



International Baccalaureate®
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Primary Years Programme

The Primary Years Programme as a model of transdisciplinary learning





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IB mission statement

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

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

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

IB learner profile

The aim of all IB programmes is to develop internationally minded people who, recognizing their common humanity and shared guardianship of the planet, help to create a better and more peaceful world.

IB learners strive to be:

Inquirers	They develop their natural curiosity. They acquire the skills necessary to conduct inquiry and research and show independence in learning. They actively enjoy learning and this love of learning will be sustained throughout their lives.
Knowledgeable	They explore concepts, ideas and issues that have local and global significance. In so doing, they acquire in-depth knowledge and develop understanding across a broad and balanced range of disciplines.
Thinkers	They exercise initiative in applying thinking skills critically and creatively to recognize and approach complex problems, and make reasoned, ethical decisions.
Communicators	They understand and express ideas and information confidently and creatively in more than one language and in a variety of modes of communication. They work effectively and willingly in collaboration with others.
Principled	They act with integrity and honesty, with a strong sense of fairness, justice and respect for the dignity of the individual, groups and communities. They take responsibility for their own actions and the consequences that accompany them.
Open-minded	They 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.
Caring	They show empathy, compassion and respect towards the needs and feelings of others. They have a personal commitment to service, and act to make a positive difference to the lives of others and to the environment.
Risk-takers	They approach unfamiliar situations and uncertainty with courage and forethought, and have the independence of spirit to explore new roles, ideas and strategies. They are brave and articulate in defending their beliefs.
Balanced	They understand the importance of intellectual, physical and emotional balance to achieve personal well-being for themselves and others.
Reflective	They give thoughtful consideration to their own learning and experience. They are able to assess and understand their strengths and limitations in order to support their learning and personal development.

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How is transdisciplinary learning defined in the Primary Years Programme?

Through acknowledging and aiming to meet the diverse needs of the student—physical, social, intellectual, aesthetic, cultural—IB World Schools implementing the Primary Years Programme (PYP) ensure that the learning is **engaging, relevant, challenging** and **significant**. The PYP cannot claim exclusively to provide opportunities for learning that are engaging, relevant and challenging, because these are the staple underpinnings of all educational endeavours that are worth pursuing. However, the claim to provide education that is significant is a value-added component of the PYP. Significance is added to the PYP by the commitment to student learning in a transdisciplinary context, embedded in the essential elements of the curriculum framework. Specifically, this is the defined transdisciplinary knowledge, identified as the transdisciplinary themes of the programme of inquiry, and the key concepts and transdisciplinary skills identified in *Making the PYP happen: A curriculum framework for international primary education* (2009).

There is a list of terms that apply to various modes of learning that are not limited to the confines of the subject areas, for example, interdisciplinary, multidisciplinary, transdisciplinary, and so on. As indicated by Gardner, there continues to be a lack of consensus about the definitions, “The term transdisciplinary is often used interchangeably with integrated, interdisciplinary, multidisciplinary and thematic, but research currently occurring nationally and internationally ... would negate the interchangeability of the terms. One reason for this seems to be directly linked to authenticity of learning—the reason for learning, the relevance to the learner and a deliberate focus on understanding the present world.”

The preferred term to describe the PYP is transdisciplinary and in this context the meaning of the prefix “trans” is two-fold: to convey learning that has relevance across the subject areas and more importantly, learning that transcends the confines of the subject areas to connect to what is real in the world. As suggested by Nicolescu (1999), “Transdisciplinarity is ... radically distinct from multidisciplinary and interdisciplinary because of its goal, the understanding of the present world, which cannot be accomplished in the framework of discipline research.” The PYP, being transdisciplinary according to the definition offered here, is markedly different from the interdisciplinary approach of the International Baccalaureate (IB) Middle Years Programme (MYP) where “students come to understand bodies of knowledge and modes of thinking from two or more subject groups and integrate them to create new understanding” but where the learning is nevertheless “rooted in the disciplines” (MYP *Coordinator’s notes* November 2009). In the IB Diploma Programme, the culminating programme in the IB continuum of educational programmes, there is a further transition. Here, the primary organizer of the programme is the focus on academic disciplines, albeit supported by a core that includes inquiries into theories of knowledge (figure 1).

PYP	MYP	DP
Transdisciplinary	Interdisciplinary	Disciplinary
Primary organizer: the five essential elements (knowledge, concepts, skills, attitudes, action)	Primary organizer: the subject groups integrated through the areas of interaction (approaches to learning, community and service, health and social education, human ingenuity, environments)	Primary organizer: the subject groups supported by the core, which includes theory of knowledge

Figure 1

It is interesting to note, particularly given the continuum illustrated in figure 1, that much of the research literature that refers to transdisciplinary learning arises in tertiary education, specifically in the areas of science, technology and medicine. For example, the transdisciplinary model for education advocated by Ertas (2000) “transcends the artificial boundaries imposed by traditional academic organizational structures.” He further postulates that “A transdisciplinary education program is built around a core. This core is then surrounded by knowledge and skills selected from various disciplines.” In considering what might be included in the PYP transdisciplinary *core*, it could be argued that the following components of the PYP framework would belong there.

- The programme of inquiry, the transdisciplinary feature of the **knowledge** element of the PYP
- The PYP key **concepts** that have relevance across and beyond the subject areas
- The PYP transdisciplinary **skills**
- The PYP **attitudes** that broadly support all learning and contribute to the holistic development of the student
- The opportunities that arise from the learning to take **action**, to solve problems or to enhance learning, both of the individual and of the group

This core—the five essential elements of the PYP that support transdisciplinary learning in the programme—would be supported by knowledge, concepts and skills derived from the PYP subject areas (figure 2).

