded to compulsory and optional units combined to acknowledge this.

- Regarding the scores for **Depth of Knowledge**:
  - Both DP mathematics subjects at SL were given a score of 2. Both subjects were judged to cover the topics of 'Number and algebra', 'Functions', 'Geometry and trigonometry', 'Statistics and probability', and 'Calculus' in considerable detail, building in complexity and requiring a substantial amount of pre-requisite knowledge. At HL, both DP mathematics subjects were awarded a score of 3 for depth of knowledge. The subjects were judged to cover topics in a high level of detail, with many subtopics having high complexity and requiring a large amount of pre-requisite knowledge.
  - The MBG compulsory units do not have a significant breadth of content, but some topics, such as calculus, statistics and probability, and functions are covered in considerable detail, requiring pre-requisite knowledge and a progression of learning. However, taking into account the number of topics studied in depth, and also noting that the topics were not studied in quite the same level of detail as DP SL, resulted in a 1.5, rather than a 2, being awarded. If optional units are also studied, then there is a greater depth of knowledge, as these build and extend the knowledge learnt in the compulsory units. However, units such as Probability and Statistics only add concepts such that the coverage is similar to DP SL, whilst others, such as Drawing Mathematics, represent further breadth, rather than depth. The topic of calculus is the only area which the units cover significantly more complex content. Therefore, taking into account the number of topics, as well as noting that the number and type of optional units students take is their choice, a score of 2, rather than a 3 was deemed appropriate for the compulsory and optional units combined.

- Regarding the scores for **Volume of Work**:
  - Both DP mathematics subjects at SL were deemed to comprise a moderate-heavy volume of work and were given a score of 2. The panel concluded that the teaching time allotted to cover the different concepts was short (150 hours) but acknowledged that some subtopics contained basic concepts and recapped prior learning, hence 2 was deemed an appropriate score. For HL, both DP mathematics subjects were considered to have a heavy volume of work, due to the short amount of time allocated (240 hours) and the level of complexity of the content, which combined merited a score of 3.
  - For MBG Mathematical Thinking I, II, and III units, a total of 192 hours is allocated, and for Selected Topics units, the current allocation is 96 hours. As mentioned, the compulsory units do not represent a considerable breadth of content or level of complexity, and therefore it was deemed that this was a generous amount of time to cover the content, resulting in a score of 0. The optional units are each allocated 48 hours, which was again deemed a generous amount of time, though a score of 0.5 was awarded to acknowledge the increase in complexity of content being covered.

- Regarding the scores for **Outstanding Areas of Subject Demand**:
  - Both DP mathematics subjects at SL contained one area of outstanding demand, which was the ‘mathematical exploration’. This element of the SL subjects was considered to apply skills typically needed in higher education, such as extended writing and presentation of mathematical concepts, student-led exploration, and academic writing skills. Therefore, a score of 1 was awarded to both SL subjects for the inclusion of this element. In addition to this, both subjects at HL had further areas of outstanding demand. For mathematics: analysis and approaches, some of the identified outstanding areas of demand were proof by induction, complex numbers (De Moivre’s theorem), vectors (cross product, equations of planes and intersections), and Maclaurin series. For mathematics: applications and interpretation, some identified areas of outstanding demand were eigenvalues and eigenvectors, nonlinear regression, Markov chains, second order differential equations, slope fields, Euler’s method, and phase portraits. Overall, there was a high number of outstanding areas of demand and a score of 3 was awarded to both HL subjects.
  - For all units, the skills and content covered was deemed to not require any substantial demand beyond what is typical for upper-secondary mathematics. The coverage of limits in Differential Calculus (optional unit) and the use of software in Drawing Mathematics were discussed, however, it was ultimately decided that these were not large/challenging enough to warrant a score beyond 0.

5.2 Sciences

DP physics[74]
Physics is a subject option from the DP sciences subject group, offered at both SL and HL. This subject has content that is common to both SL and HL, as well as AHL content that is featured only in the HL. Thus, the HL has greater breadth and depth than SL. This subject is intended to prepare students for university courses such as engineering, physics, and others requiring a strong science background. HL is suitable for those intending to pursue further study in an area requiring a strong background in physics.

DP chemistry[75]
Chemistry is a subject option offered within the DP sciences subject group, at both SL and HL. This subject has content that is common to both SL and HL, as well as AHL content that is featured only in the HL. Thus, the HL has greater breadth and depth than SL. This subject is designed to prepare students for university courses such as medicine, biological science and environmental science. HL is suitable for those intending to pursue further study in an area requiring a strong background in chemistry.

DP biology[76]
Biology is a subject option within the DP sciences subject group, offered at both SL and HL. This subject has content that is common to both SL and HL, as well as AHL content for HL. Thus, HL has greater breadth and depth than SL. This subject is designed to prepare students for university courses such as biology, medicine, dentistry, and biomedical engineering. HL is suitable for those intending to pursue further study in an area requiring a strong background in biology.

Natural Sciences, Experimental Sciences and Technology[77]
Natural Sciences, Experimental Sciences and Technology is one of the four Areas of Knowledge articulated in the Common Curriculum Framework for Higher Secondary Education in Mexico and includes common learning for all high school students. This area is described as referring to human activities and the study of the natural world. In addition to studying these areas, students formulate and verify hypotheses, raise questions and search for answers related to the processes and dynamics of natural phenomena. Some of the units within the Natural Sciences, Experimental Sciences and Technology knowledge area are compulsory for all MBG students and some are optional.

Compulsory *Natural Sciences, Experimental Sciences and Technology units in the MBG:*

There are six compulsory units in the Core curriculum component. These are designed in a transversal way; therefore each one contains elements of all the science disciplines.

[74] International Baccalaureate. (2023). *Physics guide*.
[75] International Baccalaureate. (2023). *Chemistry guide*.
[76] International Baccalaureate. (2023). *Biology guide*.
[77] Mexican Secretariat of Public Education. (2024). *Base Document for Bachillerato General.*

- **Matter and its interactions**[78]

This unit is taught in the first semester of the MBG and provides foundational knowledge of scientific concepts. Content includes elements, molecules, microscopic structure, the water cycle and temperature changes within chemical reactions.

- **Conservation of energy and its interactions with matter**[79]

This unit is taught in the second semester of the MBG, and whilst it builds on some concepts covered in the Matter and its interactions, it is also aimed at providing a foundational knowledge of scientific concepts. Content includes different types of energy and energy transfers, electromagnetic fields, changes of state, and the energy in chemical reactions.

- **Ecosystems: interactions, energy and dynamics**[80]

This unit is taught in the third semester of the MBG and contains fundamental areas of science but has a greater focus on biology than the previous units. Content includes cells, photosynthesis and respiration, the carbon cycle, food webs and ecosystems.

- **Chemical reactions: conservation of matter in the formation of new substances**[81]

This unit is taught in the fourth semester of the MBG and is designed to build on the content studied within the 'matter and its interactions' unit by providing more depth and detail. Content includes chemical reactions, exothermic and endothermic reactions, atomic structure, the periodic table and nuclear reactions.

- **Energy in the processes of daily life**[82]

This unit is taught in the fifth semester of the MBG and builds on the knowledge acquired through previous units. This unit focuses on how energy is linked to the real world and how understanding it helps students to make sense of phenomena in their day-to-day lives. Content includes forces, motion, momentum, Newton's laws, , magnetic fields and electricity.

- **Organisms: structures and processes. Inheritance and biological evolution**[83]

This unit is taught in semester six of the MBG and builds biology and chemistry content from previous units. Content includes specialised cells, reproduction, variation, inheritance, natural selection, adaptation, evolution and protein synthesis.

There are also three compulsory units within the Mandatory Extended Core component.

[78] Mexican Secretariat of Public Education. (2023). *Programme of Knowledge Area Studies in Matter and its Interactions.* Available from*:* *https://educacionmediasuperior.sep.gob.mx/work/models/sems/Resource/13634/1/images/La%20materia%20y%20sus%20interacciones%20CNEYT%20I%20.pdf?*

[79] Mexican Secretariat of Public Education. (2023). *Programme of Knowledge Area studies in Conservation of energy in its interactions with matter.*

[80] Mexican Secretariat of Public Education. (2023). *Programme of Knowledge Area studies in Ecosystems: interactions, energy and dynamics.*

[81] Mexican Secretariat of Public Education. (2023). *Programme of Knowledge Area studies in Chemical reactions: conservation of matter in the formation of new substances.*

[82] Mexican Secretariat of Public Education. (2023). *Programme of Knowledge Area studies in Energy in the processes of daily life.*

[83] Mexican Secretariat of Public Education. (2023). *Programme of Knowledge Area studies in Organisms: structure and processes. Inheritance and biological evolution.*

- ***Science Workshop I***[84]
  This unit is taught in the second semester and weaves together the overarching concepts from other units. However, within Science Workshop I there is more focus on practical work and experimental activities. These include designing models, formulating questions and hypotheses and proposing solutions to problems within the students' environment.

- ***Science Workshop II***
- ***Space and Society***

At the time of writing this report, there is currently no publicly available documentation for the MBG units Science Workshop II and Space and Society.

Optional *Natural Sciences, Experimental Sciences and Technology units in the MBG:*[85]

- **Selected Topics in Physics I**
- **Selected Topics in Physics II**
- **Selected Topics in Chemistry I**
- **Selected Topics in Chemistry II**
- **Selected Topics in Biology I**
- **Selected Topics in Biology II**
- *Health Sciences I*
- *Health Sciences II*

The optional Natural Sciences, Experimental Sciences and Technology units listed above are part of the Extended Core component and, if chosen, are studied in the last two semesters of high school. Students of the MBG choose eight optional units, typically four pairs, from a range of Areas of Knowledge and Socio-cognitive Resources, and therefore the number of above optional units studied will vary between students. Each unit deepens students' knowledge of a particular area of science. Notably, the 'Health Sciences I & II' have been listed in the optional units to provide awareness of the full range of science optional subjects offered in Mexico, but they have not been included in this analysis.

The analysis will consider, and distinguish between, Natural Sciences, Experimental Sciences and Technology units which are compulsory in the MBG, and those which are optional.

5.2.1 Learning Outcomes – Sciences

This section compares and contrasts the learning outcomes of curricula falling within the category of science.

The learning outcome themes for all science subjects were extracted from the aims and assessment objectives of the DP sciences subject group, hence the themes are the same for physics, chemistry and biology.

[84] Mexican Secretariat of Public Education. (2024). *Programme of the UAC of the Knowledge Area Science Workshop I.*
[85] Undersecretary of Higher Secondary Education. (2018). *Programs of Study for the Class of 2022 – 2025. Propaedeutic Training Component.* Available from: Programs of Study for the Generation 2023 - 2026 and Subsequent. (sep.gob.mx)

In order to provide comprehensive and detailed analysis of the presence of the DP learning outcome themes within the Mexico curricula, a two-pronged approach was taken. The MCCEMS provides the general guidance on how the curriculum should be structured, but it also includes the skills which it aims to instil in all students and refers to these as 'Learning Progressions'. To provide the most comprehensive analysis, sections from subject group documentation, in addition to the Learning Progressions, were utilised. A holistic view was taken in order to encompass all aims of the MCCEMS, including the Learning Progressions, and the competences found elsewhere. For the specific areas of the MBG documentation that were used in this analysis, see Table 4 in section 3.1.

The following table demonstrates the learning outcome themes that were extracted from the DP learning outcomes and indicates if and where they were judged to have presence within the learning outcomes of the MBG curricula.

Table 23: Presence of the DP sciences subject group learning outcome themes in the MBG

Themes extracted from the learning outcomes of the DP sciences subject group	Presence in the Bachillerato General	
1. Conceptual understanding and making connections		Strongly present in Learning Progressions, General Competences and Extended Disciplinary Competences.
2. Use and application of knowledge, methods, tools, and techniques that characterise science		Strongly present in Learning Progressions, General Competences and Extended Disciplinary Competences.
3. Creativity and critical thinking (problem-solving, analysis, evaluation, synthesis)		Strongly present in the Learning Progressions, General Competences and Extended Disciplinary Competences.
4. Apply skills necessary to carry out insightful and ethical investigations (planning, collecting data, organising, following ethical guidelines)		Strongly present in the Learning Progressions, General Competences and Extended Disciplinary Competences.
5. Development of technological skills		Present in the Learning Progressions, General Competences and Extended Disciplinary Competences.
6. Effective collaboration and communication		Strongly present in the Learning Progressions, and General Competences.
7. Awareness of global and local problems and the environmental, ethical, cultural, and social impact of science		Not particularly evident in the Learning Progressions, however, strongly present in the General Competences and Extended Disciplinary Competences.

Key:

	This theme is well-evidenced in the learning outcomes of the MBG.		*This theme is partially evidenced in the learning outcomes of MBG.*		*This theme is not evident in the learning outcomes of the MBG.*

Presence of the DP's Learning Outcome Themes

As can be seen in Table 23, there is strong alignment between the DP learning outcome themes and the Mexico curricula. All DP learning outcome themes are found within many areas of the Mexico curricula, although some are more strongly and widely emphasised than others. Below, the extent to which each theme is present in the MBG is discussed in more detail.

1. Conceptual understanding and making connections

There is strong evidence of the DP's theme of making connections and developing conceptual understanding within the MBG. For compulsory units, the Learning Progressions describe 'Science and Engineering Practices', where students are drawing on different sources of information and then comparing them with what they learn in the classroom. The fundamentals of Science Workshop I also highlight the importance of this theme through the discussion of how students will reflect on the relationship between science, technology and the context in which they are covering different concepts.

For the optional units, the General Competences also include this theme through requiring students to express ideas and concepts, articulate knowledge from various fields, and establish relationships between them and their daily life. Finally, the Extended Disciplinary Competences expect students to carry out interdisciplinary projects, which further strengthens the presence of this theme.

2. Use and application of knowledge, methods, tools, and techniques that characterise science

The DP's theme of knowledge, methods, tools and techniques that characterise science encompasses different aspects, and therefore parts of it can be found in different places; these various parts taken as a whole result in this theme being strongly present in the MBG. For compulsory units, the Science and Engineering Practices state that students will collect evidence and then explain phenomena based on this evidence. It goes further to stipulate that this evidence is consistent with the ideas and theories of science. Science Workshop I aims to promote skills such as observation, experimentation and problem solving.

Regarding optional units, the General Competences cover this theme well, as they require students to follow instructions and procedures reflectively, understanding how each step contributes to achieving an objective. Students are also expected to build hypotheses, design, and then apply models to test the validity of these hypotheses. Furthermore, it is outlined that students will synthesise the evidence they obtain through experiments to produce conclusions and formulate new questions. The Experimental Sciences Extended Disciplinary Competences also illustrate this theme by outlining a requirement for students to use specialised tools and equipment, and handling substances and equipment appropriately and safely.

3. Creativity and critical thinking (problem-solving, analysis, evaluation, synthesis)

The DP's theme of using critical thinking, particularly analysis and synthesis, is strongly reflected within the Mexico curricula. For compulsory units, students are expected to formulate, refine and evaluate problems, evaluate information and its reliability and make evidence-based decisions from a critical standpoint. Skills highlighted in Science Workshop I include observation, experimentation and problem-solving, as well as the aim of encouraging students' capacity for logical thinking. The focus on transversality in the Core curriculum component emphasise the importance of students' critical thinking and their ability to reflect, discuss, contrast and investigate information.

The General Competences require students to choose between sources of information and discriminate between them based on their relevance and reliability; thereby requiring students to analyse and evaluate different texts or data sets. This theme is also present in the Extended Disciplinary Competences, where students are expected to synthesise evidence, evaluate

arguments, critically and responsibly assess benefits and risks and evaluate the implications of the use of science and technology. Problem-solving is also an aspect that is present through the Mexico curricula and mentioned repeatedly in various areas through references to students proposing ways to solve a problem and defining a course of action with specific steps. This also encompasses the creativity aspect of this DP theme through the focus on students designing prototypes or models in order to solve problems.

4. Apply skills necessary to carry out insightful and ethical investigations

There are many references in the Mexico curricula to skills involving investigations, such as the descriptions within the Science and Engineering Practices where students are required to develop skills of planning and conducting research, searching for information to use as evidence for carrying out planned investigations. There is also a statement referring to the analysis and interpretation of data, followed by reference to students building explanations and designing solutions. The introduction to the Science Workshop I unit mentions practical work, and describes the promotion of observation, experimentation and problem-solving skills. Another compulsory unit, Science Workshop II, is likely to contain further evidence of practical work; however, at the time of writing, this unit was not publicly available for review.

For optional units, the General Competences detail scientific investigations more clearly through statements describing how students will build hypotheses and design and apply models to test their validity, as well as the synthesis of evidence obtained through experimentation to produce conclusions and formulate new questions. The Extended Disciplinary Competences of the Experimental Sciences show the presence of this theme through the description of students using specialised tools and equipment and applying the appropriate health and safety techniques to practical work in order to minimise risk. Therefore, overall, there is strong presence of this DP theme in the Mexico curricula.

5. Development of technological skills

Technology skills are mentioned less frequently throughout the MBG than other skills, although there is a strong presence of this theme, nonetheless. In the compulsory units, the Science and Engineering Internship promotes the development of technological skills through expecting students to use mathematical and computational thinking, including for the design of simple computational models. Furthermore, the Learning Progressions outline how the socio-cognitive resource of Digital Culture can be integrated into Natural and Experimental Sciences and Technology through providing access to Socio-cognitive virtual laboratories, databases and simulations, and thus further reinforcing that the development of technological skills is an overarching theme.

For the optional units, the General Competences also demonstrate this theme by expecting students to use information and communication technologies to process and interpret information. Moreover, the development of technological skills can be inferred from some of the Extended Disciplinary Competences for Experimental Sciences, as these include using specialised tools and equipment and designing prototypes and models – all of which will likely involve the application of technology.

6. Effective collaboration and communication

Both communication and collaboration are skills mentioned throughout the Mexico curricula. For example, the compulsory units include repeated reference to highlighting the importance of working collectively and promote different ways for students to communicate their ideas.

For the optional units, while not explicitly present in the Extended Disciplinary Competencies for Experimental Sciences specifically, the General Competences evidence this theme by outlining expectations for students to cultivate interpersonal relationships, express ideas, share opinions, and consider others' perspectives. Moreover, the 'effective' aspect of this DP theme is really highlighted through the expectation that students will apply different communication strategies depending on the audience, the context and the objectives of the communication.

7. Awareness of global and local problems and the environmental, ethical, cultural, and social impact of science

References to the impact of science at global and local levels are less explicit than the other DP learning outcome themes. However, it can be inferred from some of the introductions given for the compulsory units that these aspects will be considered during the course. Indeed, the introduction to both 'Conservation of Energy and its Interaction with Matter' and 'Energy in the Processes of Daily Life units' stipulate that students should establish a broader understanding of how the world works and how humanity takes advantage of this knowledge. Furthermore, Science Workshop I expects students to understand how science and technology influence each other and society, as well as how science and technology can offer alternatives to address specific problems in an individual's environment. Also, the MCCEMS expect the Social Sciences Area of Knowledge to be integrated into Natural and Experimental Sciences and Technology through the consideration of social, economic and cultural perspectives.

For the optional units, there is also presence of this theme in the General and Extended Disciplinary Competences. Indeed, the General Competences describe students being able to recognise and understand biological, economic, political and social implications, including environmental damage, in an interdependent global context, and the Extended Disciplinary Competences expect students to apply scientific and technological advances to improve the conditions of their social environment.

Other Themes in the MBG

There are no other themes within MBG science that are not also present in the DP.

Summary

All DP learning outcome themes are present in the MBG's Learning Progressions, which are shared across all science disciplines. Within the Extended Disciplinary Competences (Experimental Sciences), there is also evidence of all DP learning outcome themes. Some themes are heavily emphasised in the MBG (namely conceptual understanding, critical thinking and problem-solving), whilst others are referenced less regularly (insightful investigations and awareness of the impact of science), but nevertheless still have a strong presence.

5.2.2 Content – Physics

This section compares and contrasts the content of the DP and MBG curricula falling within the category of physics. In order to support visual comparison at-a-glance, the DP and MBG physics curricula are presented below in diagrams which show the key topics and subtopics included in each.

Figure 13: DP physics content visualiser[86]

A. Space, time and motion	A.1 Kinematics	A.2 Forces and momentum	A.3 Work, energy and power	A.4 Rigid body mechanics (HL only)	A.5 Galilean and special relativity (HL only)
B. The particulate nature of matter	B.1 Thermal energy transfers	B.2 Greenhouse effect	B.3 Gas laws	B.4 Thermodynamics (HL only)	B.5 Current and circuits
C. Wave behaviour	C.1 Simple harmonic motion (SL + AHL)	C.2 Wave model	C.3 Wave phenomena (SL + AHL)	C.4 Standing waves and resonance	C.5 Doppler effect (SL + AHL)
D. Fields	D.1 Gravitational fields	D.2 Electric and magnetic fields	D.3 Motion in electromagnetic fields	D.4 Induction (HL only)	
E. Nuclear and quantum physics	E.1 Structure of the atom (SL + AHL)	E.2 Quantum physics (HL only)	E.3 Radioactive decay (SL + AHL)	E.4 Fission	E.5 Fusion and stars
Experimental programme	Practical work	Collaborative sciences project	Scientific investigation		

[86] '(HL only)' and '(SL + AHL)' are used to flag, respectively, topics only taught at HL and topics taught at both SL and HL, but which also feature additional higher level content.

Figure 14: Visualiser of common science content in the MBG

Core curriculum component	**Natural Sciences, Experimental Sciences and Technology**	1. Matter and its interactions	2. Conservation of energy and its interactions with matter	3. Ecosystems: interactions, energy and dynamics	4. Chemical reactions: conservation of matter in the formation of new substances	5. Energy in the processes of daily Life	6. Organisms: structures and processes. Inheritance and biological evolution
Mandatory Extended Core curriculum component	**Natural Sciences, Experimental Sciences and Technology**	1. Science Workshop I	2. Science Workshop II*				

**At the time of writing, the programme of study for Science Workshop II was not publicly available*

Figure 15: MBG physics content visualiser

Extended Core curriculum component (optional)	***Selected Topics in Physics I***	**Block I**	Static	Apply the balance conditions that different force systems have, creating prototypes or observing bodies in balance, to analyse their characteristics in practical situations in their environment and thus encourage critical thinking in decision making.
		Block II	Rational dynamics	Use the rotating system as elements of analysis to understand principles and explain the causes of this type of movement present in its context, showing a disposition for collaboration, methodical and organized work.
		Block III	Simple Machines	Use prototypes of simple machines as analysis models, showing a willingness to collaborative, methodical and organized work, finding the advantage of their use and efficiency in different contexts.
		Block IV	Impulse and Momentum	Examine physical phenomena that present collisions, explaining the relationship between impulse, momentum and the law of conservation, to understand the behaviour of bodies, working collaboratively and making decisions in a conscious and informed manner, assuming the consequences generated by such events in any context.
	Selected Topics in Physics II	**Block I**	Electromagnetism	Apply knowledge of magnetic forces, magnetic fields and electromagnetic induction, analysing hypothetical and real situations, to understand the electromagnetic phenomena present in the environment and reproduce them through prototypes, working in a collaborative, methodical and organized manner to improve critical and creative thinking.
		Block II	Wave motion	Apply the principles of vibratory and wave movements, analyse waves to obtain their associated magnitudes, explaining the phenomena related to them, focusing on sound and light waves, common in the context, favouring critical thinking and collaborative work.
		Block III	Optics	Use Snell's law, the phenomena of reflection and refraction, to analyse the behaviour of a light ray in different media and thus understand its operation with images when said ray is reflected or refracted, analysing the function of mirrors and lenses, integrated into different instruments of daily life, promoting critical thinking, showing a willingness to methodological and organized work.

