

***DEVELOPING AND ASSESSING
THINKING SKILLS
The International Baccalaureate Project***

***Final Report Part 2
Evaluation of Current IB Programmes***

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by

Robert Swartz

***National Center for Teaching Thinking
Boston, USA***

and

Carol McGuinness

***Queen's University Belfast
Northern Ireland***

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1 The Purpose and Structure of the Part 2 Report

In the initial proposal we identified two main questions to be answered in our reports. There were:

- The state of the art today with regard to identifying important and teachable kinds of thinking, how they can *be taught*, and how they can *be assessed*.
- How the present IB programmes align with this picture.

While the focus of the Part 1 Report was on the first question, the main focus for this Part 2 Report is to evaluate the extent to which the three IB programmes align with the principles and practices that were identified in the first report.

To begin, we return to the concluding overview from the Part 1 Report that is synthesized into Table 1.1 below. The table is structured into three main columns related to (1) Thinking Objectives in a curriculum; (2) Teaching Thinking, Principles and Practices; and (3) Assessing Thinking, Principles and Practices. We will use the more detailed statements in each column as criteria against which to evaluate the IB programmes. As the reader will see in the Methodology Section 2, these criteria also form the basis for the coding scheme that we used as a tool to interrogate and record our observations from the IB documents.

Table 1.1 An Integrated Research and Practice Informed Framework for Developing and Assessing Thinking Skills and Related Constructs				
Thinking Objectives	Teaching		Assessment	
	Principles	Practices	Principles	Practices
Thinking Skills	Make thinking organisers explicit	Teach explicit thinking organizers/strategies in the classroom, graphic organisers, thinking routines	Align teaching and assessment practices with thinking objectives in the classroom.	Prompt student performances that display the use of thinking skills, habits of mind, and the efficacy of thinking dispositions.
	Advance deep thinking challenges	Give students something challenging to think about, more than routine tasks	Be specific about the performance criteria and standards expected for the use of	Design assessment rubrics and ratings that incorporate
	Engage students in collaborative thinking to ensure joint meaning making, interaction, and dialogue	Prompt the students to make the thinking that results from their use visible and public	Thinking Skills	Specific criteria
Metacognition	Prompt students to adopt a strong metacognitive perspective	Use collaborative groups, arrange the classroom to facilitate interaction, develop a thinking language, support sustained dialogue about thinking	Metacognition	Appropriate Standards
	Teach for transfer of the skilful thinking being learned	Teach students explicit strategies to plan, monitor and evaluate their thinking skills and thinking dispositions. Give time to do this.	Thinking Dispositions	Next Steps
	Cultivate thinking dispositions and habit and minds	Explicitly teaching to facilitate the transfer of learned thinking procedures to other curricular and non-curricular contexts;	Adopt assessment for learning principles	Growth Patterns
Thinking Dispositions	Generalise the approach from thinking classrooms across all grades in the school	Create classroom norms and expectations about thoughtfulness and the habitual use of thinking strategies		Share the criteria and standards with students
		Prioritise teachers' professional development and teachers' planning time		Give feedback and identify next steps
				Use self and peer assessment to communicate and share standards, promote assessment literacy re thinking objectives

The source documents we have consulted on the OCC are:

For PYP

Making the PYP happen
PYP A basis for practice
PYP A model of transdisciplinary learning
PYP Developing a transdisciplinary programme
PYP Planner
PYP Exhibition guidelines
Assessment in the PYP Annotated samples

For MYP

From Principles to Practice
Teaching the disciplines in the MYP: Nurturing big ideas and deep understanding
Personal Project Guide (2011-2013)
Powerpoint for Unit Planning in MYP
Co-ordinators' Handbook 2013-2014
Command Terms in the MYP
Humanities Subject Guide
Science Subject Guide
Physical Education Subject Guide
Arts Subject Guide
Approaches to Learning Literature Review
Examples of assessed student work

For the Diploma

Theory of Knowledge Guide
Diploma Assessment Principles and Practice
CAS Guide
Extended Essay Guide
Grade Descriptors for several subjects
Command Terms in the MYP (which is relevant for DP as well)
Examples of student presentations for TOK

We have also browsed the OCC and briefly reviewed a range of other materials that we considered might be useful (e.g., the history of the various programmes). From these documents we have built up a picture of the educational philosophy of the IB programmes, together with the distinctive orientations, curriculum elements and practices of each individual programme – PYP, MYP and the Diploma. Nevertheless, it should be emphasised at this stage that our analysis is necessarily confined to what we can find out through the analyses of *documents*, and this is limited compared to being able to see what actually goes on in IB schools.

The remainder of the report is structured into the following sections:

Section 2 outlines the rationale for the design of the coding matrices that were used to evaluate the IB programmes. This section is almost identical to the proposed methodology that was submitted as part of the original proposal.

Section 3 reports an evaluation of the thinking objectives, the teaching of thinking practices, and the assessment of thinking practices, using the coding matrices for analysing the PYP curriculum documents. The section ends with recommendations for the PYP.

Section 4 reports an evaluation of the thinking objectives, the teaching of thinking practices, and the assessment of thinking practices, using the coding matrices for analysing the MYP curriculum documents. The section ends with recommendations for the MYP.

Section 5 reports an evaluation of the thinking objectives, the teaching of thinking practices, and the assessment of thinking practices, using the coding matrices for analysing the Diploma curriculum documents. The section ends with recommendations for the DP.

Section 6 draws together the recommendations for the three IB programmes.

2 Methodology

2.1 Overview of the Coding Matrices for the Document Analyses

Three different Coding Matrices were created –

- For interrogating and coding the IB programmes with regard to **thinking goals and thinking objectives** in the curriculum;
- Interrogating and coding the IB programmes with regard to **pedagogical approaches for enhancing thinking**;
- Interrogating and coding the IB programmes with regard to **practices for assessing thinking**.

Each matrix has a basic similar coding structure, with slight variations for each of the three purposes. On the *vertical* dimension of the matrix are the thinking-related constructs that have emerged as important from the research and practice literature in the Part 1 Report. These are common across all matrices. Once again, they are:

Thinking Skills: Using this code, documents were examined for reference to thinking processes of any kind that are taught, both general and specific (with one exception, see below). Examples could be contained, for example, in critical thinking activities, activities requiring evaluation, excursions into analysis, classification projects, requests for prioritising tasks and items, engagement in problem-solving, thinking about options, creating an argument, or developing creative ideas. While the coding required that the type of thinking is merely mentioned at a general level, the

commentary explains whether it is described in sufficient detail such that it can become both teachable and eventually assessable. This is a more demanding criterion than just naming the type of thinking, important though that is.

Thinking Dispositions: Using this code, documents were examined for reference to any learner attributes associated with dispositional support of thinking. Examples might include practising open-mindedness, curiosity, being persistent, striving for accuracy, being adventurous and taking risks with ideas, and related constructs such as an overall commitment to thinking as a way of trying to solve problems. Again, while the coding criterion required that thinking dispositions are just named the commentary explains whether they are described in sufficient detail to make them both teachable and assessable.

Metacognitive Thinking: This type of thinking in which we think about our own thinking in a variety of ways was coded separately because of the central role that it plays in the development of thinking and its role in teaching thinking. Examples might include having students develop a plan for solving a problem, prompts to follow a thinking procedure introduced earlier, and overall evaluation of the way a student engages in key types of thinking like decision making. Different terms might be used to describe this kind of thinking – thinking about thinking, reflective thinking, managing thinking, strategic thinking, self-management (although this term is broader than metacognition). Whatever the term used, the coding required that the type of thinking was just named while the commentary explains if it was described in sufficient detail to make it both teachable and assessable.

Beliefs about Knowledge: Using this code, documents will be examined for reference to beliefs about knowledge and the role they might have influencing both thinking dispositions and a student's ability to engage in thinking. Examples might include references to the status of knowledge – absolute vs. relative, provisional knowledge, the nature of truth claims in various disciplines and the criteria used to assess them, knowledge creation in historical or social contexts. Initially, we considered that this code was likely to become more prominent in the IB programmes for older students. Although we continued to report on the evaluations of all the programmes using the code, we have not given it the same status as the other codes, as there is not the same consensus in the research/practice literature about its importance as the other codes.

The headings for the *horizontal* dimension of the matrix differ depending on the purpose – curriculum, pedagogy, and assessment. These will be described as each matrix is introduced.

Each IB programme – Primary Years, Middle Years and Diploma programmes – will be examined separately and coded into separate matrices for these different levels.

2.2. Coding thinking at the level of thinking goals and thinking objectives in the curriculum

IB curriculum documents were interrogated to evaluate whether or not the various thinking constructs are mentioned, how frequently they are mentioned, and how detailed is the description in the different types of curriculum documentation. The horizontal codes are intended to identify documents at different levels of specificity. The purpose is to drill down through the documentation to see if thinking goals articulated at the general level successfully find their way into specific plans.

Thinking Construct	General Curriculum Guidelines	Thinking Objectives at subject level	Transdisciplinary Themes, Areas of Interaction	Units of Work (e.g., Exhibition)	Example Lesson Plans (if available)
Thinking Skills					
Thinking Dispositions					
Metacognitive Thinking					
Beliefs about Knowledge					

2.3 Coding thinking at the level of pedagogical approach

Teaching approaches and workshop materials were interrogated to evaluate the extent to which thinking is promoted in the ways identified on the horizontal axis, and through the general and open-ended questions at the top and bottom of the matrix.

In this coding matrix the headings across the horizontal dimension refer to pedagogical principles and practices that are known to be important for teaching thinking – making thinking explicit, using various methods for making thinking more visible, direct instruction in certain forms of thinking, engaging in exploratory talk, collaborative work around thinking, teaching for transfer. We recognise that the available documentary material with regard to interrogating pedagogy is limited without access to direct classroom observations.

What is the general approach to promoting and enhancing thinking?			
Thinking Construct	The degree to which reference to thinking is made explicit or visible in the classroom	What methods are employed to make thinking explicit? (thinking organisers, graphic organisers thinking routines dialogue, collaborative work,)	The degree to which efforts are made to rehearse thinking across different contexts (teach for transfer)
Thinking Skills			
Thinking Dispositions			
Metacognitive Thinking			
Beliefs about Knowledge			
Is there any reference to ideas such as thinking classrooms, cultures of thinking, communities of enquiry, etc.?			

2.4 Coding thinking at the level of practices for assessing thinking

It is recognised that assessments can differ with regard to WHO makes the assessment (teacher, peer, self or external agent), the PURPOSE of the assessment (formative or summative) and the PERFORMANCE that is being assessed (e.g., oral presentation, group discussion, enquiry project, essay, portfolio). However, we consider that, irrespective of these other considerations, the extent to which the assessment task not only REQUIRES specific sorts of thinking, but whether the way the task is formulated can give us a reliable assurance that student responses will reveal the thinking in question, are quite essential in successful assessments of thinking. Also crucial is to what degree the marking criteria include explicit criteria related to thinking, to what extent the marking schemes/rubrics indicate the level of performance that has been achieved, and how the performance/grade is reported back to the student.

With reference to any assessment task, formative or summative, externally assessed, teacher assessed, or peer/self-assessed, the following will be examined-			
Thinking Construct	The question that is set, what is asked of the student, the teacher prompt	Success Criteria, Marking Criteria	Marking Schemes, Rubrics, Indicators about the level of performance achieved
Thinking Skills			
Metacognitive Thinking			
Thinking Dispositions			
Beliefs about Knowledge			

All available curriculum, teaching support, assessment guidance and assessment examples were interrogated for the extent to which the questions that are set and the teacher prompts actually *require* students to think in desirable ways, and the extent to which the criteria used to judge the quality of thinking that is presented reveal that quality, and *are actually used* in marking criteria or in marking schemes that clearly articulate the level of skill revealed in the thinking episode being assessed. We will also assess the extent to which these criteria are shared with the students in the spirit of assessment for learning and used as the basis for feedback and next steps.

3 The Primary Years Programme

3.1 General Overview

The Primary Years Programme is essentially a transdisciplinary curriculum consisting of a programme of inquiries on key transdisciplinary themes which are designed and conducted across each primary year/grade and built up over the whole primary phase. Six inquiries are completed by the students each year (4 in the early years) and these are timetabled alongside teaching in specific subjects which follow either the IB scope and sequence or a nationally or locally prescribed curriculum. Overall, students could complete up to 50 inquiries during the course of their primary education – presuming they are at pre-school and primary school from 3-12 years. Students' inquiry experience culminates in a major class inquiry called the Exhibition in the final year of primary school. All students' work – oral, written and other performances are internally assessed. There are no required external assessments.

The focus of the current analysis is on the development and assessment of thinking skills which are briefly coded in the three matrices as outlined in the proposal. The text accompanying each matrix provides a more extended commentary and critique.

3.2 Thinking Objectives and Goals in the PYP (Coding Matrix 1)

Thinking Construct	General Curriculum Guidelines	Thinking Objectives at subject level	Transdisciplinary Key Concepts Skills	Units of Work (e.g. Exhibition)	Lesson Plans (PYP Inquiry Planner)
Thinking Processes	IB profile refers to a number of thinking processes particularly under the attributes of ‘thinkers’ and ‘inquirers’	Subject specific skills are outlined in scope and sequence for subjects Key concepts are exemplified at the subject level but thinking skills are not	Thinking Skills (modification of Bloom’s Taxonomy) References also to thinking processes in other skill domains – social, research, communication and self-management (Key concepts offer rich opportunities for developing specific types of thinking. However, the transdisciplinary thinking skills are not linked to the key concepts for this purpose)	All transdisciplinary learning is the objective of the Exhibition IB Profile Themes Key Concepts Thinking Skills Other Skills Attitudes	There are questions in the inquiry to prompt teachers to include transdisciplinary skills. Precise thinking skills do not have to be specified in the inquiry, unlike key concepts which do have to be specified and thus drive the understanding of the central idea
Thinking Dispositions	IB profile refers to a number of thinking dispositions particularly under the attributes of ‘open-mindedness’ and ‘risk takers’	No mention	PYP attitudes – creativity, curiosity, confidence, independence		
Metacognitive Thinking	IB profile describes an attribute of being reflective about learning There is a strong emphasis throughout on reflection for the purposes of making meaning	No mention beyond Reflection as a Key Concept	Metacognition is included as one of the transdisciplinary thinking skills Reference to metacognitive thinking in the key concept ‘reflection’		
Beliefs about Knowledge	Some reference in the transdisciplinary key concept ‘reflection’ about evidence, bias and reliability and what it means to know in different disciplines.				

