

# Curriculum Design for Mathematics in the MYP

CONCEPTS, INQUIRIES AND STRATEGIES

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# ABOUT THE AUTHOR

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Rita authored the official MYP mathematics textbooks, *MYP: By Concept* for the IB with Hachette Learning. As the Founding Head of Secondary at Nord Anglia International School Dublin, Rita successfully led the school through rapid expansion and achieved IB authorisation for both the Middle Years and Diploma Programme, earning high commendations and bringing IB Continuum to Ireland for the first time. In 2024 she founded an educational consultancy Eblana Learning, supporting the IB and schools globally in their curriculum and AI development.

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# PREFACE

The location is a sunlit, bustling piazza in Rome. A handsome, slightly balding man sits at a table in an outdoor café, sipping a cappuccino. He wears an achingly trendy white suit, looking cool despite the sun. He appears to be reading a newspaper printed on pink paper. Placing the newspaper down, he makes direct eye contact with me. I lean forward. He speaks of the majesty of Paul Gascoigne and of Faustino Asprilla's latest goal celebrations. I cannot tear my eyes away. I am spellbound!

I am 14 years old and the man on the TV is James Richardson, the presenter of *Football Italia* – a British TV show from the 1990s. Interested as I was in this golden age of Italian football, my attention was gripped by this unfamiliar lifestyle. Here was this non-Italian somehow mimicking their 'vibe' – sitting in a café, looking effortlessly sophisticated and cool. My fate was sealed. I would live in Italy ... But how would I get there? I needed a way to travel, my only goal in life to find, and then taste, a cappuccino. Not easy in Dublin at the time.

These dreams were in stark contrast to my actual surroundings, living a suburban adolescence in the grey Ireland of the 1980s. Little did any of us know that we were about to enter a period of intense, and uncharacteristic, optimism in Ireland. Peace was coming to the island and the diaspora grew in confidence around the globe. Being Irish was a little bit cool for the first time in our history, and the Irish went straight out to exploit it!

With the intensity of a teenager, I vowed travel would be my life. But not teaching. Never teaching! There were at least four generations of teachers just before me, and a suspicion that our Viking ancestors came to Ireland not to pillage but to lecture. And so I wanted to forge my own path and direction. But life has its own intentions, and teaching came for me anyway.

After university in Dublin, I prepared to travel, but a broken jaw delayed it. My parents insisted that not being able to speak was not a disadvantage as 'there was nothing wrong with my ears', and I could listen and learn while recuperating. The list of one-year courses was limited, so the teacher qualification seemed to mollify them.

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The problem was that from my first moment in front of a class I adored it. I even ignored the classic 'Don't smile til Christmas' advice, as I could not hide my glee. I loved teaching then and I adore it still. I am annoyingly more enthusiastic about it now than I was more than 25 years ago when I began. And this was a transferable skill, an opportunity to pack up my qualifications and carry them lightly with me all over the world.

Once qualified, the first international school I applied to in Italy advised me to get UK experience, so I immediately moved to Leeds to find a job. The recruitment cycle was unfamiliar to me, so I had no idea that a school still looking at the end of August was a red flag. Neither did I understand what they meant when they told me that, as a school, they were at about 11%. I smiled politely and happily took the job offered. Later it became clear that they meant approximately 11% of their students achieved five GCSEs each!

It was a baptism of fire, as the last teacher in was given the least desirable classes – as a rite of passage, I presume. I was given all the 'bottom sets'. My favourite and most challenging was a Year 11 set 9, who had very little interest in the beauty of mathematics but did derive great joy from creating new nicknames for me as their first order of business daily.

This resistant audience aside, I found myself impressed by the teaching methods in England. Unlike the extremely traditional, and change resistant, Irish system at the time, the UK was experiencing massive investment under 'New Labour'. My mind was blown by assessment for learning (AFL) and skills achievement, and anything at all that diverged from memorisation and mastery. Resources were 'adapted', teachers defined 'expectations' for students and gave detailed feedback on learning how to learn. Brain Gym and whiteboards were all the rage. What an enlightened and progressive system, I thought ...

But the wanderlust persisted. Once I'd met, and married, my new English husband we headed onwards to Switzerland, where we first encountered the International Baccalaureate (IB), in the form of the Diploma Programme (DP). This was an epiphany for me! A revelation! Here was something truly revolutionary, thought I. What I had thought was true pedagogic love for the English system had been but a passing whim. Here was a system that valued the whole person, more than results or league tables. But I was a fickle follower, it appeared, because discovering the Middle Years Programme (MYP) in Bermuda several years later, it supplanted the DP in my heart almost instantly too.

In the years, and various schools, that followed, we encountered diverse backgrounds and attitudes to education and behaviour. Whether there was extreme wealth or poverty, affluence or physical neglect, privilege or deprivation,

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I always found that the kids themselves had good hearts and great minds, and wanted to understand and be understood. No matter the context, each year had its joys, and I feel fortunate to have had the opportunity to be a positive influence in their lives.

It has to be acknowledged that the IB has an intense learning curve – I often felt that I needed to learn and unlearn in equal measure. But, thanks to our initial IB experience and training, we as a teaching couple could access new opportunities and advancements. And so we forged onwards to Bermuda, the Netherlands, the US, Germany and Ireland. With each new role I became increasingly submerged within the world of the IB. Teaching has been a wonderful way to develop my career, see the world and do a meaningful, rewarding job at the same time.

None of these systems are perfect of course, just as there is no perfect school. I have been through periods of awe, overload, comfort, ease, disillusionment and influence. I find myself now in an era of radical acceptance of the IB's strengths and occasional contradictions. You can be truly converted to the worldview of the IB while simultaneously understanding the frustrations it can bring forth. You also need to be self-aware enough to know when you start to sound like you're in some kind of cult.