Structure

There are many differences in structure between DP physics and the MBG units. Physics in the DP is a distinct, two-year subject, offered at either SL or HL. In contrast, the MBG offers the knowledge area of Natural Sciences, Experimental Sciences, and Technology, which encompasses physics and other sciences. The compulsory units in this knowledge area integrate the sciences and all content within these units is studied to the same level. Only in the optional units of this knowledge area is physics offered as a separate science discipline. The compulsory units altogether span the duration of the MBG, whereas the optional units only span the final year. Therefore, within the MBG, there is more emphasis on breadth of scientific knowledge and less scope to specialise in physics specifically.

DP physics content is broken down into five overarching, discipline-specific themes: Space, time and motion, The particulate nature of matter, Wave behaviour, Fields, and Nuclear and quantum physics. In contrast, the MBG's compulsory units integrate physics (and other science) concepts into six overarching scientific areas such as 'Matter and its interactions'. For the optional units, the MBG offers Selected Topics in Physics I and Selected Topics in Physics II. These units are each organised into three-four blocks of learning.

Content Alignment

The following table represents a simplified summary of the MBG's content alignment, at topic-level, with DP physics (SL and HL). The analysis considers the alignment that the compulsory units alone have with DP physics, as well the alignment of all the units combined (compulsory and optional).

Table 24: Summary of the content alignment between the DP physics topics and the MBG

DP physics themes and topics	Presence of SL content in the MBG		Presence of AHL content in the MBG	
	Compulsory units	Compulsory and optional units	Compulsory units	Compulsory and optional units
A. Space, time and motion				
A.1 Kinematics			N/A	N/A
A.2 Forces and momentum			N/A	N/A
A.3 Work, energy and power			N/A	N/A
A.4 Rigid body mechanics	N/A	N/A		
A.5 Galilean and special relativity	N/A	N/A		
B. The particulate nature of matter				
B.1 Thermal energy transfers			N/A	N/A
B.2 Greenhouse effect			N/A	N/A
B.3 Gas laws			N/A	N/A
B.4 Thermodynamics	N/A	N/A		
B.5 Current and circuits			N/A	N/A
C. Wave behaviour				
C.1 Simple harmonic motion				
C.2 Wave model			N/A	N/A
C.3 Wave phenomena				
C.4 Standing waves and resonance			N/A	N/A
C.5 Doppler effect				
D. Fields				
D.1 Gravitational fields				
D.2 Electric and magnetic fields				
D.3 Motion in electromagnetic fields			N/A	N/A
D.4 Induction	N/A	N/A		
E. Nuclear and quantum physics				
E.1 Structure of the atom				
E.2 Quantum physics	N/A	N/A		
E.3 Radioactive decay				
E.4 Fission			N/A	N/A
E.5 Fusion and stars			N/A	N/A
Experimental programme				

Key:

	Strong presence of this topic in the MBG.		*Partial presence of this topic in the MBG.*		*Little or no presence of this topic in the MBG.*	N/A	*This topic does not exist at the respective level.*

Compulsory units:

- Matter and its interactions
- Conservation of energy and its interactions with matter
- Ecosystems: interactions, energy and dynamics
- Chemical reactions: conservation of matter in the formation of new substances
- Energy in the processes of daily life
- Organisms: structures and processes.
- Science workshop I

Optional units:

Selected Topics in Physics I & II

Any alignments found in the compulsory units are carried over and combined with those in the optional units, to represent all the physics content offered in the MBG.

As evidenced in table 24, there is at least partial alignment between some of the MBG physics topics and the DP, with some topics showing strong alignment. Each DP theme will be taken in turn and discussed in more detail below.

Theme A: Space, time and motion

Regarding SL content from Theme A: Space, time and motion, the MBG units only partially align with the content from one DP topic, namely A.2 Forces and momentum. Some of the content from this topic, such as momentum and Newton's three laws of motion, is covered in the MBG's compulsory unit 'Energy in the Processes of Daily Life'. Furthermore, the MBG's optional unit, Selected Topics in Physics I, includes some similar content on forces, the conservation of momentum, and elastic and inelastic collisions. However, the compulsory and optional units, either alone or combined, do not cover all the content in A.2 Forces and momentum, as they do not identify specific mathematics formulae or include force calculations such as viscous drag and buoyancy, frictional forces, Hooke's law, or free-body diagrams. Finally, the MBG units contain very little similar content to the DP's topics A.1 Kinematics and A.3 Work, energy, and power.

Regarding AHL content in Theme A: Space, time and motion, the MBG's optional unit Selected Topics in Physics I aligns strongly with the content in A.4 Rigid body mechanics, as it also includes the calculation of torque and angular acceleration, moments of inertia and equilibrium. The MBG compulsory units alone have no alignment with DP AHL content, and there is no presence of A.5 Galilean and special relativity content in any of the MBG units.

Theme B: The particulate nature of matter

Regarding SL content from Theme B: The particulate nature of matter, the MBG units only partially align with the content from one DP topic, namely B.1 Thermal energy transfers. The compulsory MBG unit 'Conservation of Energy and its Interactions with Matter' contains similar content relating to the internal energy of a system, and conduction, convection, and thermal radiation. Furthermore, the optional unit Selected Topics in Physics I references using scales and magnitudes to record and systemise information. However, there is no specific reference to Kelvin and Celsius in the MBG units, and there is a very limited presence of other B.1 content, such as thermal energy transfers (Q) and luminosity.

Finally, the MBG units do not contain similar content to the DP's B.2 Greenhouse effect and B.5 Current and circuits topics, nor the AHL topic of B.4 Thermodynamics.

Theme C: Wave behaviour

The MBG's compulsory units do not align with the DP physics content in Theme C: Wave behaviour, as they do not cover simple harmonic motion, the wave model, wave phenomena, standing waves and resonance, or the Doppler effect. The optional MBG units also do not cover standing waves and the Doppler effect but do have some alignment with the other topics covered in this theme, discussed below.

Regarding SL content from Theme C: Wave behaviour, the MBG's optional units have partial alignment with three of the DP's topics. Selected Topics in Physics II broadly requires students to explain simple harmonic motion, though does not provide much more detail than this, resulting in only partial alignment with C.1 Simple harmonic motion. Furthermore, the same unit has some alignment with the content in C.3 Wave phenomena, as it also covers reflection

and refraction and Snell's law. However, there is no indication that it includes superposition of waves, or the different types of interference as DP physics does. Selected Topics in Physics I includes some similar content to C.2 Wave model, as it covers the nature of wave motion, visible light and non-visible spectrum, and recognition of sound properties. Whilst there is no specific reference in the unit to the equation linking frequency, time and wave speed, there is a comment "La naturaleza del movimiento ondulatorio" which translates to "the nature of wave motion".[87] This statement may include the equation linking frequency, time and wave speed, but it requires too much inference to determine precisely.

The MBG optional units mostly do not include AHL content from theme C: Wave behaviour, such as simple harmonic motion, mechanical waves and electromagnetic waves, standing waves and resonance, and the Doppler effect. However, it is possible that DP AHL content pertaining to simple harmonic motion could be covered under the broad requirements for students to explain simple harmonic motion in Selected Topics in Physics II.

Theme D: Fields

The MBG's compulsory units do not align with SL or AHL DP physics content in theme D: Fields, as they cover no, or very little, content regarding gravitational, electric, and magnetic fields. The optional MBG units similarly do not include much content related to fields but do have slightly more alignment with DP content - discussed below.

Regarding SL content within theme D: Fields, the MBG units include some similar content to D.2 Electric and magnetic fields. Indeed, the compulsory 'Energy in the Processes of Daily Life' unit in the MBG and the optional Selected Topics in Physics II unit cover Coulomb's law, magnetic field lines, and uniform electric field strength between parallel plates. However, there is no coverage of the equation for electric field strength, or aspects of electric charge, and therefore the MBG units (when combined) only have partial alignment with this topic.

With regards to AHL content from theme D: Fields, the Selected Topics in Physics II unit strongly aligns with content in topic D.4 Inductions, as it also covers magnetic flux, Faraday's Law, and Lenz's Law. However, the MBG's optional (and compulsory) units do not include a significant amount of AHL content from theme D: Fields, such as gravitational potential energy, gravitational fields, electric potential energy and electric field strength.

Theme E: Nuclear and quantum physics

The MBG's compulsory and optional physics do not cover much of the DP's SL or AHL content in theme E: Nuclear and quantum physics. Indeed, they do not include similar content regarding the structure of the atom, quantum physics, radioactive decay, or fusion and stars. However, it can be noted that the compulsory unit 'Chemical Reactions: Conservation of Matter in the Formation of New Substances' partially aligns with SL content from E.4 Fission, as spontaneous and neutron-induced fission, and the role of chain reactions in nuclear fission reactions, are both present. However, control rods, moderators and heat exchangers, or the properties of nuclear fission products are not covered.

[87] Undersecretary of Upper Secondary Education. (2018). *Selected Topics of Physics.* p. 14.

It is worth noting that some content found in theme E: Nuclear and quantum physics may also be within the MBG's compulsory unit 'Space and Society'. However, it is not possible to confirm this as, at the time of writing, this unit was not publicly available.

Experimental programme

The DP's experimental programme is outlined in a way that emphasises the need for students to enhance and embed their understanding through the use of practical work and the development of scientific skills such as experiments, databases, simulations and modelling. However, the realities of this within each school may differ in terms of the exact practical activities carried out and the context these activities are conducted within. The MBG curricula make references throughout the science subject area to activities that may be described as practical experiments. For example, the common Core unit Matter and its Interactions includes a statement where, throughout the course, students will "carry out practices related to the nature of matter and its properties".[88] This goes further to then describe how students will develop skills such as using models and obtaining and analysing data. The MBG optional unit Selected Topics in Physics I describes students operating different types of simple machines and working collaboratively to build prototypes. These aspects suggest a strong presence of practical work within the MBG.

Summary

There is overall very little content alignment between DP physics and the compulsory MBG units. Indeed, the MBG's compulsory units only have partial alignment with SL content in topics A.2 Forces and momentum, B.1 Thermal energy transfers, and E.4 Fission. As the compulsory units do not contain other physics content (see table 24), their overall breadth and depth of physics content is significantly less than DP physics SL and, more so, DP physics HL.

The compulsory and optional units combined contain slightly more DP content than the MBG compulsory units alone. Indeed, the content of the optional units increase alignment with SL content, particularly in C.1 Simple harmonic motion, C.2 Wave model, C.3 Wave phenomena, and D.2 Electric and magnetic fields. Furthermore, the optional units include some occasional AHL content, particularly from A.4 Rigid body mechanics. However, the compulsory and optional units combined still represent a significantly lesser breadth and depth of physics content than DP physics SL and DP physics HL. As can be seen from table 25 there is no significant content within the MBG physics that is not also found in the DP physics.

*Table 25: MBG physics content which is not covered in the DP**

Significant MBG physics content which is not included in the DP*
There is no significant MBG physics content that is not included in the DP.

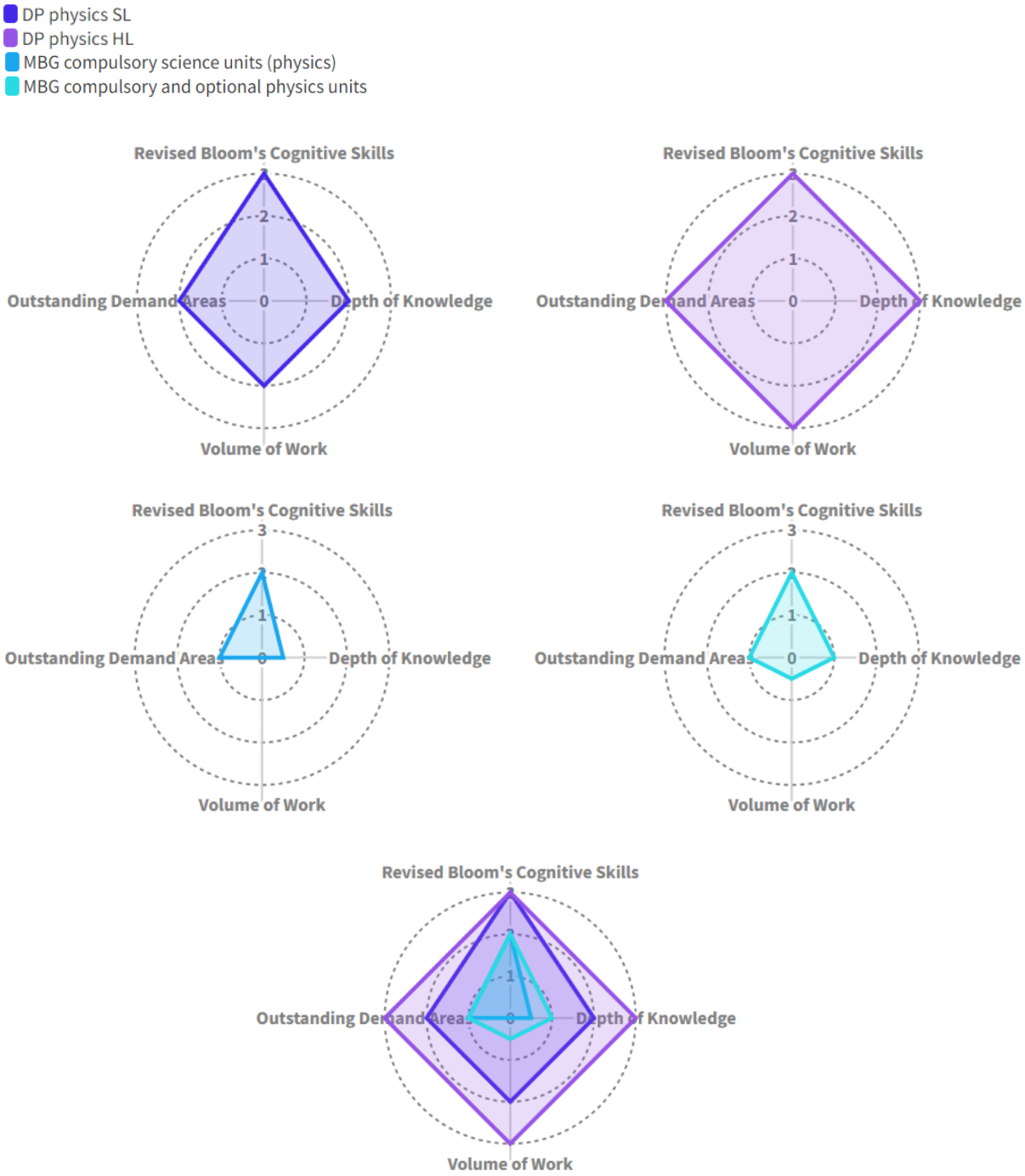
*Notably, 'significant content' does not include topics which are typically studied *prior* to upper secondary

[88] Mexican Secretariat of Public Education. (2023). *Learning Progressions in the Area of Natural Sciences, Experimental Sciences and Technology*. p. 36. Available from: educacionmediasuperior.sep.gob.mx/work/models/sems/Resource/13516/1/images/Ciencias naturales experimentales y tecnologia - sintetico.pdf

5.2.3 Demand – Physics

The DP and MBG curricula were analysed using the same demand tool in order to create a demand profile for DP physics SL, DP physics HL, MBG compulsory science units (physics), and MBG compulsory and optional physics units. These demand profiles are presented below in the form of radar diagrams, with the last diagram showing all profiles superimposed in one place, enabling immediate visual comparison.

Figure 16: Visual representations of subject demand



The panel of experts carried out a detailed analysis of each course and reached a consensus on the scores shown in the profiles above. The following points were particularly important within the panel discussion:

- Regarding the scores for **Bloom's Cognitive Skills**:
  - DP physics has the same learning outcomes for both SL and HL, meaning that these scores are the same. These were judged to merit a score of 3 due to the high levels of critical thinking, critical awareness and elements of synthesis and creation present in the majority of Aims and Assessment Objective 3.
  - For the MBG compulsory units and the MBG compulsory and optional units (combined), a score of 2 was given. Whilst there is strong evidence of skills such as analysis, problem-solving and showing innovation, this was not tailored to subject content. A score of 2 was given due to statements being too generalised. Whilst the Extended Disciplinary skills are written with a scientific focus, this did not warrant raising the score above a 2 as there was not enough evidence of higher order thinking skills such as synthesis and creation.

- Regarding the score for **Depth of Knowledge**:
  - DP physics SL was deemed to merit a score of 2 for depth of knowledge due to the mathematical pre-requisite skills and competences required to access the course, as well as the moderate to high level of cognitive complexity of the knowledge that students are expected to acquire. As to the HL course, the greater depth and additional opportunities provided for extended thinking in the additional higher level option topics pushed the score to a 3.
  - The MBG compulsory science units received a score of 0.5 for depth of knowledge. The coverage of physics in the compulsory units is fairly shallow as they include mostly basic, rather than complex concepts. This is to be somewhat expected as the compulsory units integrate chemistry, physics and biology. However, within these units there is a greater focus on chemistry and biology rather than physics. The MBG compulsory and optional science units received a higher score of 1. There is a greater depth of physics content covered in the MBG optional units, though very few topics are covered in considerable detail and not many complex concepts are included, thus a score of 1, rather than 2, was deemed appropriate.

- Regarding the scores for **Volume of Work**:
  - The DP physics SL was judged to comprise a moderate-heavy workload (a score of 2) as students are exposed to multiple physics topics, with each topic being allocated a standard to short amount of time. The volume demands of the HL course, on the other hand, were found to be sufficient to meet a score of 3. Even though the number of topics per hour is smaller, these topics are covered in great depth and with a focus on application.
  - A score of 0 was given for the MBG compulsory science units. Due to the high number of teaching hours allocated to the compulsory units, and the low depth of knowledge score, it was deemed that a significant amount of time was dedicated to covering content of a basic level. The MBG compulsory and optional physics units combined have been given a score of 0.5 for volume of work. While a generous number of hours are also allocated to optional units, the inclusion of a

few complex concepts, such as rigid body mechanics, resulted in a slightly higher score being awarded.

- Regarding the scores for **Outstanding Areas of Subject Demand**:
  - For the DP physics SL course (awarded a score of 2), the IA scientific investigation research project that students need to undertake, the linking questions outlined in the syllabus and the collaborative sciences project were considered to be areas of stretch. In addition to the latter, the HL course features additional higher-level topics which were deemed to include additional areas of stretch, meriting a score of 3.
  - The MBG compulsory units alone, and the MBG compulsory and optional units combined, received the same score of 1 for this category. The interdisciplinary nature and significant real-world focus of the MBG units results in a strong emphasis on connections. Moreover, there was evidence of project-based learning, which contains scope for students to explore scientific concepts in-depth. Altogether, these aspects were deemed to warrant a score of 1.

5.2.4 Content – Chemistry

This section compares and contrasts the content of the DP and MBG curricula falling within the category of chemistry. In order to support visual comparison at-a-glance, the DP chemistry syllabus and the MBG chemistry-related units are presented below in diagrams which show the key topics and subtopics included in each.

Figure 17: DP chemistry content visualiser[89]

Structure	**Structure 1. Models of the particulate nature of matter**	Structure 1.1 – Introduction to the particulate nature of matter	Structure 1.2 – The nuclear atom (SL + AHL)	Structure 1.3 – Electron Configurations (SL + AHL)	Structure 1.4 – Counting particles by mass: The mole	Structure 1.5 – Ideal gases
	Structure 2. Models of bonding and structure	Structure 2.1 – The ionic model	Structure 2.2 – The covalent model (SL + AHL)	Structure 2.3 – The metallic model (SL + AHL)	Structure 2.4 – From models to materials (SL + AHL)	
	Structure 3. Classification of matter	Structure 3.1 – The periodic table: Classification of elements (SL + AHL)	Structure 3.2 – Functional groups: Classification of organic compounds (SL + AHL)			
Reactivity	**Reactivity 1. What drives chemical reactions?**	Reactivity 1.1 – Measuring enthalpy changes	Reactivity 1.2 – Energy cycles in reactions (SL + AHL)	Reactivity 1.3 – Energy from fuels	Reactivity 1.4 – Entropy and spontaneity (HL only)	
	Reactivity 2. How much, how fast and how far?	Reactivity 2.1 – How much? The amount of chemical change	Reactivity 2.2 – How fast? The rate of chemical change (SL + AHL)	Reactivity 2.3 – How far? The extent of chemical change (SL + AHL)		
	Reactivity 3. What are the mechanisms of chemical change?	Reactivity 3.1 – Proton transfer reactions (SL + AHL)	Reactivity 3.2 – Electron transfer reactions (SL + AHL)	Reactivity 3.3 – Electron sharing reactions	Reactivity 3.4 – Electron-pair sharing reactions (SL + AHL)	
Experimental programme	Practical work	Collaborative sciences project	Scientific investigation			

[89] '(HL only)' and '(SL + AHL)' are used to flag, respectively, topics only taught at HL and topics taught at both SL and HL, but which also feature additional higher level content.

Figure 18: Visualiser of common science content in the MBG

Core curriculum component	Natural Sciences, Experimental Sciences and Technology	1. Matter and its interactions	2. Conservation of energy and its interactions with matter	3. Ecosystems: interactions, energy and dynamics	4. Chemical reactions: conservation of matter in the formation of new substances	5. Energy in the processes of daily life	6. Organisms: structures and processes. Inheritance and biological evolution
Mandatory Extended Core curriculum component	**Natural Sciences, Experimental Sciences and Technology**	1. Science Workshop I	2. Science Workshop II*				

**At the time of writing, the programme of study for Science Workshop II was not publicly available*

Figure 19: MBG chemistry content visualiser

Optional Extended Core curriculum components	***Selected Topics in Chemistry I***	**Block I**	States of aggregation of matter and chemical nomenclature	Explain the characteristics of the states of aggregation of matter, the laws of gases and the rules of the nomenclature of chemical compounds for their application in biogeochemical cycles and industrial processes present in the environment, favouring collaborative and organized work.
		Block II	Stoichiometry	Develop stoichiometric calculations of the limiting reagent, efficiency and purity from a balanced chemical equation to apply it to solve problems in your environment, favouring methodical and organized work.
		Block III	Solutions	Prepare proposals using the preparation of different types of solutions to solve problems in the environment with a critical and responsible attitude.
	Selected Topics in Chemistry II	**Block I**	Chemical Kinetics	Analyse the factors, speed, abundance and balance of a chemical reaction to provide solutions to problems in the environment, promoting beneficial behaviour in society.
		Block II	Thermochemistry and Electrochemistry	Apply different processes to build an electro-voltaic cell, based on the analysis of the functioning of thermodynamics and electrochemistry, reflecting on human actions and their environmental impact.
		Block III	Organic Biomolecules	Demonstrate the structures of organic biomolecules through functional groups to contextualise their chemical classification, favouring the disposition to critical and informed work.

Structure

There are many differences in structure between DP chemistry and the MBG units. Chemistry in the DP is a distinct, two-year subject, offered at either SL or HL. In contrast, the MBG offers the knowledge area of Natural Sciences, Experimental Sciences, and Technology, which encompasses chemistry and other sciences. The compulsory units in this knowledge area integrate the sciences and all content within these units is studied to the same level. Only in the optional units of this knowledge area is chemistry offered as a separate science discipline. The compulsory units altogether span the duration of the MBG, whereas the optional units only span the final year. Therefore, within the MBG, there is more emphasis on breadth of scientific knowledge and less scope to specialise in chemistry specifically.