The primary focus for developing thinking and related attributes can be found in the *transdisciplinary* component of the curriculum which consists of several different themes, concepts, skills and attitudes. For example, the transdisciplinary themes are organised around seven questions (Who we are? Where we are in place and time? How we express ourselves? How the world works? How we organise ourselves? Sharing the planet?). The themes are sufficiently broad to generate many different central ideas which form the basis for the inquiries. Essentially, the themes define the content of an inquiry and how it might link to, or depend on, teaching in the specific subject areas.

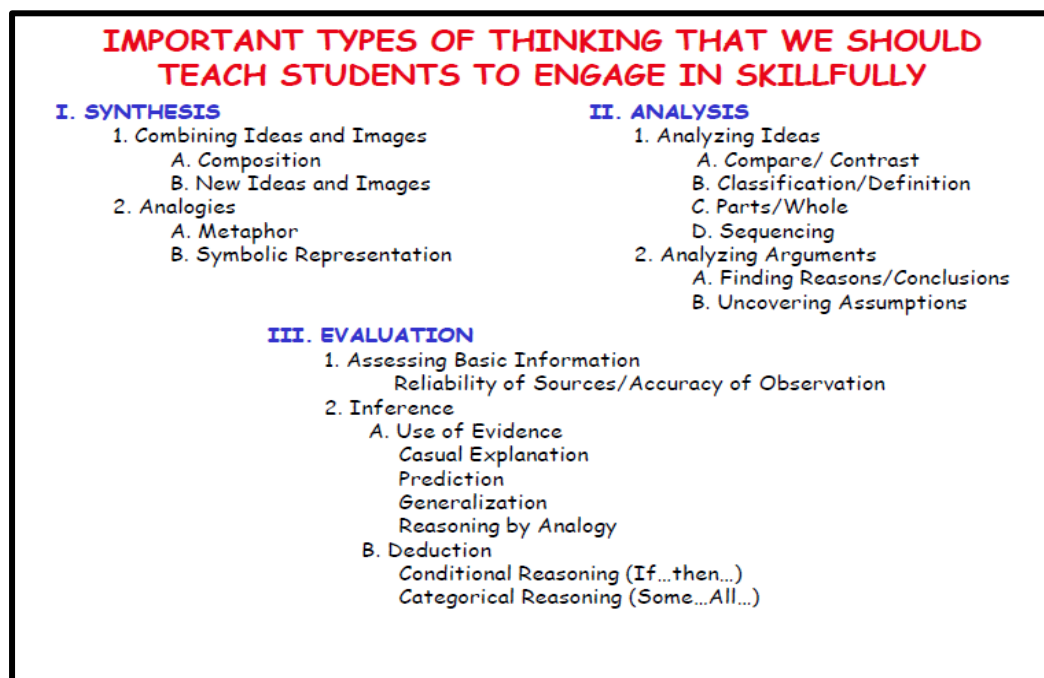
More importantly, for the development of thinking, are the other transdisciplinary elements –the *transdisciplinary skills, attitudes and the key concepts*. The overarching IB learner profile also identifies attributes that are relevant to thinking skills and thinking dispositions. These will be discussed, in turn, as a basis for providing the key ingredients for a thinking curriculum.

3.2.1 Transdisciplinary Skills

Six different frameworks capture a range of skills – thinking skills, research skills, communication skills, social skills, and self-management skills. So there are many frameworks to support learning goals with potential relevance for thinking.

The thinking skills framework essentially consists of Bloom’s taxonomy (acquisition of knowledge, comprehension, application, synthesis and evaluation) with some additions (dialectical thought, and metacognition). Bloom’s taxonomy is very widely used as the basis for highlighting the importance of higher order thinking as a learning objective. However, the main problem with the taxonomy, as we commented in Part 1 Report, Section 2.2, is that its original intention was to identify learning objectives or learning outcomes and it is not framed in a language that makes the thinking process amenable for instruction. Although more recent reformulations of the taxonomy have attempted to refocus the objectives in a more thinking-oriented language, additional work still remains to be done to turn Bloom’s categories into thinking strategies that would be useful for instructional purposes. For example, if the thinking objective is set as ‘analysis’ and the cognitive demand of a task is to ‘compare and contrast two things’, then further elaboration is required to turn this command into a thinking strategy such that a student can potentially learn how to do it, that a teacher could model it, or that it could become the focus for instruction in a variety of different ways. We have elaborated on this point extensively in Section 2.2 and Section 2.3 of the Part 1 Report. In the context of PYP, an articulation of Bloom’s Taxonomy as in Figure 8, p.21, *Making PYP Happen*, is an

ideal place to do this elaboration, perhaps using the model we articulate in Part 1, Section 2.2 (copied below).



The other transdisciplinary skills frameworks also identify thinking-related processes that could benefit from being more explicitly linked to the main thinking skills framework. For example, in the Research Skills framework, references are made to ‘sorting and categorising information’, and ‘drawing conclusions from relationships and patterns that emerge from organised data’. While these thinking objectives are more or less consistent with Bloom, the social skills and self-management skills framework reference types of thinking more oriented towards actions – towards problem-solving and decision-making – that do not fit so well within Bloom. For example, under Social Skills/group decision-making, there is reference to ‘discussing ideas, asking questions, working towards and obtaining consensus’. While these could be articulated in more detail, they do reference a more interactive and dialogic form of thinking that is also poorly represented in Bloom. Another example can be seen in the Self-Management and Research Skills frameworks where reference is made under ‘organisation’ and ‘planning’ to anticipatory thinking and forethought as a prelude to problem-solving – ‘planning and carrying out activities effectively’, developing a course of action, writing an outline, devising ways of finding out necessary information; ‘selecting an appropriate course of action or behaviour based on fact’. Articulation of a clearer decision making strategy like we outline in Part1, Section 2.2 and 2.3, would pull these ways of speaking together. And, as we suggest in Part 1, the following can be added to the list of types of thinking that need to be taught skillfully above:

IV Complex Thinking Processes

1. Decision Making

2. Problem Solving

3.2.2 Key Concepts

Key concepts are considered to be an essential element of the PYP. The PYP is committed to a 'concept-driven curriculum' as a means of supporting inquiries. The general argument is that education often focuses on rote learning and superficial understanding at the expense of students gaining a deeper understanding of significant ideas. Thus the role played by key concepts is to deepen understanding by having students re-visit the key concepts and appreciate how they transcend subject boundaries. Key concepts thus act as a meta-framework and help to increase conceptual coherence right across the curriculum, both in the programme of inquiries and in subject specific teaching. The key concepts identified for the PYP are Form, Function, Causation, Change, Connection, Perspective, Responsibility and Reflection. These key concepts are exemplified in each of the subject guides and they are the only transdisciplinary element to be illustrated in this way (as far as we can find). Key concepts are very well developed in the PYP documentation and a lot of learning seems to depend on them. For example, it is claimed that "A concept-driven curriculum helps the learner to construct meaning through improved critical thinking and the transfer of knowledge". In other curricula with an emphasis on improving higher order thinking or critical thinking (e.g., the new Northern Ireland Curriculum, introduced in 2007, or Key Competences in the New Zealand Curriculum), it is not unusual for a thinking framework rather than a key concept framework to be assigned this cross-cutting curriculum role. However, adding an appropriate thinking framework to drive the application of these concepts will give the students who go through the PYP a richer and deeper learning framework, and could connect it to the MYP and the DP into which the same thinking framework could be embedded.

So, though not explicitly declared as part of the PYP thinking skills framework, we have examined the key concepts with regard to their instructional potential for enhancing thinking as well as deepening understanding. Other school curricula who adopt an intentional 'infusion' approach to teaching thinking would generally expect to deliver on both objectives – deep understanding and enhanced thinking, though none (to our knowledge) have developed cross-cutting key concepts (though the ideas has emerged in the New Generation Standards for Science in the US). PYP may be in a

unique position to make explicit linkages between a concept-based curriculum and a thinking-based curriculum thus breaking through any false dichotomies there may be between teaching for understanding and teaching for thinking.

The eight key concepts identified are: Form, Function, Causation, Change, Connection, Perspective, Responsibility, and Reflection. They are currently framed in terms of a key question, definition, rationale, and examples of related concepts. It would not be too great a jump to include examples of the kinds of thinking skills that would map onto the demands of understanding the concept and where a greater skillfulness in a certain type of thinking would help the student probe the key concept and deepen their understanding of the concept in context. For example:

“Key Concept: Form

Key question What is it like?

Definition The understanding that everything has a form with recognizable features that can be observed, identified, described and categorized.

Rationale This concept was selected because the ability to observe, identify, describe and categorize is fundamental to human learning within and across all disciplines.

Examples of related concepts Properties, structure, similarities, differences, pattern.”

The cognitive demand involved in understanding the concept seems to involve being able to identify features, to characterise patterns, and to categorise. One of the most common articulated thinking strategies to serve this purpose (at Bloom’s level of analysis) is to compare and contrast, following a simple set of questions.

Compare and Contrast: *How are they similar (with regard to form)? How are they different (with regard to form)? What similarities and differences seem to be important? What categories or patterns do you see among the similarities and differences? What conclusion is suggested by these patterns?*

Comparing and contrasting is one of the ways we do analysis. And, indeed, it is one of the forms of thinking that students can be taught to do skilfully. The strategy quoted above can be taken to define this skill. (Please note: the way we treat compare and contrast here rejects the idea that it just involves listing similarities and differences. Rather, to do this kind of thinking *skillfully* involves asking and answering the additional extending questions.)

These questions could be included as prompts for the key concept FORM.

Another example is:

“Key Concept Function

Key question How does it work?

Definition The understanding that everything has a purpose, a role or a way of behaving that can be investigated.

Rationale This concept was selected because the ability to analyse function, role, behaviour and the ways in which things work is fundamental to learning within and across all disciplines.

Examples of related concepts

Behaviour, communication, pattern, role, systems.”

From a Bloom perspective, the cognitive demand involved in understanding this concept is also a form of analysis, asking the student to examine a ‘whole’ in terms of parts, and how they might interact for certain purposes. Again, a thinking strategy that might be useful for this purpose is to follow a set of questions related to parts/whole thinking, such as:

***Skillful Parts-Whole Thinking:** What smaller elements make up the whole? For each part, what would happen if the part (or several parts) was missing? What is the function of the part (parts)? What then is the relationship between the parts and whole – how do the parts contribute to the whole being able to do what it does, for example?*

These questions could be included as prompts for the key concept FUNCTION and can be taken to define how to think about the relationship between the parts of something and the whole so that we understand how it works.

The **Key Concept ‘Reflection’** seems to provide a very rich opportunity to develop both critical evaluation and a metacognitive perspective and could link forward to the Theory of Knowledge in the Diploma Programme.

“Key question How do we know?

Definition The understanding that there are different ways of knowing, and that it is important to reflect on our conclusions, to consider our methods of reasoning, and the quality and the reliability of the evidence we have considered.

Rationale This concept was selected for a series of interrelated reasons. It challenges the students to examine their evidence, methods and conclusions. In doing so, it extends their thinking into the

higher order of metacognition, begins to acquaint them with what it means to know in different disciplines, and encourages them to be rigorous in examining evidence for potential bias or other inaccuracy.

Examples of related concepts

Review, interpretation, evidence, responsibility, behaviour.

From a Bloom perspective, this is a form of evaluation. One thinking strategy that may be useful here is the elaborated form of metacognition referenced in Part 1, Section 4.5.1.

Managing Our Own Thinking *What kind of thinking did I just do? How did I do it – what questions did I ask and answer to engage in this kind of thinking? How effective was this: did it yield a result that I was confident in? If not, how might I change my thinking strategy? How will I do this kind of thinking the next time it is called for?*

3.2.3 Attitudes and Dispositions

We have identified two frameworks in the PYP programme that make reference to personal attributes and characteristics that are not dissimilar to the idea of thinking dispositions as they are developed in the research literature referenced in the Part 1 Report, Section 2.5. In that section it was proposed that, as well as being able to think skillfully, good thinkers also have the inclination to do so when it is called for, they are alert to the contexts in which it might be useful and they put a high value on thinking and thoughtfulness.

Both the PYP attitudes and the IB learner profile contain elements that relate to developing a disposition for thinking. We have two points to make about these frameworks. The first point is that the idea of ability to think well and the inclination/habit of thinking well are not well distinguished in the descriptions. For example, in the IB learner profile, good Thinkers “*exercise initiative* in applying thinking skills critically and creatively to *recognize and approach* complex problems” – implies an inclination and motivational stance – as well as the ability to “make reasoned, ethical decisions”. In contrast, the learner attribute Open-Minded is entirely couched in dispositional language – open-minded people “*understand and appreciate* their own cultures and personal histories and *are open* to the perspectives, values and traditions of other individuals and communities. They are *accustomed to seeking and evaluating a range of points of view*, and are *willing* to grow from the experience”. Similarly, in the PYP attitudes statements, some aspects refer to abilities/skills and others to dispositions. For example, Independence is defined as “thinking and acting independently, making their own judgments based on reasoned argument, and being able to defend their judgments” – the second and third points in the statement clearly require learners to

be able to make judgements based on reasoned argument, as well as to do so independently. While this distinction may seem trivial, it is important to frame thinking dispositional objectives as clearly as possible if they are to be made more amenable to teaching and to assessment. Skills and dispositions may need slightly different teaching and assessment approaches. (See Part 1, Section 4.7)

The second point is just the sheer number of disposition-like objectives that are being identified across the two frameworks – 12 PYP attitudes and 10 attributes in the IB learner profile. While there are overlaps between them, and not all of the attitudes/attributes point specifically to thinking dispositions, there is a need to reconcile the two frameworks, perhaps identifying a smaller number of broad dispositions that motivate and support thinking. We suggest, for example, identifying a small cluster of desires and interests as primary thinking dispositions, and then a cluster of more specialized ones. For example, “Wanting to find out what is true” and “Wanting to understand others” might fall into the first group, while “Listening for understanding and with respect”, “Being open-minded and “Thinking collaboratively with others” might fall into the second group.

We make a more general point about coherence and alignment in the next section.