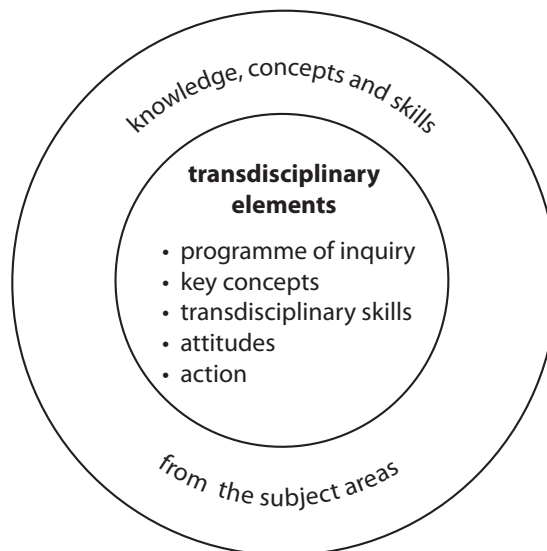


Figure 2

The word *transdisciplinarity* was first used in 1970 by Piaget (Nowotny 2003), at an Organization for Economic Cooperation and Development (OECD) congress in Nice, France on improving methods of teaching in universities. Despite the focus of the congress, Piaget’s perspective was based on his observations of young students and what he saw as a “new kind of knowledge” resulting from the “fluctuation of disciplinary boundaries”. Nicolescu claims that since the early 1970s transdisciplinarity has been “in a kind of sleep because nobody really succeeded in capturing what this was really about—beyond the disciplines” (Volckmann 2007). The PYP, through both the educational theories that have influenced its development and its practice in schools, does address that oversight.

In the following decades, the concept of transdisciplinarity has seemed to resonate most noticeably in three discrete but affiliated areas: university education, education for sustainable development, and curriculum reform in schools. The following are examples of work that has been undertaken in each of these areas.

University education

The Academy of Transdisciplinary Education and Research, at Texas Tech University, USA, has been established “to provide leadership in the development of new models of learning and innovative teaching environments to complement transdisciplinary curricula. Such innovations will include active learning environments, less dependence on formal lectures, project based learning, learning through teamwork, and motivations that inspire lifelong learning.” Additionally, an objective of the academy is to “foster global perspectives on education” (Ertas 2000). There are clearly some parallels between these statements, the mission statement of the IB and the documented goals of the PYP.

Education for sustainable development

A presentation, entitled “Beyond the Four Pillars” (Leo 2006), was given at a conference sponsored by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) in Bangkok, Thailand in 2006. It wove together content from the Delors report (1998) about learning to know, learning to do, learning to live together, learning to be, with Gardner’s (1993) multiple intelligences. It was stated that “UNESCO encourages transdisciplinary approaches to education for sustainable development”. *Interdisciplinary* and *transdisciplinary* were defined as follows.

Interdisciplinary: “Transferring the methods, models, processes or forms of logic from one learning area and applying these within another”.

Transdisciplinary: “Focus on issues across learning areas, between them and beyond them, for the emergence of new and broader perspectives and for deeper understanding of the interrelatedness of complex issues.”

The presentation also listed emerging transdisciplinary approaches, much of which are already exemplified in the PYP, such as:

- the need for coherence in curriculum design
- schools as *learning communities*
- a collaborative, discovery approach to *issues-based learning*
- an active, participatory approach promoting critical thinking.

Reference is also made in the presentation to the need for a *dialogical process*, as described by Freire (1996), where a local issue or problem is identified, which then leads to an in-depth inquiry on the part of the students, much as you might witness in a PYP **exhibition** in the final year of the programme. In summary, “Transdisciplinary learning combined with the development of multiple intelligences & thinking skills and the study of the universal enables learners to understand the bigger picture and interconnectedness of life ...”.

Curriculum reform in schools

The New Basics Project initiated in Queensland, Australia in 2000 identified “skills in high-tech and print literacies, in face-to-face social relations and public self-presentation, problem identification and solution, collaborative and group capacity” as the new basics that need to be developed by blending “old and new knowledge and skills” through the process of “authentic pedagogy” (Education Queensland 2000). The project acknowledged Newmann’s (1996) definition of authentic pedagogy as consisting of “higher-order thinking, depth of knowledge and understanding, substantive conversation, and connectedness to the real world”, and his findings that “authentic pedagogy—specifically intellectual engagement and

connectedness—enhance student achievement on both conventional measures (standardised achievement tests) and alternative measures (moderated teacher assessment of student work).” In an attempt to build a curriculum that requires decisions on what knowledge and skills to include from “a potentially infinite range”, rich tasks were identified, those that are “intellectually demanding, relevant, credible to the community and futures orientated”, tasks that are described in the PYP as **engaging, challenging, relevant** and **significant**. Education Queensland (2001) describes these “rich tasks as transdisciplinary”, providing the means to cut through the overcrowded curriculum, in much the same way as the **central ideas** from the PYP transdisciplinary programme of inquiry, adapted in each IB World School implementing the PYP to reflect local context.

The commonality in all three areas is a shared understanding of the concept of transdisciplinarity as authentic learning beyond the subject areas—learning connected to the world—such that the subject areas are not in opposition to, but complement and support, transdisciplinary learning.

Why is transdisciplinary learning central to PYP philosophy and practice?

The PYP endorses a belief that students learn best when the learning is authentic and transdisciplinary—relevant to the real world—where the learning is not confined within the boundaries of traditional subject areas but is supported and enriched by them (*Making the PYP happen: A curriculum framework for international primary education* 2009).

Is this all too demanding for young students? Shouldn't they be concentrating on becoming competent in the literacies, developing the tools for learning—learning how to learn? At the IB North America annual regional conference in The Bahamas in 2006, Dr Crew, the then superintendent of Miami-Dade public school system, commented on the obligation teachers have to make PYP students skillful in the literacies so that they are able to engage in the higher-order, conceptually based thinking that the transdisciplinarity of the PYP requires: "Clearly, the PYP is a step up and students have to be given the tools to take that step." That step up cannot be taken without a functional command of the appropriate literacies, particularly language, mathematics and the arts, and without the motivation that comes from a level of mastery of those literacies that allows students to feel confident enough to make a contribution to the collaborative problem-solving process of inquiry.

PYP classrooms and schools, where the theory is being turned into effective practice, provide learning environments where coherent, authentic teaching and learning takes place, as opposed to the all-too-often compartmentalized, disconnected teaching and learning experience that can happen in a classroom. The PYP allows transparent connections to be made across the teaching and learning, so that students are aware of the relevance of the learning to their reality and are encouraged to respond with a high level of engagement.