DP chemistry content is broken down into two overarching areas (Structure and Reactivity), and three themes within each: Structure 1, 2 and 3 and Reactivity 1, 2 and 3, each of which is then organised into subtopics. In contrast, the MBG's compulsory units integrate chemistry (and other science) concepts into six overarching scientific areas such as 'Matter and its interactions'. For the optional units, the MBG offers Selected Topics in Chemistry I and Selected Topics in Chemistry II. These units are each organised into three blocks of learning.

Content Alignment

The following table represents a simplified summary of the MBG's content alignment, at topic-level, with DP chemistry (SL and HL). The analysis considers the alignment that the compulsory units alone have with DP chemistry, as well as the alignment of all the units combined (compulsory and optional).

Table 26: Summary of content alignment between the DP chemistry topics and the MBG

DP chemistry topics	Presence of SL content in the MBG		Presence of AHL content in the MBG	
	Compulsory units	Compulsory and optional units	Compulsory units	Compulsory and optional units
Structure 1. Models of the particulate nature of matter				
Structure 1.1 – Introduction to the particulate nature of matter			N/A	N/A
Structure 1.2 – The nuclear atom				
Structure 1.3 – Electron configurations				
Structure 1.4 – Counting particles by mass: The mole			N/A	N/A
Structure 1.5 – Ideal gases			N/A	N/A
Structure 2. Models of bonding and structure				
Structure 2.1 – The ionic model			N/A	N/A
Structure 2.2 – The covalent model				
Structure 2.3 – The metallic model				
Structure 2.4 – From models to materials				
Structure 3. Classification of matter				
Structure 3.1 – The periodic table: Classification of elements				

Structure 3.2 – Functional groups: Classification of organic compounds				
Reactivity 1. What drives chemical reactions?				
Reactivity 1.1 – Measuring enthalpy changes			N/A	N/A
Reactivity 1.2 – Energy cycles in reactions				
Reactivity 1.3 – Energy from fuels			N/A	N/A
Reactivity 1.4 – Entropy and spontaneity (AHL only)	N/A	N/A		
Reactivity 2. How much, how fast and how far?				
Reactivity 2.1 – How much? The amount of chemical change			N/A	N/A
Reactivity 2.2 – How fast? The rate of chemical change				
Reactivity 2.3 – How far? The extent of chemical change				
Reactivity 3. What are the mechanisms of chemical change?				
Reactivity 3.1 – Proton transfer reactions				
Reactivity 3.2 – Electron transfer reactions				
Reactivity 3.3 – Electron sharing reactions			N/A	N/A
Reactivity 3.4 – Electron-pair sharing reactions				
Experimental programme				

Key:

	Strong presence of this topic in the MBG.		*Partial presence of this topic in the MBG.*		*Little or no presence of this topic in the MBG.*	N/A	*This topic does not exist at the respective level.*

Compulsory units:

- Matter and its interactions
- Conservation of energy and its interactions with matter
- Ecosystems: interactions, energy and dynamics
- Chemical reactions: conservation of matter in the formation of new substances
- Energy in the processes of daily life
- Organisms: structures and processes.
- Science Workshop I

Optional units:

Selected Topics in Chemistry I & II

Any alignments found in the compulsory units are carried over and combined with those in the optional units, to represent all the chemistry content offered in the Bachillerato General

As evidenced in table 26, there is at least partial alignment between some of the MBG chemistry topics and the DP, with some topics showing strong alignment. Each DP theme will be taken in turn and discussed in more detail below.

Structure 1: Models of the particulate nature of matter

Regarding SL content within Structure 1, there is strong alignment between the MBG and the DP through all topics within this unit. In particular, topics 1.1 - Introduction to the particulate nature of matter, and 1.4 - Counting principles by mass: the mole, have a strong presence in the MBG. Two topics within the MBG compulsory units align well with the DP Structure 1.1:

'Matter and its Interactions', and 'Chemical Reactions, Conservation of Matter in the Formation of New Substances'. Both these reference the use of the particle model to understand matter, and how substances are made of one type of atom. The compulsory units also partially align with Structure 1.2, and 1.3, as they include content regarding atomic structure, patterns in the periodic table and properties of the light given off by atoms.

Structure 1.4 shows strong alignment with the optional units in the MBG, particularly 'Selected Topics in Chemistry I' which includes stoichiometric calculations and molar relationships, as well as calculations regarding the purity of chemicals. This supports the conclusion that there is a strong presence of Structure 1.4 content in this unit. In addition, 'Selected Topics in Chemistry I' covers the gas laws and ideal gas equation. However, there is not enough detail to conclude that there is a strong presence of Structure 1.5 content.

Regarding AHL content within Structure 1; there is no alignment between the MBG and topics 1.2 – The nuclear atom or 1.3 – Electron configurations. Indeed, there are no references to mass spectra, emission spectra or ionisation energy data in the MBG, therefore no alignment could be found for these.

Structure 2: Models of bonding and structure

Regarding SL content within Structure 2, topics 2.1 - The ionic model and 2.3 - The metallic model show partial alignment with the MBG. The compulsory units include the attraction and repulsion between electrical charges, and the structure, properties and transformations of matter, which aligns well with DP topic 2.1 content focused on ionic bonds and ionic compounds. However, the MBG documentation is not detailed enough to conclude that there is a strong presence of this content. The compulsory units of the MBG also partially align with the DP Structure 2.3 topics, as they include electrical charges at the atomic scale. However, without specific mention of metallic bonds or radius of metal ions, the units cannot be considered to have strong alignment with this topic's SL content.

Furthermore, the MBG shows no alignment with topics 2.2 - The covalent model and 2.4 - From models to materials as the content within these topics has little to no presence in the MBG. The compulsory and optional units also do not include any of the AHL content from Structure 2.

Structure 3: Classification of matter

Regarding SL content within Structure 3, the MBG shows some alignment with both DP topics. Indeed, the MBG compulsory units contain an overarching, general statement which broadly refers to properties that are predictable from patterns (e.g. the reactivity of metals, the types of bond formed, and the reaction with oxygen). Whilst this is covering periodicity and implicitly suggests that certain DP content within topic 3.1 is present in the MBG, without key terminology such as 'valence electrons' and a specific focus on key Groups (such as the halogens and the Group 1 metals), only a partial, rather than strong, alignment can be concluded.

Topic 3.2 - Functional groups: classification of organic compounds shows full alignment with the MBG optional units. Indeed, Selected Topics in Chemistry II includes coverage of the chemical classification of organic biomolecules and distinguishing between functional groups of organic biomolecules. Furthermore, chemical nomenclature (oxides, hydroxides, hydrides

etc.) is present within 'Selected Topics in Chemistry I', thereby further strengthening this alignment.

Regarding AHL content within Structure 3, there is no alignment between the MBG and topics 3.1 - The periodic table: classification of elements and 3.2 - Functional groups: classification of organic compounds. Within the MBG there is no mention of the DP HL content within these topics.

Reactivity 1: What drives chemical reactions?

Regarding SL content within Reactivity 1, the topics show variation in how much alignment there is between the DP and MBG. The compulsory units partially align with Reactivity 1.2, as they include references to the energy required to break bonds. Moreover, aside from a small reference to reactions gaining or releasing energy, the compulsory units contain very little other Reactivity 1 content, thus there are no further alignments with DP topics.

The optional units have partial alignment with Reactivity 1.1 – Measuring enthalpy changes, as Selected Topics in Chemistry II includes endothermic and exothermic reactions. Furthermore, the optional units strengthen the alignment with Reactivity 1.2, as, in addition to bond energies, Hess' Law is covered in Selected Topics in Chemistry II. Finally, none of the units cover combustion or fuels, thus there is no alignment with Reactivity 1.3 – Energy from fuels content.

Regarding AHL content within Reactivity 1, Reactivity 1.2 Energy cycles in reactions shows partial alignment with the MBG optional units due to the presence of entropy calculations in the Selected Topics in Chemistry II topics. However, there is no alignment between Reactivity 1.4 Entropy and spontaneity and the MBG as the detailed calculations requiring Gibbs energy are not present in the MBG.

Reactivity 2: How much, how fast and how far?

Regarding SL content within Reactivity 2, there is no alignment between the MBG and the DP within topic 2.1 How much? Reactivity 2.2 – How fast? The rate of chemical change, and Reactivity 2.3 How far? The extent of chemical change both show strong presence in the MBG in the compulsory units and the optional Selected Topics in Chemistry II taken together. The MBG compulsory unit 'Chemical Reactions, Conservation of Matter in the Formation of New Substances' includes coverage of the energy required or released in chemical reactions, and reversible reactions in the context of dynamic equilibrium. This alignment is further evidenced by the optional unit Selected Topics in Chemistry II, which includes activation energy and Le Châtelier's principle.

Regarding AHL content within Reactivity 2, there is no alignment between the DP reactivity 2.2 How fast? The rate of chemical change and the MBG. There is partial alignment between the MBG units and Reactivity 2.3 How far? The extent of chemical change. Indeed, one of the compulsory MBG units includes dynamic equilibrium, however as it does not specify 'equilibrium law', and with no mention of Gibbs' energy change, there is not enough detail to conclude that there is a strong presence of this topic's content.

Reactivity 3: What are the mechanisms of chemical change?
Regarding SL content within Reactivity 3, the MBG compulsory units do not contain any content from this DP unit. However, topic 3.1 shows partial alignment and 3.2 has strong presence in the MBG optional units. The overlapping content between the DP reactivity 3.1 is present in the MBG's optional topic 'Selected Topics in Chemistry I', as it includes acids and bases and the calculation of pH and OH. There is no mention in the MBG units of the logarithmic nature of the pH scale, and the ion product constant of water (Kw) is also not found within the MBG, hence the alignment here is only partial. Reactivity 3.2 content has a strong presence in the MBG optional topic 'Selected Topics in Chemistry II', as it includes the characteristics of oxidation-reduction reactions and the applications of electrolysis. There is no alignment between the DP topics Reactivity 3.3. Electron sharing reactions and Reactivity 3.4 Electron-pair sharing reactions and the MBG.

Regarding AHL content within Reactivity 3, there is no alignment between the topics 3.1 proton transfer reactions, 3.2 electron transfer reactions and 3.4 electron-pair sharing reactions, and the MBG.

Experimental programme
The DP's experimental programme is outlined in a way that emphasises the need for students to enhance and embed their understanding through the use of practical work and the development of scientific skills such as experiments, databases, simulations and modelling. However, the realities of this within each school may differ in terms of the exact practical activities carried out and the context these activities are conducted within. The MBG curricula make references throughout the science subject area to activities that may be described as practical experiments. For example, the common Core unit Matter and its Interactions includes a statement where, throughout the course, students will "carry out practices related to the nature of matter and its properties".[90] This goes further to then describe how students will develop skills such as using models and obtaining and analysing data. The MBG optional unit Selected Topics in Chemistry I describes students combining different chemical substances in order to prepare solutions. These aspects suggest a strong presence of practical work within the MBG.

Summary
In summary, the MBG compulsory units show at least partial alignment with the DP SL chemistry course. When the MBG compulsory and optional units are taken together, there is a greater level of overlap between the DP SL chemistry and the MBG. For HL content, there is very little alignment between the MBG and the DP. Only one DP topic (Reactivity 2.3 How far? The extent of chemical change) shows partial alignment with the MBG compulsory units. Reactivity 1.2 Energy cycles is the only DP topic that shows presence in the MBG when viewing the compulsory and optional units together. This shows that the DP covers both a greater breadth and depth of chemistry content than the MBG.

[90] Mexican Secretariat of Public Education. (2023). *Learning Progressions in the area of Natural Sciences, Experimental Sciences and Technology.* p. 36.

Table 27: MBG chemistry content which is not covered in the DP

Significant MBG chemistry content which is not included in the DP*
• **Chemical Reactions – Conservation of Matter in the Formation of New Substances** – The Chemistry of the air, how to improve what we breathe? *(presumably focused on pollution/particulates etc.)* • **Matter and its Interactions –** Nanotechnology • **In general –** the relation of things to the use in the world/community/environment.

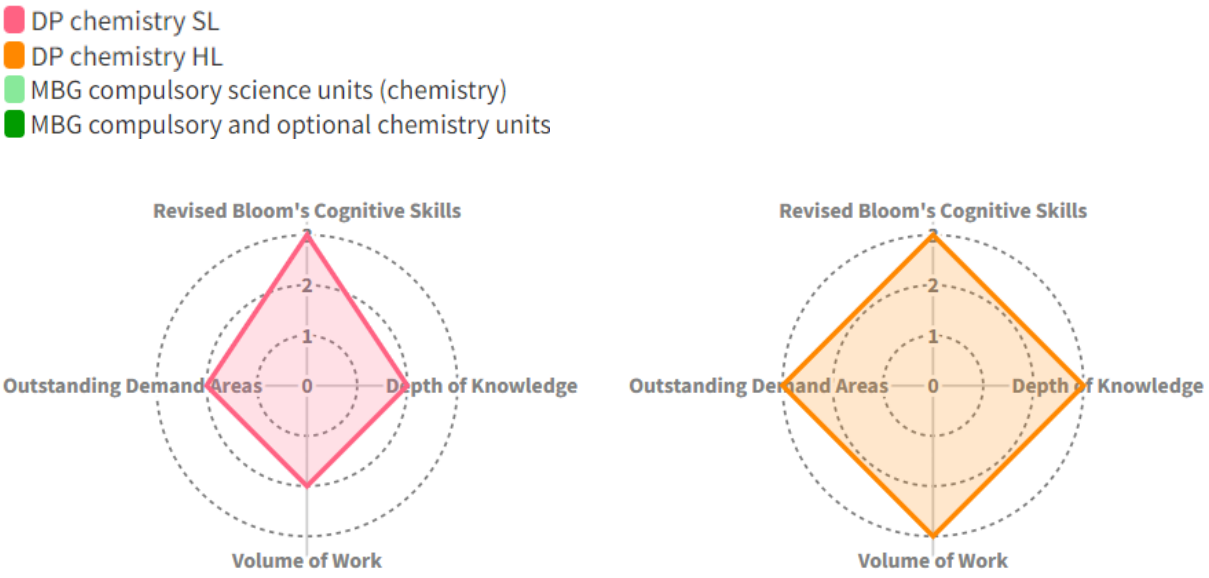
*Notably, 'significant content' does not include topics which are typically studied *prior* to upper secondary.

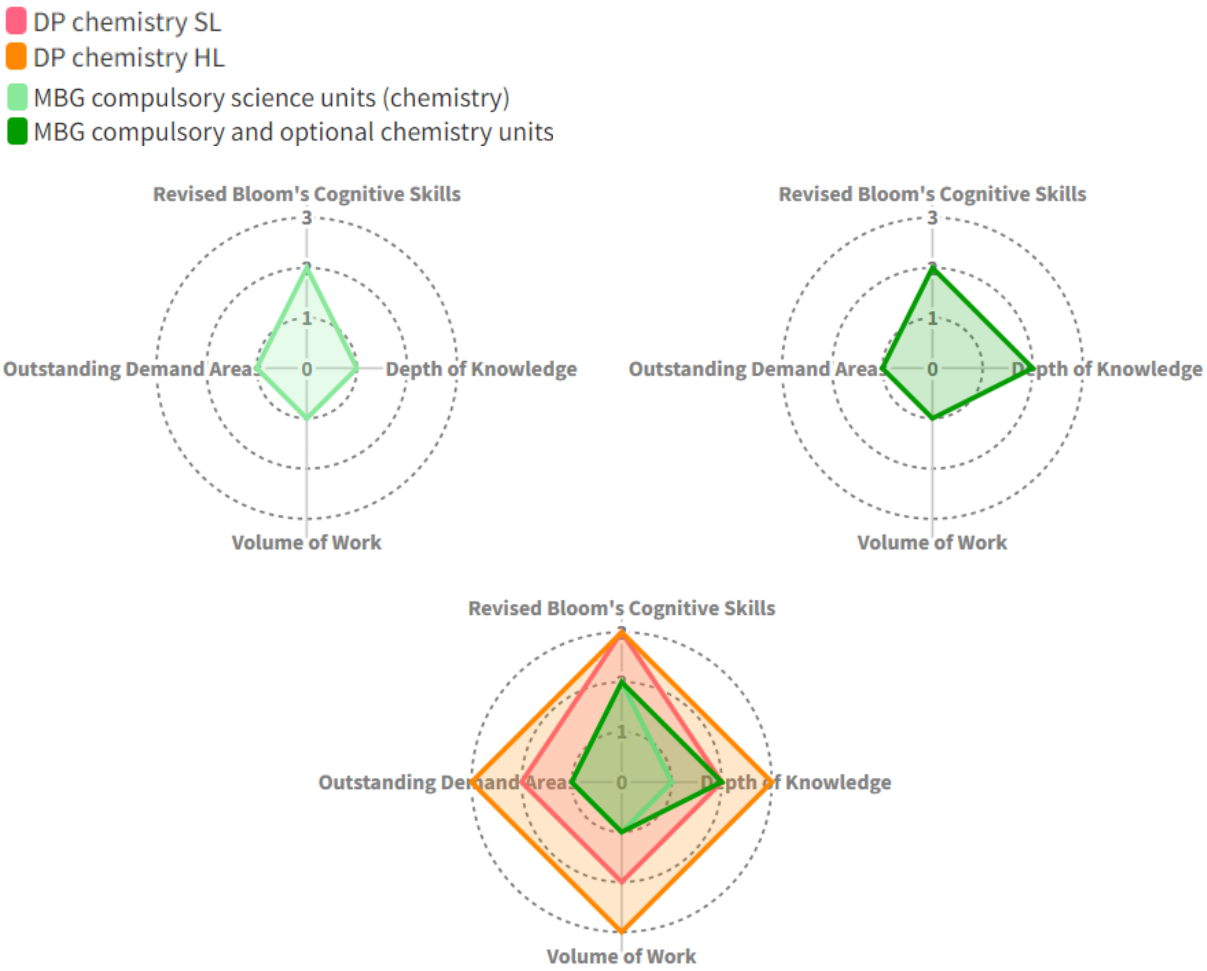
As seen in table 27, there are certain aspects of chemistry content present in the MBG that is not covered in the DP. The first of these being the chemistry of the air and how to improve this, which is likely to be focused on particulates and pollution within the air. Whilst this is something that is generally included at an educational level prior to upper secondary, there is not enough detail in the documentation to determine the level to which this is covered. The same can be said of the other aspects in table 27; nanotechnology and the relation of chemistry content to the use in the world/community/environment. Both these areas may be covered to a fundamental level, or it may be that a great level of detail in these areas is covered, however there is not enough detail within the documentation to determine this.

5.2.5 Demand – Chemistry

The DP and MBG curricula were analysed using the same demand tool in order to create a demand profile for DP chemistry SL, DP chemistry HL, MBG compulsory science units (chemistry), and the MBG compulsory and optional chemistry units (combined). These demand profiles are presented below in the form of radar diagrams, with the last diagram showing all profiles superimposed in one place, enabling immediate visual comparison.

Figure 20: Visual representations of subject demand





The panel of experts carried out a detailed analysis of each course and reached a consensus on the scores shown in the profiles above. The following points were particularly important within the panel discussion:

- Regarding the scores for **Bloom's Cognitive Skills**:
  - DP chemistry has the same learning outcomes for both SL and HL, meaning that these scores are the same. These were judged to merit a score of 3 due to the high levels of critical thinking, critical awareness and elements of synthesis and creation present in the majority of Aims and Assessment Objective 3.
  - For the MBG compulsory units and the MBG compulsory and optional units (combined), a score of 2 was given. Whilst there is strong evidence of skills such as analysis, problem-solving and showing innovation, this was not tailored to subject content. A score of 2 was given due to statements being too generalised. Whilst the Extended Disciplinary skills are written with a scientific focus, this did not warrant raising the score above a 2 as there was still not enough evidence of the synthesis and creation higher order thinking skills.

- Regarding the score for **Depth of Knowledge**:
  - DP chemistry SL was deemed to merit a score of 2 for depth of knowledge due to the mathematical pre-requisite skills and competences required to access the course, as well as the moderate to high level of cognitive complexity of the

knowledge that students are expected to acquire. As to the HL course, the greater depth and additional opportunities provided for extended thinking in the additional higher level option topics pushed the score to a 3.
    - The MBG compulsory units received a score of 1 for depth of knowledge, whereas the compulsory and optional MBG units taken together received a score of 2. Some aspects of the MBG compulsory units appear to be below the level of upper secondary, and although there are areas of DP SL chemistry that are present in these MBG units; many of the more challenging topics are not covered in the MBG, hence the score of 1 for these units. The optional units of the MBG go into slightly greater depth and begin to explore some areas of the DP HL course, therefore a higher score of 2 was merited.

- Regarding the scores for **Volume of Work**:
    - The DP chemistry SL was judged to comprise a moderate-heavy workload (a score of 2) as students are exposed to multiple chemistry topics, with each topic being allocated a standard to short time amount of time. The volume demands of the HL course, on the other hand, were found to be sufficient to meet a score of 3 as, even though the number of topics per hour is smaller, these topics are covered in great depth and with a focus on application.
    - A score of 1 was given to both the MBG compulsory units and the compulsory and optional units combined. This is a higher score than what was given to the MBG physics course, due to more chemistry content being covered in the compulsory units. However, the workload was not deemed significant enough to warrant a similar score to the DP, as fewer chemistry topics are covered. These topics are also not studied in extensive depth and therefore the amount of time allocated to them is fairly generous, thus resulting in a score of 1.

- Regarding the scores for **Outstanding Areas of Subject Demand**:
    - For the DP chemistry SL course (awarded a score of 2), the IA scientific investigation research project that students need to undertake, the linking questions outlined in the syllabus and the collaborative sciences project were considered to be areas of stretch. In addition to the latter, the HL course features additional higher-level topics which were deemed to include additional areas of stretch, meriting a score of 3.
    - The MBG compulsory units alone, and the MBG compulsory and optional units combined, received the same score of 1 for this category. The interdisciplinary nature and significant real-world focus of the MBG units results in a strong emphasis on connections. Moreover, there was evidence of project-based learning, which contains scope for students to explore scientific concepts in-depth. Altogether, these aspects were deemed to warrant a score of 1.

5.2.6 Content – Biology

This section compares and contrasts the content of the DP and MBG curricula falling within the category of biology. In order to support visual comparison at-a-glance, the DP biology syllabus and MBG biology-related units are presented below in diagrams which show the key topics and subtopics included in each.

Figure 21: DP biology content visualiser[91]

A: Unity and diversity	**1. Molecules**	A1.1 Water*	A1.2 Nucleic acids*	
	2. Cells	A2.1 Origins of cells (HL only)	A2.2 Cell structure*	A2.3 Viruses (HL only)
	3. Organisms	A3.1 Diversity of organisms*	A3.2 Classification and cladistics (HL only)	
	4. Ecosystems	A4.1 Evolution and speciation*	A4.2 Conservation of biodiversity	
B: Form and function	**1. Molecules**	B1.1 Carbohydrates and lipids	B1.2 Proteins*	
	2. Cells	B2.1 Membranes and membrane transport*	B2.2 Organelles and compartmentalization*	B2.3 Cell specialization*
	3. Organisms	B3.1 Gas exchange*	B3.2 Transport*	B3.3 Muscle and motility (HL only)
	4. Ecosystems	B4.1 Adaptation to environment	B4.2 Ecological niches	
C: Interaction and interdependence	**1. Molecules**	C1.1 Enzymes and metabolism*	C1.2 Cell respiration*	C1.3 Photosynthesis*
	2. Cells	C2.1 Chemical signalling (HL only)	C2.2 Neural signalling*	
	3. Organisms	C3.1 Integration of body systems*	C3.2 Defence against disease	
	4. Ecosystems	C4.1 Populations and communities	C4.2 Transfers of energy and matter	
D: Continuity and change	**1. Molecules**	D1.1 DNA replication*	D1.2 Protein synthesis*	D1.3 Mutations and gene editing*
	2. Cells	D2.1 Cell and nuclear division*	D2.2 Gene expression (HL only)	D2.3 Water potential*
	3. Organisms	D3.1 Reproduction*	D3.2 Inheritance*	D3.3 Homeostasis*
	4. Ecosystems	D4.1 Natural selection*	D4.2 Sustainability and change*	D4.3 Climate change*
Experimental programme	Practical work	Collaborative sciences project	Scientific investigation	

*Includes additional higher level (AHL) content.

