

Concepts

Concepts and conceptual understanding

Summary

- Concept-based inquiry is a powerful vehicle for learning that promotes meaning and understanding, and challenges students to engage with significant ideas.
- Concepts are powerful, broad and abstract organizing ideas that may be transdisciplinary or subject-based.
- Concepts help to build understandings across, between and beyond subjects.
- Key concepts provide a lens for conceptual understandings within a transdisciplinary unit of inquiry; related concepts provide a lens for conceptual understandings within a specific subject.

A concept-driven curriculum

Concept-based inquiry is a powerful vehicle for learning that promotes meaning and understanding, and challenges students to engage with significant ideas. This is central to the Primary Years Programme (PYP) philosophy. Purposeful inquiry is supported by a concept-driven curriculum (Wiggins, McTighe 2005).

A concept-driven curriculum is the means through which students develop their conceptual understandings. Students co-construct beliefs and mental models about how the world works based on their experiences and prior learning. They integrate new knowledge with their existing knowledge and apply these understandings in a variety of new contexts. They learn to recognize patterns and see the connections between discrete examples to strengthen conceptual understandings.

Concepts

A concept is a “big idea”—a principle or notion that is enduring and is not constrained by a particular origin, subject matter or place in time (Erickson 2008). Concepts represent ideas that are broad, abstract, timeless and universal. Concepts add depth and rigour in student thinking to the traditional “two-dimensional” curriculum consisting of facts and skills. Concepts place no limits on breadth of knowledge or on depth of understanding, and therefore are accessible to every student.

Concepts help to:

- explore the essence of a subject
- add coherence to the curriculum
- deepen disciplinary understanding
- build the capacity to engage with complex ideas
- build understandings across, between and beyond subjects
- integrate and transfer learning to new contexts.

Concepts are powerful, broad and abstract organizing ideas that may be transdisciplinary or subject-based. They represent the vehicle for students' inquiry into the opportunities and challenges of local and global significance. Concepts are concise; they are usually represented by one or two words.

Key concepts

The PYP identifies seven key concepts (figure CO01) that facilitate planning for a conceptual approach to transdisciplinary and subject-specific learning. Together, these key concepts form the component that drives the teacher- and/or student-constructed inquiries that lie at the heart of the PYP curriculum.

Key concepts	Key questions	Definition
Form	What is it like?	The understanding that everything has a form with recognizable features that can be observed, identified, described and categorized.
Function	How does it work?	The understanding that everything has a purpose, a role or a way of behaving that can be investigated.
Causation	Why is it as it is?	The understanding that things do not just happen; there are causal relationships at work, and that actions have consequences.
Change	How is it transforming?	The understanding that change is the process of movement from one state to another. It is universal and inevitable.
Connection	How is it linked to other things?	The understanding that we live in a world of interacting systems in which the actions of any individual element affect others.
Perspective	What are the points of view?	The understanding that knowledge is moderated by different points of view which lead to

		different interpretations, understandings and findings; perspectives may be individual, group, cultural or subject-specific.
Responsibility	What are our obligations	The understanding that people make choices based on their understandings, beliefs and values, and the actions they take as a result do make a difference.

Figure CO01 *Seven key concepts*

Key concepts drive learning experiences and help to frame a unit of inquiry. By identifying and investigating key concepts, students learn to think critically about big ideas. This may be done through broad, open-ended questions in an inquiry. When concepts are viewed as a set of questions, the inquiry is directed, purposeful and manageable.

The questions associated with the key concepts in figure CO01 are a starting point. They represent an introduction to a way of thinking about learning and teaching. They can be used in any order and as regularly as the students and teachers require. There can be more than one concept in an inquiry. In collaboration with students, teachers identify and document the most relevant key concepts in each unit. While the seven concepts in figure CO01 have been identified in the curriculum framework, they are not the only concepts worth exploring, and schools are encouraged to add to this list.

