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Research summary

Concept-based teaching and learning: Integration and alignment across International Baccalaureate programmes

Summary developed by the IB Research department based on a report prepared by:

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November 2019

Background

In her seminal work on concept-based teaching and learning (CBTL), Hilda Taba (1962) emphasized the need to focus more on conceptual understandings rather than merely teaching facts. CBTL aims to promote the learning of concepts, which supports the generation and understanding of ideas, the transfer of knowledge and skills, and a critical or reflective perspective towards knowledge itself.

The International Baccalaureate (IB) has been at the forefront of attempts to develop curricula integrating CBTL. This study investigates how consistent the IB's efforts have been to encourage CBTL in its programmes.

Research methods

The first phase of the study was a literature review to identify effective approaches to CBTL and how conceptual understanding might be assessed in developmentally appropriate ways. Second, based on a comprehensive curriculum audit, the study closely examined the four IB programmes—Primary Years Programme (PYP), Middle Years Programme (MYP), Diploma Programme (DP) and Career-related Programme (CP)—to determine the degree to which such approaches are embedded in each set of guidelines and integrated across the programmes. Lastly, to understand the experiences and views of professionals involved in the management and design of the programmes, semi-structured interviews were conducted with 10 senior IB curriculum leaders.

Findings

Literature review

Researchers conducted a detailed review of research materials, arriving at a set of principles against which IB programmes and subjects could be audited. A number of key principles were derived from the literature, and these principles were organized into five themes, as shown below. These five themes then formed the basis of the programme documentation audit.

- The nature of concepts
- Development of conceptual understanding
- Concept-based teaching (key features)
- Concept-based teaching (classroom interaction)
- Assessment approaches

The literature review also analysed the teaching approaches and strategies that support the development of conceptual understanding. Particular features of pedagogy are associated with CBTL, including inquiry-led learning, authentic learning activities, dialogic discussion and flexible integrated assessment. The IB has been recognized for consistently

promoting some of the most effective teaching and learning approaches related to concept-based learning.

Ultimately, the literature review confirmed that CBTL is a relevant approach for contemporary education. CBTL encourages the learning of concepts, facilitating the understanding of ideas, the transfer of knowledge, and a reflective perspective towards knowledge itself.

Audit of programme documentation

Following the interrogation of a range of IB documents, using the principles gleaned from the literature, a comparative table was constructed, focusing on a) how the principles were met, or not met, in the IB *From principles into practice* documents, and b) whether there were differences in the matching of these principles across the four IB programmes.

The visual summary of ways in which the four programmes currently meet the principles arising from the literature review were marked in the comparative tables, based on the following colour codes.

	This principle fits with the material in the documentation
	This principle partially fits with the material in the documentation
	This principle does not fit with the material in the documentation
	We could find no evidence regarding the fit of this principle

The nature of concepts

A limited number of identified concepts are used to structure the content of IB programmes. In the PYP, MYP, DP and CP, these include both concepts identified as "big ideas", which are seen as trans- or interdisciplinary, and also disciplinary concepts, which set out the learning content of the programmes. Table 1 documents how the theme "the nature of concepts" is reflected in IB programmes.

Table 1

Theme: The nature of concepts		PYP	MYP	DP	CP
Principles from the literature	1. Concepts are mental representations of categories of objects, events or other entities.				
	2. Concepts are generally defined as mental representations of categories of objects, events or other entities. They are thus abstractions and have also been called "enduring understandings", "essential understandings", and "big ideas", terms which tend to be used synonymously in the literature.				
	3. Concepts vary in terms of their level of abstraction and/or universality, from everyday concepts, low-level or microconcepts, to key concepts, high-level or macro-concepts. It is important that some emphasis be given in teaching to the more overarching concepts rather than trying to cover lots of material in a superficial way.				

Theme: The nature of concepts		PYP	MYP	DP	CP
	4. Concepts are tools for organizing experience but also for extending the effects of such experience beyond the here and now.				
	5. A threshold concept changes the way in which a student views a subject. Such a concept is likely to be challenging to the learner but, once acquired, is irreversible and transformative.				