I understand now that I have also been extremely privileged and the role that plays in everything. I had no idea how lucky I was to speak English, to have a recognisable and well-regarded education, and the freedom of movement globally that so many are denied. The IB philosophy has a way of reminding you of that privilege, and your responsibility to acknowledge it and change it for others where you can.

Fortunate as I was in this, we were doubly blessed to have made most of our mistakes in teaching in an era before the parent email or the social media record. Today, the job itself is vastly different to when I started. Expectations are also different. Nowadays you wouldn't hear of a 'hangover cabinet' for furtive napping. As teachers, we were virtually inaccessible to parents for months, and as a result things were neither discussed nor addressed. The situation is much better now, in terms of safeguarding and higher standards and expectations, but mistakes are so much more visible, and this can make the risk of experimentation less appealing.

One day, my husband, Andrew, saw a job advert that he described as 'short of saying the candidate must have green eyes and hate fish, it could be describing you perfectly'. The position was for a passionate educator to become curriculum and assessment manager for the ivory tower of the IB itself, in The Hague. I reluctantly left the classroom but relished the opportunity to actually craft what

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was going to be taught in classes around the world. This was the most formative part of my journey so far.

My motivation in authoring this book is to share the most successful practices I have observed in schools globally. It was a dream job, working with incredible mentors and thinkers. No one rolled their eyes when I got excited about research, or laughed when I proposed something new to try. I was encouraged to challenge ideas, but more importantly to make abstract ideas in education work at the school level and in a variety of contexts. My mentor, and professional hero, Robert Harrison consistently assured me that, while I missed the classroom, I was instead in thousands of classrooms every day with my work. That helped my homesickness for teaching, at least in the short term.

So, I have lived the IB for years now and done almost every single role within and without it – writing the curriculum, publishing the official textbooks, opening up a greenfield site for the MYP and DP, examining, leading workshops, etc. It became clear to me that this unique bird's eye view allowed me to help those who are struggling, curious or simply hungry to improve. This book is for anyone interested in the past, present and future of curriculum development in MYP Mathematics, and I hope it has practical transfers for other subjects too.

The book is also designed as a resource for those who might feel overwhelmed, tired or change resistant. They may wish to live the IB philosophy and pedagogy but in the most efficient way possible, as many teachers are tired and overburdened. Every day I see posts on social media and in WhatsApp groups clamouring for help and guidance, and I try to help where I can. But it's unsustainable in that format. These teachers are often confused or panicked, but they crave reassurance through genuine assistance and I hope they find it in these pages.

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# CHAPTER 1

## THE IB MISSION

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This book is written to support MYP mathematics teachers, to enable and empower them to function as successful curriculum designers and exemplary practitioners.

### Key thinking points

In this chapter, there are explanations/discussions of:

- the IB and its guiding mission statement
- the history of the IB
- the development of the Middle Years Programme (MYP)
- the key features you'll find throughout this book.

### Where should we start?

Let us begin. Each of the chapters that follow will be framed by a learner profile attribute and linked to the ideas within. However, as this is the introductory chapter, we will begin with the International Baccalaureate (IB) itself, where it has come from and what it is for. Our considerations begin with the IB's mission statement. This mission statement underpins the entire philosophy of the organisation and will help to ground our deliberations within the aims of the IB.

You've probably worked in many places that have mission statements. You may even feel that they all sound the same. Certainly, there are commonalities between schools' mission statements seen online. None say they wish to provide a substandard education or that their students will be anything other than world-class. I've never read one that I disagreed with, as they all feature honourable intentions and ambitions. Who wouldn't want that?

So we need to look at the IB's mission statement with fresh eyes, as if for the first time. Before The Hague, I have to confess that I hadn't read it particularly thoroughly. In fact, I'm not sure I read it at all. It was always at the front of the guides, on the pages I flipped past to get to what I thought was most important – the syllabus. Years later, when it was part of my job, I finally did just that. I read it slowly, and determined how much of it I understood and agreed with. Also, did any of it actually impact my teaching practice?

### What are the key features?

Throughout this book, as we move through the different stages of curriculum development, I will indicate different features that can support your understanding. These key features include resource signposts, information about influential researchers and educators in the field, AI prompt suggestions and recommendations for further reading.

## What is the IB mission statement?

The International Baccalaureate aims to develop inquiring, knowledgeable and caring young people who help to create a better and more peaceful world through intercultural understanding and respect.

To this end the organization works with schools, governments and international organizations to develop challenging programmes of international education and rigorous **assessment**.

These programmes encourage students across the world to become active, compassionate and lifelong learners who understand that other people, with their differences, can also be right.

### International Baccalaureate Organization

I find nothing to object to in this statement. These are lofty, excellent goals and truly the purpose of education, but there is something special for me about the last phrase 'other people, with their differences, can also be right'. In literature, there is a practice of reading called *florilegia*, where extracts are brought together, like a 'best of' or curated group. The word comes from Latin and refers to the gathering or collecting of flowers. The idea is that the reader waits for something to blossom on the page and then gathers it, to savour and enjoy later. The modern equivalent, I believe, is when we see something on our phones that we like and we take a screenshot to remember it later.

For me, this last line of the mission statement blooms when I read it. It sparkles. It glows and clamours for my attention. I cannot think of any greater goal for myself and for the conflict in the world than the idea that other people can also be right. It implies that I have to sometimes accept that I am, on very rare occasions, wrong myself. This lesson in humility, and prompt for compassion and peace, is the most powerful for me. It is something I have never seen in any other statement of a mission.

In one particularly stressful phase of a curriculum rollout, all the curriculum managers had been attending seminars and conferences, trying our best to help stressed and anxious teachers accept that the changes were for the better. We were emotionally and intellectually exhausted, and some of us felt a little jaded from travel and from what we perceived as an ungrateful audience to all our hard work. It was not a good look for me and I will admit I am now quite ashamed of it.