As an example, consider a unit under the transdisciplinary theme “How the world works” with the central idea “Over time, living things adapt to their unique environments” (unit example 1).

- The key concept of “form” could focus the unit on classification and geographical descriptions.
- The key concept of “connection” could focus the unit on how the characteristics of the species connects to features of the environment to ensure survival.

- The key concept of “perspective” could focus the unit on the theories of evolution and adaptation.

Students may choose particular geographies, species or human-initiated change that are significant, relevant, challenging and engaging within this inquiry. As big ideas, concepts place no limits on breadth of knowledge or on depth of understanding, and therefore provide opportunities for every student to participate, regardless of particular background or interests.

Related concepts

Related concepts explore key concepts in greater detail and also add depth to the programme. In contrast to the broad key concepts, related concepts are more narrowly focused. All subjects have associated concepts that reflect the nature of its specific content. For example, in science, “adaptation” could be a related concept connected to the key concept of “change”; in individuals and societies, “sustainability” could be a related concept associated with “change and responsibility”.

Figure CO02 provides some examples of related concepts. Additional related concepts can be found in the PYP scope and sequence documents. However, there are an unlimited number of related concepts that may be drawn from state/provincial/national curriculums to support the inclusion of those requirements into the units of inquiry.

Key concepts	Key questions	Examples of related concepts
Form	What is it like?	Properties Structure Similarities Differences Pattern
Function	How does it work?	Behaviour Communication Pattern Role Systems
Causation	Why is it as it is?	Consequences Sequences Pattern Impact
Change	How is it transforming?	Adaptation Growth Cycles

		Sequences Transformation
Connection	How is it linked to other things?	Systems Relationships Networks Homeostasis Interdependence
Perspective	What are the points of view?	Subjectivity Truth Beliefs Opinion Prejudice
Responsibility	What are our obligations?	Rights Citizenship Values Justice Initiative

Figure CO02 *Examples of related concepts*

From concepts to conceptual understandings

Inquiries in the PYP begins with the central idea. The central idea is the primary conceptual lens that frames the transdisciplinary unit of inquiry. It provides teachers with a structure to introduce concepts that span across national, cultural and subject boundaries to support students' conceptual understandings of a transdisciplinary theme. Supporting agency means recognizing that students bring to the inquiry varying degrees of prior knowledge, and differing cultural and personal perspectives and experiences to the inquiry. These differences may result in a range of conceptual understandings arising from the concepts and ultimately the central idea. Whereas knowledge is locked in time and place, the rich and fluid context of the learners and the learning community renders conceptual understandings that are changeable and may be elaborated or reinterpreted (Milligan and Wood, 2010). For this reason, Milligan and Wood (2010: 492) suggest that "conceptual understandings are better understood as transition points rather than endpoints". The central idea, therefore, is a platform from which students launch their intellectual exploration of the transdisciplinary themes.

Key concepts provide a lens for conceptual understandings associated with a transdisciplinary theme; related concepts provide a lens for conceptual understandings within a specific subject. Concepts facilitate depth and complexity in learning and provide a structure for conceptual understandings that build upon the knowledge and skills to extend and deepen student learning. Compared to simply learning or memorizing isolated facts, locked in place and time, conceptual understandings are changeable, contextual, and may be elaborated or reinterpreted (Milligan, Wood 2010).

The exploration and re-exploration of concepts lead students towards an appreciation of ideas that transcend disciplinary boundaries, as well as towards a sense of the essence of each subject. Students gradually work towards a deepening of their conceptual understandings as they approach those concepts from a range of perspectives.

Knowledge = FACTS = know

Concepts = BIG IDEAS = understand

Differentiating concept- and fact-based learning

Concept-based learning moves beyond facts and leads to breadth and depth of understanding. Exploring concepts distinctly differs from exploring facts in the following ways.