The development of conceptual understanding

All IB programmes showed a clear commitment to the development of conceptual understanding by students, in all subject areas. The expression of conceptual understanding becomes progressively more discipline-focused as the student proceeds through the programmes. Curriculum leaders within the IB see a concept-based approach to teaching and learning as a longer-term goal of the review process for programmes, subjects and an IB education generally (Table 2).

Table 2

Theme: Concept development		PYP	MYP	DP	CP
Principles from the literature	6. Concepts develop spontaneously as children experience the world and try to make sense of it. Schooling needs to build on these spontaneous concepts by deliberately introducing learners to a wider range of scientific or academic concepts that they probably would not develop simply through personal life experiences.				
	7. Children's concepts are generally localized to a particular area of expertise and may not generalize to other areas without deliberate prompting.				
	8. Crucial to the development of scientific or academic concepts is helping to arouse the learner's conscious awareness of a concept, thus assisting generalizability across subjects or situations.				
	9. Young children are capable of abstract thinking, provided that the context of such thinking makes human sense to them.				
	10. Theories help learners to identify those features that are relevant to a concept and influence how concepts are stored in memory. Therefore, even quite young children need to be encouraged to theorize (predict) about aspects of the world.				
	11. Learners need to be encouraged to develop their concepts in an area through both assimilation (adding new information to existing mental structures) and accommodation (reworking existing conceptual structures to take account of new information).				
	12. Students learn best when: a) concepts are taught in the context of a specific domain of knowledge rather than in contexts that are more general b) concepts are learned in the process of solving authentic problems rather than when pieces of information are presented as isolated facts to be learned c) the difficulty of a task meets student capabilities.				

Concept-based teaching—key features and classroom interaction

There were some gaps where it was difficult to find evidence that the principles derived from the literature informed the IB approach. Looking at the nature of these gaps, they mostly involved principles that focus on classroom action rather than underpinning

curriculum structures. This could suggest a gap in terms of the documentation rather than the recommended pedagogic practices (Tables 3 and 4).

Table 3

	Theme: Concept-based teaching—key features	PYP	MYP	DP	CP
Principles from the literature	13. Effective concept-based teaching processes involve asking students to: a) identify examples of a concept b) organize and reflect upon this c) provide counter examples d) develop generalizations e) apply those generalizations to previous and future knowledge.	🟡	🟡	🟡	🟡
	14. Concept-based teaching is conceived as a form of inductive teaching in which learners are guided to understand the big ideas rather than being taught directly about these ideas.	⚫	⚫	⚫	⚫
	15. Curriculum should not stress knowledge as a body of information to be mastered but rather as the joining in with traditions of discourse through which students are enculturated to the values of academic disciplines.	⚫	⚫	⚫	⚫
	16. In concept-based teaching, teachers are not required to teach all the factual content of a subject but should select and reorganize only the material they need to ensure that their students can access and learn the big ideas.	⚫	🔴	🔴	⚫
	17. The big ideas of a subject take the form of concepts and generalizations that help learners manage and make sense of the massive amount of information they encounter in subjects.	🟢	🟡	🟢	🟡
	18. Approaches in which students are encouraged to apply their understandings to real-life problems are more successful than traditional textbook-based approaches.	⚫	⚫	⚫	⚫
	19. Backwards design in curriculum planning begins with the objectives of a unit or course—what students are expected to learn and be able to do—and then proceeds "backwards" to create lessons to achieve those desired goals.	⚫	⚫	⚫	⚫
	20. Key features of effective concept-based teaching models include recognizing that both facts and concepts are essential elements of curriculum and that learning is at its most effective when organized as a collaborative activity.	🟢	🟡	🟡	🟡
	21. Concept-based teaching can be thought of as a learning cycle divided into five steps: engagement, exploration, explanation, application, evaluation.	⚫	⚫	⚫	⚫
	22. The implementation of concept-based teaching can bring enhanced freedom to choose for teachers, but this can in itself generate lack of consensus, and teachers will need careful support as they try to implement such an approach.	⚫	⚫	⚫	⚫