I was facilitating a session one day when I had two educators from the same region of conflict ask for advice on some rather different assessment challenges. The first, a Palestinian teacher, explained that it was not unusual for them to have to climb over rubble in the morning to get into school, and what were my recommendations for criterion assessments when this happened? By coincidence there was an Israeli teacher present, and she echoed these concerns from her school's side: 'What should I do when a Criterion B assessment is interrupted for a bomb siren and the students might reveal the pattern?'

### Key feature: Anecdotal evidence

As we proceed through the world of curriculum development, learner profile attribute by learner profile attribute, I will share insights from the thousands of schools I have worked with and from my own personal experience. These examples and counterexamples may resonate with something you have experienced or align with your view of the MYP. Alternatively, they might also serve as a warning of what not to do!

These questions baffled me. I sputtered out something along the lines of, 'I think you guys have more important things to consider than MYP grading in that case.' Wow, was I ever wrong!

Both teachers disagreed with me instantly, in the most strident terms. They explained that this education was precisely what they valued and were hoping to instil in the next generation, that the IB gave them a language to talk about tolerance and acceptance when conflict was at its most harmful. It genuinely had

never occurred to me that anything we did could ever be this important. They were living the mission statement in trying to create a better and more peaceful world. It humbled me, and I remembered those two teachers every time I made a curriculum change, resource or recommendation, asking myself how it might impact schools like theirs.

On a practical note, it is really important to make students aware of this mission statement. Assemblies are great for this, but a physical reminder in the form of a classroom poster can frame conversations. It is something to refer to regularly, especially useful in conflict resolution or restorative conversations: 'You two seem to be having a disagreement, but can we both accept that ...', 'Our goal in this school is to be a community and to understand each other ...'.

Later, when I was head of school for a brand new MYP and DP school in Dublin, we made sure that we had large mission statement posters in every classroom and working space before authorisation. Of course, this was intended to impress visitors, but it also served as a subliminal reminder for every day. We placed the school's own learning vision alongside too – it helped us live and breathe the IB ideals as a community. If you don't have one in your classroom or office, go and print one right now. Or ask your coordinator – it might inspire them to share with all.

## Where did it all come from?

So where did the IB come from? If you are reading this book, then I have to assume that you are relatively new to the IB and certainly weren't involved in its inception. So you may only be familiar with the modern and current version of the IB, vast, global and influential. But it wasn't always thus ...

The IB was born of two extremely specific needs, one of which was very practical and the other much more idealistic. The two goals were symbiotic but not in an immediately obvious way, born of the coincidence of post-war liberalism and rising globalism. From a practical perspective, there was a growing need for a portable or transferable education for international families. These families were highly mobile, increasing in number as the globalism began to have an effect. Families of diplomats and multinational executives understood the dangers of moving their children repeatedly, in and out of very disparate national systems, often to their detriment when applying to colleges.

The second goal was much more progressive in its thinking – there were calls for a different type of education, one that would help young people engage with the complexities of the world and a desire to make it a better place for all humanity. This was heavily influenced by the culture of post-war liberalism that

also lay behind the establishment of other institutions of international order, such as the United Nations, among others. This motivation also fitted well in the worldview of these diplomatic families, who were for the most part also internationally minded and motivated to preserve peace and harmony. The issues in education crossed disciplinary, geographical and cultural borders, just as these families would.

To meet both these goals, a teacher-led initiative began, with its origins in Geneva as well as several established international schools, and drawing on substantial grants from Unesco and other supporting governments. Its remit was to develop an internationally recognised educational programme that would be validated for university entry. The Diploma Programme was the priority, and following a prolonged period of development, was established in 1968. It remained the priority of the IB for far decades afterwards. There had been some preliminary work done on similar primary school provision, but little progress had been made in this area due to lack of funding. The middle years were overlooked as it was felt that the British system's qualifications at the time provided sufficient support, albeit without a shared philosophy.

Before long, the IB Diploma was recognised and highly attractive to others besides the jet-setting diplomats and executive multinational families. It was desirable as a philosophy in schools beyond the private, international and self-considered Tier 1 scene. Cynics might say it also became a respected brand and quality mark, which gave schools credibility and recognition if they had sufficient resources.

Another concern of schools and teachers when interacting with the IB is often the associated cost. These are expensive programmes to get authorised and to sustain. One member of the Heads Council described it me as 'reassuringly expensive', which was an opinion I hadn't really considered before. His position was that, to maintain such a high standard and **pedagogy** required a commitment that kept half-hearted, opportunistic enterprises at bay.

My time at the IB coincided with a period of massive transition from small educational organisation to behemoth, and there were teething problems from such rapid expansion. Perhaps it can appear austere, authoritative or confusing, but in the not-too-distant past the IB was a very tight-knit community of educators. Many of the older IB Educators (often called IBEN) would bemoan the changes, feeling the lack of the connection present in the early days. Talking to the original author of the Primary Years Programme (PYP), Ann Hickey, recently, it was clear that it was an organisation for teachers, run by teachers.

Others believed that the organisation was elitist, out of reach of so many who could benefit from this philosophy. There had been a feeling that the focus was palpably white, western facing, overly British and of the old-world order. The IB was certainly responsive to this criticism, and I saw many advances in this over the years. One colleague, David Jones, was particularly vocal on this matter. In my interview he grilled me intensely on how I would support under-resourced and under-recognised schools in Africa, for example. It was a regular refrain in discussions, often to positive effect.