3.2.4 Issues of Alignment and Coherence of PYP goals for a Thinking Curriculum

With regard to developing a more explicit approach to developing thinking within PYP, there is no shortage of frameworks that mention either/both thinking constructs, thinking skills, and thinking dispositions of various kinds. From a school planning point of view, it might be that there are just too many – with many overlapping meanings (we have noted in the OCC Sample Assessments for the Exhibition that teachers are valiantly asking students to self-assess across all the separate frameworks).

There may be some merit in creating a ‘bigger picture’ of the interrelations and interdependencies between the different frameworks. For example (and this is just a crude attempt) – putting Key Concepts in the first column and allowing them to lead the classification. We are not attempting to complete this matrix at this point, as there are still too many uncertainties about the direction that the IB might take with regard to furthering the pursuit of thinking objectives in their programmes, but we do urge that the PYP curriculum team consider this.

Key Concepts	Transdisciplinary Thinking Skills (Bloom expanded in appropriate ways)	Elements of other Transdisciplinary Skills that include Thinking Objectives	PYP Attitudes (relevant to thinking dispositions)	IB Learner Profile (relevant to thinking skills and disposition)
Form				
Function				
Causation				
Change				
Connection				
Perspective				
Responsibility				
Reflection				

3.3 Pedagogical Approach to Teaching Thinking in PYP (Coding Matrix 2)

The PYP subscribes to a constructivist (and sometimes a socio-constructivist) theory of learning and realises this through an inquiry-based pedagogy. Essentially students complete six inquiries per year (four in the early years). Inquiries are designed around one of the key transdisciplinary themes, with a central idea and 'lines of inquiry'. Each inquiry must also identify up to three different key concepts to be part of the inquiry. An inquiry is conducted over several weeks.

What is the general approach to promoting and enhancing thinking? A general constructivist approach to learning is adopted with inquiry-based learning as the main method. Students complete six inquiries across each year (4 in the early years). A programme of inquiry is designed across the each grade/year, and must focus on one of the transdisciplinary themes, and up to three key concepts. Inquiries are intended to deepen conceptual development as well as promoting good thinking (and many other skills besides). The Exhibition is the collaborative inquiry completed in the final primary year. The PYP planner gives a good overview of how teachers design and complete an inquiry. Use of Bloom’s taxonomy as a means for making thinking more explicit in the classroom is advised.			
Thinking Construct	The degree to which reference to thinking is made explicit or visible in the classroom	What methods are employed to make thinking explicit? (thinking organisers, thinking routines , dialogue, collaborative work)	The degree to which efforts are made to rehearse thinking across different contexts (teach for transfer)
Thinking Processes	A general reference to making learning outcomes and the learning process transparent to students	With specific reference to PYP attitudes – there is mention of the need for modelling, being part of the vernacular of classroom, part of classroom discussions, recorded in teachers’ notes, taught and assessed.	No specific mention beyond key concepts being illustrated in each subject area
Thinking Dispositions		General reference to a metacognitive framework. No specific models or methods are mentioned	It is not clear the extent to which this is made explicit to the students and is part of the metacognitive dialogue
Metacognitive Thinking			Not clear to what extent the <i>transdisciplinary</i> nature of the thinking skills are made clear to the students
Beliefs about Knowledge	No information on how the key concept ‘reflection’ which makes reference to ways of knowing, reliability of evidence and so on plays out in the classroom.		
Is there any reference to ideas such as thinking classrooms, cultures of thinking, communities of enquiry, etc.? There is a big emphasis on communities of inquiry, on collaborative work between students, between students and teachers, and between teachers (where there is a high need to collaborate in order to design the programme of inquiries across a single year and through the school), though no specific reference to thinking classrooms or cultures of thinking.			

3.3.1 The PYP Inquiry Planner

We are using the PYP Inquiry Planner as the closest indicator of the pedagogical approaches that PYP teachers follow when they are designing, implementing, and reflecting on an inquiry. In one of the sections, transdisciplinary skills are mentioned in the following way:

“How best can we learn?”

What are the learning experiences suggested by the teacher and/or students to encourage the students to engage with the inquiries and address the driving questions?

What opportunities will occur for transdisciplinary skills development and for the development of the attributes of the learner profile?”

At the end of planner, teachers are asked to evaluate the following

“To what extent did we include the elements of the PYP?”

What were the learning experiences that enabled students to:

- develop an understanding of the concepts identified in “What do we want to learn?”
- demonstrate the learning and application of particular transdisciplinary skills?
- develop particular attributes of the learner profile and/or attitudes?

In each case, explain your selection.”

Coding Matrix 2 asks specifically about ‘the degree to which thinking is made explicit or visible in the classroom’. At this point we identify as relevant one of the Teaching Thinking Principles and Practices that was developed in the Part 1 Report, in Sections 4.2, 4.3 and 4.4. ‘Making Thinking Explicit’. In those sections, we described the approach that involves infusing instruction in strategies for skillful thinking into content instruction. Following this approach, a thinking strategy to meet the demands of a complex task is articulated and made explicit and students are given an opportunity to rehearse it in different contexts and to reflect upon it in a metacognitive way (in the PYP case, to recognise its transdisciplinary potential and use it). The research evidence base is now accumulating that the explicit approach to teaching thinking is more effective in improving the quality of students’ thinking and in promoting deeper understanding of content materials than the immersion approach. Of course, in classrooms that are successful in teaching thinking, both approaches are likely to be used as the teacher makes judgements about the levels of thinking competence that the students have already acquired at a particular point in time.

The risk of the inquiry-based pedagogical approach is that, while students are presented with challenging questions in a meaningful and authentic context that will certainly stimulate their

thinking, students may not be sufficiently skilled in their thinking to engage with the questions at the cognitive level that is demanded. Some students may be competent but others may not. Hence, there are good reasons why the explicit instruction of thinking is particularly important for an inquiry-based curriculum. The cognitive demands in inquiry-based teaching are already high, but the students' responses may not always meet expectations particularly with students from diverse backgrounds and previous educational experiences. At first sight the two approaches – explicit instruction and inquiry-based pedagogy – may seem to be at odds with one another but they need not be. As we discussed in Part 1 in the case of explicit instruction of higher order thinking (critical thinking in particular), they can complement one another, if the explicit instruction is woven into an inquiry in a manner that ensures that all children have at least adequate thinking tools to engage with the inquiry question at the expected level (see Part 1 Report, Section 4.9 on designed extended units and projects). In the PYP guidance material that we had available, there was not much evidence of guidance related to making thinking more explicit, beyond some general references to making learning outcomes and learning processes transparent in the classroom which implies a metacognitive approach, but does not spell it out. This is possibly due to how thinking is framed in the Bloom taxonomy – a point that has been made several times in earlier sections and in the Part 1 Report.

There is one additional important reference in the PYP Bubble Planner that does acknowledge the difference between explicit and more naturally arising teaching opportunities.

“When providing students with the opportunity to develop transdisciplinary skills, the attributes of the learner profile and/or the attitudes, teachers need to be mindful of the difference between opportunities that arise authentically from the learning, as opposed to **explicitly** targeted teaching opportunities.”

These distinctions between designing learning opportunities:

- to explicitly teach thinking,
- to practice and reinforce thinking with some teacher support,
- to expect students to think autonomously and skilfully in naturally occurring situations where thinking is demanded,

needs to be made much clearer in the PYP Inquiry Planner (see Part 1 Report, Section 4.5.2, Towards Self-Regulation: Scaffolding and Fading).

Another important issue in the teaching thinking literature is transfer. Students need to recognise that a thinking skill that is learned in one context can and should be applied in new contexts – that is the point of characterising a skill as transdisciplinary. The transdisciplinary nature of the PYP, and key concepts, should provide perfect opportunities for this. However, the IB guidance material does not directly address the question of transfer, assuming perhaps that it will occur naturally. There is extensive research to suggest that this does not happen. (See Part 1 Report, Section 4.5.3, Teaching for Transfer).

In general, although metacognition is mentioned several times as an *objective* for the PYP (e.g., as one of the thinking skills that are identified, and in the key concept ‘reflection’), this emphasis is not strongly represented in the PYP material on *teaching*. Becoming metacognitively able –that is, both becoming more alert to patterns in your own thinking and being able to direct and control those patterns – is generally considered important both as part of the normal developmental process as well as a means for improving thinking and learning. Promoting metacognition in the classroom can take many forms:

- developing a language for talking about thinking (putting precise words on concepts),
- modelling by the teacher of specific forms of thinking,
- using prompts and/or questions at the beginning and end of lessons to alert students to be reflective about the patterns in their thinking,
- using thinking strategies and graphic organisers to help students recognise the steps in thinking,
- teaching to enable the student to transfer the thinking to another context, either to another curriculum area, or outside the classroom.

These are the tools that make thinking EXPLICIT in classroom practices and make thinking more visible. Thus they need to be part of the planning process and given a prominent place in planning guides and unit plans (See Part 1 Report, Section 4.5, Adopting a Metacognitive Perspective).

3.4 Approaches and Practices of Assessment in PYP (Coding Matrix 3)

With reference to any assessment task, formative or summative, externally assessed, teacher assessed, or peer/self-assessed, the following will be examined-			
All assessment of PYP in internal assessment. There is an emphasis on assessment of the learning process as well as the product or performance. Self-assessment features largely for the transdisciplinary skills. In order to complete this coding matrix, some samples of assessment for units of inquiry and for the Exhibition were examined			
Thinking Construct	The question that is set, what is asked of the student, the teacher prompt	Success Criteria, Marking Criteria	Marking Schemes, Rubrics, Indicators about the level of performance achieved
Thinking Processes	Command terms from Bloom’s Taxonomy are used extensively in the MC and DP, with implications for PYP. We found no mention of Command Terms at PYP level	From the sample of assessment of units of inquiry and the Exhibition that is available on the OCC, there is evidence that teachers are devising their own criteria, rubrics and continua to enable students to assess themselves on a variety of transdisciplinary skills that includes thinking skills. Sometimes these are constructed in collaboration with the students. In these criteria/rubrics, thinking is evaluated in a very general way, although there are one or two examples of complex assessment being carried on Exhibitions	
Metacognitive Thinking			
Thinking Dispositions	Reference in the PYP planner to identify PYP attitudes and IB learner attributes to be assessed in a specific unit of inquiry		
Beliefs about Knowledge	No evidence of assessment at this level		

All assessment in the PYP is internal assessment. The guidance draws particular attention to the importance of assessing the learning *process* as well as the *product*. This seems particularly appropriate as units of assessment are developed over an extended period of time and some of the transdisciplinary skills, like thinking skills, may have to be taught/learned in an earlier phase of a unit in order for the inquiry to be successfully completed. There were many good examples of students' self-assessment of the different transdisciplinary skills, indicating that students had grasped their meaning and were able to appraise themselves. And there were some excellent examples of teachers assessing prior learning and then attempting to monitor changes in the level of skill at the end of an inquiry. These comments are made on the basis of the example we found in the OCC and it is not clear how widespread is this practice across the programme.

In general, the absence of the a more detailed and consistent articulation of thinking as an instructional objective, and the absence of explicit instruction meant that thinking skills were being assessed at a very general level, though there were examples of teachers attempting to develop rubrics showing growth and progression. There is probably a need for the PYP curriculum team to give teachers much more direction on the development of criteria, standards and rubrics for assessing thinking skills, metacognitive thinking and thinking dispositions (See Part 1 Report, Section 5, Assessment Principles and Practices).

3.5 Recommendations about Teaching and Assessing Thinking in the PYP

In the PYP there are many fine contexts explicitly identified as appropriate for thinking instruction and assessment, and in some of these interesting details are offered about how to go about this. We find many of these are appropriate for thinking instruction, and the PYP objectives, instructional practices, and assessment techniques are well placed for elaboration based on the models summarized in Table 1.1. in the first section of this report. Our suggestions are, therefore, in the spirit of adding to the programme in ways that will make thinking instruction more organized and effective and, indeed, more coordinated across the three programmes.

With regard to the thinking goals and thinking objectives of the PYP, we recommend that the PYP curriculum team consider the following:

- To further articulate the existing generic (transdisciplinary) thinking skills based on Bloom to make them more amenable to instruction, following the argument outlined in the Part 1 Report, Sections 2.2 and 2.3;
- To use the language of thinking in articulating these objectives and to do so consistently not only throughout the PYP but also throughout the MYP and the DP, including TOK;
- To extend the Bloom's classification to include problem-solving and decision-making, thus connecting it more explicitly with the other important types of thinking that combine the three higher-order thinking categories;
- To further explore the key transdisciplinary concepts as opportunities for teaching thinking in ways that deepen students' understanding of these concepts;
- To identify dispositions that are specific to thinking as objectives for the programme and to distinguish these from other desirable learner characteristics and attributes that the programme also wants to achieve.

With regard to pedagogical approaches to teaching thinking in the classroom, we recommend that the PYP curriculum team consider the following:

- To be more explicit about thinking strategies so that they can be more visible in the classroom along with student responses, and to be more open to direct teaching, prompted metacognitive reflection, and teaching for transfer;
- To infuse instruction in relevant thinking skills into inquiry cycle which the dominant pedagogical approach of the PYP;
- To develop a more explicit stance with regard to the importance of metacognition as a means to help students gain some control over their thinking and direct it in new contexts, and to help students practice this regularly in the classroom
- To explicitly emphasize key thinking dispositions in the classroom, some of which already appear in the IB literature;
- To develop a program of guidance for teachers in IB schools on classroom models and strategies to support the above approaches.

With regard to assessment, we recommend that the PYP curriculum programme team consider:

- To align internal assessment practices with the objectives of thinking instruction in the PYP based on the above changes in instructional practices:
 - teachers would then use the precise language of thinking in writing and using explicit assessment prompts to cue students to the skills that the prompt requests the students to display;
 - based on the explicit classroom strategies being taught, teachers would develop more precise assessment criteria in the standards, rubrics, and continua that guide their assessment of student thinking.
- To have a separate platform for reporting the results of their assessment with regard to thinking, so that the thinking-related criteria can be used both to provide formative feedback to the student and to determine next steps, as well as to be used for summative assessment purposes by teachers and schools.