Transdisciplinarity contributes to the international dimension of the programme in as much as it is essential to the construct of the PYP curriculum framework in which themes of global relevance—indicators of our shared humanity—are identified and defined. It provokes the learner into reflecting on, and reconsidering, what he or she believes about the world and about his or her place in it. "Students will feel increasingly challenged and obliged to respond to that challenge when faced with problems relating to themselves in the world and with the world," (Freire 1996).

As stated in *Making the PYP happen: A curriculum framework for international primary education* (2009), the PYP provides opportunities to bring about systemic change in a school or in a school system. Freire (1996) admonishes us that there is "no such thing as a neutral educational process, either it brings about conformity or participation in the transformation of the world." And, in accord, the mission statement of the IB challenges us to "create a better and more peaceful world".

Engaging with the concept of transdisciplinarity forces a paradigm shift that moves most teachers out of their comfort zone, a reason why the required high level of collaboration with colleagues and students is important, as indicated in the *IB Programme standards and practices* (2005). A school working towards candidacy status as an IB World School will realize that engaging with the PYP is not business as usual. For example, effective implementation of the PYP will bring about "a change in the relationship between students and teachers", whereby students "become co-investigators in dialogue with the teacher and jointly responsible for a process in which all grow" (Freire 1996).

The IB learner profile, which applies across the continuum of IB programmes and is relevant to the students and educators in IB World Schools, lists *knowledgeable* as one of the attributes. Klein (1998), in her discussion about what it means *to know*, refers to "the progression of the conceptualization of knowledge from simple to complex, from fragmented to connected and collaborative, from boundary-forming to boundary-blurring, from analysis to synthesis, from a singularity to an integrative process", a definition in keeping with the PYP commitment to transdisciplinarity.

There is a frequently expressed perspective that valuable educational research is solely data driven, that is, quantitative research—a belief that influential research must allow for statistical analysis. This perspective is often reinforced by the kinds of assessment outputs valued by schools, often subject-specific standardized achievement tests. In particular, national or state schools that are government funded have looked for evidence to support their decision to become IB World Schools implementing the PYP. The most pervasive strategy used to provide that evidence—a standardized achievement test of disciplinary learning—is clearly not a best-fit for the overarching aims of the PYP as described in the IB mission statement and in the IB learner profile. However, these test scores are judged as the most meaningful indicators of the success of these schools locally.

Yet other research—qualitative research—that is theoretical and experientially based has determined both the values embedded in, and the structure of, the PYP. The International Schools Curriculum Project, the group of educators that initiated the PYP, relied considerably on the experience of those educators—heads of school, principals, teachers—trained within a variety of national systems, most of whom had taught within those systems before moving into the field of international education as practised in “international” schools. They looked to educational theorists, such as Vygotsky, Piaget, Bruner, Gardner, to provide philosophies that were in alignment with their expertise and perspectives. International schools, which are financially supported mainly as a result of the school’s fee structure, are not under the same kind of pressure to be reliant on an externally produced subject-specific assessment tool. These latter schools have more freedom to determine how they measure success both of individual student performance and of the efficacy of the PYP.

What components of the PYP curriculum model indicate the transdisciplinary nature of the programme?

A commitment to transdisciplinary learning is reflected in the PYP curriculum model and in the curriculum framework that supports it. The PYP curriculum model indicates the iterative relationship between the written, taught and assessed components of the curriculum. The intended output of this highly articulated model is an educational experience for students, and teachers, that is coherent in all its aspects. The written curriculum is defined by five essential elements—knowledge, concepts, skills, attitudes, action—all of which contribute to a learning experience that is transdisciplinary.

The challenge for the PYP, since its inception, has been to define the knowledge component—what is worth knowing that is of relevance to 3–12 year olds, wherever they are in the world and regardless of which ethnic or cultural group they belong to. The resolution of this dilemma in the PYP is the defining of six globally significant **transdisciplinary themes** that resonate with, and allow us to explore, our human commonality. They are significant because:

- they contribute to the uniqueness of the PYP
- they ensure and extend the international dimension of the programme
- they require learning about what is “real” in the world
- they indicate the complexity and the connectedness of the human condition.

Additionally, these themes (figure 3), are not derived from the traditional subject areas but, in their scope, they **transcend** them. This use of the word *transdisciplinary* to mean knowledge transcending the knowledge residing within the subject areas was initially described by Beane (1995). Due to the sum of these characteristics, these themes are best described as transdisciplinary, in keeping with the UNESCO definition of transdisciplinarity that “involves going between, across and beyond different disciplines to develop both a new vision and experience of learning.” (Leo 2006)

<i>The Basic School, Boyer, EL. 1995</i> Core commonalities	<i>Curriculum Integration and the Disciplines of Knowledge, Beane, JA. 1995</i> Centers for learning experiences	<i>Making the PYP happen: A curriculum framework for international primary education, IB. 2009</i> Transdisciplinary themes
The life cycle	Conflict	Who we are
The use of symbols	Living in the future	Where we are in place and time
Membership of groups	Cultures and identities	How we express ourselves
A sense of time and space	Jobs	How the world works
Response to the aesthetic	Money and careers	How we organize ourselves
Connections to nature	The environment	Sharing the planet
Producing and consuming		
Living with purpose		

Figure 3
McGough 1996 (adapted from MA dissertation)

What components of the PYP curriculum model indicate the transdisciplinary nature of the programme?

As stated in other PYP curriculum documents, the work of Boyer (1995), specifically his definition of a *curriculum with coherence* structured around *core commonalities*, was seminal in informing the debate that led to the identification of the PYP transdisciplinary themes. Boyer's overarching concern was to address the question "What does it mean to be an educated person?" and to discover whether it was possible "to organize schools in ways that would relate the curriculum even more directly to students' lives, helping them understand more about who they are and, even more important, who we are as human beings". Boyer proposed an integrated core that "concerns itself with the universal experiences that are common to all people, with those shared activities without which human relationships are diminished and the quality of life reduced." Although Boyer was considering the reform of the entire spectrum of formal schooling, it became evident to him that "education is a seamless web, that one level of learning relates to every other, and that the most promising prospects for educational reform are in the elementary school".