Lastly, the rapid expansion gave rise to another problem. There was a question of principles and moral authority, which continues in certain circles online to this day. I was involved in many heated debates between colleagues regarding our investment or expansion into cultures that didn't always fully subscribe to the same beliefs. There were those who felt that it showed us to be over-adapting and compromising too far, while others felt that the IB's presence in any environment where it could encourage peace and intercultural understanding warranted some flexibility. I was often in the first camp, but passionate educators from schools in those regions utterly changed my mind. Theirs were the voices to be respected.

It cannot be understated how influential the IB philosophy and approach has been on other educational systems. This is rather disgustingly referred to in the organisation as 'positive backwash', and it is true that many other systems have made incremental changes towards it. It is the very manifestation of a rising tide lifting all boats. Some openly reference the ideas, others more obliquely, but the impact is clear. It is hard to imagine, as we view the global influence it has, that the IB only recently celebrated its 50th birthday!

The three other programmes came later, in the form of the aforementioned Primary Years Programme (PYP), a Middle Years Programme and a Career-related Programme (CP), giving the IB a full continuum of strong, stand-alone programmes. These were all designed to be 'broad, balanced, conceptual and connected', with a range of academic studies and learning experiences. The table below shows a comparison of the four programmes. We will discuss the development of the MYP in the next section.

Programme	Unique characteristics	Curriculum (content)	Assessment (certification)	Common threads throughout
Primary Years Programme (PYP), 1997	In the PYP, learning aims to transcend traditional boundaries between subject areas, using six transdisciplinary themes of global significance.	There are sample scope and sequence documents provided, but curriculums must be developed by schools.	Assessment guidance is neither defined nor prescribed by the PYP, and so these are school-based decisions.	Common threads between all four programmes: – international mindedness – developing the attributes of the IB learner profile – approaches to learning. All four IB programmes also require completion of a culminating project: the PYP exhibition; the MYP personal project or community project; the DP extended essay; the CP reflective project. These are a showcase for knowledge, understanding and skills. They are a culminating celebration of learning.
Middle Years Programme (MYP), 1994	In the MYP, students explore six global contexts that are developed from, and extend, the PYP transdisciplinary themes.	While there is no defined curriculum content, there is a great deal of guidance in the guise of a framework. The exact content can be determined by the school, although there is an expected exit point, 'Prior Learning', for the DP.	Assessment is defined but not prescribed in the MYP. External assessment is available in the form of eAssessment, but it is by no means taken up by the majority of schools. It remains the only route to a validated MYP Certificate.	
Diploma Programme (DP), 1968	In the DP, the curriculum consists of six subject groups and the three elements of the DP core, as well as the theory of knowledge (TOK) course, which encourages students to become more aware of their own perspectives and assumptions.	There are individual detailed subject guides and specifications in each subject offered in the DP.	It is the only programme to have clearly defined curriculum and assessment outcomes, and fully externally validated grades.	
Career-related Programme (CP), 2012	In the CP, students combine the study of DP courses with career-related studies and the four elements of the CP core, to prepare them for personal and professional situations.	The CP curriculum is a subset of the Diploma Programme where students engage with a number of DP subjects as well as additional requirements.	Assessment follows Diploma Programme protocols, with adaptations allowed.	

These programmes have developed organically over time and in response to real demand but weren't always developed in reference to one another. It is also fair to say that each review does look for opportunities to bring them iteratively closer to one another.

Interfacing, or communicating, with the IB can sometimes feel frustrating. You might face inconclusive answers or find that educators interpret details differently, leading to certain interpretations becoming 'the gospel'. There have been strides in the past decade: an improved IB Answers service, more school services teams and a revamped exchange platform on My IB are products of this drive to improve access.

*Education is an act of hope in the face of an always-uncertain future. An IB education calls forth the absolute best in students and educators alike. The IB believes that together we can help to prepare students for living and working in a complex, highly interconnected world.*

**Source: 'What is an IB education?', My IB**

### Key feature: Further reading

Although most of us are trying to figure out the most efficient ways to balance everything, occasionally we get some time to read and further our craft. Many of us even enjoy reading about mathematics for pleasure, or we might need some recommendations for uber-keen parents or students. When it is relevant, I will highlight some academic research or current writings that fit within the scope of our discussions. In the appendix you will find a list of books that would make the ultimate MYP Mathematics library, should you be blessed with an infinite budget.

## What about the MYP?

In this section let's dive further into the MYP in particular, and its own unique features and history.

### Why did the MYP develop, and how?

The MYP sprang from an initiative by groups of teachers and administrators who wanted to develop a curriculum for the middle years of schooling. It was intended that this curriculum would share much of the same philosophy as the DP and would prepare students for success in that programme. It would also provide academic challenge while concerning itself with the development of young people and their personal, social and emotional wellbeing.



### Key feature: Resources signpost

Throughout this book you will find directions to resources which will help you implement the advice given. They can also help you elevate your practice or understand the programmes better. These resources might be online, games, manipulatives, groups or companies to add to your repertoire.

It could be said that this is the last chance for students to play with learning before the high-stakes, controlled environment of the DP and CP. The first draft of the MYP curriculum was produced in 1987, and the IB authorised the first 15 MYP schools in 1994. It often surprises me how much later the MYP arrived than the DP. I was almost in university myself when the first MYP schools were authorised.

One of the most significant steps in trying to start to articulate the three programmes was adopting the PYP student profile and renaming it the IB learner profile, describing the attributes of an IB educated learner. Presented by the head of programme development, Judith Fabian (and built on the inspirational work of Kevin Bartlett and others), the learner profile gave a common language across the programmes and strengthened their connections. Judith was a formidable head of programme development, in the best way. She was cool and calm, with an effortless authority, in the style of Mary Robinson. I was in awe of her and tried to learn as much as I could before she retired.