4 The Middle Years Programme

4.1 General Overview

In comparison to the PYP, The Middle Years Programme (MYP) is characterised as representing a shift from a transdisciplinary curriculum to a disciplinary curriculum, with opportunities for interdisciplinary learning through five areas of interaction. It is a five year programme, designed for learners from 11-16 years of age. Assessment is at the level of the subject (8 subject areas must be studied) and a personal project is completed at Year 5. The MYP is not externally assessed by IB, though schools can submit samples of students' work to be moderated. Assessment is internal and is criterion-related, with very explicit learning objectives and grading criteria specified for each subject. The five areas of interaction are not separately assessed. It is expected that the learning achieved through these areas will be assessed through the subject units of assessment and through the personal project. The curriculum is organised and taught through units of inquiry. Compared to the PYP, the key concepts/themes/questions are not specified by the IB for MYP. The MYP is written largely at the school level. Each personal project is supervised and guided by a teacher (and sometimes more than one teacher). It can be conducted as a group but must be written up individually.

The focus of the current analysis is on the development and assessment of thinking skills which are briefly coded in the three matrices as outlined in the initial proposal. The text accompanying each matrix provides a more extended commentary and critique. We are aware that the MYP is in transition, with a new programme being introduced in 2014 with some features that are similar to the PYP, together with IB external assessments. Nevertheless, we hope that the substance of our commentary and critique will still apply.

4.2 Thinking Objectives and Goals in the MYP (Coding Matrix 1)

Thinking Construct	General Curriculum Guidelines	Thinking Objectives at subject level	Areas of Interaction	Units of Work (e.g. Personal Project)	Example Lesson Plans (MYP Planner)
Thinking Processes	<p>IB profile refers to a number of thinking processes particularly under the attributes of 'thinkers' and 'inquirers'</p> <p>Reference to thinking skills progression in Vertical and Horizontal planning (no model provided)</p>	<p>ATL skills to be integrated with subject learning; Subject Guides give examples of how to do this.</p> <p>Objectives for each subject generally include an explicit mention of thinking, e.g. Humanities – thinking critically</p> <p>Bloom's command words are used in subject objectives</p>	Approaches to Learning (ATL) has 7 skills including thinking (generating ideas, arguments, deductive reasoning, problem solving, creative thinking)	<p>All the ATL skills are objectives for the Personal Project</p> <p>Thinking is explicitly mentioned in several of the personal project objectives</p>	<p>Question on planner to prompt how a unit will contribute to subject-specific and general approach to learning, no specific mention of thinking.</p> <p>Reference to thinking skills progression in Vertical and Horizontal planning (no model provided)</p>
Thinking Dispositions	<p>IB profile refers to a number of thinking dispositions particularly under the attributes of 'open-mindedness' and 'risk takers'</p>	<p>Thinking dispositions are not strongly represented through ATL beyond a general learning orientation of working independently. The shift towards more disciplinary learning is reflected in more specific dispositional and values-based concerns, such as appreciation of the arts, attitudes to science,</p>			
Metacognitive Thinking	<p>IB profile describes an attribute of being reflective about learning</p>	<p>Metacognitive thinking does not have a high profile beyond a general reference to reflection on learning. Reflection is one strand of the ATL framework</p>		<p>Reflection on learning is mentioned an objective in relation to process journals, e.g., Process journal specific to personal project</p>	
Beliefs about Knowledge			<p>Area of interaction called Human Ingenuity asks for some consideration of how knowledge is accumulated and used</p>		

Coding Matrix 1 presents a brief overview of how the thinking is represented in the MYP as a learning objective and how the key ingredients for thinking are conceptualised. We note that thinking as a learning objective is mentioned many times across the MYP. We have identified explicit frameworks in two different parts of the curriculum guidance materials – as part of the area of interaction called Approaches to Learning (ATL) and as objectives in the subject guides, where the main influence is Bloom’s taxonomy and the elaboration of Bloom through the IB Command Terms.

4.2.1 Thinking Objectives within the area of interaction, ATL

As the name implies, ATL are *approaches* to learning and should more appropriately be evaluated in the instruction and pedagogy section rather than under thinking objectives. But, as ATL make reference to different types of thinking, and the descriptions are a mixture of *types* of thinking and *instructional techniques* to prompt the thinking (see examples below), we will examine what kinds of thinking are highlighted. Explicit mention is made to the use of arguments (e.g., logical progression of arguments, challenging arguments), critical thinking (e.g., deductive reasoning, evaluating solutions to problems), creative thinking (e.g., generating ideas, multiple perspectives), and problem-solving (e.g., identifying problems, planning, evaluating solutions to problems and so on). There is no specific mention of higher- order thinking in the context of ATL or of a hierarchy that would be typical of a Bloom-like approach. The ATL list is:

- generating ideas – including the use of brain-storming;
- planning- including storyboarding and outlining a plan;
- inquiring—including questioning and challenging information and arguments, developing questions, using the inquiry cycle;
- applying knowledge and concepts—including logical progression of arguments;
- identifying problems—including deductive reasoning, evaluating solutions to problems;
- creating novel solutions—including the combination of critical and creative strategies, considering a problem from multiple perspectives.

We would like to make two points about this list. Firstly, it is more ad hoc than Bloom’s taxonomy , and omits important types of thinking such as analysis and decision-making, that we would argue should be included as objectives in a thinking curriculum, and which were included in the PYP programme. It is also not clear what are the criteria for including and excluding different types of thinking. Secondly, with regard to the previous discussion about broad vs. differentiated objectives

(Part 1 Report, Section 2.2) the list can be subjected to the same critique advanced with regard to Bloom's taxonomy – that merely identifying and naming a type of thinking does not create a thinking skill. Types of thinking need to be framed in terms of the explicit thinking strategies that point a way forward for students to become more skilful in exercising that particular type of thinking. We have already rehearsed how this can be achieved in the Part 1 Report.

4.2.2. Thinking Objectives in the Subject Guides and IB Command Terms

Although Bloom is not mentioned specifically in the MYP subject guides (as far as we could find), the design of the many of the objectives at the subject level is clearly following Bloom. For example, in the Humanities Subject Guide, four learning objectives are identified: Knowledge and Understanding; Investigating; Thinking Critically; and Communicating. The criteria used to evaluate critical thinking clearly follow Bloom's higher order thinking categories (analysis, evaluation, synthesis) and are identified in this way:

"Students should be able to:

- *analyse concepts, events, issues, models and arguments*
- *analyse and evaluate a range of sources in terms of origin and purpose, recognizing values and limitations*
- *interpret different perspectives and their implications*
- *synthesize information in order to make valid, well-supported arguments."* (Humanities Guide, p. 11)

Following this, the IB command terms are then used to help teachers and students to understand more fully what 'analyse', 'evaluate' and 'synthesize' would mean.

Analyse Break down in order to bring out the essential elements or structure. To identify parts and relationships, and to interpret information to reach conclusions.

Evaluate Assess the implications and limitations; make judgments about the ideas, works, solutions or methods in relation to selected criteria.

Interpret Use knowledge and understanding to recognize trends and draw conclusions from given information.

Synthesize Combine different ideas in order to create new understanding." (Humanities Guide, p. 12)

This approach certainly goes some way to using a more differentiated set of thinking objectives, as advocated in the Part 1 Report, Section 2.2., *Broad vs. Differentiated Types of Objectives*. Nevertheless, we still recommend that the more differentiated descriptions are shaped up into a thinking strategy and form the basis for teaching the thinking as a skill in the classroom. It is

important to recognise that although the command terms are good prompts for certain forms of thinking, they are not in themselves 'thinking skills' and we have elaborated that point several times now.

The last point to note for the MYP thinking skills objectives is about alignment and consistency. Firstly, it may not be clear to schools/teachers/students how the types of thinking as identified in the ATL framework align with Bloom's taxonomy and the command terms. Secondly, from reading across the subject guides, the programme would benefit from a more consistent use of the command terms when setting learning objectives.

4.2.3 A Cautionary Note about the Meaning of Metacognitive Thinking

We would also like to comment on the meaning of the term 'metacognitive' thinking, how it is used in the research literature with regard to thinking development and how it is being used in the MYP guidance materials. In the guidance materials the importance of reflection and evaluation of learning is certainly identified as an important curriculum objective. However, we argued in the Part 1 Report, Section 2.4, that metacognition has a more precise meaning in terms of the role it plays in the development of thinking. A more precise meaning is:

- knowing about *thinking* strategies in general;
- becoming aware of one's own *thinking* strategies;
- reflecting and evaluating one's own *thinking* strategies
- with the intention to plan and direct future thinking in more skilful ways'

This meaning is at the heart of the notion of learnable intelligence. The expectation is that the student will eventually internalise the more skillful thinking and use it spontaneously in future contexts. Thus the instructional goal of metacognitive thinking – to help the learner become more self-regulation – will be achieved. So the meaning of metacognition is more precise, with an explicit focus on future thinking and self-regulation, than is generally captured in the term 'reflection'.

4.2.4. Where are Thinking Dispositions in the MYP programme?

Our impression is that the focus on broad dispositional objectives became blurred in the MYP. Clearly, the focus in our report is on *thinking* dispositions, which we have defined as broad inclinations and motivators that support learners in the habitual use of effective thinking, such as open-mindedness, a willingness to see other perspectives and to consider alternative approaches; truth-seeking and striving for accuracy and reliability of sources; inquisitiveness and curiosity,

seeking out problems to solve and so on. These are dispositions that cut across disciplines and are more like the learner attributes in the IB Learner Profile. We think that the dispositional emphasis in the MYP has shifted to attitudes and values associated with disciplinary knowledge, such as personal engagement in the arts, attitudes to science, and lifelong enjoyment of physical activity. We do not mean to imply that these are not important and worthwhile curriculum goals. But we do recommend the MYP identify clearly articulated, teachable and assessable transdisciplinary thinking dispositions, preferably linked to the IB learner attributes, to support skillfull thinking in the 11-16 year old age group.

4.3 Pedagogical Approach to Teaching Thinking in MYP (Coding Matrix 2)

What is the general approach to promoting and enhancing thinking? In common with PYP, the MYP adopts a largely constructivist approach to learning, with an emphasis on inquiry-based learning as the main method. However, unlike PYP, the number of inquiries and the central questions are not specified. The MYP unit planner outlines a methodology for planning a unit, including what areas of interaction will be the focus, and how ATL will be developed. Use of Bloom as a means for making thinking more explicit in the classroom is advised. References are made to vertical and horizontal progression of thinking using Bloom.			
Thinking Construct	The degree to which reference to thinking is made explicit or visible in the classroom	What methods are employed to make thinking explicit? (thinking organisers, thinking routines , dialogue, collaborative work)	The degree to which efforts are made to rehearse thinking across different contexts (teach for transfer)
Thinking Processes	<p>The need to make skills explicit is recognised as part of ATL area of interaction.</p> <p>The consistent use of the IB Command terms in the classroom is recommended so that they become the language for thinking.</p>	<p>No specific mention of methods other than general advice</p>	<p>ATL makes specific reference to transfer</p> <p>Consistent use of command terms across subjects is advised and expected</p> <p>Reference to using the command terms for horizontal and vertical progression across the IB continuum, but no model is provided</p>
Thinking Dispositions	No precise advice on developing dispositions		
Metacognitive Thinking	ATL gives opportunities to students to reflect on learning, including their thinking		
Beliefs about Knowledge	No evidence		
Is there any reference to ideas such as thinking classrooms, cultures of thinking, communities of enquiry, etc.? No specific mention of thinking classrooms, but a very strong emphasis on communities of inquiry, holistic learning, etc. There is also a strong need for teachers to collaborate as the five year MYP curriculum is specified at a very high level of abstraction by the IB.			

Coding Matrix 2 captures the main approach to developing thinking that we have captured in the MYP. Again two main sources for advice about teaching thinking can be found in the MYP guidance material – Approaches to Learning, and the use of IB Command Terms

4.3.1 Positioning Approaches to Learning (ATL) in the Curriculum

Approaches to Learning is the area of interaction in the MYP where skills development of all kinds is located – thinking skills, collaborative skills, organising skills, communication skills, information literacy skills, and reflective skills. Approaches to Learning are not taught as a separate unit and the expectation is that all teachers will take responsibility for developing these skills in their own subject teaching and/or in any interdisciplinary inquiry units with the other areas of interaction. The implication is that skills, including thinking skills, will be taught either through immersion in the subject teaching or through a more deliberate and explicit infusion approach that we have been advocating. The MYP guidance material recognises the need to adopt a more explicit approach to skills development. For example,

“Teachers cannot assume that students have the necessary skills and knowledge to be successful learners and must explicitly teach a range of learning skills and strategies. This needs to be done in an agreed way that takes into account the context of the school and the specific needs of the students. It is important that teachers make explicit to students that the generic tools for learning are applicable to all areas of study, in addition to those that are subject-specific skills.” (MYP Principles to Practice, p. 22)

Further advice as to when this should be done is referenced with regard to when schools make yearly plans, what they call horizontal planning (vs. vertical planning, where progression in skills across grade years would be considered). It is advised that a document be produced at *school level* that provides teachers of all subject groups with clear guidance on the use of ATL in any one year and also to plan the development of students’ ATL skills and thinking processes to ensure a logical progression of skills taught and reinforced over time (vertical progression). We could not find any specific advice on how to do this in the IB curriculum guidance materials. Two issues arise here. The first one is a substantive issue and has to do with having a shared model of thinking objectives across-the-curriculum, with explicit thinking strategies to be introduced at specific times or to be reinforced by teachers in other subject areas, or further elaborated and made more complex, as students progress through the grades. The second issue is getting the logistics right. We have argued previously (see Part 1 Report, Section 4.5.3, *Teaching for Transfer*) that even if thinking is explicitly infused in single subject areas, greater planning and collaboration between departments is required to ensure cross-subject transfer in middle schools and high schools, than would be the case, for example, in primary schools where a single teacher is likely to be in charge of a class for most of the timetable.

