

Research summary

Developing and assessing thinking skills

Extracted from a research report prepared for the IB by:

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Introduction

This study aims to create a research-informed and coherent framework for teaching and assessing thinking and to evaluate IB programmes against this framework. The reports address two main areas:

- best practices in identifying important and teachable kinds of thinking, how they can be **taught** and how they can be **assessed**
- how three of the present IB programmes align with this picture.

Bloom's taxonomy of six educational objectives (Bloom et al 1956)—knowledge, comprehension, application, analysis, synthesis, and evaluation—is probably the best-known framework on thinking. Bloom's taxonomy, and its more recent modifications (for example, Anderson, Krathwohl 2001) have become a prevailing influence in the field of teaching higher order thinking and in moving students' learning away from rote memorization and superficial understanding. As the IB programmes draw heavily on Bloom's taxonomy (with some modifications), the authors employ a critical analysis of Bloom's approach and offer alternative, though related, approaches as a way of making thinking more teachable and assessable.

The findings are presented in two parts. The first part consists of three sections that discuss thinking objectives, pedagogy and assessment. Each section begins with a brief overview of key concepts and key approaches from the research literature and then analyses specific concepts and/or practices. Over the three sections a coherent framework is developed. The second part of the report then presents the authors' evaluations of the Primary Years Programme (PYP), Middle Years Programme (MYP) and Diploma Programme (DP) through the lens of the three-part framework. Building on these evaluations, the authors make both general recommendations and recommendations specific to each IB programme.

Summary of findings

Report part one

Teaching thinking

This section identifies emerging pedagogical principles that have been found to be successful for teaching thinking, as well as specific practices and techniques. The authors draw on systematic reviews that include narrative reviews and quantitative meta-analysis, summarizing trends and findings, and closely examine the approaches adopted by specific programmes that have made a positive impact on students' thinking and learning of various kinds.

From this analysis the authors identify the following principles as important to teaching thinking:

- teaching explicit thinking organizers/strategies in the classroom
- prompting students to make their thinking visible and public
- advancing deep thinking challenges using engaging questions as a form of prompting rather than didactic instruction
- engaging students in collaborative thinking to ensure joint meaning making, interaction and dialogue
- prompting students to adopt a strong metacognitive perspective
- teaching with the explicit goal of facilitating the transfer of the learned thinking procedures to other curricular and non-curricular contexts

- cultivating thinking dispositions and habits of mind
- generalizing the instructional approach used in thinking classrooms to multi-grade and multi-subject curriculums, hence creating model thinking-based schools with a commonality of purpose and practice.

The authors argue that it is important to be specific about the thinking objectives of the curriculum and to frame these in a way that encourages students to become more skilful in their thinking. There is now considerable evidence to support the position that deliberately labelling the kind of thinking to be exercised, outlining a possible plan for the thinking or a thinking strategy, and discussing with students some common pitfalls in thinking lead to better learning outcomes than just immersing students in open-ended challenges that require deep thinking. In a comprehensive meta-analysis, Abrami and his colleagues (Abrami et al 2008) compiled the results of 117 studies that had taught critical thinking in a variety of curriculum arrangements: as a separate general course with explicit critical thinking objectives; using an infusion approach with content objectives and an explicit emphasis on critical thinking; using a mixed approach where a general approach preceded infusion; and an immersion approach, where case studies, vignettes, inquiries and so on were the only methods adopted to provoke the thinking and no explicit mention was made of specific strategies. All the explicit approaches had a more positive impact on critical thinking, as assessed by post-test measures of critical thinking, than the immersion approach. Whatever the limitations of the meta-analytical approach to reviewing previous studies, they do capture general trends and the growing consensus is towards making the thinking more explicit.

In the classroom, what it means to make thinking more explicit can refer to different things. As thinking is a mental activity, it is often said to be “hidden”, especially from novice learners. When we ask students to “think more critically” sometimes they do not know what they have to do. So making thinking explicit can refer to the actions that the teacher takes to make the mental moves in the thinking more transparent to the learner, for example, outlining a plan for more skilful thinking through a set of questions. The importance of making thinking explicit or making it more visible is generally acknowledged in many programmes and approaches, primarily because it opens up the world of thinking for students, giving them opportunities to understand what thinking is, the variety of mental moves and strategies that comprise good thinking, as well as opportunities to practise it in different contexts.