Details of other key individuals, groups and research influences behind the development from 1980 to 2010 can be found in *History of the Middle Years Programme* (Nicolson, 2010). For those interested in the granular detail of who, when and what was decided, this document is a treasure trove of detail and long-forgotten conversations. To make sure I fully understood the nuances, I also interviewed the author, Malcolm Nicolson, who was also the head of MYP development at that time.

The history of the MYP document details an uncertain period, due to a lack of strategic planning, when the future might have been hugely different for MYP. It may be because the Diploma Programme was increasing exponentially and curriculum development in that programme was rolling out, so they were stretched to the limit. As an account it is highly personal, sometimes indulgent, but rich in detail. Speaking to Malcolm added colour to that detail, including the fact that the origin of the document was a drunken warning from one of the programme's founders that 'everyone who knew everything was dead or dying and this knowledge hasn't been captured'. I found this fascinating.

Reading Malcolm's history of the MYP made me realise that the people behind the curriculum had names and faces, and that these were humans who were thinking about the classroom and the examinations and more. As a result, it made me determined that this book would hopefully do the same – give insight into the 'behind the scenes' conversations that happen in the meetings that decide our fates in schools. Malcolm's document ends just before the most significant phase of the MYP development: the 'Next Chapter'.

In 2010, the IB began this major review of the programme, leading to the publication of a new *From Principles into Practice* (FPIP) and new guides for all subject groups in 2014 (IBO, 2014). Malcolm and his team achieved a huge amount in a very short time, and the review was financially very successful and conceptually progressive. He was most proud of the changes they made to the concepts, and felt that if they could do it all again there would more of a focus on design thinking. He also indicated a wish that the next review would have been done sooner.

We discussed the shame that no similar document exists for development since 2010. Without the institutional memory, who is to know or to care that there were at one point 97 key concepts in Arts and only 4 in Sciences, and that they ended up at 16 because 'it felt about right', or how the global contexts came to be, thanks to a timely intervention from a PYP colleague.

Every academic staff member must join at a certain point in the review cycles, and some are luckier than others. I initially felt that I was unlucky to have arrived just after the launch of a hugely significant review into the entire programme: the aforementioned Next Chapter. It felt like I had arrived at the end of this particular party, feeling like the lights has just been switched on and I was a little too late for all the fun. For example, after Next Chapter further changes were off the table to allow for bedding in. Robert Harrison (my mentor) was in a similar position, having taken over not long before my arrival. I was his first hire in his new role. There were limitations to what we could change post-review, but it was a very exciting time as he brought a vision and thoroughness to the review changes.

Before long I felt very fortunate to be there to support its rollout, find mistakes and correct them, and add detail and understanding where I could. Following this, I authored further guidance, a new MYP Mathematics framework and supported the eAssessment development. Our lot in life became advancing the cause, promoting the ideals and picking up any loose threads of the review that might have remained. I literally slept with the curriculum guide under my pillow and the pages of *From Principles into Practice* taped to my bathroom walls.

Meanwhile, my husband's plight was to temporarily remain in Bermuda, playing golf and receiving 'We're sorry your wife left you' pity cakes.

Now we are at a point in time where many in the community have no idea of the world before then, or even recognise the change. Funnily enough, most people I meet now have no memory of the MYP before the Next Chapter, and fewer still remember the days of *Homo faber*.

The Next Chapter review addressed concerns of the community and countered the critical nicknames: 'Many Years of Projects', the 'muddle in the middle', the 'forgotten middle child'. Some concerns remain.

Often the pressure in the Diploma can drift downwards and be visited upon the MYP. This comes in the form of 'they need to be ready for Diploma' or 'they need to know x and y and we don't have time for the concepts stuff'. Running counter to these claims is the evidence of iterative change in the DP. In the last DP review, the curriculum manager, Deb Sutch, was very open to embedding and increasing the conceptual understanding, thereby moving the DP incrementally closer to the MYP.

But still there is this backward-mapping pressure. It is fairly commonplace to have the MYP 1 to 3 curriculum (or grades 6 to 8), a very inquiry-based, joyful curriculum, and then have MYP 4 to 5 as ostensibly a pre-DP curriculum. The separation of standard and extended certainly reinforces this idea, and we have to remind ourselves that it is not a 'mini DP', that it must remain its own programme.

By all means, please prepare them for Diploma Programme success, but not at the expense of the MYP's own unique identity. Too much in one direction and they are only good 'knowers', who don't seem to think for themselves, too much in the other direction and they are fantastic 'thinkers' but don't seem to know anything. The sweet spot in the middle is where the MYP functions at its best. But this takes thoughtful planning and careful execution of that plan to give students the best experience. Don't allow it to become the forgotten middle child if you are fortunate enough to work in a continuum school.

The next phase of curriculum development is upon us now, and the 'Enhancing the MYP' project will no doubt visit all these aspects of the MYP. I feel confident that they will retain the benefits, **rigour** and innovation of the programme, while increasing flexibility and assistance for schools. As always, good teaching and learning will remain, and it is in the very capable hands of an experienced curriculum manager, for whom I have a great deal of respect.

## How do I bring all this together?

Now that we have a detailed knowledge of the ‘who’, ‘how’ and ‘when’, we should think about the ‘what’ of putting together a strong MYP Mathematics curriculum. There are many layers of moving parts to an IB education. This section is intended for those of you brand new to the curriculum, but I hope it will also prove useful to those who are familiar with, but not fluent in, IB terminology.

It can be such a shock to the system when first confronted with the IB lingo. After a while you forget how many of the terms and ideas you take for granted. A colleague called David Hunt joined the IB around the same time as me. He was not an educator and had never encountered the IB prior to his appointment. I hope he will forgive me that I can’t remember what his specific job title was, but it was definitely business-facing. One day in conversation he took me by surprise when he stopped me mid-rant with, ‘You people all are talking in a language that you think is English and sounds like English, but it really isn’t!’ I was intrigued as well as defensive.