4.3.2 The Role of Command Terms in Teaching Thinking in the MYP

Command terms refer to the instructional adjectives, like *describe, list, compare, analyse, evaluate* that are normally used as prompts for assessment tasks to indicate the level of thinking that is required to adequately respond to the task. The IB have classified these according to Bloom's hierarchy ranging from more descriptive task requirements, such as describing and listing, to more higher order thinking requirements like analysing, evaluating, and synthesising. This is common practice in setting assessment tasks. However, in the IC Command Terms document for the MYP, the guidance goes one step further, and invites the use of the Command Term as a strategy to teach thinking as well as for assessing purposes. For example, it is claimed that:

"Command terms make thinking skills explicit by using them for questions in tests or essays; in formative and summative assessment; to help transfer interdisciplinary understandings as part of an array of inclusive strategies; or as support for learners with differing language profiles." (Command Terms for the MYP, p. 5)

"Each command term refers to specific thinking skills, practices and processes that constitute a subject or discipline, along with its content. In order to understand a discipline, which is a particular way of knowing, it is necessary to be fluent in the relevant command terms. The use of command terms overlaps between subject areas and should not be divided as being more or less applicable from one to another. (Command Terms for the MYP, p. 5)

While we agree with many of the general messages about the importance of developing a consistent approach between teaching and assessing thinking, and a language for talking about thinking that transcends disciplinary boundaries, we would like to say again that a command term is NOT a thinking skill. We developed this argument in the Part 1 Report in Section 2.3, *The Elusive Nature of Thinking Skills*, and then again with regard to making thinking more explicit from a teaching point of view, in Section 4.3, *Making Thinking Explicit, Implications of a Combined Bloom/Ennis approach to Teaching Thinking*. Essentially, before types of thinking as indicated in command terms can be called thinking skills, they need to be framed in terms of the explicit thinking strategies that point a way forward for students to become more skillful in exercising that particular type of thinking.

4.3.3 MYP Units and Inquiries

In the MYP, all teaching is planned through units of inquiry which can be either disciplinary or interdisciplinary. Unlike the PYP, the themes and central questions for the units of inquiry are not predetermined by the IB documentation and are designed locally by each school. However, the MYP unit design planner follows the principles of backward design for planning purposes and the inquiry cycle is the dominant pedagogical approach.

The comments that we made in Section 3.3.1 with regard to inquiry-based teaching in the PYP, we will repeat here.

The risk of the inquiry-based pedagogical approach is that, while students are presented with challenging questions in a meaningful and authentic context that will certainly stimulate their thinking, students may not be sufficiently skilled in their thinking to engage with the questions at the cognitive level that is demanded. Some students may be competent but others may not. Hence, there are good reasons why the explicit instruction of thinking is particularly important for an inquiry-based curriculum. The cognitive demands in inquiry-based teaching are already high, but the students' responses may not always meet expectations particularly with students from diverse backgrounds and different previous educational experiences.

We have been advocating a very explicit and direct approach to teaching thinking as the research evidence base is now accumulating that the explicit approach to teaching thinking is more effective in improving the quality of students' thinking and in promoting deeper understanding of content materials than immersion approach (see Part 1 Report, Section 4.2). At first sight the two approaches – explicit instruction and inquiry-based pedagogy – may seem to be at odds with one another but they need not be. They can complement with one another, if the explicit instruction is woven into an inquiry in a manner that ensures that all students have at least adequate thinking tools to engage with the inquiry question at the expected level (see Part 1 Report, Section 4.9 on designing extended units and projects that include explicit teaching of thinking). The MYP guidance materials are particularly sensitive to the need to teach skills explicitly as noted in Section 4.3.1 above and the PBL model might be a useful way to combine the two approaches.

4.4 Assessment of Thinking in MYP (Coding Matrix 3)

With reference to any assessment task, formative or summative, externally assessed, teacher assessed, or peer/self-assessed, the following will be examined-

All MYP units are internally assessed according to criteria outlined by the IB.

Each IB subject guide outlines learning objectives and the assessment criteria map directly onto the objectives, mostly concerned with the final assessment at Year 5. There is evidence of using the principles of backward design. Areas of interaction, including ATL, are not separately assessed, but are to be assessed through the subjects. The personal project at Year 5 is also used to assess achievements in areas of interaction, including ATL.

Thinking Construct	The question that is set, what is asked of the student, the teacher prompt	Success Criteria, Marking Criteria	Marking Schemes, Rubrics, Indicators about the level of performance achieved
Thinking Processes	Command words from Bloom's taxonomy are to be used for setting assessment tasks	Each subject has explicit marking criteria that include some reference to the kind of thinking that is valued in that subject, e.g., thinking critically in humanities, scientific reasoning in science. Terms from Bloom are used in grade descriptors with precise definitions. Good example is Humanities Subject Guide	Final published grades have 7 levels and include reference to the quality of thinking (analysis, evaluation, synthesis, application, originality, insight) Subject guides use 5 levels (0, 1/2, 3/4, 5/6, 7/8). Some rubrics make qualitative distinctions between levels, others are more quantitative (little, satisfactory, excellent)
Metacognitive Thinking		Yes, some opportunity to assess in the 'process' objective in the personal project, related to reflection on development as a learner	Yes, levels are outlined using the terms, minimal, some, satisfactory, well-developed
Thinking Dispositions	Unlike the PYP, there is not much emphasis on the IB profile in the MYP. A more general dispositional focus can be found in some subject guides, e.g., 'attitudes to science', 'personal engagement with the arts'		
Beliefs about Knowledge	Not much evidence at the level of assessment,		

4.4.1 Criteria, Standards and Rubrics

The MYP is not externally assessed by IB though schools can submit students' work for moderation to help with their own internal standard setting. But unlike the PYP, very extensive and detailed guidelines are provided at the level of each subject and for the personal project. The assessment is criterion-related. In each subject guide, a number of criteria that are relevant to the subject are identified and 5 standards or performance levels are outlined in each subject guide. The criteria and standards are guided by Bloom's taxonomy and extensive use is made of the IB Command Terms to elaborate on the meaning of instructional verbs, with a view to developing a common understanding of their meaning and intention. In terms of standard setting, Bloom's taxonomy is used very effectively. In the previous section, we used the Humanities Subject Guide as an example because it explicitly sets Thinking Critically as an assessment objective. We will use it again here to make some comments about how assessment criteria, standards and a marking rubric have been developed to mark students' written work. We chose it for illustrative purposes because it is the best example among the subject guides of how Bloom's taxonomy can be articulated in a direction that more explicitly supports the assessment of thinking skills in the manner in which we have been advocating.

Example: from Humanities Subject Guide

The learning objective under consideration is *Thinking Critically* (the other objectives, are *Knowing and Understanding*, *Investigating*, *Communicating*)

Following Bloom's taxonomy of educational objectives, four criteria have been identified to assess the critical thinking and all can be said to be from the higher-order taxonomic categories.

Students should be able to:

- analyse concepts, events, issues, models and arguments;
- analyse and evaluate a range of sources in terms of origin and purpose, recognizing values and limitations;
- interpret different perspectives and their implications; synthesize information in order to make valid, well-supported arguments.

The matrix below describes five performance standards that are numerically ordered. Each performance is described holistically, though the bullet points clearly show how each separate criterion contributes to each standard. The advice is that assessors should find the 'best fit' between the qualities of the student's work and the description, as the method of combining the criteria. In terms of the Assessment Principles and Practices with regard to criteria, standards and rubrics (see Part 1 Report, Section 5.2), this example is a mixture of an holistic and an analytic rubric; while it provides an overall description of the performance, it also preserves the separateness of

each criterion. We also note positively how even the lowest performance description (Level 1-2) requires some evidence of the highest order categories, for example, “making connections between information in a limited attempt to make arguments”, which becomes more demanding as the level of performance shifts so that for Level 6-7, the evidence required is “synthesizes information to make valid, well-supported arguments”. Also, although the levels are numerically ordered, we have the impression that there is a qualitative shift at Level 5-6, where the evidence for critical thinking begins to satisfy the criteria in a more satisfactory way.

Standard/Achievement Level	Description of Performance at the Level
0	The student does not reach a standard described by any of the descriptors below.
1-2	The student: <ul style="list-style-type: none"> • makes a limited attempt to analyse concepts, events, issues, models or arguments • describes some sources in terms of origin and purpose and recognizes some values and limitations • identifies different perspectives • makes connections between information in a limited attempt to make arguments.
3-4	The student: <ul style="list-style-type: none"> • completes a simple analysis of concepts, events, issues, models or arguments • completes a simple analysis and/or evaluation of some sources in terms of origin and purpose, recognizing values and limitations • identifies different perspectives and their implications • makes connections between information to make simple arguments.
5-6	The student: <ul style="list-style-type: none"> • completes a satisfactory analysis of concepts, events, issues, models or arguments • satisfactorily analyses and/or evaluates a range of sources in terms of origin and purpose, recognizing values and limitations • interprets different perspectives and their implications • synthesizes information to make valid arguments.
7-8	The student: <ul style="list-style-type: none"> • completes a detailed analysis of concepts, events, issues, models or arguments • effectively analyses and evaluates a range of sources in terms of origin and purpose, recognizing values and limitations • thoroughly interprets a range of different perspectives and their implications • synthesizes information to make valid, well-supported arguments.

Command terms and MYP definitions

Analyse Break down in order to bring out the essential elements or structure. To identify parts and relationships, and to interpret information to reach conclusions.

Describe Give a detailed account or picture of a situation, event, pattern or process.

Evaluate Assess the implications and limitations; make judgments about the ideas, works, solutions or methods in relation to selected criteria.

Identify Provide an answer from a number of possibilities. Recognize and state briefly a distinguishing fact or feature.

Interpret Use knowledge and understanding to recognize trends and draw conclusions from given information.

Synthesize Combine different ideas in order to create new understanding

We would like to say that this is a well-crafted rubric and we can see how it would be very helpful to teachers in grading students' written work. But even with the best crafted holistic rubric the main issue is the degree of subjectivity in interpreting the meaning of the descriptive terms in relation to a piece of student work. The problem of subjectivity in criterion-related grading is not confined to the assessment of higher-order thinking, though it can be more problematical as there is perhaps less consensus about the meaning of higher-order descriptive terms compared to terms that point more directly to factual statements, descriptions of concepts and events, and so on. Subjectivity can be dealt with in several ways:

- (1) By trying to make the rubric descriptions as detailed and concrete as possible so as to reduce the likelihood of disagreement between graders;
- (2) Getting teachers/markers to work together to ensure that they share a common understanding of the meanings of the terms *in relation to examples of students' work*; this can be done through standard setting and moderating examples of students' work either at school level or department level, or through examination boards for external assessment purposes.
- (3) And both of these can be used together.

With regard to (1) we can see that the IB Command Terms help to make terms like "analyse", "evaluate", and "interpret" more concrete. But the problem often arises with trying to qualify the terms so that they can be judged at different levels of proficiency. For example, in the above example, the levels of performance for the first criterion "analyse concepts, events, issues, models and arguments" are described in terms of "limited attempt", "simple analysis", "satisfactory analysis" and "detailed analysis", which leaves too much to the interpretation of the marker. So a marker might need to know more about what is it about the quality of an analysis that implies it is limited, or simple or detailed. We do not mean to say that there is an absolute answer to this – it can only be judged in a context. But some general characteristics can be described, perhaps building on the IB Command Terms and the MYP definitions. For example (and this for illustrative purposes only and could be improved upon):

Analyse Break down in order to bring out the essential elements or structure. To identify parts and relationships, and to interpret information to reach conclusions.

- **Limited Analysis:** Is able to identify some parts of the concept, event, model or argument, but cannot do much more, and because of this can draw only on a limited conclusion
- **Simple Analysis:** Is able to identify the constituent parts, and see how they might fit together, drawing a conclusion but without giving reasons about the possible functions of the parts
- **Satisfactory Analysis:** Is able to break down the concept, event, model or argument into essential parts, sees the relationship between the whole and the parts, can identify structure, reach a conclusion and give reasons about some of the functions of the parts

- **Detailed Analysis:** Is able to break the concept, event, model or argument into its constituent parts, carefully considering the relationship between the whole and the parts, identifying structure and/ or common patterns, and reaching a well-supported conclusion based on reasons and justifications about the functions of the parts

With regard to (2) above, we do not know to what extent teachers in MYP schools get together with the purpose of establishing a common understanding of standards and rubrics through cross-moderation and/or cross-grading or to what extent the IB gives more specific guidelines about this (we may not have accessed this). But as the curriculum for the MYP programme is designed primarily at school level, there is likely to be many opportunities for such cross-moderation. It would be particularly important that the meanings of the IB Command Terms and the associated standards were shared *across* disciplinary boundaries. We noted that there is variation in the use of Bloom and the Command Terms in the subject guides that we examined.

4.4.2 Assessment for Learning

While the focus of the above discussion was on making the use of criterion-related rubrics more reliable for summative assessment, a more articulated analytic rubric is also important to inform students about the criteria against which their written work (or any performance) will be evaluated, to give them feedback on their current performance, and to identify what steps they need to take to improve. This is where words like “limited”, “simple”, “satisfactory” are not very helpful. What the student needs to know is how they can make their work better, what kinds of things do they need to do. So sharing the criteria, making them as accessible as possible, through classroom discussion of what the terms means and the differences between the standards, and using peer and self-assessment are all practices that are recommended by the assessment for learning research literature.

4.5 Recommendations about Teaching and Assessing Thinking in the MYP

In the MYP there are many fine contexts explicitly identified as appropriate for thinking instruction and assessment, and in some of these interesting details are offered about how to go about this. We find many of these quite appropriate for thinking instruction, and the MYP objectives, instructional practices, and assessment techniques are well placed for elaboration based on the models summarized in Table 1.1 in the first section of this report. Our suggestions are, therefore, in the spirit of adding to the programme in ways that will make thinking instruction more organised and effective and, indeed, more coordinated across the three programmes.

With regard to the thinking goals and thinking objectives of the MYP, we recommend that the MYP curriculum team consider the following:

- To align the existing Thinking Skills from the ATL with the approach based on Bloom and the IB Command Words to form a coherent framework for thinking skills objectives;
- To further articulate the existing frameworks (either ATL or Bloom) to make them more amenable to instruction, following the argument outlined in the Part 1 Report, Sections 2.2 and 2.3;
- To extend the Bloom's classification to include problem solving and decision-making, thus connecting it more explicitly with the other important types of thinking that combine the three higher-order thinking categories;
- To identify dispositions that are specific to thinking as objectives for the programme and to distinguish these from other desirable learner characteristics and attributes that the programme also wants to achieve.