[91] Unless specified as HL only, all the above are studied in SL and HL, with the latter also including the AHL content.

Figure 22: Visualiser of common science content in the MBG

Core curriculum component	**Natural Sciences, Experimental Sciences and Technology**	1. Matter and its interactions	2. Conservation of energy and its interactions with matter	3. Ecosystems: interactions, energy and dynamics	4. Chemical reactions: conservation of matter in the formation of new substances	5. Energy in the processes of daily life	6. Organisms: structures and processes. Inheritance and biological evolution
Mandatory Extended Core curriculum component	**Natural Science, Experimental Sciences and Technology**	1. Science Workshop I	2. Science Workshop II*				

**At the time of writing this report, the programme of study for Science Workshop II was not publicly available*

Figure 23: MBG biology content visualiser

Optional Extended Core curriculum components	***Selected Topics in Biology I***	**Block I**	Biology as a Science	Explain the purpose of the scientific method to recognize its importance and build critical and reflective thinking.
		Block II	Cellular processes and molecular biology	Relate the cellular structure to the correct functioning of the human body through the identification of biochemical elements that intervene in metabolic processes; to reflexively understand the importance of the study of molecular biology
		Block III	Genetic Engineering and the applications of biotechnology	Question the application of biotechnology and genetic engineering techniques, as well as the consequences of their use in the community, by recognizing the risks and benefits that they present, responsibly promoting the use of products and services derived from it.
	Selected Topics in Biology II	**Block I**	Biodiversity and its study techniques	Recognise the importance of biodiversity and its study techniques to the development of human society, analyzing the biological components that make Mexico a mega-diverse country under a legal framework of species conservation; that allow you to promote in your community, in a responsible manner, actions for the preservation of life.
		Block II	Biology of plants and fungi	Justify the ecological and social relevance of plants and fungi, critically examining their classification based on their anatomical-physiological characteristics, as well as the different uses and applications they have; responsibly promoting the preservation of these species in the community.
		Block III	Animal biology and ethology	Argue the ecological and social relevance of animals, as well as the different functions they have; based on the analysis of their classification according to their structure and physiology, associating this with the biological bases of animal behavior, to responsibly promote the preservation of these species in their community.
		Block IV	Ethnobiology	Define interculturality, valuing different traditions in the community that are related to the use of plants, fungi and animals, encouraging an approach to the cultural roots of the country, promoting the care of species in an environment of respect.

Structure

There are many differences in structure between DP biology and the MBG units. Biology in the DP is a distinct, two-year subject, offered at either SL or HL. In contrast, the MBG offers the knowledge area of Natural Sciences, Experimental Sciences, and Technology, which encompasses biology and other sciences. The compulsory units in this knowledge area integrate the sciences and all content within these units is studied to the same level. Only in the optional units of this knowledge area is biology offered as a separate science discipline. The compulsory units altogether span the duration of the MBG, whereas the optional units only span the final year. Therefore, within the MBG, there is more emphasis on breadth of scientific knowledge and less scope to specialise in biology specifically.

DP biology content is broken down into four themes: Unity and Diversity, Forms and Function, Interaction and Interdependence, and Continuity and Change. Each of these themes has four levels within them: Molecules, Cells, Organisms, and Ecosystems, which are then organised into topics. In contrast, the MBG's compulsory units integrate biology (and other science) concepts into six overarching scientific areas such as 'Ecosystems: interactions, energy and dynamics'. For the optional units, the MBG offers Selected Topics in Biology I and Selected Topics in Biology II. These units are each organised into three-four blocks of learning.

Content Alignment

The table below represents a simplified summary of the MBG's content alignment with DP biology (SL and HL) themes and levels. For reasons described above, all compulsory units from the MBG were used and the optional units; Selected Topics from Biology I & Biology II, were also used in biology analysis.

Table 28: Summary of content alignment between the DP biology themes and levels and the MBG

DP biology themes and levels	Presence of SL content in the MBG		Presence of AHL content in the MBG	
	Compulsory units	Compulsory and optional units	Compulsory units	Compulsory and optional units
A Unity and Diversity				
A1 Molecules				
A2 Cells				
A3 Organisms				
A4 Ecosystems				
B Form and Function				
B1 Molecules				
B2 Cells				
B3 Organisms				
B4 Ecosystems				
C Interaction and Interdependence				
C1 Molecules				
C2 Cells				
C3 Organisms				
C4 Ecosystems			N/A	N/A
D Continuity and Change				
D1 Molecules				
D2 Cells				
D3 Organisms				
D4 Ecosystems				
Experimental Programme				

Key:

	Strong presence of this level in the MBG.		*Partial presence of this level in the MBG.*		*Little or no presence of this level in the MBG.*	N/A	*This does not exist at the respective level.*

Compulsory units:

- Matter and its interactions
- Conservation of energy and its interactions with matter
- Ecosystems: interactions, energy and dynamics
- Chemical reactions: conservation of matter in the formation of new substances
- Energy in the processes of daily life
- Organisms: structures and processes.
- Science workshop I

Optional units:

- Selected Topics in Biology I & II

Any alignments found in the compulsory units are carried over and combined with those in the optional units, to represent all the biology content offered in the Bachillerato General

As evidenced in table 28, the MBG has partial alignment with some of the themes and levels in DP biology, and shows strong alignment with a few. Each DP theme will be taken in turn and discussed in more detail below.

Theme A: Unity and Diversity

Regarding SL content within A: Unity and Diversity, of the compulsory units within the MBG, Matter and its interactions shows partial alignment with topic A1.1. The compulsory units of

the MBG also partially align with aspects of cell structure within A2.2 and there is strong alignment between these units and content of A4.1 and A4.2.

The compulsory and optional units of the MBG taken together bring greater alignment between the two curricula, with Selected Topics in Biology II showing partial alignment with DP A1.1 Water. The MBG optional unit Selected Topics in Biology I shows greater alignment with the DP content of A1.2 Nucleic Acids due to the inclusion of content such as the basis of the genetic code, the structure of RNA and DNA and the components of a nucleotide. However, there were areas of content which were not found in the MBG units: hydrogen bonds, cohesion and adhesion of water molecules within topic A1.1, and specific references to complementary base pairing, and conservation of the genetic code as evidence of universal ancestry were not evidenced in the MBG. Many aspects of cell structure are present in Selected Topics in Biology I, and virtually all content within A4.2 Conservation of biodiversity is found in Selected Topics in Biology II.

Regarding AHL content from Unity and Diversity, there is no alignment between the DP and MBG with regards to A1 Molecules and A2 Cells. However, A3 Organisms shows partial alignment, due to the HL topic of A3.2 Classification and cladistics showing partial presence within the MBG. Within the compulsory units of the MBG there is partial alignment with A4.1 Evolution and speciation due to the presence of adaptive radiation as a source of biodiversity. The MBG's optional unit of Selected Topics in Biology II includes some aspects of classification that are found in topic A3.2, thereby showing partial alignment.

Theme B: Form and Function

Regarding SL content, there is no alignment between the MBG's compulsory units and content within B: Form and Function. The only alignment with B: Form and Function comes from the MBG optional Selected Topics in Biology I unit, which contains some SL content from B2.1 Membranes and membrane transport where there is the inclusion of the structure of cell membranes, as well as simple diffusion across cell membranes. Although the optional units do not include other content from level B2 Cells, the summary table shows that there is a partial presence overall due to B2.1 being a larger topic than the others within theme B. Whilst there is no alignment between the MBG biology and DP for B3 Organisms, it can be noted that this content may be found in the MBG optional subjects of Health Sciences I and II, as they cover the structure of the main systems within the body (musculoskeletal, nervous, cardiovascular and respiratory).

Regarding AHL content, the MBG does not align with any AHL content from theme B: Form and Function. There is no mention within the MBG of the more advanced aspects of transport, such as sodium-potassium pumps and gated ion channels in neurons, nor is there mention of adaptations of cells (sperm, egg and cardiac muscle), or specific organelle structure (chloroplasts and mitochondria).

Theme C: Interaction and Interdependence

Regarding SL content within C: Interaction and Interdependence, topics within C1 Molecules and C4 Ecosystems show partial presence in the compulsory MBG units. The content of C1.2 Cell respiration can be inferred from the MBG compulsory units 'Organisms, Structures and Processes' and 'Energy in the Processes of Daily Life'. However, this is derived from more all-encompassing statements that describe cellular respiration, the synthesis of new molecules

and the breaking of oxygen bonds to form new substances. Overall, level C.4 shows partial alignment with the MBG due to the majority of C4.2 content being present within the compulsory unit of 'Ecosystems – Interactions, Energy and Dynamics', alongside little to no presence of content within C4.1.

There is at least partial presence of all theme C levels when viewing the compulsory and optional units of the MBG together. The MBG shows partial presence of topic C1.1 within the optional subject of Biology I, where enzymes and their role in chemical reactions is included. Photosynthesis is less evident in the MBG, therefore much of the SL content of C1.3 shows no alignment. The SL content of C2.2 shows partial alignment with the MBG optional unit Biology I, as it can be inferred that through the study of 'nervous cellular communication' that there would be coverage of at least some aspects of neurons, action potentials and synapses. However, this content *is* found within the MBG optional unit of Health Sciences I. Whilst the SL content of topic C3.1 shows no alignment, there is presence of a small amount of content from C3.2. The MBG optional unit Biology I includes coverage of the innate and acquired immune system, antigens and antibodies. Within Biology I, it can be inferred that there is also coverage of B lymphocytes and T lymphocytes, however this is not explicitly stated. The MBG optional unit Health Sciences I does contain some SL aspects of C2 and C3; such as, hormones, neurotransmitters, synapses, nerve impulses from the former, and pathogens and the primary defence barriers of the latter.

Regarding HL content within theme C: Interaction and Interdependence, there is no presence of content within C1 Molecules and C3 Organisms in the MBG, however there is partial alignment with C2.1 and C2.2. There is not enough detail within the MBG curriculum documentation to determine full alignment, but the optional unit Biology I includes the components of and communication within the nervous system, thereby suggesting some coverage of these HL aspects.

Theme D: Continuity and Change

Regarding SL content within theme D: Continuity and Change, within the MBG compulsory unit 'Organisms, Structures and Processes' there is a very broad reference to homeostasis through references to organisms responding to stimuli and the possibility of breaking states of internal balance. Whilst this may include some aspects of DP topic D3.3 Homeostasis, there is not sufficient evidence to be certain.

There is partial alignment between the MBG optional unit Biology I and DP topic D1.2 Protein synthesis. The process of transcription through the creation of mRNA and tRNA, as well as the effect of mutations on protein structure is all included in the MBG. However, there is no presence of DP topics D1.1 DNA replication or D1.3 Mutations and gene editing, therefore the overall judgement for D1 topics is partial presence in the MBG compulsory and optional units taken together. There is no evidence within the MBG of subject content within D2 or D4 topics.

Regarding the HL content within theme D: Continuity and Change, there is no alignment found between the DP levels and the MBG. However, within D3.3, all HL content of this topic (the structure of the kidney and its role in osmoregulation and excretion) can be found within the MBG optional unit of Health Sciences I.

Additional biology content within the MBG

The MBG optional units contain some biology content which is not covered by DP biology and is summarised in the table below.

Table 29: MBG biology content which is not covered in the DP

Significant MBG biology content which is not included in the DP*
○ GMO products, biotechnology ○ Plants and fungi endemic to Mexico and the importance of their preservation ○ Ethnobiology

*Significant content mostly does not include topics which are typically studied *prior* to upper secondary.

The optional unit Biology I of the MBG contains Block III: Genetic Engineering and the applications of biotechnology. Within this block, students will study the uses and implications of biotechnology within a social, environmental and economic context. In addition, this block includes the institutions and regulations for GMO product use in Mexico.

Within the 'discipline focus' description of the optional Biology II unit, it states that it will address the study ethnobiology and bring students "closer to the cultural roots of the use…of plants, fungi and animals…promoting a respectful environment of interculturality".[92] This is expanded on in the description of the 'purpose' of Block III which states that students will argue the ecological and social relevance of animals, to responsibly promote the preservation of species.

Experimental programme

The DP's experimental programme is outlined in a way that emphasises the need for students to enhance and embed their understanding through practical work and the development of scientific skills such as experiments, databases, simulations and modelling. However, the realities of this within each school may differ in terms of the exact practical activities carried out and the context these activities are conducted within. The MBG curricula make references throughout the science subject area to activities that may be described as practical experiments. For example, the common Core unit Matter and its Interactions includes a statement where, throughout the course, students will "carry out practices related to the nature of matter and its properties".[93] This goes further to then describe how students will develop skills such as using models and obtaining and analysing data, and the MBG optional unit Selected Topics in Biology I describes students applying steps of scientific methods. These aspects suggest a strong presence of practical work within the MBG.

Summary

In summary, at both SL and HL, the MBG compulsory units show little alignment with the DP in terms of both breadth and depth. The MBG compulsory units show presence of content within themes A: Unity and Diversity, and C: Interaction and Interdependence, but there is little to no content from themes B: Form and Function and D: Continuity and Change. The MBG compulsory units do not include any AHL content from any DP themes, showing that the DP

[92] Undersecretary of Higher Secondary Education. (2018). *Selected Topics in Biology II. Programs of Study for the Class of 2022 – 2025. Propaedeutic Training Component.* Available from: Programs of Study for the Generation 2023 - 2026 and Subsequent. (sep.gob.mx).

[93] Mexican Secretariat of Public Education. (2023). *Learning Progressions in the area of Natural Sciences, Experimental Sciences and Technology.* p. 36.

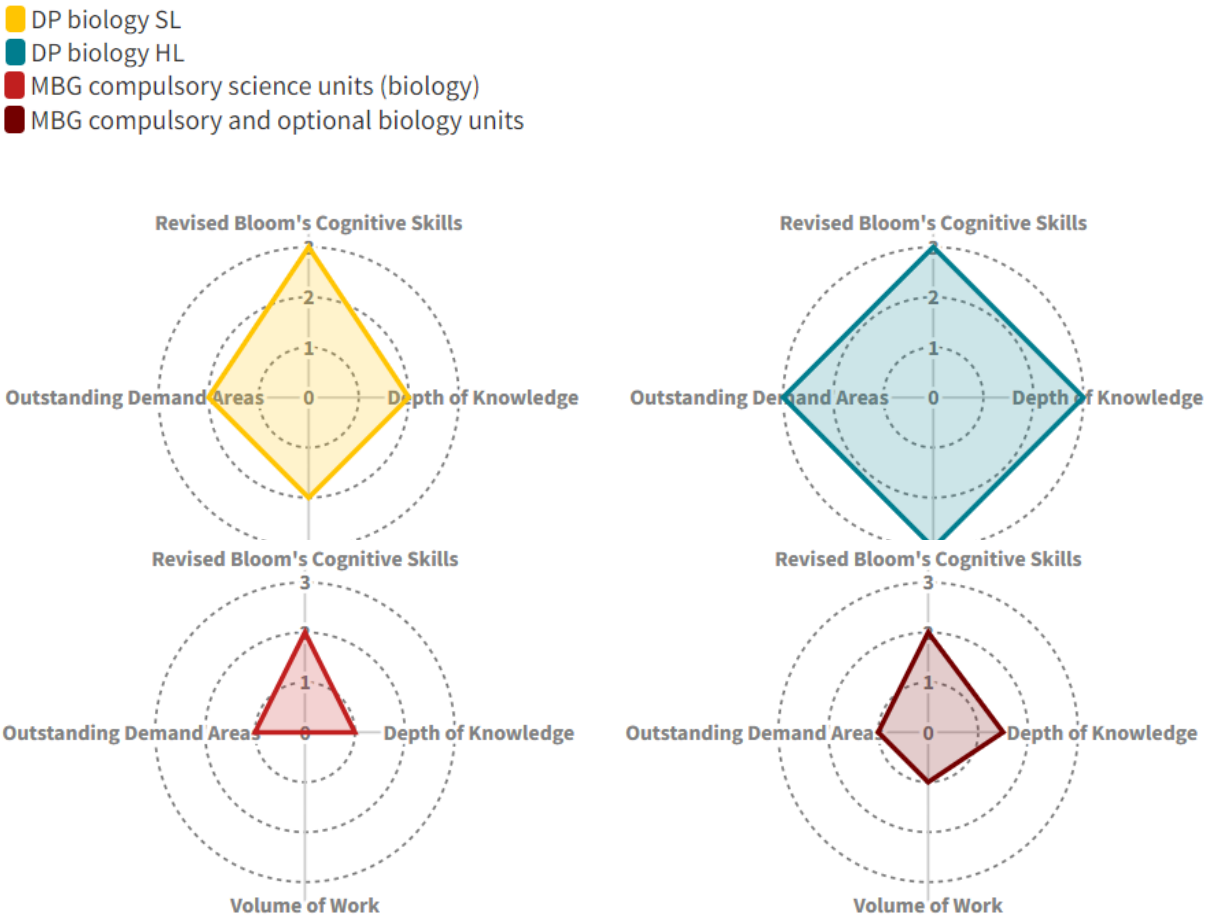
biology goes into much greater depth than the MBG compulsory units. Regarding the MBG compulsory and optional units taken together, this shows greater alignment between the MBG and the DP. At SL, there is some level of alignment with each of the DP biology themes, showing slightly more breadth than the MBG compulsory units alone. At HL, the compulsory and optional units taken together contain little DP AHL content, with only one level from theme A: Unity and Diversity, and one level from theme C: Interaction and Interdependence showing partial alignment. This demonstrates that the DP biology course has a greater breadth and depth than the MBG.

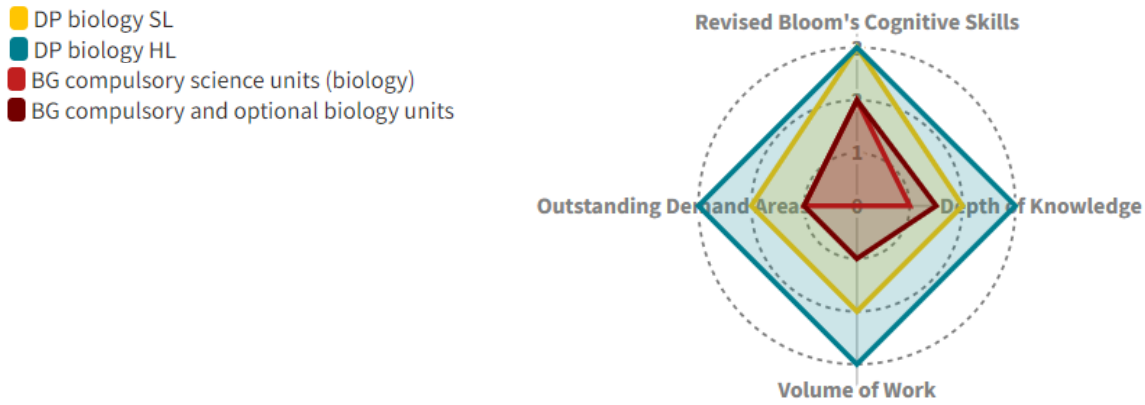
Some differences in content alignment may be due to the structure of the curriculum and the subjects that are offered by the MBG. For example, the entire content of HL topic A2.3 and both some SL and HL content of theme B are found within the optional Health Sciences units of the MBG, rather than biology. Having said this, the DP still covers a wider range of biology content, to a much greater depth, than the MBG.

5.2.7 Demand – Biology

The DP and MBG curricula were analysed using the same demand tool in order to create a demand profile for DP biology SL, DP biology HL, MBG compulsory science units (biology) and the MBG compulsory and optional biology units. These demand profiles are presented below in the form of radar diagrams, with the last diagram showing all profiles superimposed in one place, enabling immediate visual comparison.

Figure 24: Visual representations of subject demand





The panel of experts carried out a detailed analysis of each course and reached a consensus on the scores shown in the profiles above. The following points were particularly important within the panel discussion:

- Regarding the scores for **Bloom's Cognitive Skills**:
  - DP biology has the same learning outcomes for both SL and HL, meaning that these scores are the same. These were judged to merit a score of 3 due to the high levels of critical thinking, critical awareness and elements of synthesis and creation present in the majority of Aims and Assessment Objective 3.
  - For the MBG compulsory units and the MBG compulsory and optional units (combined), a score of 2 was given. Whilst there is strong evidence of skills such as analysis, problem-solving and showing innovation, this was not tailored to subject content. A score of 2 was given due to statements being too generalised. Whilst the Extended Disciplinary skills are written with a scientific focus, this did not warrant raising the score above a 2 as there was not enough evidence of higher order thinking skills such as synthesis and creation.

- Regarding the score for **Depth of Knowledge**:
  - DP biology SL was deemed to merit a score of 2 for depth of knowledge due to the pre-requisite skills and competences (e.g. interpretation of graphs data, mathematics skills, some chemistry and geography links) required to access the course, as well as the moderate to high level of cognitive complexity of the knowledge that students are expected to acquire. As to the HL course, the greater depth and additional opportunities provided for extended thinking in the additional HL topics pushed the score to a 3.
  - The MBG compulsory science units has been given a score of 1 for depth of knowledge. The course content is fairly top-level and shows evidence of being covered in a fairly shallow way. The MBG compulsory and optional science units has been given a higher score of 1.5. This is due to the presence of higher-level content and more challenging DP content found in the MBG optional units, rather than being present in the Core units.

- Regarding the scores for **Volume of Work**:
  - The DP biology SL was judged to comprise a moderate-heavy workload (a score of 2) as students are exposed to multiple biology topics, with each topic being

allocated a standard to short amount of time. The volume demands of the HL course, on the other hand, were found to be sufficient to meet a score of 3 – even though the proportion of topics per allocated teaching hour is smaller, these topics are covered in great depth and with a focus on application.

- A score of 0 was given for the MBG compulsory science units. Due to the low score given for depth of knowledge, a large amount of time is devoted to covering content of a basic level. The amount of biology content in the MBG is fairly low and therefore students have a generous amount of time to cover foundational level biology, hence the score of 0. The MBG compulsory and optional science units taken together have been given a score of 1 for volume of work. The addition of the optional selected biology topics in the MBG gives a greater workload and therefore a higher score is justified. However, whilst there were some references to aspects of DP HL biology content, most of the more challenging components were found in the Health Science MBG optional units. Therefore, the amount of time given to the compulsory and optional units together was still considered to be generous and therefore warranted a score of 1.

- Regarding the scores for **Outstanding Areas of Subject Demand**:
  - For the DP biology SL course (awarded a score of 2), the IA scientific investigation research project that students need to undertake, the linking questions outlined in the syllabus and the collaborative sciences project were considered to be areas of stretch. In addition to the latter, the HL course features additional higher-level topics which were deemed to include additional areas of stretch, meriting a score of 3.
  - The MBG compulsory units alone, and the MBG compulsory and optional units combined, received the same score of 1 for this category. The interdisciplinary nature and significant real-world focus of the MBG units results in a strong emphasis on connections. Moreover, there was evidence of project-based learning, which contains scope for students to explore scientific concepts in-depth. Altogether, these aspects were deemed to warrant a score of 1.

5.3 Language and Literature

Below is the list of subjects and units used in the language and literature subject comparison analysis.