He challenged my viewpoint in a very helpful way. I had always taken for granted that the onus was on the receiving end – they would simply have to ‘learn it and get with the programme’, literally. David helped me to understand that: ‘You want people to come to the product, you want it to be user friendly, to increase its reach,’ he explained.

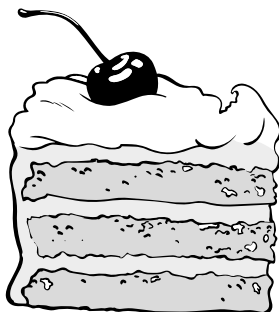
This was something from the business world that I did not comprehend. ‘You’re dealing with teachers,’ I would say. ‘They will learn it.’ To which he would counter, ‘They are also people, and these particular people are often time-poor, under pressure or working in a non-native language.’ He also was keen to stress that the education world was populated by non-teachers too, and that clarity was a form of kindness to them.

With this in mind, take a look at the MYP Programme Model circle on the IB website which illustrates everything we must bring together. This single image shows all the elements of the programme in concentric circles, placing the learner profile at the centre. This can help us to collate the ideas. It does not, however, give us an elaboration of relative importance for us as curriculum planners.

The following chapters will provide a deep dive into each part of this programme model in turn. We discuss concepts in chapter 1, for example, action and service in chapter 7, and projects in chapter 8. There is inevitably so much more to think about than what is contained in the circle that represents the IB Middle Years Programme.

Let’s break these ideas down first and then reassemble them into a gold-standard, world-leading curriculum! Thinking of Dave Hunt and his frustration

with too much jargon, here is an analogy to explain how the optimal curriculum should work, without overly relying on the definitions:



MYP conceptualised as baking delicious treats

- Concept-based education – The concepts are the big ideas within the programme, those things that are important, transferable and ever present. These are the base ingredients of baking – the flour, sugar and eggs. They form the basis of everything that we do and provide the structure and substance. We will discuss concept-based learning in the next chapter too.
- Subject groups – Each subject group (Languages, Individuals and Societies, Sciences, Mathematics, The Arts ...) adds a unique flavour, like different ingredients (cocoa, vanilla, fruits, nuts) that you choose based on the type of cake (or educational experience) you want.
- Learner profile – The IB learner profile attributes (Thinkers, Communicators, Risk-takers, etc.) are like different baking techniques. They shape how students approach learning and personal development, much like how kneading, mixing or creaming affect a cake's texture and consistency.
- Assessment criteria – Just as following a recipe correctly and giving the right amount of time and attention ensures a successful cake, adhering to IB assessment criteria and guidelines ensures students meet the **objectives** and achieve academic success. For further discussion of assessment, turn to chapter 3.
- International-mindedness – Adding spice, flavouring, colouring or extracts. Adding depth and perspective to give flavours. Unique flavouring is the special ingredient, like a unique spice or extract, which gives an IB education its distinctive global perspective and flavour.
- **Approaches to learning** (ATLs) – These are the methods, tools and technique that teachers use, akin to mixers, ovens and baking pans. They facilitate the learning process, ensuring that the 'ingredients' are combined

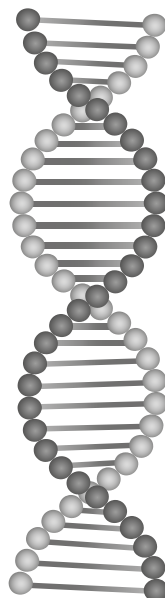
effectively to produce a well-rounded education. You will see these in all programmes, and we discuss them in chapter 4 in some depth.

- Branches of reasoning – There are categories of baked goods such as buns, breads, cakes and cookies. All share a family resemblance but are sufficiently different to keep things connected yet interesting.
- Inquiry – This is like a baker experimenting with different recipes and ingredients to create something new or improve upon an existing recipe. It's about asking questions, exploring and being creative in the learning process. We encourage curiosity and innovation in students' approach, and in the questions they ask and answer.
- Service – In the IB, service learning is about applying what you've learned to help and enrich the community. Students use the skills, knowledge and understanding they've gained to make a positive impact on others, just as sharing a cake can bring joy and benefit to those who receive it. We discuss the role of service within the mathematics curriculum in chapter 8.
- Reflection – Just as bakers taste the cake they have made and decorate it, continuous reflection and improvement in the IB ensures that the educational experience is both effective and appealing, by adjusting the ingredients or method accordingly. In the IB, reflection is a critical part of the learning process, continuous and deeply personal. Just as with baking, we are testing, tasting, adjusting and then savouring our success.

You could also look at the complex and beautiful structure of DNA as another analogy to illustrate the interconnected nature of the programme components. You could say that one of these is close to my heart and one is close to my head! One represents the creative and playful side of mathematics. The other speaks to the part of the mathematics teaching identity that craves completion, order and connections.

The structure of the DNA double helix can be visualised as the MYP programme if we assign different parts of the curriculum within. I like to imagine each of the strands of the double helix as ribbons of contents and concepts, existing relatively independently of one another. The elegance of the MYP programme is that we connect them using 'meaning-making connectors'.

The nucleotide base pairs that connect them can be imagined as different pairings via approaches to learning, global contexts, inquiry and learner profile attributes. These connections allow



these ideas to interact harmoniously and remain intimately linked. The molecules that make up parts of the backbone are a good representation of reflection, action and service, and just as DNA carries the genetic information necessary for life, so does the MYP equip students with everything they need to thrive.

### Key feature: Further reading

Eugenia Cheng

The model of thinking about the IB requirements as baking must have been influenced by the writings of Eugenia Cheng. She is a mathematics communicator and writer, who seems to have the power to make all mathematics delicious.