With regard to pedagogical approaches to teaching thinking in the classroom, we recommend that the MYP curriculum team consider the following:

- To be more explicit about thinking strategies so that they can be more visible in the classroom along with student responses, and to be more open to direct teaching, prompted metacognitive reflection, and teaching for transfer;
- To infuse instruction in relevant thinking skills into the structured inquiry cycle which is the main pedagogical approach advocated in the MYP;
- To infuse instruction in relevant thinking skills into the Year 5 Personal Project, based on the PBL model;
- To develop a more explicit stance with regard to the importance of metacognition as a means to help students gain some control over their thinking and direct it in new contexts, and to help students practice this regularly in the classroom;
- To create opportunities to teach for transfer across disciplinary boundaries;
- To explicitly emphasise key thinking dispositions in the classroom, some of which already appear in the IB learner profile;
- To develop a program of guidance for teachers in IB schools on classroom models and strategies to support the above approaches.

With regard to assessment, we recommend that the MYP curriculum programme team consider:

- To align internal assessment practices with the objectives of thinking instruction in the MYP based on the above changes in instructional practices:
 - teachers would then use the precise language of thinking in writing and using explicit assessment prompts to cue students more to the skills that the prompt requests the students to display;

- based on the explicit classroom strategies being taught, teachers/the curriculum team would develop more detailed assessment criteria in the standards, rubrics, and continua that guide their assessment of student thinking, building on existing good practice in the MYP.
- To have a separate platform for reporting the results of their assessment with regard to thinking, so that the thinking-related criteria can be used both to provide formative feedback to students about their current level of thinking and to determine the next steps on how to improve it, as well to be used for summative assessment purposes by teachers and schools.

5 The Diploma Programme

5.1 Introduction

The Diploma Program introduces a new structure for teaching thinking: a separate course called Theory of Knowledge. This is considered part of the “core” for this group of students. Instruction in this course takes place in conjunction with instruction in courses in the standard disciplines. The stated connection between the two is that what is learned in the core, especially with regard to thinking, is transferred into the learning experiences that students have in the disciplinary courses, forming what is described as a powerful learning experience that substitutes for the standard and traditional rote-learning approach to teaching in the disciplines.

Teaching thinking in a separate course is not new in education and it may be useful to rehearse our discussion about separate courses from the Part 1 Report, Section 3.1.

In fact it is in higher education that teaching students to get better at thinking has the longest history, manifesting itself in courses in logic, both usually emphasizing formal (deductive) logic, and sometimes inductive logic, as exemplified in the sciences. Then, especially in the 1990s, many of these morphed into courses that provide instruction in both formal and *informal* logic (usually emphasising the identification of types of fallacies in reasoning, like the *ad hominem* fallacy, as a way of identifying everyday arguments that are suspect or downright invalid). And through the 1990s into the 2000s, this all morphed again into courses that were called “Critical Thinking”, and focus almost exclusively on techniques for identifying, analysing, and evaluating arguments, as they appear in everyday discourse and perhaps in the sciences.

To some extent this model has been adopted in pre-college programs, especially since the 1980s, though in most of these cases logic is not the focus of the course, but rather argument in everyday discourse and/or scientific method, emphasising, like their university counterparts, identifying, analysing, and evaluating everyday and scientific arguments. Some small number of these pre-college critical thinking courses were more specialised courses, sometimes created with a philosophical focus, rather than with what is viewed as a more narrow focus just on how to determine the validity of arguments. While most of these pre-college courses in critical thinking were offered to students as electives, they sometimes were required.

We mention all of this because the TOK course included in the IB curriculum falls within this tradition. But it is also important to think about the TOK course against the background of the reasons why many schools (and colleges) have moved away from a separate-course model for teaching thinking, especially critical thinking, to an *infusion* model, in which thinking instruction is infused directly into content instruction.

There are two sorts of problems that have been identified with the separate critical thinking course model. The first is practical. Many schools have little room for another separate course in what has become an overcrowded curriculum. But of course if a new course is considered very important, there always seems to be a way of squeezing other curricular components to make place for it.

The second set of problems is more serious. They relate to either the perceived or documented ineffectiveness in changing the thinking habits of students both in their other academic work and in their lives outside of school. A standard diagnosis is that students tend to treat what they learn in separate critical thinking courses as self-contained skills, and while they may do well in such courses, once they are done they are done and, like much else of what they learn in school, it is time to move on to something else.

One of the main reasons for the worries about transfer is that the way critical thinking courses are developed and taught *normally* contains little if any *teaching for transfer* – that is, direct instruction in which students are challenged in the course to use what they have learned about critical thinking with examples from their other courses, or with challenging situations that call for critical thinking in their lives outside of school. Equally, the instructors who teach the disciplinary courses do not normally provide opportunities for students who have taken critical thinking courses to use their critical thinking skills in connection with their other courses, so there is little support given to students to help them with transfer. While transfer is mentioned in the TOK literature, there seems to be little evidence of it in the actual descriptions of the TOK course, and virtually no evidence that it is picked up in the cluster of disciplinary courses in the DP.

Consequently, one main focus in our evaluation of TOK is whether there is adequate transfer into the content fields, both disciplinary and interdisciplinary, to provide students with:

- Opportunities for thinking beyond rote learning;
- The use of an explicit thinking vocabulary;

- The use of explicit procedures for analysing and critically evaluating knowledge claims in the standard areas of knowledge.

A number of questions therefore emerge from this discussion that we feel need to be answered to get a good sense of how IB handles this transfer issue:

(TR1) Is the idea here that once students develop the thinking skill taught in TOK, transfer will be automatic? Or is it that there is direct teaching for transfer incorporated into the TOK course?

(TR2) What about the approach to teaching content in the disciplinary courses? Is the IB plan to have that restructured so that thinking skills learned in the core are explicitly infused into the way the content is taught, assuming that the students have by then mastered these skills in the TOK course?

(TR3) And what about the teachers who teach those courses? Does IB provide guidance for them in classroom techniques that can be used to facilitate the learning through thinking that has been stated as an objective?

Our sense, from the material available to us, is that answering TR1 reveals little if any direct teaching for transfer in the TOK course, while TR2 and TR3 are pretty clearly answered in the negative. So to summarise our sense of where IB stands on this issue, here is another ready-made context in the IB curriculum where enrichment to enhance students learning and using thinking skills can be undertaken.

We now turn to the TOK course itself, after which we will comment on the CAS and Disciplinary/Interdisciplinary components of the DP. We base our discussion of the DP on the framework we have presented representing the variations and options in play in mainstream teaching of thinking over the past 15 years.

5.2 What do we find in TOK vis. a vis. teaching thinking?

TOK *does not use* the standard vocabulary of thinking and thinking skills as its dominant characterisation of its mission. Rather, it draws from a philosophical tradition and describes its mission in terms related to *knowledge*, consistent with the way certain issues about knowledge are articulated in epistemology, one of the standard branches in philosophy. But unlike programmes

like *Philosophy for Children*, TOK does not focus on standard epistemological issues like the challenge of scepticism, or the problem of “other minds” (How do we know that what we think of as other *people* are not more than cleverly constructed robots with no consciousness?). TOK disclaims this kind of focus. Rather, it takes as a given that knowledge is real and attainable, and makes as the primary TOK question (described as a “knowledge question”) “How do we (How does he/she) know _____?” In a sense TOK is *applied epistemology*.

But TOK does not just want students to ask this question. Rather, they teach students to follow it with more specific questions like “What *evidence* is there for _____?” , “What *experiments* were undertaken to show _____?”, or “What (primary) *sources of information* is _____based on?”. This is the fundamental approach of TOK to any knowledge claim, and its instructional goal is to make this questioning strategy a habit practiced by the students with regard to any knowledge claim.

It is not clear from the DP literature, however, whether these questions are to be co-developed by teachers and students, or whether the suggestion is that teachers formulate these and present them to students. In the Part 1 Report, we mentioned that the co-development of strategies for skillful thinking tends to be more effective in actual thinking-skill instruction than teacher-development of these strategies. Furthermore, it is not clear whether, when formulated, these are to be presented to students as an explicit strategy to follow when considering a knowledge claim or whether they are presented just as important questions – among other questions – to consider when answering a basic knowledge question. Perhaps this fine detail of classroom practice with regard to teaching thinking is left to teachers who will be teaching TOK courses in different schools. However, we wish to note that such alternatives for classroom practice are not mentioned, outlined, or their pros and cons discussed in any DP document that we have seen. Our suggestion, again following the results mentioned in Part 1, is that if co-construction is not the norm, this, too, is a context in which such a practice can be easily introduced.

The process we have described is a probing analytical process in which students, guided by a series of questions about knowledge, attempt to understand the basis for specific knowledge claims. But there is a second objective stated in the literature on TOK. This is partially hidden behind this analytical process, and is a richer and deeper goal: TOK also aims at having students ask and answer a subsidiary question: What counts as *good evidence/good reliable* sources of information that will adequately *justify* (support) such knowledge claims? By prompting students to answer these

questions TOK aims to help students develop *standards for adequate support for knowledge claims*. And it is this that will, in turn, allow them to *evaluate*, and not just describe, knowledge claims and their support. Thus, having students formulate, ask, and answer such series of knowledge questions has another set of objectives:

- Deepening students understanding of the methodology of an *Area of Knowledge (AOK)* like history, the natural sciences, and mathematics.
- Critically evaluating whether specific knowledge claims within these AOKs are adequately supported.

It is this practice in TOK where skill at critical thinking is clearly an objective. We suggest that this is made explicit and clear by using the language of critical thinking, and by locating what is being done in an overall thinking-based framework that we have suggested could be introduced in the PYP and used to guide the practices of teaching thinking through the MYP, right up to and into the DP. An example of such a framework is the enhanced and detailed Bloom structure we have displayed in Part 1 Report, Sections 2.2 and 4.2.

Three important offshoots of practice designed to achieve this second set of objectives are well noted in the TOK literature. They are that:

- Students find that in different fields (disciplines) there are different standards for what counts as good support;
- The standards are often couched in subject-specific terminology (e.g., “experimentation” and “controlling variables” in the sciences, “confirmation by primary sources” in history, etc.);
- Knowledge claims are not considered “the final word” on anything, but acknowledged to be subject to different points of view and revisable in the light of new information.

This last point has a direct bearing on the need to be *open-minded* in any exploration of the basis for and viability of a knowledge claim.

This is the basic conceptual framework for what is taught to students in the TOK core course.

5.3 Comments on the Formulation of The Learning Goals in TOK (Coding Matrix 1)

Here is a summary using the coding matrix for thinking objectives.

Thinking Construct	General Curriculum Guidelines	Thinking Objectives at subject level	Inter-disciplinary themes	Units of Work (e.g. Presentation)	Example Lesson Plans (if available)
Thinking Processes	Overarching stated objective is that students understand and have skill at identifying what constitutes good thinking, what problems people have with thinking, and can identify what kinds of thinking are required in different situations. Skill at assessing knowledge claims also a primary stated objective. Five specific types of thinking mentioned: analytical, critical thinking, problem solving, making reasonable decisions	A generic goal is that students know to look for ways that knowledge is arrived at in the different disciplines, and they develop skill at finding that out. This means skill at identifying, analysing, and evaluating ways that knowledge claims are justified in the various disciplines. This is usually stated in language referring to knowledge rather than thinking.	Subject-specific themes are the focus.	Presentation emphasizing themes about knowledge, writing showing skill at understanding and critically evaluating knowledge claims.	Using knowledge strategies to analyse and evaluate knowledge claims in specific disciplinary case studies
Thinking Dispositions	Open-mindedness, and attitudes that enable students to respect, strive to understand and fairly evaluate other points of view.	Open-mindedness, and attitudes that enable students to respect, strive to understand and fairly evaluate other points of view.		Open-mindedness, and attitudes that enable students to respect, strive to understand and fairly evaluate other points of view	
Metacognitive Thinking	Skill at thinking about thinking in ways that enable students to evaluate, modify and correct the way they think.	Skill at thinking about thinking in ways that enable students to evaluate, modify and correct the way they think.		Showing skill at thinking about thinking in ways that enable students to evaluate, modify and correct the way they think.	
Beliefs about Knowledge	Knowledge claims are subject to modification and change through ongoing inquiry.				

We want to suggest that even though what we have just described is not primarily couched in the language of the thinking skill movement, the difference here is only a terminological one. What TOK is describing is a rich and deep conception of what it takes to be a *good critical thinker*. In the language of the thinking skill movement, perhaps best represented by the work of Robert Ennis and his followers, critical thinking is directed on the question “What should I believe or do?” This is a clear *normative* question and underlying it is the quest for finding out what is true – about us, about the world, about the universe. As we read the IB documents on TOK that is exactly what the quest is that drives the knowledge questions that make up the approach to thinking in TOK. And in fact, numerous times throughout the articulation of the objectives of TOK, “critical thinking” is stated as one of the main things they are after in helping students develop their thinking. To us this is not just an overlap but an exact match.

In addition, we find that what TOK articulates, while not couched in the terminology of Bloom’s Taxonomy, must pretty clearly be viewed by any proponent of using Bloom to frame the teaching of thinking as a way of articulating in detail what our goals need to be in helping students develop skill at *evaluation*. TOK, one might say, provides us with a way of starting with one of the Bloom categories and articulating what is involved in doing this type of thinking well. We would suggest that this can become crystal clear in the guidance on TOK by making these connections using the language of thinking.

5.4 How will the fundamental goals of TOK be achieved in the classroom (Coding Matrix 2)?

In the TOK literature the primary technique promoted for use in the classroom is to have the students focus on “real-life examples” in which “knowledge” is claimed to be the result, and to use the TOK strategy to analyse and evaluate these claims. “Real-life examples” seem to mean not everyday examples (like someone trying to figure out why his car won’t start), but rather real examples embedded in the disciplines. While there is a paucity of examples given to guide teachers in how this is to work, enough is said to make us think that examples of the scientific investigation that lies behind the “discovery” that exposure to ultraviolet light can cause cancer, or that gravity distorts light — real cases, the analysis of which will reveal the standards of experiment and evidence that need to be satisfied to support a knowledge claim in the sciences. Similarly, the development of a historical account of the causes of the collapse of Nazi Germany in the Second World War can be based on the study of one of the many accounts of the Second World War and we

presume that even present controversial cases like the claim that cigarette smoking causes cancer, or that human behaviour is causing global warming, can also be used to give students practice in both analysing the components of these cases and also evaluating the knowledge claims made. However, we find a paucity of examples of using TOK thinking skills to think about such real-life examples in the TOK literature — examples that can be used to provide guidance to teachers about how to practice such engagements by students. Nor do we find much discussion of important instructional techniques that can be used to enhance such instruction, like the use of collaborative thinking groups and the need to help students make their thinking visible and accessible to others in their groups with examples of how this might be done, e.g., through reporting forms, the use of graphic organisers, either using hard copy or shared computer access.