Language A: language and literature[94]
Language A: language and literature (DP LA:LL) is a subject offered within the DP's language and literature subject group. This subject introduces the critical study and interpretation of written and spoken texts from a wide range of literary forms and non-literary text-types**.** The subject is available at SL and HL, with HL requiring the study of a greater number of literary works and non-literary texts, and a fourth assessment component in the form of an essay.

Language and Communication[95]
Language and Communication is one of the four Socio-cognitive resources in the MCCEMS and includes common learning for all high school students. Indeed, it encompasses the development of skills which will allow students to use language, express themselves, relate to others, and process information from different sources, both in their native language and others. Socio-cognitive resources play transversal roles in the curriculum, being designed to support and enhance learning in the Areas of Knowledge and other Socio-cognitive Resources. In the Bachillerato General, there are some Language and Communication units which are compulsory, and some which are optional. The curricular learning units that have been used in the analysis are described below.

*From the **compulsory** Language and Communication units in the Bachillerato General:*

- **Language and Communication I, II, and III**[96]
  Language and Communication I, II, and III are part of the Core curriculum component of the Bachillerato General and are common learning for all high school students. These units place emphasis on developing skills related to the reading and composition of texts and other sources of information. Over the three semesters students learn to identify fundamental information, analyse, critically evaluate, and draw upon different texts and information sources to discuss a topic.

*From the **optional** Language and Communication units in the Bachillerato General:*

- **Communication Sciences I and II**[97]
  Communication Sciences I and II are part of the Extended Core curriculum component of the Bachillerato General and, if chosen, are studied in the last two semesters of high school.

[94] International Baccalaureate. (2019). *Language A: language and literature.*
[95] Mexican Secretariat of Public Education. (2023). *Learning progressions for the socio-cognitive resource Language and Communication.* Available from: Progresiones de Aprendizaje - Lengua y Comunicación.pdf (sep.gob.mx)
[96] Ibid.
[97] Undersecretary of Higher Secondary Education. (2018). *Programs of Study for the Class of 2022 – 2025. Propaedeutic Training Component. Communication Sciences I and II.* Available from: Programs of Study for the Generation 2023 - 2026 and Subsequent. (sep.gob.mx)

The analysis will consider, and distinguish between, the Language and Communication units which are compulsory in the Bachillerato General, and those which are optional.

5.3.1 Learning Outcomes – Language and Literature

This section compares and contrasts the learning outcomes of curricula falling within the category of language and literature. For DP LA:LL learning outcomes, the DP sets out aims and assessment objectives, which are the same for all subjects within the studies of language and literature subject group. The language and literature learning outcomes for the MBG are drawn from the learning goals and learning progressions for the compulsory units (Languages and Communication I, II, and III), as well the General Competencies and Extended Disciplinary Competencies articulated for the optional units reviewed (Communication Sciences I and II).

The following summary table demonstrates the learning outcome themes that were extracted from the DP's language and literature subject group and indicates if and where they were judged to have presence within the learning outcomes of the MBG.

Table 30: Presence of the DP language and literature subject group learning outcome themes in the Bachillerato General.

Themes extracted from the learning outcomes in the DP language and literature subject group	Presence in the Bachillerato General	
1. Develop knowledge of a wide range of diverse texts and forms.		This theme is strongly present in many of the MBG's learning outcomes for Language and Communication I, II, and III.
2. Understand the relationship between context and text.		This is a strong theme in the Bachillerato General's learning outcomes, evidenced by the requirement to consider contexts when analysing texts.
3. Extract meaning and interpret text.		This theme is well evidenced through the interpretation of information from multiple sources, situations, and contexts. Also, students must explain meaning, identify key ideas in a text, and infer conclusions.
4. Understand the writer's craft.		This theme is not explicitly present within the Bachillerato General's learning outcomes for language and literature.
5. Formulate and express ideas in a variety of ways.		This theme is strongly present, as the learning progressions for Language and Communication II require students to express their ideas, knowledge and experiences. They also must transmit their knowledge, questions and experiences through verbal and non-verbal methods.
6. Develop an appreciation of intertextuality and interdisciplinarity.		There is little to indicate that intertextuality is considered within the Bachillerato General's learning outcomes. Interdisciplinarity can be inferred from the units' documentation, but it is not explicit in the learning outcomes.
7. Develop identity through the study of language and literature		This theme is present in the Bachillerato General's learning outcomes, for both the compulsory and optional units.

Key:

	This theme is well-evidenced in the learning outcomes of the MGB.		*This theme is partially evidenced in the learning outcomes of the MGB.*		*This theme is not evidenced in the learning outcomes of the MGB.*

Presence of the DP's Learning Outcome Themes

There is reasonable alignment between the DP's and MBG's language and literature learning outcomes, with most of the DP's learning outcome themes being at least partially evidenced. The presence of each DP theme is discussed in more detail below.

1. Develop knowledge of a wide range of diverse texts and forms.

The DP's theme of developing knowledge of a wide range of diverse texts and forms is strongly present in the Bachillerato General's learning outcomes for Language and Communication compulsory units. Some of the different text forms mentioned are speeches, audios, videos, and images. Moreover, several learning outcomes within Language and Communication compulsory units express the requirement to review, value, organise, or synthesize information from multiple sources, situations, and contexts.

2. Understand the relationship between context and text.

The DP's theme of understanding the relationship between text and context is strongly present within the Bachillerato General's learning outcomes, particularly within the Language and Communication compulsory units. This theme is highlighted in the requirements to interpret information from multiple sources and contexts and to explain their meaning clearly. Students must use context in order to understand communicative intent, such as using local frames of reference to influence interpretation and are also required to vary communication strategies depending on the context. In the optional units, students consider cultural contexts and how this impacts non-literary texts (such as advertising).

3. Extract meaning and interpret text.

The DP's theme of extracting meaning and interpreting texts is strongly present within the Bachillerato General's learning outcomes of both the compulsory and optional units. Indeed, students are similarly required to identify key ideas from texts, interpret information from various sources, and infer conclusions.

4. Understand the writer's craft.

The DP's theme of understanding the writer's craft is not explicitly present within the Bachillerato General's learning outcomes for language and literature. Indeed, unlike the DP, there are no references to understanding and analysing the choices made by the author, such as the use of literary devices and stylistic techniques.

5. Formulate and express ideas in a variety of ways.

The DP's theme of formulating and expressing ideas in a variety of ways is a strong theme in the Bachillerato General's learning outcomes, found in both the compulsory units and the optional units. Indeed, students are expected to share their ideas, knowledge, and experiences through verbal and non-verbal communication, and in a manner appropriate to the academic, personal, or social communicative context. It is also expected that students use information and communication technologies to express ideas, and that they structure their

ideas in a clear and logical manner, basing judgements on the analysis and evaluation of various sources**.**

6. Develop an appreciation of intertextuality and interdisciplinarity.

The DP's theme of intertextuality and interdisciplinarity is not explicitly present within the Bachillerato General's learning outcomes for the compulsory or optional units reviewed. In the DP, intertextuality is an area of exploration, and throughout the course, students will see similarities and differences among diverse texts through the study of topics such as chronological development and investigations into theoretical perspectives. With regards to interdisciplinarity, there is no explicit mention of linking language with other subjects within the learning progressions. However, the documentation does include information on how other Socio-cognitive Resources (e.g. Mathematical Thinking) and Areas of Knowledge (e.g. Natural Sciences, Experimental Science and Technologies) might use skills from Language and Communication. In the optional units, there are interdisciplinarity references that suggest links to geography and philosophy. As intertextuality is a significant focus of the DP, and as interdisciplinarity is not embedded into the learning progressions for Language and Communication, it has been determined that, overall, this DP theme is not evidenced.

7. Develop identity through the study of language and literature

The DP's theme of developing identity is well-evidenced in the Bachillerato General's learning outcomes for both the compulsory and optional units. Indeed, the learning goals from the compulsory units expect students to "expand their knowledge, perspectives, criticisms and experiences"[98], as well as to express their "experiences and notions of reality".[99] Additionally, the General Competencies of the optional units expect students to recognise their own prejudices and modify their points of view based on new evidence. Meanwhile, the Extended Disciplinary Competencies expect students to use information from different texts to "guide their interests". [100]

Summary

Overall, there is reasonable alignment between the DP and MBG language and literature subjects with regards to learning outcomes. In particular, the learning outcomes have strong similarities with regards to critical analysis skills, exploring a range of different texts and forms, understanding the impact of context, interpreting information and meaning, and developing identity over the course. However, the theme of appreciating intertextuality receives a significantly lesser focus in the MBG compared to the DP, as does understanding the writer's craft. Finally, no significantly different learning outcome themes emerge from the MBG for language and literature.

5.3.2 Content – Language and Literature

This section compares the content of DP language A: language and literature with the MBG content from Language and Communication I, II, III and Communication Sciences I and II. To

[98] Mexican Secretariat of Public Education. (2023). *Learning progressions for the socio-cognitive resource Language and Communication.*
[99] Ibid.
[100] Undersecretary of Higher Secondary Education. (2018). *Programs of Study for the Class of 2022 – 2025. Propaedeutic Training Component. Communication Sciences.*

support the visual comparison at-a-glance, the content from the DP and MBG are presented in the following diagrams.

Figure 25: DP language A: language and literature content visualiser

Areas of exploration	**Readers, Writers and Texts**	Why and how do we study language and literature?	How are we affected by texts in various ways?	In what ways is meaning constructed, negotiated, expressed and interpreted?	How does language use vary amongst text types and amongst literary forms?	How does the structure or style of a text affect meaning?	How do texts offer insights and challenges?
	Time and Space	How important is the cultural or historical context to the production and reception of a text?	How do we approach texts from different times and cultures to our own?	To what extent do texts offer insight into another culture?	How does the meaning and impact of a text change over time?	How do texts reflect, represent or form a part of cultural practices?	How does language represent social distinctions and identities?
	Intertextuality: Connecting Texts	How do texts adhere to and deviate from conventions associated with literary forms or text types?	How do conventions and systems of reference evolve over time?	In what ways can diverse texts share points of similarity?	How valid is the notion of a classic text?	How can texts offer multiple perspectives of a single issue, topic or theme?	In what ways can comparison and interpretation be transformative?
Literary works (four for SL and six for HL)	Literary texts should take into account the following considerations:	Authors	Literary forms	Period	Place		
Non-literary texts	Non-literary texts should:	Be extended, full-length major non-literary texts, or groups of shorter non-literary texts that share the same text type and authorship.		Have time allocated to them such that there is a balance with the time spent on literary works within each area or in the course as a whole.			

Figure 26: Visualiser of Language and Communication units in the Bachillerato General.

	Component of the Bachillerato General	Curricular Learning Units		
Language and Communication	Core curriculum component (Compulsory Units)	**Language and Communication I** (Reading comprehension and composition of texts, as well as the study and composition of various sources of information, in order to distinguish fundamental information from accessory information (summary and simple narrative)) Learning Progressions 1-16	**Language and Communication II** (Reading comprehension and composition of texts, as well as the study and composition of various sources of information, in order to analyze and express a critical opinion about the content and form (review and critical commentary)) Learning Progressions 1-15	**Language and Communication III** (Reading comprehension and composition of texts, as well as the study and composition of various sources of information, in order to analyze a topic based on the reading or study of two or more texts or sources of information (essay and discussion)) Learning Progressions 1-16
	Extended Core curriculum component (Optional Units)	**Communication Sciences I** Block I: The communicative process Block II: Communicative models Block III: Types of communication Block IV: Communication and culture Block V: The use of the Internet in communication	**Communication Sciences II** Block I: The newspaper as means of mass communication Block II: Radio as a means of mass communication Block III: Television as a means of mass communication Block IV: Cinema as a means of mass communication	

Structure

The Bachillerato General organises Language and Communication into units, with some belonging to the Common Core curriculum component (compulsory units) and others to the Extended Core curriculum component (optional units). In contrast, DP LA:LL is a whole subject, rather than a set of units. Each unit in the MBG lasts one semester, whereas the DP LA:LL (SL or HL) is studied for the duration of the programme (two years). Both the DP and MBG allow students to pursue further language studies, with the offer of doing a HL course in LA:LL in the DP and the choice of Language and Communication optional units from the Extended Core curriculum component of the MBG.

Subject content in DP LA:LL is primarily guided by three overlapping, conceptual areas of exploration: the nature of interactions between readers, writers and texts; the way texts interact with time and space; and intertextuality, meaning how texts interact with one another. Each area of exploration includes a list of guiding conceptual questions for consideration. For example, in the 'readers, writers and texts' area of exploration, it is suggested that students understand 'Why and how […] we study language and literature.'

Content in the MBG's compulsory units, Language and Communication I, II, and III, are articulated as learning progressions, which are an integration of the categories, sub-categories, knowledge and concepts, and learning goals. The four categories of Language and Communication are 'Attend and understand', 'Exploring the world through reading', 'The verbal, visual and graphic expression of ideas', and 'Inquire and share as vehicles of change'. [101]. Moreover, each unit lasts one semester and has an overarching focus, these being: distinguishing between fundamental and accessory information, analysing content and form, and discussing a topic based on two or more sources. Therefore, the sequencing of content is more prescriptive in the MBG, as these decisions are made by the schools and teachers in the DP. Also, the organisation into areas of exploration in the DP presents a more integrated curricular approach, compared to the organisation of sequential and distinct units in the MBG.

The MBG's optional units, Communication Sciences I and II, are organised into blocks of learning – five for Communication Sciences I and four for Communication Sciences II. The learning blocks are overarching topics such as the communication process, communicative models, types of communication, communication and culture, and the use of internet in communication. Therefore, these units also present differences to the DP with regards to prescriptiveness of sequencing and level of integration in the curriculum organisation. It can also be noted that transversal themes will be addressed in the optional units. Indeed, teachers select one, or more, of the themes (society, the environment, health, and reading skills) to address in each block.

Content Alignment

To complement the analysis, the table below presents a simplified summary of the content alignment that the MBG units have with DP LA:LL. While the guiding conceptual questions in DP LA:LL are not prescribed or formally assessed, considering whether these are indicated to be present in the MBG helps assess the extent to which each area of exploration may be considered generally.

[101] Mexican Secretariat of Public Education. (2023). *Learning progressions for the socio-cognitive resource Language and Communication*

Table 31: Summary of content alignment between DP language A: language and literature and the MBG units

DP language A: language and literature – areas of exploration and guiding questions	Presence in compulsory units	Presence in compulsory and optional units
Areas of exploration – readers, writers and texts		
Why and how do we study language and literature?		
How are we affected by texts in various ways?		
In what ways is meaning constructed, negotiated, expressed and interpreted?		
How does language use vary amongst text types and amongst literary forms?		
How does the structure or style of a text affect meaning?		
How do texts offer insights and challenges?		
Areas of exploration – time and space		
How important is the cultural or historical context to the production and reception of a text?		
How do we approach texts from different times and cultures to our own?		
To what extent do texts offer insight into another culture?		
How does the meaning and impact of a text change over time?		
How do texts reflect, represent, or form a part of cultural practices?		
How does language represent social distinctions and identities?		
Areas of exploration – intertextuality: connecting texts		
How do texts adhere to and deviate from conventions associated with literary forms or text types?		
How do conventions and systems of reference evolve over time?		
In what ways can diverse texts share points of similarity?		
How valid is the notion of a classic text?		
How can texts offer multiple perspectives of a single issue, topic or theme?		
In what ways can comparison and interpretation be transformative?		

Key:

	There is strong presence of this guiding question in the MBG.		*There is partial presence of this guiding question in the MBG.*		*There is little or no presence of this guiding question in the MBG.*

- Compulsory units: Language and Communication I, II, and III
- Optional units: Communication Sciences I and II

In the last column, the alignments found in the compulsory units have been carried over and combined with those in the optional units, to represent all the language content offered in the Bachillerato General.

*It should be noted that the programmes of study are currently being updated and new versions were only available for Language and Communication I, II and III

Compulsory Language and Communication Units in the Bachillerato General

(Language and Communication I, II, and III)

The conceptual nature of the DP LA: LL subject content encourages students to think metacognitively about the discipline to a greater extent than what is explicitly articulated in the learning progressions for Language and Communication I, I, and III**.** However, the learning progressions of the compulsory units indicate that some areas of exploration and guiding questions may be considered as a result of what students are required to do. The learning

progressions suggest that students will engage, to some extent, with all the DP's areas of exploration in the compulsory units – below discusses in more detail the alignment that the compulsory units have with each area of exploration.

Area of exploration – readers, writers and texts

The learning progressions in the compulsory units reflect strong similarities with the readers, writers and texts area of exploration in DP LA:LL. The compulsory units similarly involve the analysis of a varied range of both literary and non-literary texts, such as stories, essays, theatre, narrative, poetry, and reviews. Within these, students are required to examine linguistic features such a rhetorical devices and similes. Therefore, this indicates that students will consider the conceptual question 'How does language use vary amongst text types and amongst literary forms?'. Moreover, the compulsory units require students to analyse the composition of texts and to consider different forms of information such as examples, similes, parallelisms, illustrations, tables, graphs, analogies, in order to obtain central messages and interpret the author's communicative intention. Furthermore, the MBG compulsory units expect students to consider both explicit and implicit meaning from elements in the text and how contextual information affects the conveyance of meaning. Overall, these elements in the compulsory units indicate that the DP LA:LL guiding questions 'In what ways is meaning constructed, negotiated, expressed and interpreted?' and 'How does the structure or style of a text affect meaning?' may be considered.

Area of exploration – time and space

The content of the MBG's compulsory units reflects weak, rather than strong, similarities with the DP LA:LL's time and space area of exploration. Students are required to study a range of culturally diverse texts such as 'Hamlet', an English text, 'Little Red Riding Hood', a French text, and 'Woman at point zero', an Egyptian text. Furthermore, the compulsory units indicate that cultural contexts are considered when analysing texts. These elements indicate some alignment with the guiding question 'How important is the cultural or historical context to the production and reception of a text?'. Furthermore, there is some indication that the DP LA:LL guiding question 'How do texts reflect, represent, or form part of cultural practices?' could be considered as students study texts which have central themes such as the cultural heritage of pre-Hispanic Mexico and gender equality.

The compulsory units also indicate that the conceptual guiding question 'How does language represent social distinctions and identities?' may be explored in the MBG, as students study character design and elements of literary location, scope, and plot within texts. Within this, students are required to understand the contextual information of the text in its entirety, including the author, country, school, historical, political, and social context, which also may prompt consideration of the conceptual guiding question 'To what extent do texts offer insight into another culture?' – though students are not explicitly required to analyse texts for insights into another culture. Finally, the conceptual question 'How does the meaning and impact of a text change over time' is partially present in semester one. Indeed, the course examines how one of the book synopses has been banned because of its controversial nature, which would suggest that there is a consideration of how topics of a text can be rejected depending on the period of time it's being received in.

Overall, there is evidence that students may consider some similar concepts to the DP LA:LL's time and space area of exploration. However, the learning progressions suggest that this area is generally considered to a significantly lesser extent by the MBG compulsory units.

Area of exploration – intertextuality: connecting texts

The learning progressions for the compulsory units do not make direct reference to intertextuality or comparing texts, therefore their alignment with DP LA:LL's 'Intertextuality: connecting text area of exploration' is very limited. While MBG students are required to identify the logical or argumentative relationships between the main and secondary ideas within a text and to recognise the internal composition and the accessory information, this is not explicitly considering the relationship between two sets of texts.

However, it can be noted that an aspect of this area of exploration may be considered in the MBG. Indeed, the guiding question 'How can texts offer multiple perspectives of a single issue, topic or theme?' may be considered during Language and Communication III, as students are expected to examine a topic using at least two texts/sources.

Optional Language and Communication Units in the Bachillerato General (Communication Sciences I & II)

The optional unit of Communication Sciences I focuses on the communication process, including characteristics, barriers, models, types of interaction, and communicative intention. Communication Sciences II focuses on communication in mass media forms, such as newspapers, radio, television, and cinematography. Both these MBG units place a strong emphasis on critical thinking and reflection and involve analysing discourse, particularly from non-literary texts, which aligns with the requirements to study non-literary texts (such as newspapers and advertisements) in DP LA:LL.

The Communication Sciences units provide scope for some further consideration of concepts similar to some of the guiding questions in DP LA:LL. For example, learning block III of Communication Science I involves analysing discourse in advertising and propaganda, while considering their contexts, functions, and characteristics. Moreover, learning block I involves consideration of how internal and external factors affect the reception of a message. Therefore, there are indications that DP LA:LL guiding questions 'How does language use vary amongst text types and amongst literary forms', and 'How important is the cultural or historical context to the production and reception of a text?' may be considered.

As another example, learning block III in Communication Science II requires students to analyse television discourse and to consider different genres, the structure of scripts, the history and evolution of television, the impact on society, and how television can reflect cultural diversity. Thus, this indicates that students may engage with similar concepts to several DP guiding questions, namely 'How does the structure or style of a text affect meaning?', How important is the cultural or historical context to the production and reception of a text?, 'How do texts reflect, represent, or form a part of cultural practices?.' and 'How do conventions and systems of reference evolve over time?'

As with the compulsory units, evidence of intertextuality is limited in the optional units, though there is an occasional activity which could provoke some consideration of this, such as

exploring the difference between advertising and propaganda and how communication models and methods have evolved over time.

Other content in the MBG units

It can be noted that the MBG units contain some content which has a lesser focus in DP LA:LL, see table 32.

Table 32: Content in the MBG units which is less present/not in DP LA:LL

Significant content in the MBG units which is less present in DP LA:LL
Language and Communication I, II, and III: ○ While essays are listed as an option in the DP prescribed reading list, their study is a requirement, and the focus, of Language and Communication III Communication Sciences: ○ The focus on communication is generally different to the focus of DP LA:LL, and results in a stronger emphasis on communication models, barriers, and theories. ○ More explicit requirement for students to produce for themselves the text types that they study (e.g. journalistic pieces, radio products, and audiovisual products for television).

Summary

Altogether, DP LA:LL content promotes more metacognitive thinking compared to MBG units, through the use of conceptual guiding questions. However, there is scope in the MBG units' content for considering concepts which relate to the areas of exploration in DP LA:LL – especially readers, writers, and texts and, to an extent, time and space.

Indeed, the Language and Communication compulsory units include content which allows students to analyse a range of texts and consider how meaning is constructed and how language use varies. Students will also consider cultural contexts and how texts offer different perspectives on presented issues. The Language and Communication compulsory units mention a broad range of text-types that span different authors, genres, cultures, and places. The optional units, Communication Sciences I and II, naturally somewhat differ to DP LA:LL, as their emphasis is on communication, rather than literature. Nonetheless, they also provide scope for consideration of concepts relating to DP conceptual guiding questions, such as how texts influence and reflect culture. However, it can be noted that non-literary texts are the exclusive focus of these units. This contrasts with specialisation in DP LA:LL, as the HL course involves further analysis of both literary and non-literary texts. Furthermore, there is a more explicit requirement in Communication Sciences units for students to produce non-literary text types, such as pieces for TV and radio.