Table 4

	Theme: Classroom interaction in concept-based teaching	PYP	MYP	DP	CP
Principles from the literature	23. Teachers ask a great many questions in lessons but need to consider varying the types of questions to include not just factual questions, which focus on content that students need to know, but also conceptual questions, which connect this factual content with the concepts that underpin it, and open questions, designed to provoke thought and discussion.	🟡	⚫	⚫	⚫
	24. Dialogic teaching has been shown to lead to enhanced learning and is characterized by certain features of classroom interaction, namely it is collective, reciprocal, supportive, cumulative, purposeful.	⚫	⚫	⚫	⚫

Theme: Classroom interaction in concept-based teaching		PYP	MYP	DP	CP
	25. Active learning pedagogies have been shown to improve student conceptual understanding and involve students actively reflecting upon what they are learning.				
	26. Concept mapping is also a tool that has been demonstrated repeatedly to have a positive impact on the quality of student learning.				

Assessment approaches

The model of assessment presented in IB documentation at programme level offers numerous opportunities for concept-based assessment through both internal and external means. However, there are differences between programmes in how this is interpreted. Most IB programmes, even at the MYP, DP and CP levels, do include some element of more student-centred assessment. Such inclusions clearly support the inquiry-based philosophy that is central to all IB programmes (Table 5).

Table 5

Theme: Assessing conceptual understanding		PYP	MYP	DP	CP
Principles from the literature	27. Students' answers in tests or examinations may not show their underlying understandings in areas of knowledge. A taxonomy of understanding (eg the SOLO taxonomy) may be a better tool for this.				
	28. A single testing instrument is unlikely to be sufficient for summative or formative assessment. A range of tools is necessary.				
	29. Talking to learners, whether through structured interviews, guided questions or encouraging thinking aloud, is one of the most effective ways of accessing their thought processes.				
	30. Asking students to express their ideas graphically can also provide a powerful window into their thought processes and understandings. This can involve the use of graphic organizers or concept maps.				
	31. Learners can be asked to represent their ongoing understandings in more structured ways through devices such as KWL grids and word clouds.				
	32. Teachers can detect changes in learners' conceptual understandings by looking for key indicators.				
	33. One of the most effective assessment tools is the giving of feedback to students—goal-oriented, actionable, personalized, timely, ongoing and consistent feedback.				

Interviews with IB curriculum leaders

Semi-structured interviews with 10 senior IB curriculum leaders have revealed that all respondents recognized the importance of CBTL and identified conceptual understanding as the overwhelming goal of an IB education. Curriculum leaders were all strongly committed to the idea of close alignment between CBTL, active learning pedagogies and authentic activities, purposefully promoting them through the guides and teacher support materials.

Colleagues discussing the role of concepts in the four programmes identified a confusion between concepts as "big ideas", which are "universal", and concepts as a form of learning beyond knowledge of facts. They related these differing understandings of concepts to

the fact that the programmes become increasingly disciplinary as students progress through their schooling. Interviewed senior staff also recognized that using a conceptual approach to curriculum content and planning could be challenging for teachers, particularly for teachers at the DP level, with their strong disciplinary backgrounds and experiences of other curricula.

Summary

The literature review undertaken in this study has confirmed that CBTL is a relevant approach for contemporary education that supports the learning of concepts, which facilitates the generation of ideas, the transfer of knowledge, and a critical perspective towards knowledge itself.

The IB has already been recognized for consistently promoting some of the most effective teaching and learning approaches related to concept-based learning. New promising teaching and learning models related to CBTL may be further explored and promoted at the classroom level.

The curriculum audit undertaken in this study has clearly shown that the IB is committed to a consistent effort to encourage CBTL. Many of the principles arising from the literature review appear to fit with IB curriculum documents. There were, however, some gaps where it was difficult to find evidence that these principles informed the IB approach. Looking at the nature of these gaps, it was clear that they mostly involved principles that focus on classroom action rather than underpinning curriculum structures.

Reference

Taba, H. 1962. *Curriculum Development: Theory and Practice*. New York, NY. Harcourt, Brace & World.

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

To cite the full report, please use the following:
Medwell, J et al. 2019. *Concept-based teaching and learning: Integration and alignment across International Baccalaureate programmes.* Bethesda, MD, USA. International Baccalaureate Organization.