It is to be noted that Boyer's research, funded by the Carnegie foundation for the Advancement of Teaching, was supported by the National Association of Elementary School Principals, USA, and was piloted in a network of schools in the 1980s.

Similarly to Boyer, in an effort to address the issue of the disenfranchised learner, whether it be student or teacher, subjected to a curriculum that is "disconnected, fragmented, incoherent, a collection of information and skills programs", Beane (1995) identified broad "centers for learning experiences".

In identifying the PYP transdisciplinary themes, the perspective and the role of the learner have been taken into consideration. The language used to define the themes suggests the learner actively constructs meaning through inquiry. This is central to the beliefs about how children learn best, as described in *Making the PYP happen: A curriculum framework for international primary education* (2009).

What adds significance to student learning in the PYP is its commitment to a transdisciplinary model, whereby global themes frame the learning throughout the primary years, including in the early years. These themes promote an awareness of the human condition and an understanding that there is a commonality of human experience. The students explore this common ground collaboratively, from the multiple perspectives of their individual experiences and backgrounds. This sharing of experience increases the students' awareness of, and sensitivity to, the experiences of others beyond the local or national community. It is central to the programme and a critical element in developing an international perspective, which must begin with each student's ability to consider and reflect upon the point of view of someone else in the same class.

(Making the PYP happen: A curriculum framework for international primary education 2009: 5–6)

Contributing to transdisciplinary learning in the PYP is student engagement with **units of inquiry** at each year level. These units are consolidated into a matrix known as the transdisciplinary **programme of inquiry**, whereby the themes of global significance, listed in figure 3, frame the learning throughout the primary years, including in the early years. The development of each unit of inquiry is focused on a **central idea** that supports conceptual development and extends understanding of the transdisciplinary theme. The PYP **key concepts**, themselves transdisciplinary, are embedded in the central ideas. Thus, the knowledge component of the written curriculum is built up of transdisciplinary layers, one supporting the other, as indicated in figure 4.

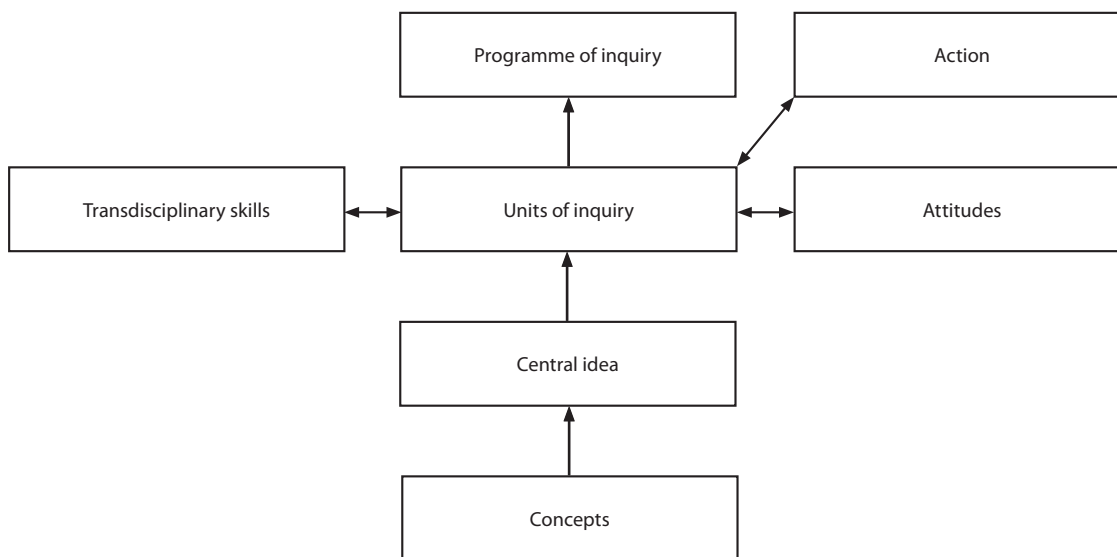


Figure 4
Layers of transdisciplinarity in the programme of inquiry

Although the IB publishes samples of programmes of inquiry, the common practice from one IB World School to another is the construction of a unique programme of inquiry, using the PYP template of transdisciplinary themes. Each school's programme of inquiry is developed to reflect the unique aspects of that school's community, from its geography to the needs and experience of its constituents. "The transdisciplinary themes provide a basis for much discussion and interpretation within a school, and allow for both local and global perspectives to be explored in the units," (*Making the PYP happen: A curriculum framework for international primary education 2009: 12*).

A high level of collaboration is required when planning transdisciplinary units of inquiry. The planning teams, usually consisting of teachers at each year level, need to plan the units together with the remainder of the curriculum for the year. However, a whole-school approach should be taken when developing and refining a complete programme of inquiry. The proposed units of inquiry at each year level need to be articulated from one year to another. This will ensure a robust programme of inquiry that provides students with experiences that are coherent and connected throughout their time in school.

Whole-school involvement in developing the programme of inquiry is, in and of itself, a professional development for all. The activity strengthens each teacher's understanding of the underlying educational theories—including transdisciplinarity—upon which the PYP is based and, through collaboration and cooperation, improves PYP practice throughout the school. The programme of inquiry will have resilience above and beyond the talents and resourcefulness of individual teachers in the school. Although it may be tempting to develop centrally a programme of inquiry for a school district in which there are two or more IB World Schools, an opportunity will have been missed to promote a deep and enduring understanding of, and commitment through ownership to, the transdisciplinary nature of the PYP in each and every school community.

The PYP, because of its commitment to transdisciplinary learning, allows schools to cut down on the amount of subject-specific content they may have been in the habit of delivering. Many PYP schools do not have autonomy in deciding what needs to be covered in the subject areas. That notwithstanding, it is advocated strongly that the principle of "less is more" should apply. The transdisciplinary themes provide the framework for a highly defined, focused, in-depth programme that eliminates redundancy and avoids the pitfalls of a personality-driven curriculum.

(Making the PYP happen: A curriculum framework for international primary education 2009: 15)

What components of the PYP curriculum model indicate the transdisciplinary nature of the programme?