In summary, the MBG units provide scope for considerations that link to some of the DP's conceptual guiding questions for LA:LL, particularly those within the area of exploration 'readers, writers and texts'. Though a range of text types are mentioned in the MBG units, the number and balance of literary and non-literary texts is not prescribed, making it somewhat difficult to compare their cumulative breadth with the SL and HL courses of DP LA:LL. That said, it can be noted that unlike the DP HL course, the MBG's optional units do not provide further opportunity to study literary text types, focusing on non-literary instead. Lastly, while the MBG units promote depth of thinking through critical analysis and reflection, they have

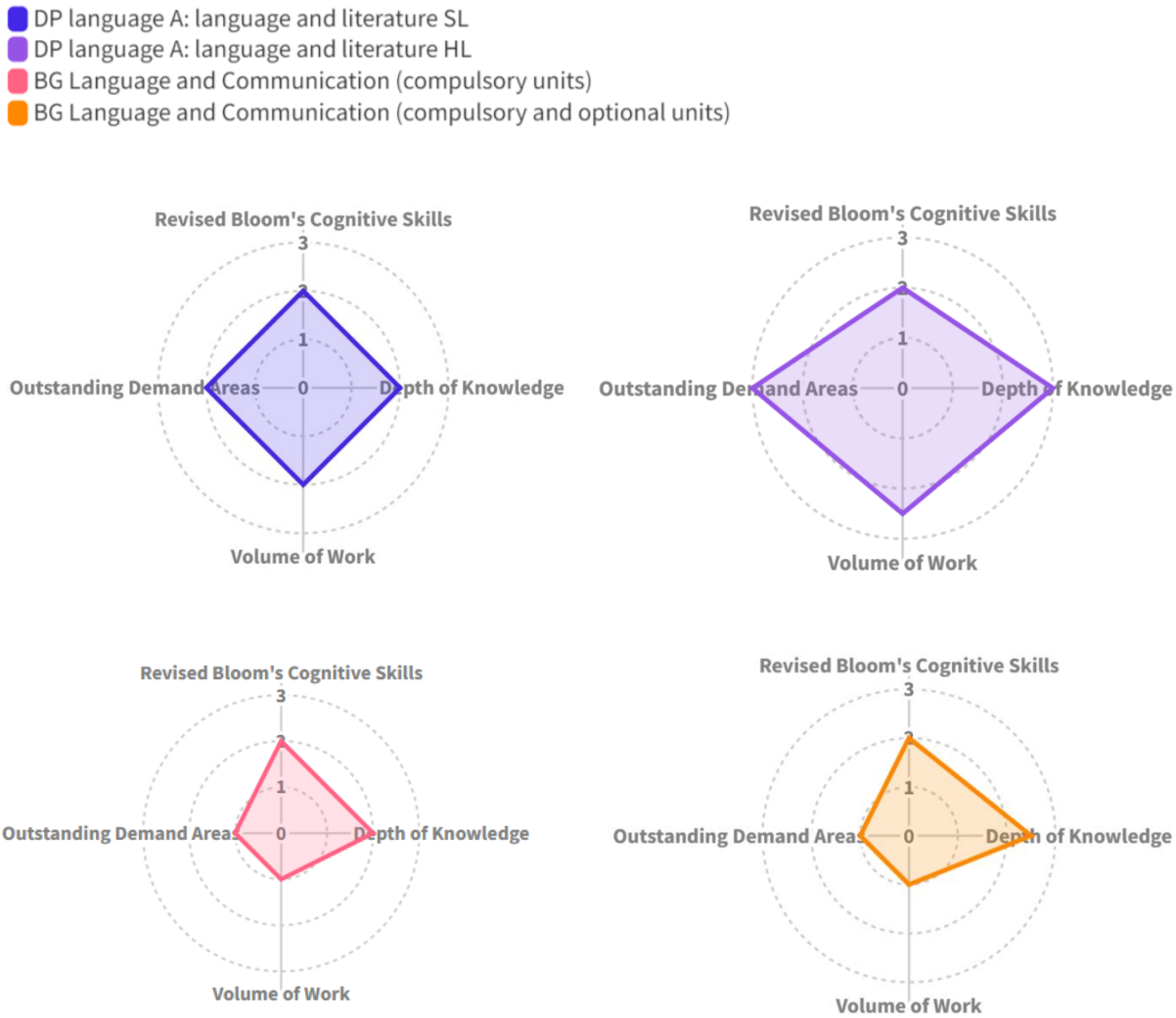
notably less depth than DP LA:LL (SL and HL) with regards to cultural and historical considerations and, more significantly, intertextuality.

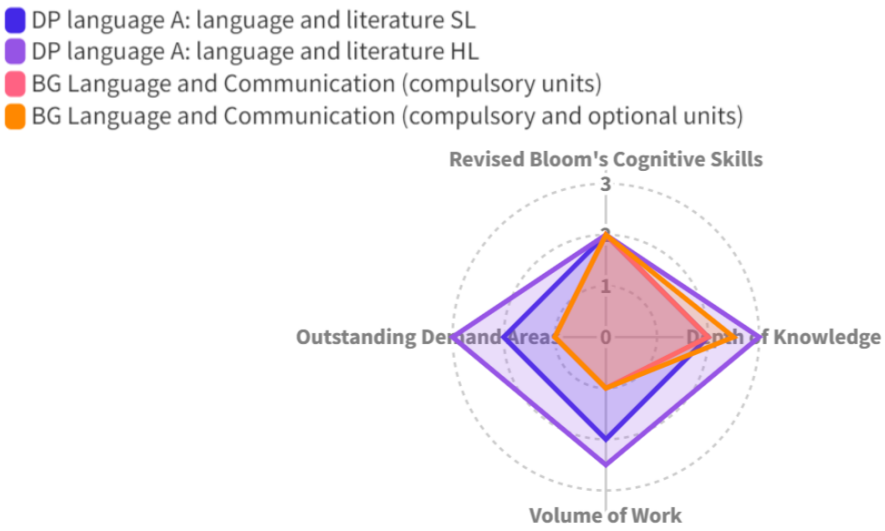
5.3.3 Demand – Language and Literature

This section considers the alignment between the DP LA:LL and the Bachillerato General's Language and Communication units in terms of demand.

The DP and Bachillerato General curricula were analysed using the same demand tool in order to create a demand profile for DP LA: LL (SL and HL), MBG Language and Communication (compulsory units) and MBG Language and Communication (compulsory and optional units) These demand profiles are presented in the form of radar diagrams, with a superimposed diagram featured to enable the immediate visual comparison of all profiles

Figure 27: Visual representations of subject demand.





The panel of experts carried out a detailed analysis of each course and reached a consensus on the scores shown in the profiles above. The following points were particularly important within the panel discussion:

- Regarding the scores for **Bloom's Cognitive Skills:**
  - DP LA:LL has the same learning outcomes for both SL and HL, resulting in these receiving the same score. The DP subjects were judged to show elements of sophisticated metacognition and the skills of evaluation and synthesis were present. However, these elements were often found to be implicit (rather than explicit) in both cases, with the majority of learning outcomes focusing explicitly on analysis, thus a score of 2 was given to both.
  - Similarly, the skills described for the MBG Language and Communication compulsory units focused on analysis with examples of students being required to organise, analyse, and synthesise, information from different sources, thus receiving a score of 2. With regards to the combination of compulsory and optional units, a score of 2 was also given, as the skills in the optional units were also primarily analysis-based.

- Regarding the scores for **Depth of Knowledge:**
  - The DP LA:LL SL was judged to merit a score of 2, as it was found to provide many opportunities for strategic thinking. Moreover, the subject content encourages conceptual understanding of language as a subject, and there is also evidence of some extended thinking. For DP LA:LL HL, the long-term reflective nature of the HL essay – which is based on the exploration carried out throughout the course in the learner portfolio – was found to feature a significant component of extended thinking, pushing the score to a 3.
  - The MBG Language and Communication compulsory units were given a score of 2, as students were required to undertake tasks that required them to use evidence and analysis. There were also elements of complex reasoning, such as evaluating sources to construct meaning, determining implicit meaning, and synthesizing information. The Communication Sciences optional units also presented evidence of students using complex reasoning, such as through making informed decisions and performing critically-reflective analysis and interpretation. While there were some elements of level 3, such as information synthesis, there was not enough

evidence of this to warrant a score of 3, and thus all units combined received a score of 2.5.

- Regarding the scores for **Volume of Work:**
  - DP LA:LL SL was judged to comprise a moderate-heavy workload, warranting a score of 2, as students were expected to engage with a high number of themes and spend a significant proportion of their time on issues beyond basic conceptual depth, including complex multidisciplinary concepts. For the DP LA:LL HL, the panel agreed on a volume of work demand score of 2.5 due to the higher number of texts studied (compared to the SL) and the addition of the HL essay. The proportion of time spent on complex reasoning was judged to push the volume of work score into a 2.5.
  - For the MBG Language and Communication compulsory units, a score of 1 was deemed appropriate. Indeed, each unit covered 15-16 different learning progressions over the allocated teaching time of 48 hours, which was deemed to be a moderate amount of work, taking into consideration the complexity of the learning progressions. The Communication Sciences optional units, each allocating 48 hours, were also deemed to present a moderate amount of work, thus a score of 1 was given to the compulsory and optional units combined.

- Regarding the scores for **Outstanding Areas of Subject Demand:**
  - A score of 2 (3-4 demand areas) was awarded to the DP LA:LL SL due to the significant presence of challenging guiding questions in the subject guide – providing frequent opportunities for higher order thinking – the expansive and exploratory nature of the syllabus, and also because students may explore different schools of thought and interrogate the development of texts over time. For the DP LA: LL HL, it was found that the HL essay and the requirement to explore an additional translated text pushed it to a score of 3.
  - A score of 1 (1-2 demand areas) was given to the MBG Language and Communication compulsory units, as in the first two semesters students were required to determine explicit and implicit thematic content in literary works, and discuss the author's implicit critical message, which was deemed to be an area of demand. This element was continued in the optional units, as students were required to critically analyse the internal and external factors that affect reception of a message. As this was a similar, rather than additional area, it was deemed that the score for the compulsory and optional units combined should also be a 1.

6. Key Findings

This section summarises the alignment and main similarities and differences found between the DP and the Mexican Bachillerato General (MBG), both at the programme level and subject level.

6.1 Programme Level

Philosophical Underpinnings

All the key themes within the DP's philosophical underpinnings (extracted from the IB learner profile, approaches to teaching, approaches to learning, and philosophy of international-mindedness) are present in the philosophical underpinnings of the MBG, although there are some differences in the degree of emphasis on specific themes. The DP themes of international outlook, diversity and intercultural understanding, and principled and community-oriented are strongly evident in the MBG. However, there is comparatively less emphasis on the DP theme of conceptual thought and understanding. It can be noted that, while related to themes present in the DP, the MBG's philosophical underpinnings specifically highlight the importance of non-violence and a culture of peace, which are not as explicitly emphasised in the DP. Due to the MBG including all key themes found within the DP, students or teachers moving between the two programmes would find a high level of consistency between the philosophical underpinnings.

Programme Structure

There are some similarities between the two programmes' structures; for example, both take a baccalaureate-style approach to encourage breadth of study. Both also require students to study units/subjects from broadly similar subject areas, with the MBG's consisting of socio-cognitive resources and areas of knowledge that span a similar number of subject areas as the DP subject groups. Additionally, both programmes allow students to specialise in particular subjects – the DP by differentiating between SL and HL, and the MBG by allowing students to choose the optional units they wish to study.

However, there are significant differences within the structure that would make movement between the two programmes challenging for both students and teachers. The MBG is three years in duration, whereas the DP is two. Another key difference is that the DP is organised into subjects that each span two years, whereas the MBG is organised into units that each span one semester. Whereas the DP is organised into separate, single-subject disciplines, the MBG organises most compulsory learning into units that span general areas, such as sciences, humanities and social sciences, with only the optional learning in the MBG being organised into units that offer a focus on specific disciplines within these areas. For example, in science, the MBG incorporates subject content into over-arching themes that cover aspects of physics, chemistry and biology all in one unit, such as 'Matter and its interactions'. This approach would make it challenging for a student to move between the two programmes; single-subject study largely begins later in the MBG, hence the compulsory units may not have covered a particular subject in as much depth as the DP by a similar point in upper-secondary. Finally, the MBG does not require similar components to TOK, CAS and extended essay in the DP core.

The components of the Expanded Curriculum in the MBG discuss the importance of students having social responsibility, and taking care of themselves physically and emotionally. This is similar to areas that are described within the IB programme, where the DP qualification addresses social, emotional and physical wellbeing of the students.

There is a key difference between the MBG and DP with regards to the Work Experience component of the MBG curriculum. This component of the MBG devotes curriculum hours to preparing students to develop specific work processes such as carrying out productive and socially useful activities that contribute to solving problems in different sectors of society, among others. Whilst the skills within this curriculum component are also present within the DP, the allocation of specific numbers of hours per week and the focus of this on the professional world differ from the DP.

Entry Requirements

The DP and MBG differ in their entry requirements; the IB encourages students and teachers to consult subject guides around expected prior learning but does not provide fixed entry requirements, whereas students wishing to study the MBG must first complete an examination. Indeed, entry to upper secondary school in Mexico is dependent on students successfully completing their lower secondary education, which is demonstrated through achieving the Certificate of Secondary Education (‘*Certificado de Educación Secundaria’)*. Additionally, a number of institutions in Mexico also require the completion of a standardised admissions test in the final year of lower secondary education. There are, however, no subject-specific entry requirements to study certain units in the MBG, which is in slight contrast to the recommendation of prior subject learning for certain DP HL courses.

Student Learning Pathways

Both the MBG and DP prioritise breadth in their programmes and cover similar subject areas. MBG students will study content from a greater breadth of subjects than those in the DP, but the DP allows for a greater degree of optionality. DP students choose all the subjects they study, whereas the majority of the MBG units are not chosen, since the compulsory units of the MBG form a large part of the programme and these are the same for all students. Additionally, DP student pathways focus on single subject specialisation, whereas MBG student pathways consist of a combination of broad areas of study and single discipline study. As single discipline study largely begins only in the last year of the MBG, DP students have more time to study single subjects and, thus, cover more depth within these.

Assessment Methods

Whereas external assessment makes up the majority of assessment in each DP subject, the MBG does not make use of external assessment, instead being comprised entirely of flexible internal assessment.

Although this would seemingly make the two programmes weakly aligned, it should be noted that the flexibility of the internal assessment in the MBG could result in a student experience similar to that in the DP. For instance, the mathematics and sciences skills targeted in each programme’s assessment show broad alignment. Moreover, from the (limited) information available on MBG assessments, the style and format of the internal assessments may share some similarities to those in the DP. For example, MBG students will complete mathematical problems, questionnaires, concept maps, essays, summaries, simulations, projects,

presentations and portfolios – many of which are also present in the DP methods of internal assessment. Therefore, although there is a heavy emphasis on internal assessment in the MBG, the format of assessment and the skills targeted by both programmes may show some similarities. That said, meaningful comparisons between the two programmes on this aspect are challenging due to the non-prescriptive nature of the MBG assessment guidance.

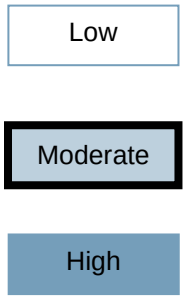
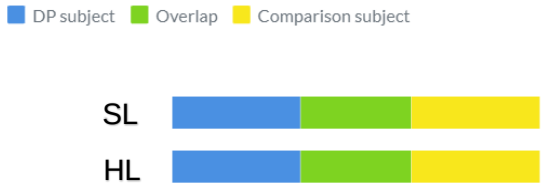
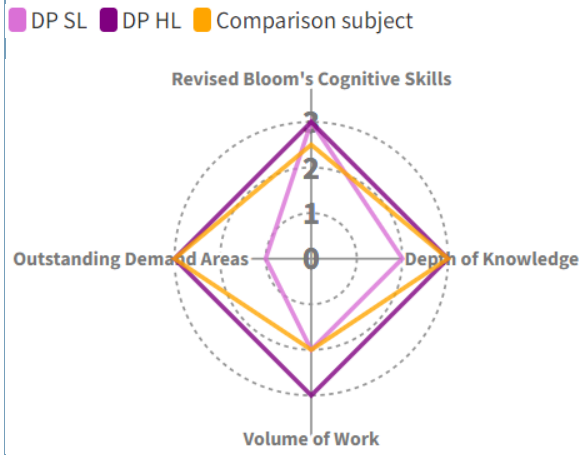
Summary

Comparing the DP and MBG, the structure of the two programmes and assessment types used are the most significant points of difference, and the philosophical underpinnings the most significant point of similarity. Both programmes target similar skills in their subjects' learning outcomes, and both equally aim to develop social, mental, physical health and professional skills. The assessment types differ significantly, however, with the DP prioritising external assessment and MBG being exclusively evaluated through internal assessment. The structural organisation of each programme also differs, with MBG students being exposed to greater subject breath and DP students to greater subject depth and higher levels of optionality.

6.2 Subject Level

This section provides visual summaries of the subject-level alignment between specific subjects within the DP and the respective comparison points in the MBG. The summaries include key findings on learning outcomes alignment, content alignment and demand alignment, as per the key below:

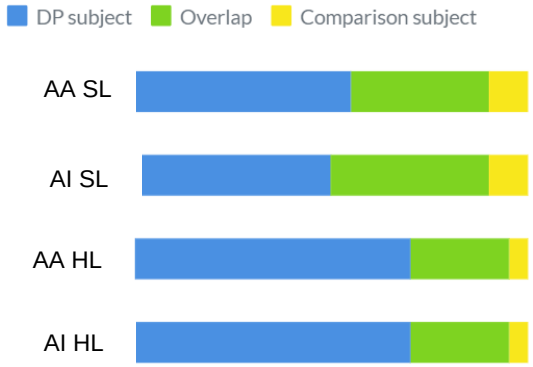
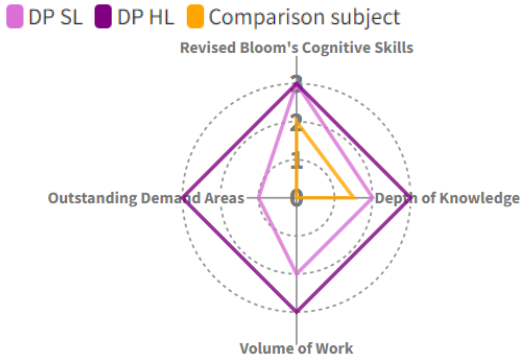
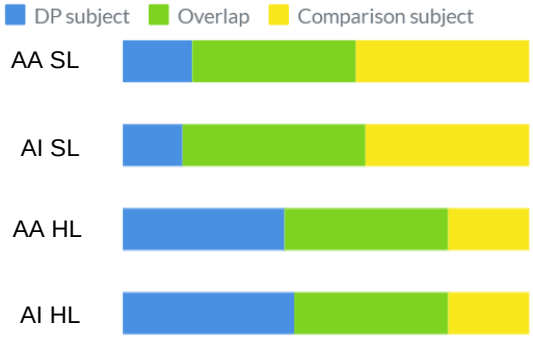
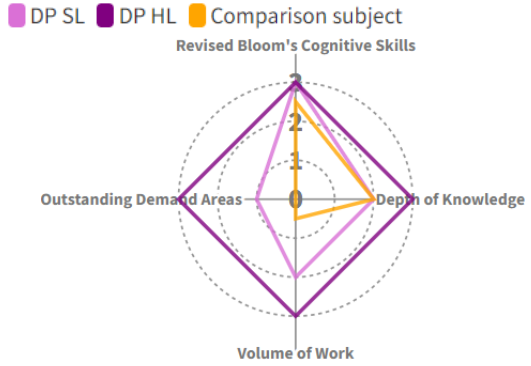
Key:

Comparison subject	Learning outcomes alignment	Content alignment	Demand alignment
Displays the name of the comparison subject	 This represents the learning outcome alignment between the DP subject and the comparison subject. A black border is placed around the selected judgement – 'Moderate' in this example.	 These bars represent the content alignment between the DP subject and the comparison. There is one bar showing alignment with SL content and another for HL content (inclusive of SL content). The **green** section of the bar represents the overlap of content between the subjects. The **blue** section represents content which was in the DP subject only. The **yellow** section represents content which was in the comparison subject only. Therefore, if, say, the blue section was longer than the yellow, this can be interpreted as DP subject having more content unique to itself than the comparison did. A large green bar would indicate that a substantial proportion of content overlaps between the DP and the comparison subject.	 This radar diagram displays the demand judgement scores for the comparison subject(s) and the DP subject – both SL and HL.

6.2.1 Mathematics Alignment

The subject level alignment between the DP mathematics subjects (AA and AI, SL and HL) and MBG Mathematical Thinking units is represented below:

Figure 28: Visual representations of subject-level alignment (mathematics)

Comparison subject	Learning outcomes alignment	Content alignment	Demand alignment
Compulsory Mathematical Thinking Units	Low Moderate High		
Compulsory and Optional Mathematical Thinking Units	Low Moderate High		

MBG Compulsory units: Mathematical Thinking I, II, and III and Selected Topics in Mathematics I and II.
MBG Optional units: Probability and Statistics I and II, Financial Mathematics I and II, Drawing I and II, Differential Calculus, and Integral Calculus.

- **Learning outcomes alignment**: there is an overall high level of alignment between the mathematics learning outcomes of the DP and MBG. Indeed, all themes extracted from the DP mathematics learning outcomes are present in the Mathematical Thinking units of the MBG.

- **Content alignment**: there is a low-moderate level of content alignment between the MBG compulsory Mathematical Thinking units and DP mathematics. Indeed, the compulsory units combined have lesser breadth and depth than both DP SL and HL and do not cover a significant amount of AA and AI content. Additionally, there is a moderate level of content alignment between the MBG's compulsory and optional Mathematical Thinking units and the DP mathematics subjects, with the optional Mathematical Thinking units covering further content from some DP topics, as well as some technical drawing content that is not in the DP. Overall, the Mathematical Thinking units combined have somewhat greater breadth than DP SL and more depth in certain topics, though an overall lesser breadth and depth than DP HL mathematics. Notably, no combination of units in the MBG presents a high level of content alignment with DP HL mathematics (either AA or AI). Also, it should be noted that MBG students choosing to specialise in mathematics need not take all the optional units, therefore, the breadth and depth of actual mathematics study is variable and depends on student choices.

- **Demand alignment**: there is a low-moderate level of alignment between the demand scores of the MBG's Mathematical Thinking units and the DP SL mathematics subjects. Indeed, the compulsory Mathematical Thinking units score less than DP SL in all demand categories, and the combination of compulsory and optional units score similarly in some, but not all, categories. There is a low level of alignment between the demand scores of Mathematical Thinking units and DP HL subjects, with the latter scoring higher in all demand categories.

The **key similarities** identified were the following:

- **Similarities in learning outcomes**: DP and MBG mathematics learning outcomes place a high emphasis on problem-solving and reasoning, communicating mathematics clearly in various forms, applying concepts to a range of contexts, and making connections within mathematics and to other subjects.

- **Similarities in content**: being of lesser breadth and depth, the compulsory Mathematical Thinking units alone do not have strong similarities with DP mathematics content. That said, the compulsory units feature some SL mathematics content from most DP topics, particularly Functions, Statistics and probability, and Calculus. The addition of optional Mathematical Thinking units strengthens the alignment with DP mathematics, as these add to the content of compulsory units. The units all combined cover some SL content in all DP topics, most particularly Calculus and Statistics and probability. Furthermore, the optional units of Differential Calculus and Integral Calculus have strong alignment with SL and AHL Calculus content in the DP, thus having similar depth to DP HL in this topic. The units align slightly more strongly with AA (SL and HL) for Calculus content and AI (SL) for Number and algebra. For the most

part, however, the DP content that they do cover is usually that which is present in both DP mathematics subjects.

- **Similarities in demand**: The MBG Mathematical Thinking units score the same or similarly to DP SL mathematics subjects in the depth of knowledge demand category, due to featuring content requiring considerable pre-requisite knowledge and the consistent requirement for a deeper engagement with content. Furthermore, the compulsory and optional Mathematical Thinking units combined score similarly to DP mathematics subjects (SL and HL) for the Bloom's cognitive skills demand category, due to a similar emphasis on analysis, synthesis, and evaluation.