Although thinking is normally considered to take place “inside the head”, it is increasingly recognized that thinking is not only a solo activity. Since the 1980s many schools have recognized the need to help students develop the kinds of social skills needed to collaborate well with others. One major influence on classroom practice has been the cooperative learning movement (for example, Blatchford et al 2003; Johnson, Johnson 1994). Establishing groups in which students divide the group task or have different roles in overseeing the workings of the group (one student as group coordinator, one as recorder, one as reporter, for example) are now common practices in many schools. The shared nature of thinking means that the children scaffold one another’s thinking and enable their thinking to travel further than would happen if they were trying to solve a problem on their own. From the point of view of teaching thinking, this approach provides another way of making thinking more visible, through the thinking words and phrases that students use in their shared experience of thinking, which can then become the object for metacognitive reflection.

The primary model used for project work over the past 25 years has been what has come to be called “problem-based learning” (PBL). Problem-based learning has been used in K–12 education as an approach to teaching creative problem-solving. The problem-solving process is usually enhanced and guided by the introduction and use of a sequence of thinking skills.

In the 2000s the model for PBL morphed into what is now called “project-based learning”. Two basic changes occurred. The first is that the repertoire of contexts for such extended units was expanded to include projects and not just problems. So, for example, the PBL structure is used not only to help students try to solve problems about air pollution, or about a business whose profits are falling off, but to engage in constructive projects like designing a new park in an urban community or organizing a class field trip to an archeological site. The second, and more important change, is that problem-based units have been replaced, in most contexts, by the original model of project work, that is, the **application** of what students have already been exposed to in the curriculum.

Assessing thinking

There are essentially two general approaches that can be identified in the field of assessment:

- (1) the psychometric or testing approach, where critical thinking, for example, is considered to be a general capability of the person that can be assessed separately and relatively efficiently in a single testing session, similar to the principle behind intelligence testing
- (2) the curriculum approach, where thinking is assessed as it manifests itself in a specific learning context in terms of the quality of students’ written work or a performance of some kind.

If we are interested in how skilfully students engage in specific kinds of thinking that we have been trying to teach them, it is important that:

- the prompt makes clear what kind of thinking the student is being asked to show evidence of, for example, whether it is analysing, comparing and contrasting, decision-making or challenging an argument
- the kinds of thinking being assessed are aligned to the thinking-related learning objectives of the curriculum, unit or course
- criteria are developed that relate specifically to characteristics of the thinking and that these are reported separately so that feedback can inform students about the quality of their thinking
- a rubric is developed that shows different standards or levels of proficiency of skilful thinking, with appropriate performance descriptors that distinguish between the levels.

Report part two

This section evaluates the extent to which three of the IB programmes align with the principles and practices that were identified in the first report. IB curriculum documents were analysed to evaluate whether or not the various thinking constructs are mentioned, how frequently they are mentioned, and how detailed the description in the different types of curriculum documentation is. The authors used four coding matrices in reviewing the literature: thinking skills/strategies, thinking dispositions, metacognitive thinking and beliefs about knowledge.

Generally, the authors suggest that the IB should articulate thinking skills more clearly in their curriculum materials and provide guidance on how to make thinking skills more explicit and visible in teaching and assessment practices in the classroom. The second part outlines a number of recommendations for each programme. A selection of these recommendations is provided below.

Recommendations

Primary Years Programme (PYP)

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

- to further articulate the existing generic (transdisciplinary) thinking skills to make them more amenable to instruction
- 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 in TOK
- to extend 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.

Middle Years Programme (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 approaches to learning (ATL) with the approach based on Bloom and the IB command terms 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
- to extend 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.

Diploma Programme (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
- 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

- to identify the development of critical thinking skills as the main objective of TOK, and creative problem-solving as the main objective of CAS
- to identify dispositions that are specifically thinking dispositions and to distinguish these from other desirable learner attributes that the programme seeks to achieve.

References

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This summary was extracted by the IB Research department. A copy of the full report is available at <http://www.ibo.org/research>. For more information on this study or other IB research, please email research@ibo.org.

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