Students inquire into and learn about local and global issues in the context of **units of inquiry**, each of which addresses a particular transdisciplinary theme. Each unit of inquiry is planned and recorded on the PYP planner. Each of these units:

- stands alone as an engaging, challenging, relevant and significant experience
- contributes to a coherent, school-wide programme of inquiry that is framed in terms of transdisciplinary themes of global significance
- draws together elements of different subject areas to support the exploration of a central idea.

Through the units of inquiry, the essential elements are synthesized into a meaningful whole, a coherent approach to teaching and learning.

It is important to note that the programme of inquiry does not necessarily constitute a school's whole programme. Well-planned inquiries provide an ideal context for learning both within and outside the programme of inquiry. It is also recognized that the subject areas have an integrity and essence of their own. Teaching about and through the subject areas is advocated when it enhances the transdisciplinary learning defined in the PYP, but not when the integration results in teaching and learning that is contrived and superficial.

(Making the PYP happen: A curriculum framework for international primary education 2009: 57)

The role of the key concepts

A concept-driven curriculum helps the learner to construct meaning through improved critical thinking and the transfer of knowledge and understanding. The PYP key concepts—form, function, causation, change, connection, perspective, responsibility, reflection—are themselves transdisciplinary and increase coherence across the curriculum. By identifying concepts that have relevance within each subject area, and across and beyond all subject areas, the PYP has defined an essential element for supporting its transdisciplinary model of teaching and learning. These concepts provide a structure for the exploration of significant and authentic content. In the course of this exploration, students deepen their understanding of the concepts and learn to think conceptually.

In planning units of inquiry, related concepts derived from the subject areas are also identified. These related concepts may be seen as subject-specific versions of the PYP key concepts, for example, *transformation* in science is a version of the key concept *change*. These related concepts deepen an understanding of the subject areas while providing further opportunities to make connections throughout the learning, from one subject to another, and between disciplinary and transdisciplinary learning.

What components of the PYP curriculum model indicate the transdisciplinary nature of the programme?

Mapping related concepts listed in the units of inquiry and derived from the subject areas (found in the scope and sequence documents, and state standards where appropriate) against the PYP key concepts

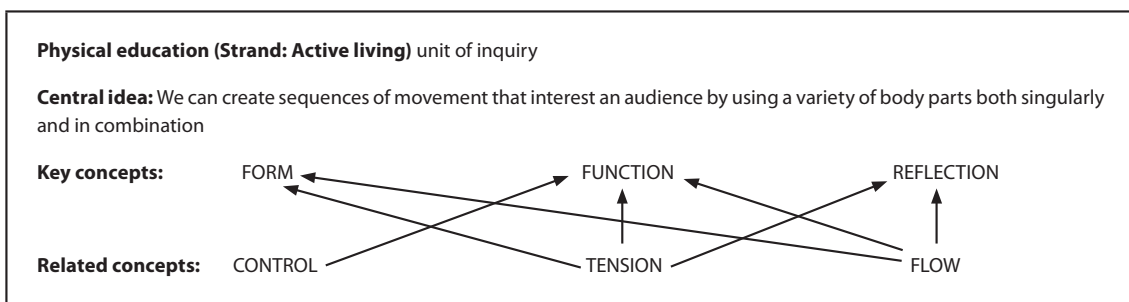
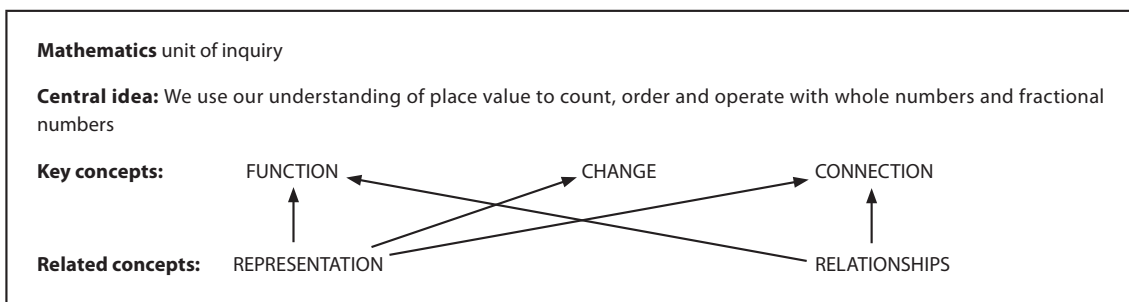
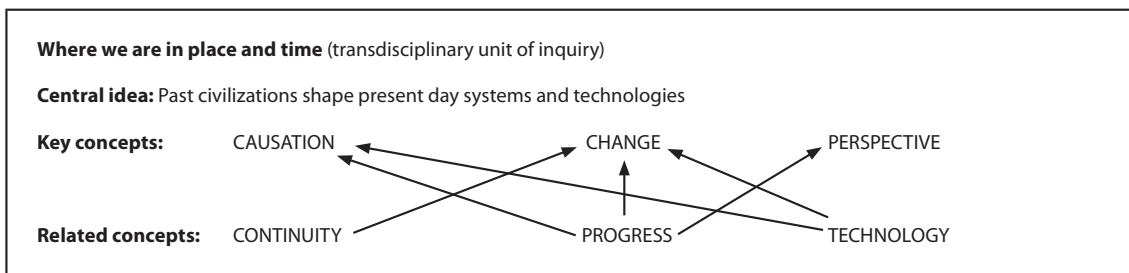
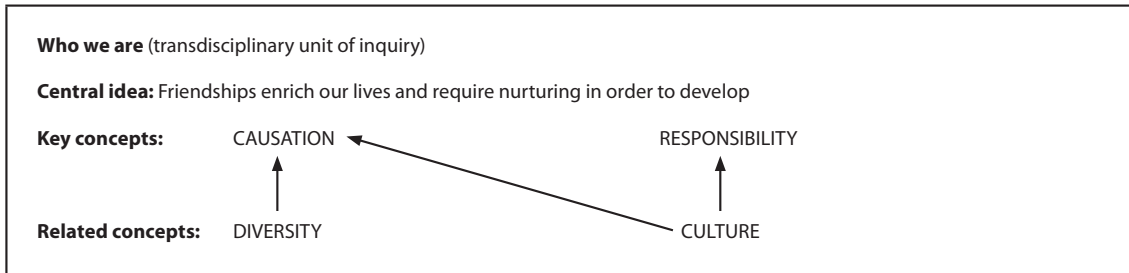