The **key differences** identified were the following:

- **Differences in learning outcomes:** there are no significant differences between the learning outcomes of DP mathematics and Mathematical Thinking in the MBG. However, it can be noted that the DP places a higher emphasis on the use of technology and inquiry-based approaches, as well as considering and using mathematics in respect of wider contexts (such as local and global issues). Conversely, the MBG units identify some specific reasoning skills to be developed, such as heuristic and intuitive thinking, that are not explicitly highlighted within DP mathematics learning outcomes.

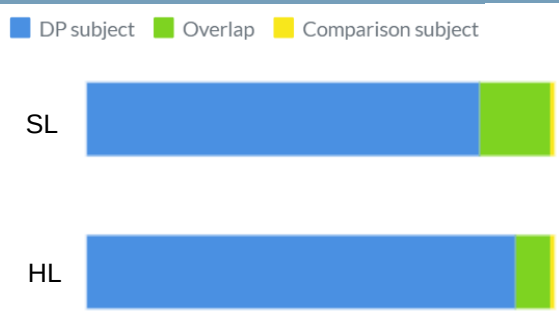
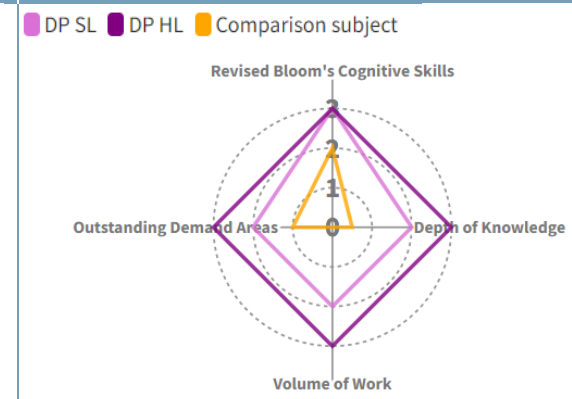
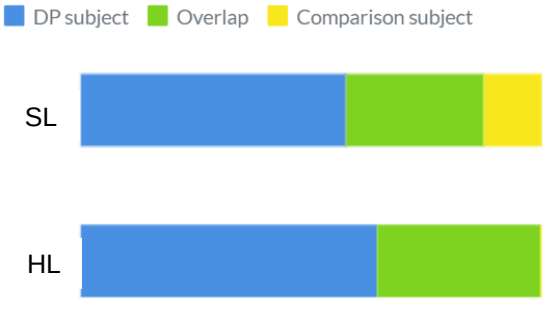
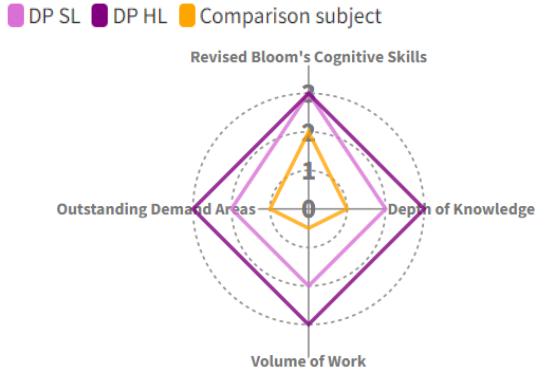
- **Differences in content:** the compulsory Mathematical Thinking units in the MBG do not cover a significant amount of content from DP mathematics. Indeed, they cover very little similar content to Number and algebra and only some of the more basic concepts in Geometry and trigonometry. Whilst there is better alignment with SL content in other DP topics, certain key sub-topics, such as integration and binomial distribution, are not included in the compulsory units. Moreover, the compulsory units generally do not include similar content to AHL sub-topics in DP mathematics subjects. The combination of compulsory and optional Mathematical Thinking units in the MBG present a stronger alignment with DP content; however, except for Calculus, the units do not cover similar content to AHL in the DP. Therefore, there is no subject (or combination of units) in the MBG that has a high level of content alignment with DP HL mathematics subjects. It can be noted that the MBG offers Drawing I and II units, which involve the application of mathematics in technical drawing, which is not covered in DP mathematics. Overall, however, the breadth and depth of MBG Mathematical Thinking is lesser than DP HL mathematics subjects.

- **Differences in demand:** the MBG Mathematical Thinking units score significantly lower than DP SL and HL mathematics subjects for volume of work. Indeed, the time allocated to each unit is generous for the complexity of its content and the number of topics covered, resulting in a lighter volume of work than that of DP mathematics. Moreover, no significant outstanding areas of demand are present in the Mathematical Thinking units; thus, they score somewhat lower than DP SL subjects and significantly lower than DP HL subjects in this regard.

6.2.2 Physics Alignment

The subject level alignment between DP physics (SL and HL) and the MBG Natural Sciences, Experimental Sciences and Technology units (physics-focus) is represented below:

Figure 29: Visual representations of subject-level alignment (physics)

Comparison subject	Learning outcomes alignment	Content alignment	Demand alignment
Compulsory Natural Sciences, Experimental Sciences and Technology Units (Physics)	Low Moderate **High**		
Compulsory and Optional Natural Sciences, Experimental Sciences and Technology Units (Physics)	Low Moderate **High**		

MBG Compulsory units: Matter and its interactions, Conservation of energy and its interactions with matter, Ecosystems: interactions, energy and dynamics, Chemical reactions: conservation of matter in the formation of new substances, Energy in the processes of daily life, Organisms: structures and processes, Science workshop I.
MBG Optional units: Selected Topics in Physics I & II.

- **Learning outcomes alignment**: the level of alignment between the sciences learning outcomes of the DP and the MBG is significant. Indeed, all themes extracted from the DP sciences learning outcomes are present in the Natural Sciences, Experimental Sciences and Technology units of the MBG.

- **Content alignment**: there is limited content alignment between DP physics and the compulsory MBG Natural Sciences, Experimental Sciences and Technology units; where alignment is found between these programmes, it is mostly of a 'partial', rather than 'full', nature. Although there is more overlapping content, the content alignment between the MBG's compulsory and optional units combined and DP physics is still low overall. In the absence of a significant amount of DP physics topics, or other physics content, overall, the MBG compulsory and optional units have less breadth and depth than both DP SL and HL physics.

- **Demand alignment**: there is an overall low level of alignment between the demand scores of DP physics and the Natural Sciences, Experimental Sciences and Technology units (physics-focus) of the MBG. DP physics receives higher scores than the MBG in all categories.

The **key similarities** identified were the following:

- **Similarities in learning outcomes:** there is a high level of alignment between the learning outcomes of DP sciences and the Natural Sciences, Experimental Sciences and Technology units of the MBG. All themes extracted from the DP are strongly evidenced in the MBG compulsory and optional units. There is particular emphasis in the MBG of the DP themes of conceptual understanding and techniques that characterise science and critical thinking, with the Extended Disciplinary Competences also highlighting the importance of conducting insightful investigations and having an awareness of the impact of science.

- **Similarities in content:** there is a small amount of overlapping content between DP physics and the MBG compulsory units. Indeed, the compulsory units' content partially aligns with DP SL content from A.2 Forces and momentum, B.1 Thermal energy transfers, and E.4 Fission. Regarding the compulsory and optional units combined, the amount of content overlap with DP physics is slightly greater than for the compulsory units alone. Indeed, the units combined strongly align with SL content from C.2 Wave model, and partially align with SL content from A.2 Forces and momentum, B.1 Thermal energy transfers, C.1 Simple harmonic motion, C.3 Wave phenomena, D.2 Electric and magnetic fields, and E.4 Fission. Moreover, the optional units also include some DP AHL content from D.4 Induction, and, particularly, A.4 Rigid body mechanics. Lastly, it can be noted that the Natural Sciences, Experimental Sciences and Technology units place significant emphasis on practical work and are, thus, judged to have strong alignment with the experimental programme component of DP physics.

- **Similarities in demand:** whilst there are no significant similarities in demand scores, the MBG compulsory and optional units together score only one point below the DP SL for three categories.

The **key differences** identified were the following:

- **Differences in learning outcomes:** there are no significant differences in the learning outcomes of DP sciences and MBG Natural Sciences, Experimental Sciences and Technology units.

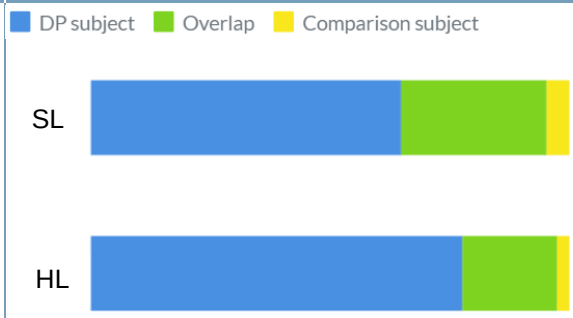
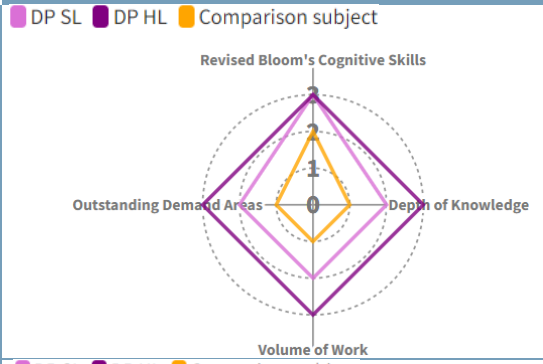
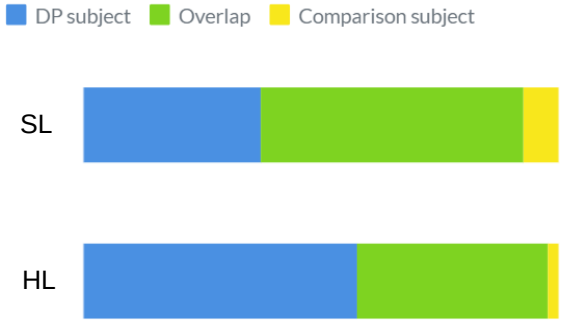
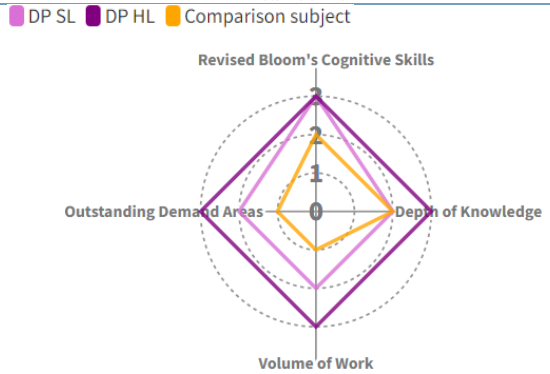
- **Differences in content:** there is a large amount of content in DP physics that is not found in the MBG compulsory units. Indeed, SL content from the majority of DP topics is not present in the compulsory units; in particular, there is no alignment with any content within C. Wave behaviour and D. Fields. Furthermore, the compulsory units contain no AHL content, and thus have very little overlapping content with DP physics HL. Regarding the MBG compulsory and optional units combined, a large amount of DP SL and AHL content remains uncovered. Although there is slightly more overlapping content with DP SL – i.e. at least one SL topic from each DP physics theme is partially present – the number of topics not covered by the MBG units is much greater. Furthermore, various DP AHL sub-topics have no presence in any of the MBG units, including A.5 Galilean and special relativity, B.4 Thermodynamics, C.3 Wave phenomena, C.5 Doppler effect, D.1 Gravitational fields, and D.2 Electric and magnetic fields. In addition, there is no alignment with DP AHL content from the topics in E. Nuclear and quantum physics. Overall, even where the optional MBG units are considered, MBG physics has less breadth and depth than both DP physics SL and HL.

- **Differences in demand:** compared to both MBG demand profiles – the compulsory units alone and the compulsory and optional units combined – DP physics SL and HL score higher in all demand categories. Indeed, for both SL and HL, DP physics shows a greater breadth and depth, which is reflected in the higher scores for volume of work and depth of knowledge. DP physics also has more stretch areas compared to physics in the MBG units, and thus scores higher for outstanding demand areas (SL scores one point higher and HL scores two points higher than MBG units).

6.2.3 Chemistry Alignment

The subject level alignment between DP chemistry (SL and HL) and the MBG Natural Sciences, Experimental Sciences and Technology units (chemistry-focus) is represented below:

Figure 30: Visual representations of subject-level alignment (chemistry)

Comparison subject	Learning outcomes alignment	Content alignment	Demand alignment
Compulsory Natural Sciences, Experimental Sciences and Technology Units (Chemistry)	Low Moderate **High**		
Compulsory and Optional Natural Sciences, Experimental Sciences and Technology Units (Chemistry)	Low Moderate **High**		

MBG Compulsory units: Matter and its interactions, Conservation of energy and its interactions with matter, Ecosystems: interactions, energy and dynamics, Chemical reactions: conservation of matter in the formation of new substances, Energy in the processes of daily life, Organisms: structures and processes, Science workshop I.
MBG Optional units: Selected Topics in Chemistry I & II

- **Learning outcomes alignment**: the level of alignment between the science learning outcomes of the DP and MBG is significant. Indeed, all themes extracted from the DP sciences learning outcomes are present in the Natural Sciences, Experimental Sciences and Technology units of the MBG.

- **Content alignment**: the level of content alignment between MBG compulsory units and DP chemistry is low. The MBG compulsory units align with only some of the DP SL content, and very little AHL content. The MBG compulsory and optional units combined show greater alignment with DP chemistry, reflecting a more moderate level of alignment. Indeed, the MBG compulsory and optional units combined align with the SL content from most DP chemistry topics. Comparatively, however, there is greater alignment with DP SL than HL, as the MBG compulsory and optional units cover very little DP AHL content. MBG students who study the optional units will experience a similar breadth of content to that of DP chemistry SL, but a lower breadth than DP HL, with the latter featuring a high number of topics showing little to no presence in the MBG. In terms of depth, the DP shows a greater depth of content than the MBG units overall, both at SL and at HL.

- **Demand alignment**: there is an overall low level of alignment between the demand scores of DP chemistry and MBG Natural Sciences, Experimental Sciences and Technology units (chemistry-focus). DP chemistry receives higher scores in all categories than the MBG compulsory units. The MBG compulsory and optional units combined did receive the same score for one category (Depth of Knowledge) as DP SL, but scored lower than the DP in all other categories.

The key **similarities** identified were the following:

- **Similarities in learning outcomes:** there is a high level of alignment between the learning outcomes of DP sciences and the Natural Sciences, Experimental Sciences and Technology units of the MBG. All themes extracted from the DP are strongly evidenced in the MBG compulsory units and optional units. There is particular emphasis in the MBG of the DP themes of conceptual understanding and techniques that characterise science and critical thinking, with the Extended Disciplinary Competences also highlighting the importance of conducting insightful investigations and having an awareness of the impact of science.

  Similarities in content: there is a small amount of content overlap between DP chemistry and the MBG compulsory units. The compulsory units cover some SL content and have, to some degree, alignment with at least one topic from each of the Structure and Reactivity units – except Reactivity 3. What are the mechanisms of chemical change? Particularly, the MBG compulsory units have strong alignment with SL content from Structure 1.1 Introduction to the particulate nature of matter and Reactivity 2.3 How far? The extent of chemical change. It can also be noted that the compulsory units have partial alignment with AHL content from Reactivity 2.3 How far? The extent of chemical change. Regarding the MBG compulsory and optional units combined, there is a greater level of content alignment with DP chemistry. Indeed, the optional units include SL content from several more DP topics, particularly increasing

alignment with topics from Structure 1. Models of the particulate nature of matter and Reactivity 3. What are the mechanisms of chemical change?. Furthermore, the optional MBG units also include slightly more AHL content, namely from Reactivity 1.2 – Energy cycles in reactions. Moreover, it can be noted that the MBG units (both compulsory and optional) have a strong presence of practical work and are thus judged to have strong alignment with the experimental programme component of DP chemistry. Overall, the MBG units (compulsory and optional) combined have moderate content alignment with DP chemistry SL and cover a similar breadth of content.

- **Similarities in demand:** whilst there are no significant similarities between the demand scores of the DP and the MBG compulsory units, the MBG received a score of only one point below the DP SL for all categories. Additionally, DP chemistry SL and the MBG compulsory and optional units score the same (two) for depth of knowledge.

The **key differences** identified were the following:

- **Differences in learning outcomes:** there are no significant differences in the learning outcomes of DP sciences and MBG Natural Sciences, Experimental Sciences and Technology units.

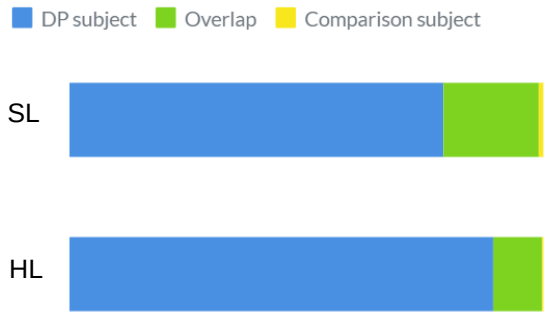
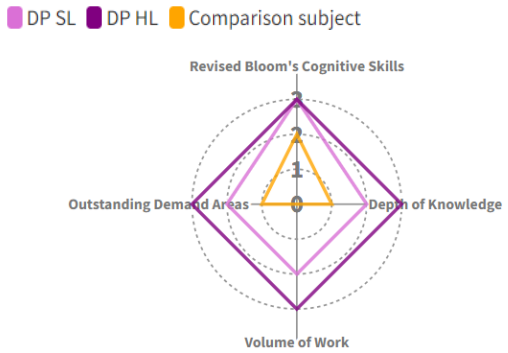
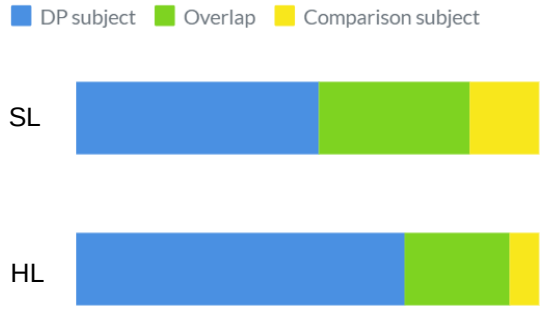
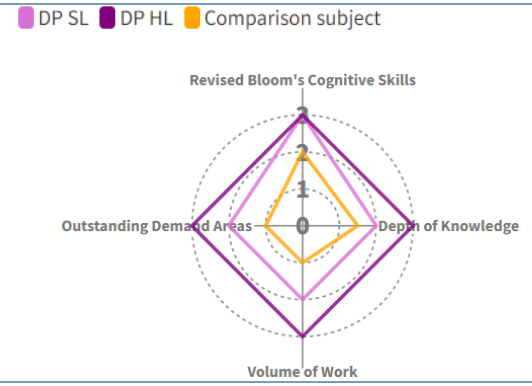
- **Differences in content:** there is limited content overlap between DP chemistry and the MBG compulsory units. Indeed, the compulsory units do not cover any content from Reactivity 3. What are the mechanisms of chemical change?, and have particularly limited alignment with Reactivity 1. What drives chemical reactions? and Structure 3. Classification of matter. In addition, the compulsory units generally do not cover DP AHL chemistry content. There is no significant chemistry content that is unique to the MBG and not found in the DP. Although relatively small concepts such as nanotechnology and the quality of the air are present in the compulsory units, there are no significantly large or complex areas of chemistry that are found in the MBG and not the DP. As such, the compulsory units have a significantly lesser breadth and depth of chemistry content than DP chemistry SL and HL. Regarding the MBG compulsory and optional units combined, there is moderate, rather than high, content alignment with DP chemistry. Indeed, six DP chemistry topics are not covered in either the compulsory or optional units and several others are only partially present. Moreover, the majority of DP AHL chemistry content is not covered by the compulsory and optional units. Therefore, while having greater alignment with DP chemistry than the compulsory units alone, the MBG units combined still have lesser breadth and depth than DP chemistry SL and, particularly, HL.

- **Differences in demand:** DP chemistry SL and HL score higher in all demand categories than the MBG Natural Sciences, Experimental Science and Technology units (chemistry-focus). Compared to MBG compulsory and optional units combined, both DP SL and HL chemistry score higher in all categories except for depth of knowledge, where DP SL has the same score. Overall, these scores reflect that DP features greater depth and breadth of chemistry knowledge than the MBG, with more opportunities for students to be stretched and challenged with regards to chemistry.

6.2.4 Biology Alignment

The subject level alignment between DP biology (SL and HL) and the MBG Natural Sciences, Experimental Sciences and Technology units (biology-focus) is represented below:

Figure 31: Visual representations of subject-level alignment (biology)

Comparison subject	Learning outcomes alignment	Content alignment*	Demand alignment
Compulsory Natural Sciences, Experimental Sciences and Technology Units (Biology)	Low Moderate **High**		
Compulsory and Optional Natural Sciences, Experimental Sciences and Technology Units (Biology)	Low Moderate **High**		

*The yellow bar for MBG Natural, Experimental Sciences and Technology units represents biology-only content, it does not represent health science topics

MBG Compulsory units: Matter and its interactions, Conservation of energy and its interactions with matter, Ecosystems: interactions, energy and dynamics, Chemical reactions: conservation of matter in the formation of new substances, Energy in the processes of daily life, Organisms: structures and processes, Science workshop I.
MBG Optional units: Selected Topics in Biology I & II.

- **Learning outcomes alignment**: the level of alignment between the science learning outcomes of the DP and MBG is significant. Indeed, all themes extracted from the DP Sciences learning outcomes are present in the Natural Sciences, Experimental Sciences and Technology units of the MBG.

- **Content alignment**: the level of content alignment between MBG compulsory units and DP biology is low. While there is greater alignment with SL than HL, the MBG compulsory units only have alignment with the SL content in two of the levels within two themes - and such alignment is deemed to be only 'partial'. Overall, the MBG compulsory units have a lesser breadth and depth of biology content compared to DP biology SL and HL. While the MBG compulsory and optional units together have greater alignment with DP biology SL, the level of alignment with DP biology remains low. The MBG compulsory and optional units have at least partial alignment with SL content in half of the DP biology levels across the four themes and partial alignment with the AHL content of one level in two themes. Overall, the MBG compulsory and optional units have a lesser breadth and depth of biology content compared to DP biology SL and, particularly, HL.

- **Demand alignment**: there is an overall low level of alignment between the demand scores of DP biology and the MBG Natural Sciences, Experimental Sciences and Technology units (biology-focus). The DP biology receives higher scores in all categories than the MBG compulsory units. The MBG compulsory and optional units score more similarly to DP SL, though it still scores lower than the DP in all demand categories.

The **key similarities** identified were the following:

- **Similarities in learning outcomes:** there is a high level of alignment between the learning outcomes of DP sciences and the Natural Sciences, Experimental Sciences and Technology units of the MBG. All themes extracted from the DP are strongly evidenced in the MBG compulsory units and optional units. There is particular emphasis in the MBG of the DP themes of conceptual understanding and techniques that characterise science and critical thinking, with the Extended Disciplinary Competences also highlighting the importance of conducting insightful investigations and having an awareness of the impact of science.

- **Similarities in content:** there is a small amount of overlapping content between DP biology and the MBG compulsory units. Indeed, the compulsory units have partial alignment with SL content from a few different DP levels – namely A2 Cells, A4 Ecosystems, C1 Molecules and C4 Ecosystems. The MBG compulsory and optional units combined have a greater amount of overlapping content with DP biology, as they cover more SL content and a small amount of AHL content. Indeed, the SL content of three DP biology levels (A2 Cells, A4 Ecosystems and C1 Molecules) is strongly present in the MBG compulsory and optional units combined, and the SL content of a further six DP levels is also partially present (these being A1 Molecules, B2 Cells, C2 Cells, C3 Organisms, C4 Ecosystems and D1 Molecules). Moreover, the compulsory and optional units combined include some DP AHL content from A3 Organisms and C2 Cells. It can be noted that, overall, the MBG units have strongest alignment with A. Unity and Diversity and C. Interaction and Interdependence. Lastly, the MBG units

(both compulsory and optional) have a strong presence of practical work and are, thus, judged to have strong alignment with the experimental programme component of DP biology.

