Primary Years Programme

The learning community

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The International Baccalaureate Organization (known as the IB) offers four high-quality and challenging educational programmes for a worldwide community of schools, aiming to create a better, more peaceful world. This publication is one of a range of materials produced to support these programmes.

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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.

As IB learners we strive to be:

INQUIRERS
We nurture our curiosity, developing skills for inquiry and research. We know how to learn independently and with others. We learn with enthusiasm and sustain our love of learning throughout life.

KNOWLEDGEABLE
We develop and use conceptual understanding, exploring knowledge across a range of disciplines. We engage with issues and ideas that have local and global significance.

THINKERS
We use critical and creative thinking skills to analyse and take responsible action on complex problems. We exercise initiative in making reasoned, ethical decisions.

COMMUNICATORS
We express ourselves confidently and creatively in more than one language and in many ways. We collaborate effectively, listening carefully to the perspectives of other individuals and groups.

PRINCIPLED
We act with integrity and honesty, with a strong sense of fairness and justice, and with respect for the dignity and rights of people everywhere. We take responsibility for our actions and their consequences.

OPEN-MINDED
We critically appreciate our own cultures and personal histories, as well as the values and traditions of others. We seek and evaluate a range of points of view, and we are willing to grow from the experience.

CARING
We show empathy, compassion and respect. We have a commitment to service, and we act to make a positive difference in the lives of others and in the world around us.

RISK-TAKERS
We approach uncertainty with forethought and determination; we work independently and cooperatively to explore new ideas and innovative strategies. We are resourceful and resilient in the face of challenges and change.

BALANCED
We understand the importance of balancing different aspects of our lives—intellectual, physical, and emotional—to achieve well-being for ourselves and others. We recognize our interdependence with other people and with the world in which we live.

REFLECTIVE
We thoughtfully consider the world and our own ideas and experience. We work to understand our strengths and weaknesses in order to support our learning and personal development.

The IB learner profile represents 10 attributes valued by IB World Schools. We believe these attributes, and others like them, can help individuals and groups become responsible members of local, national and global communities.

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Contents

A PYP learning community

Summary

- The learning community recognizes that education is a social endeavour benefiting all its members individually and collectively
- An inclusive learning community:
  - lives peacefully together by engaging with different ways of knowing and being
  - prioritizes people and their relationships
  - assumes shared responsibility for learning, health and well-being.
- Everyone in the learning community has agency, see themselves as contributors to its strength and success, and take action to affect change

A shared commitment

The IB connects a worldwide community of learners who celebrate a common humanity and share a belief that education can help to build a better and more peaceful world. Schools offering the Primary Years Programme (PYP) bring a shared commitment to the IB's mission through the learning community.

Education is a social or collective endeavour and a benefit to the community as a whole, as well as to the individuals within it. Everyone in the learning community has agency; they see themselves as contributors to its ongoing strength and success, and take action to bring about change.

To foster international-mindedness, the learning community extends to the whole IB community and views the world as the broadest context for learning. It is inclusive of everyone involved in the life of the school: students and their families, all school staff members and other important adults in the students' lives. By situating learning within local and global communities, outcomes are considered from individual and collective perspectives, highlighting the interdependence of everyone and everything.

Together the learning community:

- lives peacefully together
- prioritizes people and their relationships
- assumes shared responsibility for learning, health and well-being.

The learner profile provides many opportunities to explore attributes that underpin these outcomes, supporting everyone to be principled, caring and reflective community members.

Living peacefully together

The learning community recognizes the critical importance of learning to live peacefully together—have the capacity to relate to others and communicate effectively within and beyond the school environment. Linguistic and cultural diversity play a fundamental role in the development of personal and group identities, in establishing a sense of belonging and in enabling global engagement (Singh, Qi 2013). Students use their home and family languages, and additional languages, to engage with the wider world. They participate in a range of intercultural experiences to challenge fixed perspectives and build understanding of identities, cultures, societies and histories. The learning community understands that knowledge is created within cultural contexts, and supports opportunities for students to engage with different ways of knowing and being.

The PYP transdisciplinary themes, informed by the concept of common humanity (Boyer 1995), provides the basis for all members of the learning community to inquire into what it means to engage with, and to live peacefully in, the world. The learner profile also provides opportunities for members of the learning community to explore the attributes that support peaceful living.

Prioritizing people and their relationships

Establishing partnerships among all stakeholders, and recognizing what each member independently and collectively brings to the community, is the first step in building relationships. Through these partnerships, members of the community come together to develop and to support a shared vision, mission, beliefs and values. They demonstrate attributes of the learner profile, such as caring, principled and communicator, to strengthen these relationships.

Successful collaboration exists with mutual trust and respect for the roles and perspectives the community brings together. Structures are in place to facilitate focused and in-depth conversations about learning and teaching, and decisions are made in the best interests of the learning community. All relationships are dynamic and support the well-being of the learning community as a whole.

In an effective learning community, members form mutually rewarding and productive relationships. Therefore, it is important that schools create opportunities for the following relationships to flourish.