Facts	Concepts
<ul style="list-style-type: none"> • Knowledge-based • Content-driven • Skills-related • Supported by evidence • Frequently topical • Encourage recall and comprehension 	<ul style="list-style-type: none"> • Open-ended • Enable exploration of big ideas • Highlight opportunities to compare and contrast • Explore contradictions • Lead to deeper disciplinary and transdisciplinary understandings • Promote transfer to familiar or less familiar situations, issues, ideas and contexts • Encourage analysis and application
<p>For example, a central idea that is more limited to the exploration of facts versus transferable concepts limits the opportunities of making connections beyond the inquiry.</p>	
<p>A central idea such as “Penguins have adapted to a unique Antarctic environment” has fewer transferable opportunities beyond the inquiry.</p>	<p>The central idea “Over time, living things adapt to their unique environments” is transferable to many different contexts.</p>

Figure CO03 *Facts versus concepts*

Supporting conceptual understandings

Conceptual understandings within the programme of inquiry

In the PYP, conceptual understandings are the aim of a unit of inquiry and forms the central idea. Students arrive at, and deepen their conceptual understandings by inquiring into concepts through a range of perspectives under the central idea. Written in a neutral voice, the central idea is defined as a statement that concisely expresses understandings and connections of the chosen concepts. The statement should be substantial and open-ended enough to support students’ understanding of the transdisciplinary theme and the concepts to which the theme is connected.

By exploring concepts through a central idea, conceptual understandings are promoted and extended. Students explore concepts in each unit by calling on prior experiences to direct their learning and make connections with other concepts. As their conceptual understandings deepen, students effectively transfer and apply their understandings to construct meaning when they re-encounter similar concepts or encounter new concepts. To ensure students have opportunities to develop conceptual understandings for all key concepts, teachers integrate the concepts across age groups and themes in the programme of inquiry.

Exploring concepts is particularly important in culturally diverse school contexts where students bring rich “cultural and linguistic capital” (Darling-Hammond et al. 2015) to promote cross-cultural understanding, to create an inclusive learning environment and to enrich learning and teaching. Carefully developed central ideas promote conceptual understanding by inviting students to:

- think critically about big ideas
- recognize patterns
- make generalizations, predictions and connections across their learning
- transfer understanding to different contexts.

This can be demonstrated in the following example.

Transdisciplinary theme	Central idea	Key concepts	Related concepts
Who we are	People’s relationships have an impact on health and well-being.	Function Connection Responsibility	Cooperation Friendship Balance

Figure CO04 *Unit example 2*

Teachers can make broad conceptual statements more specific, age-appropriate and focused by asking “Why/how does this relationship or principle occur?” and “What are the implications of these conceptual understandings?”

Development of central ideas that are broad and extend students’ conceptual understandings across, between and beyond subjects requires time, careful thought and collaboration among members of the teaching team.

Conceptual understandings in single subjects

Students and teachers also use the key concepts, associated questions and related concepts to guide inquiries in subject-specific learning and teaching. The subject scope and sequence documents provide many examples of central ideas aimed to develop conceptual understandings. The following are some examples derived from those documents.

Central ideas for subject-specific inquiries.	Key concepts	Related concepts	Subjects
Patterns can be generalized using algebraic expressions, equations or functions.	Form Function Connection	Pattern Equation Algebra	This may be a stand-alone mathematics unit to introduce algebra.
We write in different ways for different purposes.	Form Causation	Genre Purpose	This language unit may be developed through a writing portfolio that can be used across several transdisciplinary units of inquiry.
Over time, living things adapt to their unique environments.	Change Connection Responsibility	Adaptation Extinction Habitats	This stand-alone science unit could connect to a unit of inquiry on human migration.

Figure CO05 *Examples of conceptual understanding*

All learning and teaching, including subject knowledge acquisition, is through concept-based inquiry. As PYP teachers become familiar with concepts and conceptual understandings, they identify authentic links between subjects and within the programme of inquiry. Single-subject teachers and support teachers connect learning through the programme of inquiry's central ideas wherever the learning is authentic. At other times, they plan their own conceptual inquiries to explore concepts that connect to the grade-level central ideas.