Figure 5

The role of the transdisciplinary skills

Both the subject areas defined by the PYP—language, mathematics, science, social studies, arts, and personal, social and physical education—and the transdisciplinary themes provide focuses for students' inquiry. These inquiries allow students to acquire and apply a set of transdisciplinary skills: social skills, communication skills, thinking skills, research skills, and self-management skills. These skills are relevant to all learning, formal and informal, in the school, and in events experienced beyond its boundaries. Students also develop skills and strategies drawn from the subject areas, but aligned with the five transdisciplinary skills. For example, becoming literate and numerate enhances students' communication skills. The acquisition of literacy and numeracy, in their broadest sense, is essential as these skills provide students with the tools of inquiry. However, the acquisition of knowledge, concepts and skills of the subject areas should not be limited to *stand-alone* teaching opportunities but also needs to be an integral part of the units of inquiry.

How do you ensure that transdisciplinary learning is evident in classroom practice?

The collaborative planning process—when the PYP coordinator and the teachers are constructing the school-wide programme of inquiry and developing transdisciplinary unit planners at each grade level—contributes the most to ensuring that transdisciplinary learning is going on throughout the school. This high level of collaboration, a requirement of the programme, contributes to the ongoing professional development of all involved, the teachers, the coordinator and, where possible, the principal. Every planning meeting is an opportunity for each teacher to rework their personal construct of the relationship between theory and practice in the PYP, as it relates to transdisciplinarity and its articulation with inquiry and international-mindedness. It is an opportunity to share experiences, ideas, processes and imaginings in a way that allows the planning group to share responsibility for the developing understanding of each member of the group.

These planning meetings also provide the time for mapping out the relationship between the school's subject-specific scope and sequence documents and the transdisciplinary programme of inquiry (figure 5). The IB advocates the use of the PYP scope and sequence documents wherever possible. However, in some regions the subject-specific content—usually knowledge, skills and benchmarks—are imposed on the school, as are the standardized achievement tests with which these externally produced curriculum documents are articulated. Under these circumstances it is still important that the school acknowledges in some practical way the conceptual development of students as indicated in the PYP documents. The school needs to *adopt or adapt* the PYP scope and sequences, or at least adapt their own scope and sequences to reflect the conceptual development of students, now organized as developmental continuums as illustrated in the PYP documents. It is not acceptable for a state or national school to be unfamiliar with the PYP subject-specific scope and sequences. To be so limits effective, pervasive practice of the PYP in the school, and in some extreme cases the school, for some time, marginalizes PYP implementation to the transdisciplinary programme of inquiry and the IB learner profile. Boyer (1995) endorses the idea that “shared human experiences might somehow be woven into the fabric of formal education, so the disciplines might be used to illuminate larger, more integrative ends.”

The ways in which the learning environment is shared between the students and the teacher indicate how easily and spontaneously students can make connections across their learning, and how available the teacher is to support or amplify those connections. Students can engage with authentic, transdisciplinary content when they are able to engage with the learning environment in an active way, manage their time and other available resources such as evidence of their learning over time, demonstrate some level of autonomy as learners through decision-making, and use feedback about their work to become more competent learners.

Student learning is supported effectively when students demonstrate an understanding of the aims of the PYP and are able to be articulate about aspects of the framework, such as the transdisciplinary components of the PYP, for example, the key concepts, the attitudes and the transdisciplinary themes that focus the students' creativity, their thinking, their learning and their reflections. They apply their conceptual understanding of the PYP curriculum framework in new learning situations, establishing processes that will support lifelong learning.

Students can share in the planning process, and may even be familiar with the PYP planner. In some cases, students have developed their own version of the planner that they may use in planning the exhibition in the final year of the programme. The exhibition is a transdisciplinary inquiry conducted in the spirit of personal and shared responsibility as well as a summative assessment activity that is a celebration as students move from the PYP into the middle years of schooling. The exhibition requires that each student, working collaboratively with others, demonstrates engagement with the five essential elements of the programme—knowledge, concepts, skills, attitudes and action—all of which are represented on the planner.

How do you ensure that transdisciplinary learning is evident in classroom practice?

No part of the PYP should be considered *the hidden curriculum* and withheld from students. What better way to enlist students' support in the process of learning than by sharing with them what the PYP has to offer them?

It is fair to mention at this point that not all of academia is convinced of the effectiveness of the concept of learners constructing meaning through the pedagogy of inquiry (Kirschner et al 2006).

What are the strategies that support transdisciplinary learning?

The role of the classroom teacher

It is usual in primary schools for each teacher to have direct responsibility for fewer students than is often the case in secondary schools. The organization of secondary and middle schools is usually structured to support disciplinary teaching, to ensure in-depth exposure to the content of the subject areas, supported by specialist teachers in those areas. It can be the case that secondary school teachers are expected to report on the performance of over 100 students during every reporting period. Primary school teachers functioning as classroom or homeroom teachers have a much better opportunity, and therefore obligation, to be aware of the learning needs and of the developmental progress of each student in the context of a wide range of teaching and learning contexts.

The success of the PYP in supporting student learning in the context of the transdisciplinary model previously described is dependent on how well each student is known. There is no better opportunity to provide for an in-depth knowledge of each student as a learner than in a primary school classroom, where the professional adult responsible for each student functions as a compassionate care-giver, a teacher, a coach, and an observant and trustworthy companion. The needs of the students are best served when one teacher is responsible for each student most of the time in order to help students make connections across their learning and with the essential elements of the PYP, and to capture those teachable moments and put them in context. Students need to be coached by teachers that know them well when they are learning in a highly integrative manner, coping with complex problems during cooperative projects. To optimize this coherence of learning through teacher observation, analysis and intervention, it was decided by the PYP committee in February 2006 that mathematics, the language of instruction, social studies and science need to be the responsibility of the classroom teacher—the teacher with whom the students spend most of their time (*PYP Coordinator's handbook 2009–2010*). Single-subject teaching of these areas is not consistent with the PYP model of transdisciplinary learning—learning that transcends the confines of the subject areas, but is supported by them. Additionally, all social studies and science are to be taught within the transdisciplinary units of the school's programme of inquiry (*Developing a transdisciplinary programme of inquiry 2008*). It is to be noted that personal and social education, as defined in the *Personal, social and physical education scope and sequence* (2009) document is the responsibility of all PYP teachers.