So once again, we find in this Diploma programme that there are many opportunities to insert the use of instructional techniques to enhance thinking skills. We suggest that examples of such techniques be included as paradigms of how such real-world examples can be turned into content that students are prompted to use and engage with specific higher-order thinking skills. And, in fact, this can all be coordinated with similar practices that we have suggested in the PYP and MYP so that students gain the needed practice to make habitual and internalise skillful thinking.

Here is a summary of these points about classroom practice related to thinking in TOK using the coding matrix for thinking instruction.

What is the general approach to promoting and enhancing thinking? Teaching students to raise and answer knowledge questions (from TOK) as a way of teaching them to be analytical and critical thinkers.			
Thinking Construct	The degree to which reference to thinking is made explicit or visible in the classroom	Methods to make thinking explicit (thinking organisers, routines , dialogue, collaborative work, cognitive conflict)	The degree to which efforts are made to rehearse thinking across different contexts (teach for transfer)
Thinking Processes	Terms like “critical thinking”, “analysis”, and “evaluating arguments” are used with students but the primary language used is the language of knowledge. Focus on subject-specific objectives: knowledge in science, knowledge in history”, etc. through case studies (“real-life examples”). Understanding of knowledge claims through analysis and critical appraisal of knowledge claims major activities.	Students asked to explicitly raise “knowledge questions” in an organised way to achieve an understanding of the methods of acquiring knowledge and an evaluation of the viability of specific knowledge claims. This tends to be subject-specific. No clear use of explicit thinking organisers. Dialogue and collaborative work stressed.	Students are taught to transfer knowledge questions from one discipline to another by practice. Mention of “far” transfer activities — using knowledge questions in everyday situations. Not clear how often this takes place.
Thinking Dispositions	Thinking “attitudes” are mentioned but not clear whether they are made explicit to the students	None mentioned.	None mentioned.
Metacognitive Thinking	“Metacognition” is mentioned but not clear how it is handled in the classroom. It is described as “thinking about thinking”.	No articulated/ organised metacognitive strategy used to guide students through the way they think about their thinking or to achieve self-guidance.	None mentioned.
Beliefs about Knowledge	Knowledge is subject to revision, can vary from person to person or culture to culture.	Inter-cultural sharing of different points of view is important, dialogue is stressed	Transfer through dialogue
Is there any reference to ideas such as thinking classrooms, cultures of thinking, communities of enquiry, etc.? Putting students in collaborative thinking groups is mentioned, as is creating a community of inquiry. Students also work collaboratively on developing their presentations, as well as conduct their presentations collaboratively. No description of IB classrooms as “thinking classrooms” or classrooms in which a “culture of thinking” is created, though formulating general knowledge questions that prompt thinking about knowledge claims in the different disciplines suggests that a general culture of thinking about knowledge claims is fostered even if it manifests itself in subject-specific activities. A culture of thinking about scientific claims, historical claims, etc. is more like what is being promoted.			

5.5 Transferring the Use of TOK Thinking Strategies to the Content Fields

At the end of Section 5.1 we formulated three important questions about procedures for teaching students to transfer the basic TOK thinking procedures into the content courses that make up the non-core superstructure of the DP program. Let us repeat these here:

(TR1) Is the idea here that once students develop the thinking skill taught in TOK, transfer will be automatic? Or is it that there is direct teaching for transfer incorporated into the TOK course?

(TR2) What about the approach to teaching content in the disciplinary courses? Is the DP plan to have that restructured so that thinking skills learned in the core are explicitly infused into the way the content is taught, assuming that the students have by then mastered these skills in the TOK course?

(TR3) And what about the teachers who teach those courses? Does DP provide guidance for them in classroom techniques that can be used to facilitate the learning through thinking that has been stated as an objective?

What the research about the transfer of thinking skill use from one context to another shows is that all three of these need to be accomplished if the use of techniques learned in one domain are to have a chance of being successfully transferred into in another domain (See Part 1 Report, Section 4.5.3, Teaching for Transfer).

One of the core strategies in TOK is to have the students make a selection of a number of AOKs, which presumably they will explore directly in separate disciplinary courses, but also practice TOK thinking within the TOK course. This can be viewed as satisfying condition (1) above. A bonus is that the guidance material describes students being challenged to use the TOK knowledge strategy in everyday examples as well. This is a clear example of the practice of teaching for “far” transfer in the TOK course – transfer into situations quite different from the contexts in which the students learned these knowledge strategies.

It is with regard to (2) and (3) that we have not been able to find any direct evidence of promotion of the practice of TOK thinking instruction based on the use of knowledge questions in the disciplinary courses in the DP. In fact, as the various DP AOKs are presented there is no indication that we can find that TOK strategies are to be infused, either on a regular basis, or occasionally, into the instruction provided in the disciplines. Moreover, nothing like (3) is even hinted at in the DP guidance on teaching in the disciplines that we have explored. (3) requires a sophisticated support system for teachers who are not accustomed to infusing instruction in thinking into content

instruction. The need for this is not mentioned in anything we have seen. However, we are aware that IB has a number of on-line professional courses for teachers in IB schools. If any of these are on teaching thinking, our study of these courses may give us a better perspective on the degree to which (3) takes place.

Similarly, we find no mention of ways of reinforcing the transfer of TOK strategies into the everyday lives of students outside school. For example, could teachers work with parents to help them stimulate their children to use TOK strategies as they gather information relevant to family life, like the use of various time-saving gadgets often advertised on TV?

So we suggest that, once again, the AOKs provide a fine context to introduce instructional ingredients that will speak to (2). This, though, may not be so easy without addressing (3). There are external on-site teacher-development programs that can be brought into a school to accomplish (3). And, in fact, this can be done efficiently and effectively if PYP and MYP level teachers are also introduced to the objectives and instructional techniques involved in infusing instruction at the level of the enhanced Bloom structure we introduced in Part 1, Section 2.2. We use the word “effectively” because of the need that we have documented in Part 1 that whatever approach to teaching thinking is adopted, it be conducted explicitly, in the appropriate language of thinking, and continued from the earliest grades in the PYP to the highest levels of the DP.

We also want to mention that within the past few years a number of new on-line courses have been developed providing support for teachers interested in innovative teaching thinking techniques. While there may soon be on-line courses on infusion available, we suggest that the IB consider developing such a course themselves to support the teachers in IB schools in bringing effective instruction of thinking into their classrooms, and evaluate their effectiveness compared to face-to-face delivery.

5.6 The Assessment of Thinking in TOK (Coding Matrix 3)

TOK stands squarely in the mainstream of programmes incorporating the teaching of thinking by rejecting multiple-choice testing and relying on two types of performance assessment: student oral presentations and written essays. And in both instances the assessment tasks are prompted by the use of specific TOK thinking vocabulary related to knowledge questions. For example, a sample student presentation available through the OCC involves students doing a group presentation in which they discuss a specific theory in physics and one of the prompts is to explain *what predictions can be derived from the theory the verification of which can provide evidence that supports the theory*.

Reproduced on pp. 62 and 64 in the IB material on the DP are rubrics for scoring both the student performances and the essays that they are asked to write. Both rubrics have 5 levels of scoring, *irrelevant* to *excellent*, and standards for each level are formulated in terms of the degree to which *knowledge questions* are raised that are connected to the real life situation specified, and the degree to which the students produce *clear and convincing arguments* in answering these questions.

Question number (2), for both the essay and the performance, has a favourable answer as well: the reporting is with regard to knowledge questions. The reporting focus for the essay, for example, is to answer this question: “Does the student present an appropriate and cogent analysis of knowledge questions in discussing the title?” Based on the distinction we made in the Part 1 Report, Section 5.2, these scoring rubrics tend to be more holistic than analytical.

There are, of course, a variety of issues that can be raised about the possible subjectivity of the judgments made by scorers based on the rubrics used for the TOK performance and TOK essay, and these carry over to the reliability of the scoring. But TOK practice in preparing the scorers speaks to many of these, and we wish to note that all such attempts at developing reliable rubrics for scoring levels of student thinking, not just in the IB programme, are subject to the same set of issues, and use the same types of safeguards found in the way that TOK prepares scorers. So our finding is that, based on the information available to us, the assessment of thinking practiced in TOK, given the thinking skills that they are teaching their students, is quite mainstream, perhaps with the one exception that in TOK the language of knowledge is the dominant language used, with only minimal use of the language of thinking. However, we also want to note that, if a shift is made in classroom practice to the kind of instructional techniques we have described in the Part 1 Report, Section 4, to

more articulated and explicit thinking strategies as the basis for instruction, a shift to more analytical rubrics like those represented in Part 1, Section 5, would be appropriate. (See our previous discussion on analytical rubrics in the MYP, Section 4.4.1)

Here is the coding for the thinking assessment in TOK.

With reference to any assessment task, formative or summative, externally assessed, teacher assessed, or peer/self-assessed, the following will be examined-			
Thinking Construct	The question that is set, what is asked of the student, the teacher prompt	Success Criteria, Marking Criteria	Marking Schemes, Rubrics, Indicators about the level of performance achieved
Thinking Processes	Uses the specific language of knowledge/thinking introduced in the instruction in TOK to prompt students displaying their thinking both in the presentation and the essay assessment process	Success/marking criteria stated in ways that define a separate platform for reporting on the skill level of the thinking displayed in both the performance and the essay.	Rubrics are written to reference different skill levels of the thinking performance of the students in both the presentation and in the essay. Explicit language describing the types of thinking being assessed is used.
Metacognitive Thinking	No reference is made to any metacognitive processes in the question that is set for the assessment	Skill at metacognitive awareness or metacognitive guidance does not play a role in the reporting.	Metacognition is not referenced in the scoring rubrics.
Thinking Dispositions	The assessment task does not refer to the display of any thinking attitudes or dispositions	The assessment scoring does not refer to the display of any thinking attitudes or dispositions	The assessment rubric does not refer to the display of any thinking attitudes or dispositions
Beliefs about Knowledge	Statements of beliefs about knowledge promoted in TOK are not prompted in this assessment.	Statements of beliefs about knowledge promoted in TOK are not scored in this assessment.	Statements of beliefs about knowledge promoted in TOK are not referenced in the scoring rubric.

We must, of course, ask if we can reach the same conclusions about the practices of the assessment of thinking in the AOKs given that, at the Diploma level, what TOK presents vis. a vis. the development of good thinking is considered a core that is designed to permeate the way thinking is handled in the disciplinary/interdisciplinary instruction offered in the DP.

The DP general guidance on assessment in the AOKs (*Diploma Programme Assessment: Principles and Practices*) advances Bloom's taxonomy as the basis for both the promotion and assessment of

higher-order thinking skills, and for setting objectives at subject level. The MYP document on Command Words develops linkages between the use of Bloom-type command words from PYP through MYP to DP, both as the basis for assessment and for classroom conversations and practices about thinking skills. Closer examination of some subject guides, sample examination questions, and marking schemes do confirm that the questions set tend to reflect a continuum from lower-order thinking (knowledge and recall) toward higher-order thinking such as analysis (e.g., compare and contrast) and evaluation (examine the limitations of...). However, it is not clear if the Bloom levels are used solely for question setting and awarding marks in marks schemes or whether, as the document on Command Words suggests, they are used as the everyday language for thinking in the classroom, as the basis for sharing assessment criteria (as would be suggested by assessment for learning practices) and given to students as formative feedback on their classwork. Either way, we cannot find evidence for assessment linkages between the TOK work on critical thinking about knowledge and belief claims and the role of Bloom's taxonomy in the assessment practices in the subject disciplines. We recommend that, at the very least, clearer linkages are made between these two approaches, but perhaps that something like the more articulated framework for teaching and assessing thinking we describe in Part 1 be introduced to elaborate the details of what the thinking objectives are when thinking is prompted by the use of these command words. This can lead to a much more consistent set of expectations with regard to what IB expects students to display when they do good thinking.

5.7 The CAS Experience in the Diploma Program

One of the important components of the diploma level programme for students is CAS (Creativity, Action, Service). In CAS, students are given the opportunity to develop real-world action-oriented extended projects that have specific non-academic goals aimed at some sort of public service but in the course of which they are expected to apply learning from the academic programme and exercise creativity. For example, one student could develop a project in which he or she manages the school's food drive based on a plan that the student develops, and the food eventually gets sent to UNESCO for distribution to needy countries.

Three important aspects of CAS are:

- (1) that the projects undertaken by students are not part of the academic programme of the school,
- (2) that in any given year they are usually coordinated by one teacher who, at his or her discretion, can play a supervisory role in their progress,
- (3) they are usually undertaken by individual, rather than groups, of students.

One implication of (1) is that while all students must engage in such projects, these projects are not graded or assessed academically in any way that is reflected in a student's academic record. One implication of (2) is that no "teaching" is associated with these projects. And one implication of the overall idea of CAS is that the connection between the academic disciplines studied in the DP and a CAS project could be very narrow, related to mathematics, for example, or cross-disciplinary.

A few comments about the model of student project work are in order here to set the CAS programme in perspective. Individual or group student projects are now common in educational programmes both at college level and K-12. Usually they happen *within* an academic discipline, and involve the *application of knowledge* gained previously in the discipline. For example, in secondary science subjects students sometimes are asked to design and undertake experimentation to try to support some scientific principle that they had learned in the particular course they were taking. Or more boldly, students are sometimes asked to apply what they have learned about toxic pollutants, for example, to some simulated or sometimes real problem that a community is having with pollution of their water supply. Or in the study of history and geography they might be asked to plan a trip to some remote site as if they were living in the middle of the 19th Century. These projects are often undertaken by individual students, though sometimes they are group projects. They usually result in some type of final report, which is summatively assessed by the teacher, with the grade often becoming part of the student's final grade in the course.

So while such projects usually result in some degree of informal and experiential learning, their primary objective is to broaden students' understanding of material they have already been exposed to and have presumably "learned". In this sense, projects are an opportunity for students to 'apply what they know', thus deepening their understanding and appreciating the relevance (real-world or discipline-world) of what they have learned in classrooms.