For example, an inquiry may be developed around the key concept of change. An art teacher explores how art aesthetics have “changed” over time and a PE teacher inquires into the skills needed to “change” from an offence to a defence position in a team sport. Students transfer their understanding of how to inquire into “change” from one context to a new one. By exploring a similar concept in different contexts, students come to appreciate and to develop new understandings and ideas that transcend subject boundaries. Teachers collaboratively plan, reflect and make adjustments as a teaching team throughout the year to ensure a coherent learning experience.

Promoting and modelling conceptual understandings

Teachers promote and model the development of conceptual understandings. Carefully crafted questions, wonderings and provocations:

stimulate critical-thinking skills by:

- providing opportunities to build on prior knowledge and experience
- expanding beyond factual knowledge
- stressing the importance of the “how” and “why” of learning
- sparking student curiosity and engaging them to think conceptually
- inviting investigation
- inviting students to justify their answers
- wording questions in ways that are accessible to students
- asking open-ended questions to allow for personal interpretation
- encouraging pattern-finding in student thinking

expand thinking by:

- generating further questions and inquiries
- seeking clarification and deepening understanding
- opening up possibilities for collaborative dialogues
- emphasizing breadth and depth of understanding

- facilitating the co-construction of meaning and engaging students in their reasoning

connect learning and support the transfer of knowledge by:

- encouraging the application of prior knowledge and skills
- creating opportunities to reflect on concepts across, between and beyond subjects
- ensuring relevance to students' experiences inside and outside school
- opening up possibilities for further inquiry
- offering opportunities to revisit concepts over time
- encouraging application and transfer of learning in different contexts
- linking prior understanding to current inquiry and current understanding to future inquiry.

Additional considerations

- How might evidence of conceptual understandings be documented?
- How does the design of learning spaces continually promote and provoke student questions and wonderings?
- What resources might engage students in thinking about the central idea? (For example, artifacts, experts, field trips, literature, multimedia.)
- How might multimodal communication strategies be available to express conceptual understandings?
- What connections can be made to the local environment to ensure authentic learning engagements?
- Do learning engagements lead to deepening conceptual understanding as the unit progresses?

Learning and teaching strategies

Strategies that support the development of conceptual understandings or central ideas will vary depending on the needs of individual students. The examples of strategies below can apply at any point of an inquiry, providing opportunities for students to build on their knowledge and experiences.

Sketch the concept: On a blank piece of paper, students create a sketch that visually represents their understanding of the central idea. They use symbols and/or pictures only—no words.

Concept map: Students use a concept map to show connections and relationships that develop through the inquiries. These concept maps provide an ongoing representation of the central idea as students add ideas and adjust their thinking.

Exit cards: Students develop questions that they still have about the central idea.

Observation: Teachers observe students as they explore an idea or task, and engage the students in conversation about their current understandings of the central idea. Observations may be recorded as anecdotal notes, audio recordings or by using a checklist or rubric.

Self-assessment: Students make entries in their journals or discuss what they have learned about the central idea/ conceptual understanding being explored. They analyse their thinking and plan for how they might further investigate the central idea.

Bus stop: The concepts being explored in the unit are presented on separate sheets. In groups, students creatively think about, and record, their ideas about the connection to the central idea using symbols and words. Each group moves around each sheet and reads what others are thinking, adding new ideas to the original ideas presented.

Provocations: Throughout an inquiry, teachers and students initiate, stimulate, challenge and extend learning through activities or artifacts that invite (and provoke) new thinking about the central idea. Provocations can include posing questions and wonderings for discussion, making a change to the physical or social learning space, stories, film, bringing in a visitor or artifacts, or inviting a response to a recent event or natural phenomenon.

This list is not exhaustive and schools are encouraged to explore other ideas.

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