When elementary teachers are faced with discrete sets of standards for each discipline, they ask, "How am I supposed to teach with so many different sets of standards?" A disturbing phenomenon is occurring as a reaction to the pressure of academic standards. Schools are embracing the idea of departmentalization as early as 1st grade. Common sense would say that primary grade students who are shuttled through a team of six or seven teachers throughout the day face a confusing array of personalities, academic expectations, and fractured programming. There is little hope of integrating anything with this plan. An elementary principal gave the rationale that teachers can specialize and better meet the academic standards because of their expertise in the area. But what happened to getting to know each child well, providing a familiar nurturing figure, and teaching to a student's strengths and weaknesses **throughout** the day? How can a teacher know 120 students well? I hope a generation of students don't fall through the cracks with this latest innovation.

Adapted from Erickson (2003)

Furthermore, given the PYP perspective on inclusivity, not only are all students engaged in the programme, but all students are engaged with each other in constructing meaning, and in doing so learning to

accommodate the range of abilities and perspectives that will inevitably exist in a heterogeneous classroom. Theorists such as Vygotsky (1978) and Piaget (1928) highlighted the importance of interaction between the learning that is taking place in the social, affective and cognitive domains. The PYP supports the belief that students' learning and their attempts to understand the world around them are essentially social acts of communication and collaboration. The PYP perspective shows a commitment to learning where all students are equally valued and supported to the fullest extent possible, but where one student's learning is not at the expense of another. Both Fischer (2009) and Immordino-Yang (2007) are clear about the significance of the emotional context on motivation to learn and even on establishing neurological learning pathways.

Differentiation through grouping to support learning in a transdisciplinary context

The PYP classroom is a dynamic learning environment, with the students moving from individual work to group work in response to their needs and the needs of the inquiries—both transdisciplinary and subject-specific—to which they have committed, or that have been designed for them. Students will change roles as they move from one group to another or even within the same group over time, working as a leader or initiator, a collaborating partner, or a contributing member of a larger group. The grouping strategies within the classroom allow for mixed-ability and ability grouping, and for groups to change continually, depending on the tasks at hand. The teacher's role is to orchestrate this changing working dynamic so that each student's learning is observed, monitored and effectively supported when working both individually and within various groups.

Mixed-ability grouping based on shared interest frequently supports collaborative learning during the transdisciplinary units of inquiry. Regrouping provides opportunities to work with others who provide different skill sets and perspectives. The strategy of grouping and regrouping should be purposeful, but not merely seen as moving away from whole-class teaching. Over time students will learn to make the group dynamic effective to produce results or to meet requirements.

Learning as a member of a group, while supporting the learning of others within the group, is a value embedded in the principles and practices of the PYP. Learning is a social act that reflects the community in which it is taking place. The community that the PYP promotes is defined by the IB mission statement, the IB learner profile, the PYP curriculum model with its transdisciplinary dimensions, and the PYP implementation standards and practices. That community is supportive, not competitive; reflects a broad spectrum of society, not an elite cohort; is integrated, not stratified; and is committed to lifelong learning, not learning to address solely summative assessment outcomes.

Types of groups

Pair and group work in a PYP classroom is viewed as a collaborative strategy and should engage students as co-learners and co-constructors of meaning. These types of groupings are more likely to be a successful strategy for an inquiry classroom if they are implemented on a regular basis over the year, where students are given the opportunity to develop and use the relevant transdisciplinary skills such as communication, self-management and social skills. If implemented in a sustained way, pair and group work can lead to more autonomous and actively engaged learners and, in turn, can ensure that the responsibility for learning is shared between students and teachers. A classroom where pair and group strategies are successfully operating provides teachers with valuable opportunities for observing each student and for gaining insight into his or her interests, strengths and needs for further learning.



Figure 6

The PYP advocates a student-centred approach to teaching and learning and there are a number of **student-centred grouping strategies** that may be evident in a PYP classroom. These are strategies where students have input into the working relationships within the group and into setting the agenda for the group to follow. The role of the teacher in student-centred group situations is as a facilitator and mentor, one who provides the necessary support and prompts to ensure that the learning experiences are achievable by all members of the group. Importantly, the teacher will need to be sensitive to the learning needs and styles of particular students and ensure that the composition of the group is suitable to the task being undertaken. Also, the teacher needs to provide an environment that encourages risk-taking and student ownership of the learning, and where students are supported in seeing themselves as competent.

There are a number of **teacher-led grouping strategies** that will also be evident in a PYP classroom, strategies where the teacher controls the group dynamic and sets the agenda for work. These include whole-class and small-group teaching and one-to-one teaching situations. It is usual to see the whole class brought together by the teacher in order to manage the day-to-day running of the class, to facilitate large group discussions, to share student work, to affirm student diversity and to create the community within the classroom. Direct teaching of the whole class still has its place, but research suggests that it is best suited for teaching procedural knowledge rather than for more complex learning experiences that require learners to monitor and regulate their thinking (Good, Brophy 1994). In small-group teaching situations, the teacher may provide explicit instruction, explain procedures, facilitate discussions, and provide opportunities for the development of particular skills. Finally, there are one-to-one or individual teacher-led situations. Similar to small-group teaching, these situations involve a teacher working with an individual student or setting students work to guide their individual development in particular areas of learning. Clearly this latter approach provides opportunity for the teacher to differentiate instruction for each student. However, the insight the teacher obtains from observing the learning that happens within larger groups and from analysing the output of each student's efforts within a group situation—often recorded in individual anecdotal records—is essential feedback for further differentiation of teaching and learning. There should also be opportunities for students to work individually, to follow their own interests and inquiries, and to work in a manner that suits them best.

The teacher and the students use these grouping strategies in a dynamic way during a transdisciplinary unit of inquiry—where the in-depth inquiries may well last for several weeks—to create an effective, collaborative learning community in which all learners contribute in a variety of ways. It is likely that student awareness and understanding of this intent extends the metacognitive context for the learning through

student reflection on what the PYP is about. The opportunity should be taken not only to teach and learn within the PYP but also to teach and learn about the PYP.