- **Similarities in demand:** whilst there are no significant similarities between the demand scores of the DP and the MBG compulsory units, the MBG received a score of only one point below the DP SL for three categories. DP biology SL and the MBG compulsory and optional units received the closest score in the depth of knowledge category, where there is only a 0.5 difference between them.

The **key differences** identified were the following:

- **Differences in learning outcomes:** there are no significant differences in the learning outcomes of DP sciences and MBG Natural Sciences, Experimental Sciences and Technology units.

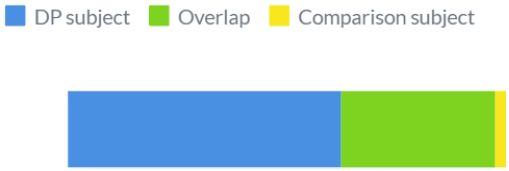
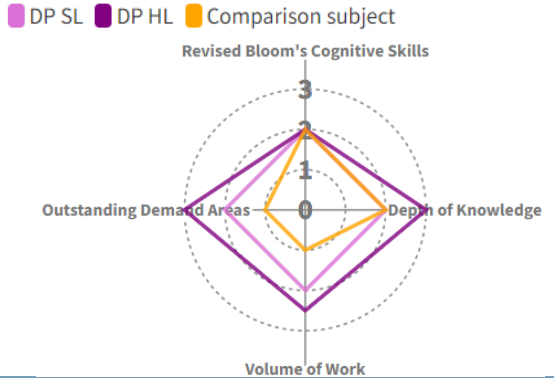
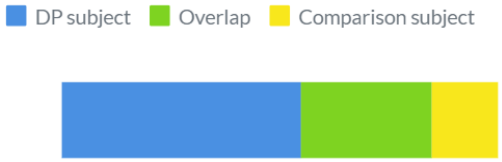
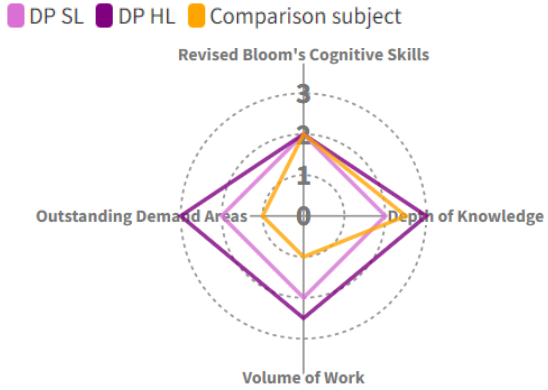
- **Differences in content:** content from a significant number of levels across the DP biology themes is absent from the MBG compulsory units. Indeed, the MBG compulsory units have no overlapping content with any of the levels from B. Form and Function and D. Continuity and Change. In addition, half of the DP biology levels from A. Unity and Diversity and C. Interaction and Interdependence are also absent from the MBG compulsory units. Moreover, the compulsory units do not contain any DP biology AHL content, nor do they feature any significant content that is not present in the DP. As such, the MBG compulsory units have a significantly lesser breadth and depth of biology content than DP biology SL and HL. Regarding the MBG compulsory and optional units combined, a significant amount of DP SL and AHL content remains absent. Indeed, the MBG units have no alignment with three out of four levels in B. Form and Function and D. Continuity and Change. In addition, the MBG compulsory and optional units combined have no alignment with the DP biology level A3 Organisms and very limited alignment with AHL biology content overall. Therefore, while having greater alignment with DP biology than the compulsory units alone, the MBG compulsory and optional units combined still have lesser breadth and depth than DP biology SL and, particularly, DP biology HL. That said, it can be noted that the MBG Health Sciences optional units have not been included in the analysis of content and may explain some of the differences in alignment. For example, the areas of the kidney and osmoregulation may be covered in the MBG Health Sciences units rather than the MBG Biology units. Lastly, within the MBG optional Biology units there is coverage of regulations for GMO product use in Mexico, which is not present in DP biology.

- **Differences in demand:** DP biology SL and HL score higher in all demand categories than the MBG Natural Sciences, Experimental Science and Technology units (biology-focus). The MBG compulsory units, and compulsory and optional units taken together, have received the same score of 2 for Bloom's cognitive skills, which is lower than both the DP SL and HL. DP biology also features greater breadth and depth, which is reflected in the higher scores for the volume of work and depth of knowledge categories. Moreover, DP biology courses have more required stretch areas than MBG units, resulting in higher scores for the outstanding demand areas category.

6.2.5 Language and Literature Alignment

The subject level alignment between DP language A: language and literature (SL and HL) and the MBG Language and Communication units is represented below:

Figure 32: Visual representations of subject-level alignment (language and literature)

Comparison subject	Learning outcomes alignment	Content alignment	Demand alignment
Compulsory Language and Communication Units	Low **Moderate** High	 The bar represents the overlap of the areas of exploration and conceptual questions that may be considered, rather than the number of texts studied - as this is not specified in the MBG documentation. The areas of exploration and conceptual questions are the same for DP SL and HL, hence only one bar is presented here.	
Compulsory and Optional Language and Communication Units	Low **Moderate** High	 The bar represents the overlap of the areas of exploration and conceptual questions that may be considered, rather than the number of texts studied, as this is not specified in the MBG documentation. The areas of exploration and conceptual questions are the same for DP SL and HL, hence only one bar is presented here.	

MBG Compulsory units: Language and Communication I, II, and III.
MBG Optional units: Communication Sciences I and II.

- **Learning outcomes alignment**: the level of learning outcome alignment between DP LA:LL and the MBG Language and Communication units is moderate. While most of the DP learning outcome themes are strongly present, there are two significant DP themes that show little to no presence in the MBG learning outcomes, resulting in an overall moderate level of alignment, rather than high.

- **Content alignment**: there is low-moderate content alignment between DP LA:LL and MBG Language and Communication units. The MBG units include content that aligns with some of the guiding conceptual questions in the DP LA:LL's areas of exploration. In particular, there is scope in the MBG units' content for consideration of concepts relating to the guiding conceptual questions from 'readers, writers, and texts' and (to an extent) 'time and space' in DP LA:LL. In contrast, the alignment that Language and Communication units have with the 'intertextuality: connecting texts' area of exploration in DP LA:LL is very limited. The alignment with DP LA:LL is low-moderate regardless of whether the MBG optional units are studied in addition to the compulsory units.

- **Demand alignment**: the demand scores of DP LA:LL courses and MBG Languages and Communication units do not align strongly overall. Indeed, the level of alignment is moderate, as DP LA:LL courses score similarly to MBG units in some categories, but higher in others. More specifically, while the MBG's Languages and Communication units show similarities in demand scores with the DP SL and HL in the areas of Bloom's cognitive skills and depth of knowledge, DP SL and HL score higher for volume of work and outstanding demand areas than the MBG units.

The **key similarities** identified were the following:

- **Similarities in learning outcomes**: five of the seven DP LA:LL learning outcome themes are strongly present in the MBG Languages and Communication units. In particular, the themes of conducting critical analysis, exploring a range of different texts and forms, understanding the impact of context, interpreting information and meaning, and developing identity through the study of language and literature are present in both curricula's learning outcomes.

- **Similarities in content**: The content of MBG Language and Communication units reflects strong similarities with DP LA:LL's 'readers, writers, and texts' area of exploration, as both involve similar study and analysis of a varied range of literary and non-literary texts. Accordingly, most DP LA:LL guiding conceptual questions (four) in this area show strong alignment with the MBG Language and Communication units, while the remaining (two) guiding conceptual questions are partially present. Additionally, MBG students may consider some similar concepts to DP LA:LL's 'time and space' area of exploration, as the majority of the guiding conceptual questions in this area are partially present in the units.

- **Similarities in demand**: DP LA:LL (SL and HL) and MBG Language and Communication units receive the same score for the Bloom's cognitive skills category, as all demonstrate a high emphasis on analysis skills, as well as evaluation and

synthesis, in their learning outcomes. There are also similarities with regards to depth of knowledge. Indeed, the MBG compulsory units score the same as DP LA:LL SL and the MBG compulsory and optional units combined score similarly (though slightly lower) compared to DP LA:LL HL. This reflects the MBG Language and Communication units' emphasis on deep engagement with content, such as through strategic thinking tasks – a similarity with DP LA:LL.

The **key differences** identified were the following:

- **Differences in learning outcomes:** two of the seven DP LA:LL learning outcome themes show little to no presence in the MBG Languages and Communication units. Indeed, the themes of appreciating intertextuality and understanding the writer's craft receive less focus in the learning outcomes of MBG units than DP LA:LL's.

- **Differences in content:** Firstly, it can be noted that the use of guiding conceptual questions in DP LA:LL promotes more metacognitive thinking compared to the content in MBG Language and Communication units. Moreover, content relating to a significant number of DP LA:LL conceptual guiding questions is absent from the MBG units. For instance, all of the DP LA:LL's guiding conceptual questions within the 'time and space' area of exploration have a partial, rather than strong, presence in the MBG Language and Communication units. Indeed, there is not enough evidence to suggest that these guiding conceptual questions, and 'time and space' generally, are considered in the MBG units to the same extent as DP LA:LL. Furthermore, the MBG Language and Communication units contain very little content which suggests that intertextuality is explored; thus having very little alignment with DP LA:LL's intertextuality: connecting texts' area of exploration. These are significant differences, as all areas of exploration in DP LA:LL have equal time allocation and importance. It can be noted that the MBG Language and Communication units include some content that is less present in DP LA:LL. Indeed, the MBG compulsory units have a higher emphasis on the study of essays and the optional units have a higher emphasis on communication models and require students to produce radio and audiovisual products.

- **Differences in demand:** MBG Languages and Communication units score lower than both DP LA:LL SL and HL for volume of work. Indeed, this reflects the more generous time allocation for the MBG units, as well as the lesser breadth and depth of content in comparison to DP LA:LL. The MBG Language and Communication units also score lower than both DP LA:LL courses for outstanding demand areas. This reflects the higher number of stretch areas required in DP LA:LL compared to MBG Language and Communication units. Lastly, it can be noted that, in these categories where the MBG units score lower, the difference is more significant compared to DP LA:LL HL than DP LA:LL SL. As such, the overall alignment with the demand of DP LA:LL HL is weaker than with DP LA:LL SL.

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Appendix A

This Appendix provides further detail on the criteria utilised by Ecctis' experts and external panel members with subject expertise to measure demand for each of the subjects analysed in this study.

Demand Profile – Subject-level Judgement

- **Revised Bloom's Cognitive Skills** score (0-3): this is an overall score of course demand, based entirely on a review of learning outcomes. Levels have been defined based on increasing emphasis on Bloom's Higher Order Thinking Skills.

    - Level 0 – remembering and understanding: learning outcomes (as well as assessment and content) are primarily focused on recall and understanding, with limited or no evidence of higher order thinking skills.
    - Level 1 – applying: learning outcomes (as well as assessment and content) comprise a mix of recall-, understanding- and application-focused objectives, with only limited presence of higher order thinking skills.
    - Level 2 – analysing: learning outcomes (as well as assessment and content) comprise a mix of recall-, understanding and application-focused goals but also feature a substantial focus on analysis. Learning outcomes can also potentially feature some (though limited) evidence of evaluation and creation-focused goals.
    - Level 3 – evaluating and creating (or synthesising): learning outcomes (as well as assessment and content) feature a predominant focus on analysis-, evaluation- and creation/synthesis.

- **Depth of Knowledge** (adapted from Webb's) score (0-3): this is an overall score evaluating the depth of knowledge or complexity of knowledge required by curriculum standards and expectations. The score is focused on subject content and learning outcomes, complemented by assessment where relevant/possible. Levels have been defined based on the level of detail studied per topic, as well as the levels of thinking described in Webb's depth of knowledge framework.

    - Level 0 – All or most topics are studied in limited detail (pre-upper secondary level). Only basic pre-requisite knowledge is required in order to grasp ideas. The level of cognitive complexity of the information students are expected to know is low (e.g. many tasks may require recall and reproduction of information such as facts, definitions, terms, or simpler procedures – acquired knowledge).
    - Level 1 – Some topics are studied in considerable detail. Moderate levels of pre-requisite knowledge are required in order to grasp ideas in some topics. The level of cognitive complexity of the information students are expected to know is low to moderate (e.g. many tasks may require engagement of some mental processing beyond habitual responses, including comparison and basic reasoning – knowledge application).

  - Level 2 – Most topics are studied in considerable detail. Considerable pre-requisite knowledge is required in order to grasp ideas in some topics. The level of cognitive complexity of the information students are expected to know is average to high (e.g. some tasks require complex reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. The cognitive demands are often complex and abstract – analysis).
  - Level 3 – All or most topics are studied in very high detail. Considerable pre-requisite knowledge is required in order to grasp ideas in most topics. The level of cognitive complexity of information students are expected to know is mostly high (e.g. many tasks may require complex reasoning, planning, developing, information synthesis, interpretation of data for problem solving, and thinking most likely over an extended period – extended thinking).

- **Volume of Work** score (0-3): this is a trifactor score, considering breadth of content and depth of content, evaluated against the programme's specified timeframe. The three factors – breadth, depth, and time – were all considered in defining the levels.

  - Level 0 – light: small number of themes and sub-themes covered; a significant majority of time is spent on straightforward or basic themes; generous time allocation per theme.
  - Level 1 – moderate: typical number of themes and sub-themes covered; more time spent on conceptually complex themes compared to Level 1 (though majority of time still spent on themes of basic depth); standard time allocation per theme.
  - Level 2 – moderate heavy: typical to high number of themes and sub-themes covered; a significant proportion of time spent on issues beyond basic conceptual depth; standard to short time allocation per theme.
  - Level 3 – heavy: high number of themes and sub-themes covered; a large proportion of time spent on issues beyond basic conceptual depth; short time allocation per theme.

- **Outstanding Areas of Subject Demand** score (0-3): this score reflects the number of content areas typically viewed as more challenging and/or conducive to intellectual stretching of learners. Levels have been defined on a scale of increasing presence of 'stretch areas'.

  - Level 0 – no stretch areas (0)
  - Level 1 – few stretch areas (1-2)
  - Level 2 – a significant number of stretch areas (3-4)
  - Level 3 – a high number of stretch areas (>4)

Appendix B

Learner profile	Approaches to learning	Approaches to teaching	International-mindedness
Inquirers: We nurture our curiosity, developing skills for inquiry and research. We know how to learn independently and with others. We learn with enthusiasm and sustain our love of learning throughout life. **Knowledgeable**: We develop and use conceptual understanding, exploring knowledge across a range of disciplines. We engage with issues and ideas that have local and global significance. **Thinkers**: We use critical and creative thinking skills to analyse and take responsible action on complex problems. We exercise initiative in making reasoned, ethical decisions. **Communicators**: We express ourselves confidently and creatively in more than one language and in many ways. We collaborate effectively, listening carefully to the perspectives of other individuals and groups. **Principled**: We act with integrity and honesty, with a strong sense of fairness and justice, and with respect for the dignity and rights of people everywhere. We take responsibility for our actions and their consequences. **Open Minded**: We critically appreciate our own cultures and personal histories, as well as the values and traditions of others. We seek and evaluate a range of points of view, and we are willing to grow from the experience.	In all IB programmes, there are five categories of skills including: **Thinking skills:** including areas such as critical thinking, creative thinking, and ethical thinking **Research skills:** including skills such as comparing, contrasting, validating, and prioritizing information **Communication skills:** including skills such as written and oral communication, effective listening, and formulating arguments **Social skills:** including areas such as forming and maintaining positive relationships, listening	In all IB programmes, teaching is: **Based on inquiry:** A strong emphasis is placed on students finding their own information and constructing their own understandings. **Focused on conceptual understanding:** Concepts are explored in order to both deepen disciplinary understanding and to help students make connections and transfer learning to new contexts. **Developed in local and global contexts:** Teaching uses real-life contexts and examples, and students are encouraged to process new information by connecting it to their own experiences and to the world around them. **Focused on effective teamwork and collaboration:** This includes promoting teamwork and collaboration between students, but also refers to the collaborative relationship between teachers and students.	The aim of all IB programmes is to develop internationally minded people who recognize their common humanity and shared guardianship of the planet. Central to this aim is international-mindedness. International-mindedness is a multifaceted concept that captures a way of thinking, being and acting characterised by an openness to the world and a recognition of our deep interconnectedness to others. To be open to the world, we need to understand it. IB programmes therefore provide students with opportunities for sustained inquiry into a range of local and global issues and ideas. This willingness to see beyond immediate situations and boundaries is essential as globalization and emerging technologies continue to blur traditional distinctions between the local, national and international. An IB education fosters international-mindedness by helping students reflect on their own perspective, culture and identities, as well as those of others. By engaging with diverse beliefs, values and experiences, and by learning to think and collaborate across cultures and disciplines, IB learners gain the understanding necessary to make progress towards a more peaceful world.

Caring: We show empathy, compassion, and respect. We have a commitment to service, and we act to make a positive difference in the lives of others and in the world around us. **Risk-Takers**: We approach uncertainty with forethought and determination; we work independently and cooperatively to explore new ideas and innovative strategies. We are resourceful and resilient in the face of challenges and change. **Balanced**: We understand the importance of balancing different aspects of our lives – intellectual, physical, and emotional – to achieve well-being for ourselves and others. We recognize our interdependence with other people and with the world in which we live. **Reflective**: We thoughtfully consider the world and our own ideas and experience. We work to understand our strengths and weaknesses in order to support our learning and personal development.	skills, and conflict resolution **Self-management skills:** including both organizational skills, such as managing time and tasks, and affective skills, such as managing state of mind and motivation.	**Designed to remove barriers to learning:** Teaching is inclusive and values diversity. It affirms students' identities, and aims to create learning opportunities that enable every student to develop and pursue appropriate personal goals. **Informed by assessment:** Assessment plays a crucial role in supporting, as well as measuring, learning. This approach also recognizes the crucial role of providing students with effective feedback.	An IB education further enhances the development of international-mindedness through multilingualism. All IB programmes require students to study, or study in, more than one language. This is because we believe that communicating in more than one language helps students to appreciate that his or her own language, culture and world view are just one of many. In this way, it provides excellent opportunities to develop intercultural understanding and respect. International-mindedness is also encouraged through a focus on global engagement and meaningful service with the community. These elements challenge students to critically consider power and privilege, and to recognize that they hold this planet and its resources in trust for future generations. They also highlight the focus on action in all IB programmes: a focus on moving beyond awareness and understanding to engagement, action and bringing about meaningful change to make a more peaceful and sustainable world for everyone.

Appendix C

Task brief – Expert Demand Panel – [Subject]

For each subject, highlight in yellow the descriptor(s) deemed to best fit each demand category, using the following criteria (please refer to the demand tables for descriptors of the levels):

- **Revised Bloom's Cognitive Skills** score (0-3): this is an overall score of course demand, based entirely on a review of learning outcomes. Levels have been defined based on increasing emphasis on Bloom's Higher Order Thinking Skills.

- **Depth of Knowledge** (adapted from Webb's) score (0-3): this is an overall score evaluating the depth of knowledge or complexity of knowledge required by curriculum standards and expectations. The score is focused on subject content and learning outcomes, complemented by assessment where relevant/possible. Levels have been defined based on the level of detail studied per topic, as well as the levels of thinking described in Webb's depth of knowledge framework.

- **Volume of Work** score (0-3): this is a trifactor score, considering breadth of content and depth of content, evaluated against the programme's specified timeframe. The three factors – breadth, depth and time – were all taken into account in defining the levels.

- **Outstanding Areas of Subject Demand** score (0-3): this score reflects the number of content areas typically viewed as more challenging and/or conducive to intellectual stretching of learners. Levels have been defined on a scale of increasing presence of 'stretch areas'.

Demand Judgements – [Subject]

Table 33: [Subject]

Demand Judgement	Score Descriptors (highlight the best-fit descriptor)	Judgement and Key Evidence
Revised Bloom's Cognitive Skills[102]	Level 0 – remembering and understanding: learning outcomes are primarily focused on recall and understanding, with limited or no evidence of higher order thinking skills.	
	Level 1 – applying: learning outcomes (as well as assessment and content) comprise a mix of recall-, understanding- and application-focused objectives, with only limited presence of higher order thinking skills.	
	Level 2 – analysing: learning outcomes (as well as assessment and content) comprise a mix of recall-, understanding and application-focused goals but also feature a substantial focus on analysis. Learning outcomes can also potentially feature some (though limited) evidence of evaluation and creation-focused goals.	
	Level 3 – evaluating and creating (or synthesising): learning outcomes feature a predominant focus on analysis-, evaluation- and creation/synthesis.	
Depth of Knowledge[103]	Level 0 – All or most topics are studied in limited detail (pre-upper secondary level). Only basic pre-requisite knowledge is required in order to grasp ideas. The level of cognitive complexity of the information students are expected to know is low (e.g. many tasks may require recall and reproduction of information such as facts, definitions, terms, or simpler procedures – acquired knowledge).	
	Level 1 – Some topics are studied in considerable detail. Moderate levels of pre-requisite knowledge are required in order to grasp ideas in some topics. The level of cognitive complexity of the information students are expected to know is low to moderate (e.g. many tasks may require engagement of some mental processing beyond habitual	

[102] Evidence pool: Learning outcomes
[103] Evidence pool: Learning outcomes, subject content, assessment types

Demand Judgement	Score Descriptors (highlight the best-fit descriptor)	Judgement and Key Evidence
	responses, including comparison and basic reasoning – knowledge application).	
	Level 2 – Most topics are studied in considerable detail. Considerable pre-requisite knowledge is required in order to grasp ideas in some topics. The level of cognitive complexity of the information students are expected to know is average to high (e.g. some tasks require complex reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. The cognitive demands are often complex and abstract – analysis).	
	Level 3 – All or most topics are studied in very high detail. Considerable pre-requisite knowledge is required in order to grasp ideas in most topics. The level of cognitive complexity of information students are expected to know is mostly high (e.g. many tasks may require complex reasoning, planning, developing, information synthesis, interpretation of data for problem solving, and thinking most likely over an extended period of time – extended thinking).	
Volume of Work[104]	Level 0 – light: small number of themes and sub-themes covered; a significant majority of time is spent on straightforward or basic themes; generous time allocation per theme.	
	Level 1 – moderate: typical number of themes and sub-themes covered; more time spent on conceptually complex themes compared to Level 1 (though majority of time still spent on themes of basic depth); standard time allocation per theme.	
	Level 2 – moderate heavy: typical to high number of themes and sub-themes covered; a significant proportion of time spent on issues beyond basic conceptual depth; standard to short time allocation per theme.	
	Level 3 – heavy: high number of themes and sub-themes covered; a large proportion of time spent on issues	

[104] Evidence pool: Subject content; assessment types and number; course duration; time allocated per topic/subtopic (where available).

Demand Judgement	Score Descriptors (highlight the best-fit descriptor)	Judgement and Key Evidence
	beyond basic conceptual depth; short time allocation per theme.	
Outstanding Areas of Subject Demand[105]	Level 0 – no stretch areas (0)	
	Level 1 – few stretch areas (1-2)	
	Level 2 – a significant number of stretch areas (3-4)	
	Level 3 – a high number of stretch areas (>4)	

[105] Evidence pool: Subject content.