Let us now turn to the question of the role of thinking instruction and assessment in CAS projects. We see in the CAS opportunities for IB to perhaps restructure its practice to bring out the great potential that such experiences have for applying already acquired knowledge from the academic disciplines, *but also acquiring and using new knowledge through a more explicit model of creative problem solving*. The PBL model for this, introduced in Part 1 Report, Section 4.9, details how this could be accomplished: developing questions that need to be answered in order to solve the problem or complete the project well can lead to focused inquiry that can lead students to learn things that provide answers to these questions. And the thinking strategies introduced to elaborate

the problem-solving process can help students use these “answers” to contribute to solving the initial problem or developing the desired project well.

It is also fairly obvious that for such projects to reap the benefits of explicit instruction in thinking skills they are best undertaken after students have become proficient in the use of these skills – that is, after basic instruction in these thinking skills in regular classroom content learning. But even if we expect students to be proficient in the use of thinking skills, it is important to explicitly plan into them the use of such appropriate thinking strategies. When this is done they also become ideal vehicles for the assessment of the degree of skill the students are using in engaging in the kinds of thinking necessary to drive these projects.

Here is an example of this type of infusion of thinking skills into a student project. One student engaged in a project which aims to outfit the school gym with the most effective and educationally manageable athletic equipment. This certainly required some careful decision making related to, amongst other things, the size of the space available and the cost of the equipment. There is no substitute to following the kind of careful strategy for skillful decision-making that we outlined earlier to make such decisions (generating options, predicting consequences of each option, evaluating and weighing up pros and cons, and on on). And that can provide a student with the raw material from which he or she can develop a written report on the project in which the choices recommended are supported and justified. Or, if specific information – data – about the quality of this equipment is sought and gathered, there is no substitute for careful judgment about the reliability of the sources that provide this information. Furthermore, as we will mention in the last section, skill at these kinds of thinking can be assessed as part of the overall assessment of the project. Such assessments can – and probably should – be primarily formative for the students, but teachers can also use them summatively.

In fact we would suggest that, together with the extended research essay program, such an enhanced CAS program, so integrated into the diploma level, and involving the need to produce a project report, can give IB a strong two-tiered basis for judging overall student learning and thinking through both their performance as investigators and the results they produce.

5.8 Recommendations about Teaching and Assessing Thinking in the DP

This initial overview of the DP builds on the overview in both the PYP and the MYP. As with the earlier programmes, there are many fine contexts explicitly identified as appropriate for thinking

instruction and assessment. But there are also other contexts within which instruction and the assessment of thinking can be either more fully developed than in the current DP documents, or inserted afresh to enhance the way DP approaches the teaching of thinking. Our recommendations are, therefore, in the spirit of adding to the programme in ways that will make thinking instruction more organised and effective and, indeed, more coordinated across the three programmes.

With regard to the thinking goals and thinking objectives of the DP, we recommend that the DP curriculum team consider the following:

- To further articulate the existing generic thinking skills based on Bloom, as in the PYP and in the MYP, to make them more amenable to instruction, following the argument outlined in the Part 1 Report, Sections 2.2. and 2.3;
- To use the language of thinking in articulating these objectives and to do so consistently with the language of thinking used in the PYP and the MYP. This is especially true of the TOK course in which this language is aligned with the language used regarding knowledge;
- To continue the explicit extension of Bloom's classification to include skillful problem solving and decision-making as objectives, as is sometimes mentioned appropriately in the IB literature on the DP, thus connecting it more explicitly with the other important types of thinking that combine the three higher-order thinking categories;
- In particular, to identify the development of critical thinking skills as the main objective of the TOK, and creative problem solving as the main objective of the CAS.
- To identify dispositions that are specifically thinking dispositions and to distinguish these for other desirable learner attributes that the programme seeks to achieve.

With regard to pedagogical approaches to teaching thinking in the classroom, we recommend that the DP curriculum team consider the following:

- To be more explicit about thinking strategies so that they can be more visible in the classroom along with student responses to these, and to be more open to direct teaching, prompted metacognitive reflection, and teaching for transfer throughout, but especially in the TOK and in all of the AOK courses;
- In particular, with regard to the critical thinking skills that are discussed in the TOK, to include regular practice by the students in using these thinking skills, in accordance with the model of explicit instruction just mentioned, to think about specific challenging issues, both theoretical and practical.

- To develop a more explicit stance with regard to the importance of metacognition as a means to help students gain some control over their thinking and direct it in new contexts, and to help students practice this regularly in the classroom, throughout the TOK, the AOK, and the CAS.
- To explicitly emphasise key thinking dispositions in the classroom, some of which already appear in the IB literature, throughout;
- To explicitly teach in the TOK for the transfer of the critical thinking skills learned in the TOK into the courses in the AOK, in the student project work in the CAS, and in the research for the final essay presentation;
- To infuse instruction in relevant thinking skills into the project work of students in the CAS, based on the PBL model, and in the development of the final essay;
- To develop a program of guidance for teachers in IB schools especially at the DP level on classroom models and strategies to support the above approaches.

With regard to assessment, we recommend that the DP curriculum team consider the following:

- To align internal and external assessment practices with the objectives of thinking instruction in the DP based on the above changes in instructional practices:
 - teachers would then use the precise language of thinking in writing and using explicit assessment prompts to cue students more directly to the skills that the assessment task is asking the students to display;
 - based on the explicit classroom strategies being taught, teachers/the curriculum team would develop more precise assessment criteria in the standards, rubrics, and continua that guide their assessment of student thinking.
- To have a separate platform for reporting the results of their assessment with regard to thinking, so that the thinking-related criteria can be used both to provide formative feedback to the student and to determine the next steps to improve their thinking, as well as to be used for summative assessment purposes by teachers and schools.

6 Restatement of the Recommendations across the three IB programmes

6.1 Preliminary Comments

Using the coding matrices as the methodological tool and the framework outlined in Table 1.1., we have carefully considered the three IB programmes, PYP, MYP and the DP, evaluating their current practices in the light of the framework, which was constructed from the research and practice literature review reported in the Part 1 Report. As we noted at the end of each programme, there are many fine contexts and practices for teaching and assessing thinking already in place in all three IB programmes. Our purpose is to extend these practices so that teaching and assessing thinking can be more effective and co-ordinated across the three programmes. Our recommendations are given in the spirit of adding value to existing practices which are well placed for elaboration based on the principles and practices summarized in Table 1.1.

The reader will note that many of the recommendations are identical across all three programmes. This stems from our general evaluation of the need for IB to articulate thinking skills more clearly in their curriculum materials and to give guidance on how to make them more explicit and visible in teaching and assessment practices in the classroom. The general thrust of those recommendations applies across all three programmes. There are also recommendations that are specific to each programme – primarily because the programmes differ in their current practices with regard to teaching thinking, for example, the DP has a stand-alone course for teaching critical thinking whereas the PYP embeds a thinking skills framework within a transdisciplinary curriculum approach.

6.2 Teaching and Assessing Thinking in the PYP

With regard to the thinking goals and thinking objectives of the PYP, we recommend that the PYP curriculum team consider the following:

- To further articulate the existing generic (transdisciplinary) thinking skills based on Bloom to make them more amenable to instruction, following the argument outlined in the Part 1 Report, Sections 2.2 and 2.3;
- To use the language of thinking in articulating these objectives and to do so consistently not only throughout the PYP but also throughout the MYP and the DP, including TOK;

- To extend the Bloom's classification to include problem solving and decision-making, thus connecting it more explicitly with the other important types of thinking that combine the three higher-order thinking categories;
- To further explore the key transdisciplinary concepts as opportunities for teaching thinking in ways that deepen students' understanding of these concepts;
- To identify dispositions that are specific to thinking as objectives for the programme and to distinguish these from other desirable learner characteristics and attributes that the programme also wants to achieve.

With regard to pedagogical approaches to teaching thinking in the classroom, we recommend that the PYP curriculum team consider the following:

- To be more explicit about thinking strategies so that they can be more visible in the classroom along with student responses, and to be more open to direct teaching, prompted metacognitive reflection, and teaching for transfer;
- To infuse instruction in relevant thinking skills into inquiry cycle which the dominant pedagogical approach of the PYP;
- To develop a more explicit stance with regard to the importance of metacognition as a means to help students gain some control over their thinking and direct it in new contexts, and to help students practice this regularly in the classroom
- To explicitly emphasize key thinking dispositions in the classroom, some of which already appear in the IB literature;
- To develop a program of guidance for teachers in IB schools on classroom models and strategies to support the above approaches.

With regard to assessment, we recommend that the PYP curriculum programme team consider:

- To align internal assessment practices with the objectives of thinking instruction in the PYP based on the above changes in instructional practices:
 - teachers would then use the precise language of thinking in writing and using explicit assessment prompts to cue students to the skills that the prompt requests the students to display;
 - based on the explicit classroom strategies being taught, teachers would develop more precise assessment criteria in the standards, rubrics, and continua that guide their assessment of student thinking.
- To have a separate platform for reporting the results of their assessment with regard to thinking, so that the thinking-related criteria can be used both to provide formative

feedback to the student and to determine next steps, as well as to be used for summative assessment purposes by teachers and schools.

6.3 Teaching and Assessing Thinking in the MYP

With regard to the thinking goals and thinking objectives of the MYP, we recommend that the MYP curriculum team consider the following:

- To align the existing Thinking Skills from the ATL with the approach based on Bloom and the IB Command Words to form a coherent framework for thinking skills objectives;
- To further articulate the existing frameworks (either ATL or Bloom) to make them more amenable to instruction, following the argument outlined in the Part 1 Report, Sections 2.2 and 2.3;
- To extend the Bloom's classification to include problem solving and decision-making, thus connecting it more explicitly with the other important types of thinking that combine the three higher-order thinking categories;
- To identify dispositions that are specific to thinking as objectives for the programme and to distinguish these from other desirable learner characteristics and attributes that the programme also wants to achieve.

With regard to pedagogical approaches to teaching thinking in the classroom, we recommend that the MYP curriculum team consider the following:

- To be more explicit about thinking strategies so that they can be more visible in the classroom along with student responses, and to be more open to direct teaching, prompted metacognitive reflection, and teaching for transfer;
- To infuse instruction in relevant thinking skills into the structured inquiry cycle which is the main pedagogical approach advocated in the MYP;
- To infuse instruction in relevant thinking skills into the Year 5 Personal Project, based on the PBL model;
- To develop a more explicit stance with regard to the importance of metacognition as a means to help students gain some control over their thinking and direct it in new contexts, and to help students practice this regularly in the classroom;
- To create opportunities to teach for transfer across disciplinary boundaries;
- To explicitly emphasise key thinking dispositions in the classroom, some of which already appear in the IB literature;
- To develop a program of guidance for teachers in IB schools on classroom models and strategies to support the above approaches.

With regard to assessment, we recommend that the MYP curriculum programme team consider:

- To align internal assessment practices with the objectives of thinking instruction in the MYP based on the above changes in instructional practices:
 - teachers would then use the precise language of thinking in writing and using explicit assessment prompts to cue students more to the skills that the prompt requests the students to display;
 - based on the explicit classroom strategies being taught, teachers would develop more detailed assessment criteria in the standards, rubrics, and continua that guide their assessment of student thinking, building on existing good practice in the MYP.
- To have a separate platform for reporting the results of their assessment with regard to thinking, so that the thinking-related criteria can be used both to provide formative feedback to the student and to determine next steps in learning, as well as to be used for summative assessment purposes by teachers and schools.

6.4 Teaching and Assessing Thinking in the DP

With regard to the thinking goals and thinking objectives of the DP, we recommend that the DP curriculum team consider the following:

- To further articulate the existing generic thinking skills based on Bloom, as in the PYP and in the MYP, to make them more amenable to instruction, following the argument outlined in the Part 1 Report, Sections 2.2. and 2.3;
- To use the language of thinking in articulating these objectives and to do so consistently with the language of thinking used in the PYP and the MYP. This is especially true of the TOK course in which this language is aligned with the language used regarding knowledge;
- To continue the explicit extension of Bloom's classification to include skilful problem solving and decision-making as objectives, as is sometimes mentioned appropriately in the IB literature on the DP, thus connecting it more explicitly with the other important types of thinking that combine the three higher-order thinking categories;
- In particular, to identify the development of critical thinking skills as the main objective of the TOK, and creative problem solving as the main objective of the CAS.
- To identify dispositions that are specifically thinking dispositions and to distinguish these for other desirable learner attributes that the programme seeks to achieve.

With regard to pedagogical approaches to teaching thinking in the classroom, we recommend that the DP curriculum team consider the following:

- To be more explicit about thinking strategies so that they can be more visible in the classroom along with student responses to these, and to be more open to direct teaching, prompted metacognitive reflection, and teaching for transfer throughout, but especially in the TOK and in all of the AOK courses;
- In particular, with regard to the critical thinking skills that are discussed in the TOK, to include regular practice by the students in using these thinking skills, in accordance with the model of explicit instruction just mentioned, to think about specific challenging issues, both theoretical and practical.
- To develop a more explicit stance with regard to the importance of metacognition as a means to help students gain some control over their thinking and direct it in new contexts, and to help students practice this regularly in the classroom, throughout the TOK, the AOK, and the CAS.
- To explicitly emphasize key thinking dispositions in the classroom, some of which already appear in the IB literature, throughout;
- To explicitly teach in the TOK for the transfer of the critical thinking skills learned in the TOK into the courses in the AOK, in the student project work in the CAS, and in the research for the final essay presentation;
- To infuse instruction in relevant thinking skills into the project work of students in the CAS, based on the PBL model, and in the development of the final essay;
- To develop a program of guidance for teachers in IB schools especially at the DP level on classroom models and strategies to support the above approaches.

With regard to assessment, we recommend that the DP curriculum team consider the following:

- To align internal and external assessment practices with the objectives of thinking instruction in the DP based on the above changes in instructional practices:
 - teachers would then use the precise language of thinking in writing and using explicit assessment prompts to cue students more directly to the skills that the assessment task is asking the students to display;
 - based on the explicit classroom strategies being taught, teachers/the curriculum team would develop more precise assessment criteria in the standards, rubrics, and continua that guide their assessment of student thinking.
- To have a separate platform for reporting the results of their assessment with regard to thinking, so that the thinking-related criteria can be used both to provide formative

feedback to students and to determine the next steps to improve their thinking, as well as to be used for summative assessment purposes by teachers and schools.