How to form effective groups

When deciding on the size and membership of a group, the purpose of the grouping should be a guiding factor for the teacher and students. The full range of grouping strategies should be explored over time in order to socialize students in an authentic way that reflects real life. For instance, groups can be organized by interest, levels of prior knowledge, demonstrated ability or performance, friendships, random assignment or student choice. There will be times in a PYP classroom where random assignment of group members meets the needs of the tasks, for example, prioritizing questions to be asked of a visiting expert. Whereas at other times prior knowledge and demonstrated performance may be necessary, for example, applying a particular mathematics concept in a problem-solving situation. Regular reflection on grouping strategies by students and teachers can also increase students' awareness of the learning process. The involvement of students in the decision over group composition and subsequent development of success criteria for group working situations can be effective in raising the effectiveness of group work.

It can be a challenge for teachers to address the range of levels of ability and capability within each class and it will be appropriate to collaborate with colleagues on how best to meet this challenge. A flexible, **within-class grouping** approach groups students from the same class into smaller groups for specific activities and purposes, as in figure 7. The major advantage of within-class flexible grouping is the temporary nature of groups, where students are assessed regularly for growth and regrouped based on that assessment. There should be opportunity for a range of groupings to ensure that all learners can be engaged in work that is meaningful for and appropriate to their specific learning needs, and the resources available to students should allow all of them to have access to the curriculum. The effectiveness of the various grouping strategies depends on "the philosophy behind the grouping, the accuracy with which grouping is made for the purposes intended, the differentiations in content, method, and speed, and the technique of the teacher" (Passow 1982).



Figure 7

Blatchford *et al* (2003) concluded that, based on experimental research, within-class groupings have been found to have modest, positive effects on student achievement, with improved social climate and better attitudes, especially in multicultural classroom settings.

A **between-class grouping** approach is primarily used to group students by ability across a grade or year level or across several grades or year levels, to allow for a whole class or a homogenous ability group to have instruction in specific curriculum areas, for example, for reading or mathematics. A refined version of this ability grouping approach allows for short-term grouping where the students are regularly regrouped as the content of the learning changes. Students' prior knowledge of the concept or level of skill development is assessed. These students are then grouped according to readiness, which may entail them working with a teacher other than their homeroom teacher for some instruction in reading or mathematics, while spending the rest of the day in their homeroom group. Clarke and Clarke (2008) raise awareness of some issues about mathematics ability groups that might inform grouping practices in an IB World School implementing the PYP. Their findings suggest that benefits from ability grouping are attributed to very high achievers, with negative impacts noted on average and low-attaining students. They noted that international testing data shows that ability grouping has an overall negative effect on a country's performance—the greater the use of ability groups, the lower the performance. Ability grouping can oversimplify the learning profiles of individual students placed in groups. Finally, despite claims of flexibility, the research reviewed by Clarke and Clarke suggests that ability groups are difficult to move out of, either in an upward or downward direction.

Within-class flexible groupings, rather than between-class groupings, are more suited to a school implementing the PYP. In the first instance, the homeroom teacher is the teacher with whom the student will usually develop the strongest relationship and who will understand the student's social, physical and academic strengths and needs. Within-class groupings can be regularly changed to reflect individual students' unique learning profiles, and there would be no impact on the timetables of other classes. The essential elements of the PYP are implemented in a transdisciplinary way across the curriculum, and within-class groupings allow for connections to be made between learning areas more readily and the homeroom teacher can extend learning for individual students when he or she is fully involved in all aspects of a student's learning.

While the predominant practice in a PYP school will be within-class flexible groupings, between-class grouping can also have a useful place in a school where there is team teaching taking place. For example, a grade or year level consisting of three classes is inquiring into the central idea, "The design of buildings and structures is dependent upon the environment and available materials" under the transdisciplinary theme *How the world works*. In order to explore the strengths and weaknesses of certain structures, each of the three teachers sets up building challenges that involve varying materials and degrees of difficulty. An initial exploration period allows the teachers and students to establish prior knowledge and interest before grouping students to take the tasks further. For between-class grouping to have a positive impact on student learning, the teachers will need to be highly collaborative, including planning learning experiences, preparing the materials, carrying out observations and providing feedback to individual students and their homeroom teachers on the work undertaken.

Summation

It is usually the case that requirements for university entrance exert a trickle-down effect, even on primary education, as evidenced by the insistence, often at the national or state level, of standardized achievement tests reflecting learning within subject areas. Understandably, parents become anxious about their child's performance in these areas. Consequently, PYP schools need to inform parents about the value-added dimensions of the programme, model commitment to the underlying philosophy of transdisciplinarity and, through parental understanding, enlist their support.

Various academic research groups around the world are looking at the reform of tertiary education. "The development of transdisciplinary education and research programmes in today's universities will be difficult, but well worth the effort. The transdisciplinary model is radically different from traditional educational patterns. The very concept of transcending the traditional disciplines stands in stark contradiction to the classical university organization around disciplinary colleges and departments," (Ertas 2000).

In the meantime, as universities struggle to initiate change, the PYP, through its commitment to transdisciplinarity, is developing competent learners and giving them the tools to engage in lifelong learning in a self-directed manner. It promotes the autonomy of the learner because the learning process and his or her active role in it are made transparent to the students and to the parents.

Let us be open-minded about the art of teaching as well as the science of teaching. At a time when it is fashionable to focus on the evidence, statistical and otherwise, of learning, we ought not to forget the finely honed *intuition* of experienced classroom teachers based on how they have learned to recognize and understand the needs of their students. In a healthy, conducive learning environment where students and teachers flourish, both are supplemental to the other. We, as educators, should not be self-conscious in taking full advantage of these differing aspects of professional practice. That said, the IB is mindful of the responsibility that it shares with IB World Schools implementing the PYP to look more closely at how to measure the effectiveness of the programme.

"The most important aspect of education is not the imparting of specific knowledge, but rather the learning of how to find knowledge when it is needed, how to assimilate that knowledge, how to integrate that knowledge, and how to synthesize new ideas and solve problems," (Ertas 2000).

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