The idea of baking a cake reminds me of the holistic and dynamic nature of an IB education, where learning is not only about acquiring knowledge but also about reflecting, inquiring and using that knowledge to contribute positively to the world. It is like a carefully balanced recipe. Remember, it is always important to check the expiry dates on your ingredients. Are you serving up the same thing every year without checking if it has gone stale?

As an experiment, I asked ChatGPT to develop this metaphor of the MYP curriculum as a cake for me. First it congratulated me on my idea – ‘What a creative analogy’ – which I adored. I knew the praise was entirely hollow, but I love compliments! Next, it served me up a word soup instead of a pleasing cake. It had simply taken every aspect of the IB it could scrape from the large language model and made most ideas a flavour or taste. It made a reasonable attempt at connecting some of the bigger ideas.

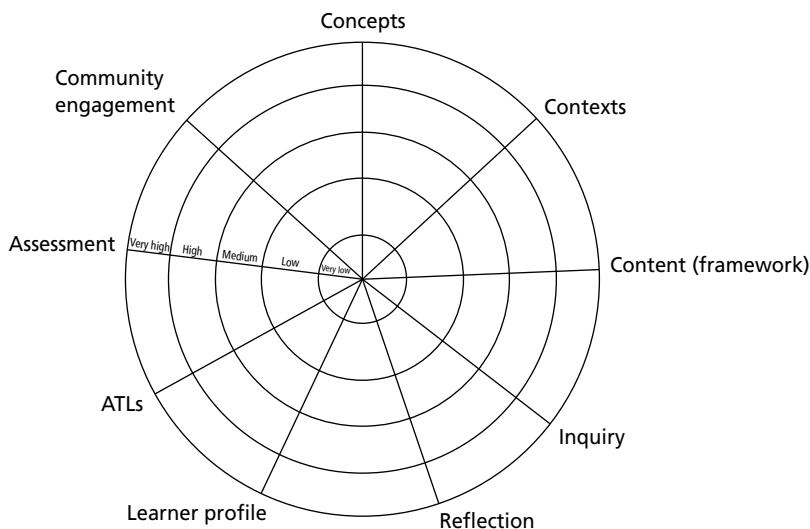
Why not try to develop your own analogy using ChatGPT, to test your comfort levels with this emerging technology? There will be lots of opportunities for us to discuss the use of generative AI throughout this book, for those interested in this world.

I like the idea of a very fluffy and emotionally laden image contrasting with one that is more clinical, appealing to different aspects of my own nature and in recognition that students will react differently to different comparatives.

At the end of each chapter, you will see the following radial chart. This is a self-assessment tool for you to track your growth in understanding the most important elements of MYP curriculum development. Starting from the centre, shade your level of familiarity from beginning to expert. Over time we will see growth in each sector, as we progress through the chapters and learner profile attributes.

## Self-assessment

Complete the reflection:



Shade in your knowledge level from low to high as you feel your comfort level lies.

### Key feature: Reflection

What analogy would you create for a complex interrelated structure such as the MYP? Would it be two-dimensional or three-dimensional?

## Glossary

**Approaches to learning** Refers to a range of skills that help students guide, support and structure learning.

**Assessment** The collection of evidence in order to make judgements about teaching and learning.

**Curriculum** An overall plan for learning that is broad, balanced and coherent. It describes the entire learning experience in a school.

\* *Not an official IB definition.*

**Objective** One of a set of statements describing the skills, knowledge and understanding that will be assessed.

**Pedagogy** The art and science of teaching (young people) as a professional practice.

**Rigour** A thorough and robust understanding of subjects that prepares students for further education and lifelong learning.\*



# CHAPTER 2

## REFLECTIVE

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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.

### Key thinking points

In this chapter, there are explanations/discussions of:

- why Reflective is an appropriate starting learner profile attribute when thinking about curriculum development
- the purpose of this book and how to use it
- what the 10 learner profile attributes are
- why the learner profile attributes give richness to our curriculum design
- the nature of mathematics (meditations)
- the key differences between MYP Mathematics and other systems.

‘... we work to understand our strengths and weaknesses ...’

### Why choose Reflective as the learner profile attribute for this chapter?

When we embark on any curriculum development, it is important to reflect. We reflect as a matter of course throughout each MYP unit of inquiry, encouraged by the IB to do so. This is facilitated by the inclusion of **reflection** in the unit planning process and then, even more explicitly, by the reflection prompts before, during and after each unit in the unit planner. To have fidelity with this process, we will reflect on where your strengths, weaknesses and needs might be. In this chapter we will consider why you have chosen this book and how you could use it most effectively. It is not designed in a way that insists on linear

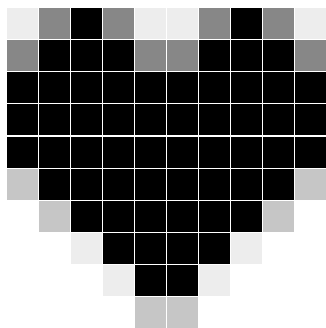
reading (although you can read it like that if you prefer). Take time to reflect on your needs. How will they be best served, given the demands on your time and attention?

## How should you use this book?

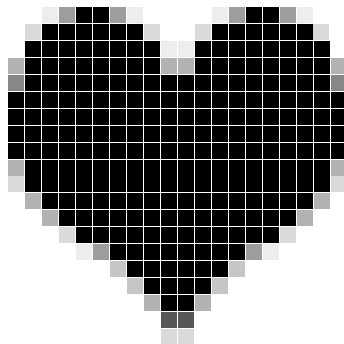
‘... to support our learning and personal development ...’

Honestly, use it in any way that you find it helpful. These chapters were designed for you, wherever you are on the journey. Maybe you’re a newbie or it’s your first time in an IB school. Or perhaps you’re a PHE or sciences teacher who has had to pick up some mathematics classes and you just need some direction. I hope this book will support more people than those who are new to the system – more experienced educators and coordinators should also find it a nudge to revisit and elevate their practice. Within each chapter, you will discover findings and suggestions, reflection opportunities and anecdotal examples to inspire or forewarn, and all of them delivered in an inquiry-based approach.

Picture the book as a digital image on a computer screen in the old dial-up days, or sometimes on Instagram with a bad Wi-Fi signal. Imagine that your understanding is an image loading on a computer, one that doesn’t have the bandwidth to download all at once. First you will get broad brushstrokes, vaguely recognisable shapes, then gradually more detail will come into focus. The image gets sharper, finally the resolution is fully loaded, and the picture (and understanding) is crystal clear!



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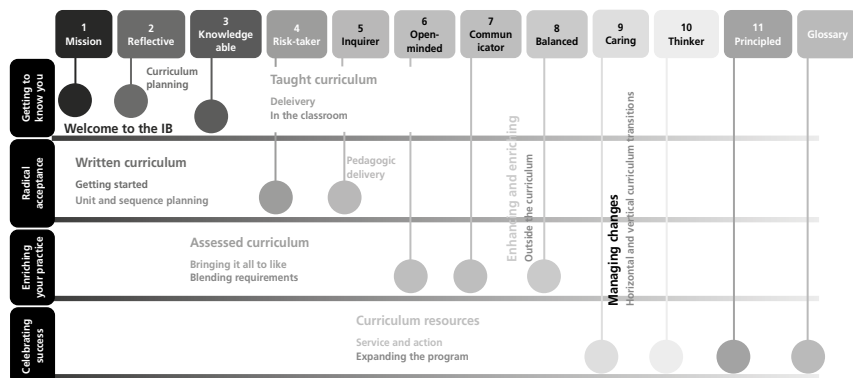


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Let’s look at some of the ways you could use this book ...

## Linearly

As a mathematician, you may find it logical to read the entire tome linearly, chapter by chapter. In this case you will progress seamlessly through the initial, foundational pieces into a deeper understanding. This is reminiscent of how we scaffold the branches of reasoning and content for our students, spiralling throughout the years, visiting and revisiting the most important ideas:



If a linear reading of the book is your preferred style, take time to reflect on the parallels of the structure with the unit planning process. We begin with our aims and goals in sight, and end with assessment as a summative activity. We can reflect on our increased knowledge and **skills**, and celebrate achievements with certain performance of understanding. Consider now your criteria for success once you have finished engaging with these ideas. Reflect on the changes you would like to see, the questions answered and other possible encouragements you might find useful.

## When time permits

In the busy life of a teacher, we often have to snatch pieces of time for professional development during the school day. If you are reading the book in this way, then I suggest you pick a chapter, choose one inquiry question within and read it while invigilating outside the next examination room.

Make sure to have something to write with, to capture your thoughts, and give yourself space and time to engage with the reflection questions honestly. Each inquiry section has been designed to have a reading time of about 8 to 12 minutes (each chapter is made up of several inquiry sections, each of which starts under a new main subheading). Refer to the workbook for more structured and practical exercises.

Some of the chapters work well as stand-alone experiences. I would suggest one of the following:

- Chapter 5 – Inquirers. This chapter focuses on the role of inquiry-based learning and how we can blend it with assessment for a rigorous curriculum.
- Chapter 7 – Communicators. Here we will consider the taught curriculum, how we communicate mathematically in a multimodal way.
- Chapter 10 – Thinkers. For educators who have a little space or time in their curriculum and are looking for a creativity boost, this chapter will work well as an example of ‘nano-learning’. Here we discuss enriching and extending the curriculum beyond our classroom walls.
- Chapter 11 – Principled. For quick, action-driven changes that you could make tomorrow, this chapter is worth giving a free period or exam invigilation to.

### **With others**

I was introduced to professional reading circles by Robert Harrison, my mentor, who had had some experience of these in previous schools. He would laugh at me when I sent him my reading wish list as it was always crazy long. At a recent professional reading circle, most colleagues hadn’t had a chance to read the selected book, so we agreed to spend the time quietly reading together. After 20 minutes of quiet page-turning and the occasional nod or smile, we turned our attention to a discussion of the contents.

Two things were very noticeable. First, people loved the chance to read uninterrupted! They commented on the satisfaction and rejuvenating effect of simply reading together. Second, their comments were instantaneous, and that made everyone more open to the perspectives of others. The lack of reflection time had the opposite effect to that I’d expected: it made people more willing to listen and accept that other opinions were valid and worth considering. You can consider the level of reflection you might integrate, either before or after reading, to elevate your thinking.

Collaborative time, coupled with reflection, is such a critical component to a successful IB school, and reading this book, in sections, could be a productive use of that time in departmental or cross-departmental meetings.

The accompanying image shows some suggested focus areas for collaborative planning time, if you are reading these chapters with colleagues.

# Curriculum Design for Mathematics in the MYP

## CONCEPTS, INQUIRIES AND STRATEGIES

Dear teachers of MYP mathematics, are you overwhelmed, confused, sceptical, exhausted, or simply ready to be inspired?

This book is written to support you and to enable and empower you to function as successful curriculum designers and exemplary practitioners.

With over 20 years of dedicated experience in education and a rich history in teaching mathematics and physics, Rita looks to lay out world-class pedagogical content knowledge and bring clear thinking and realistic advice to a subject that many do not cherish, and of which many more are needlessly afraid of.

*I wish Rita had been my teacher all those years ago. I have never known anyone with more passion for the subject or a more practical understanding of how mathematics can be taught with joy.*

**Dr Robert Harrison, Director of Education and Integrated Technology  
at ACS International Schools**



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