Students and teachers

Teachers value students for who they are—their personal and cultural identities, home and family languages, and their prior experiences and learning. The interactions between teachers and students, in particular, have a subjective and relational quality because the curriculum and associated learning engagements are a lived experience (Giles 2011). These lived experiences support teachers to know their students well—their strengths, interests, perspectives, needs and aspirations—in order to respond to their needs. Teachers encourage students to reflect on their learning, sharing timely, specific and well-considered feedback to help them set goals for future learning.

Students and teachers who have established strong, trusting relationships work in partnership. Students value their teachers as facilitators and activators of learning, and collaborate with them to identify and pursue learning goals. Students participate in planning and decisions that affect them, and feel supported and confident to take initiative and action as part of their learning.

Students and peers

Students establish relationships with their peers. Through peer relationships, they develop and practise many of the skills they will use throughout their lives. They support each other by providing feedback. They learn how to interact socially, build and maintain friendships, learn collaboratively and take collective action.

Teachers and colleagues

Teachers actively contribute to the learning of students and colleagues through collaborative practice. They take time to plan, assess and learn together—inquiring into the effectiveness of their teaching, and reflecting on its impact on learning. They ensure their professional dialogue is open and honest so that learning and teaching becomes the best it can be.

Strong collegial relationships are developed through mutual trust and respect, focusing on professionalism, open communication and a support network. Teachers may consider the following practices to develop collegial relationships.

- Induction for new teachers
- Regular staff meetings
- Co-teaching opportunities
- Professional learning communities
- Action research teams
- Inclusive learning support teams
- Peer mentoring and peer coaching
- Professional development programmes
- Study groups
- Use of technology to facilitate communication and collaboration

School, parents and legal guardians

Partnerships with parents and legal guardians benefit the students and value the perspectives they bring to the learning community. They add richness to the community by being actively involved in the life of the school to share decisions, exchange ideas, build on experiences and provide support. The partnerships between home and school provide the foundation to support students' learning, growth, health and well-being and agency.

The following are some ways that parents and legal guardians and schools can interact.

- Focus groups and working groups
- Parent councils
- Parent volunteers
- Parent evenings and parent-led events
- Student-led conferences and reports
- Learning celebrations
- School-based presentations and displays
- Student learning diaries and portfolios
- Home–school communication journals
- Mentoring for the exhibition
- Informal discussions

Sharing responsibility for learning, health and well-being

All members of the learning community are open to new ideas and committed to seeking a broad range of views and opinions, encouraging open discussion and practising transparent decision-making processes. They demonstrate agency through collective ownership, responsibility and accountability for learning and teaching, and transform schools into dynamic learning communities.

A commitment to collaboration

Collaboration demonstrates a commitment to the common goal of supporting and reflecting on a transdisciplinary learning experience and improving student outcomes. A collaborative approach involves sustained dialogue and reflection among and between all members of the learning community. This approach helps all members of the learning community to grow as learners and as professionals to improve student outcomes, health and well-being.

Collaboration is apparent at a school-wide level, as well as in day-to-day and moment-to-moment learning and teaching. The learning community collaborates in policy development, resource planning and allocation, learning space design, and culture-building. The organization of a collaborative approach may vary in response to the local context and the needs of the learning community, and will always be based on a commitment to the mission of the IB and the PYP pedagogy. Schools extend their collaborative practice to local networks and the wider global IB community through participation in professional development and encouraging teachers to become active members of the IB educator network.

A commitment to inclusion

Teachers extend learning for all students by creating an affirmative and responsive environment that considers student identities and embraces learner diversity from a strength-based perspective.

Taking shared responsibility for learning begins by establishing inclusive support structures that value diversity and support equal opportunity for all members. Members are accountable for increasing access to, and engagement in, learning for all students, regardless of their background or ability. They do so by identifying and removing barriers to learning relating to perspectives, school organization, resources, policies or physical aspects of the learning spaces. The learning community embraces authentic inclusive practices. A learning community that values inclusion ensures that all students are offered opportunities.

Inclusive support structures take into consideration:

- the context, strengths and needs of the learning community
- coordinated and clearly communicated admissions and referral policies
- confidentiality

- a deeper understanding and appreciation of learning differences
- learning opportunities and support for all students
- the impact of labelling learners
- agency and self-efficacy
- transition and integration in the learning community.

A commitment to health and well-being

Health and well-being are fundamental to quality relationships and effective interactions with others. Members of the learning community sustain school cultures by demonstrating the learner profile attribute of caring. They have a commitment to physical, social and emotional well-being, look for ways to build safe and healthy environments, and nurture resilient and optimistic learners.

Every school offering the PYP is unique and influenced by its location, culture and demographics. Therefore, every school community will address health and well-being differently. The learning community may consider the elements outlined in figure LC01.

Figure LC01: School-wide approach to promoting health and well-being

Develop a shared understanding of health and well-being among all the learning community	Promote the importance of agency—voice, choice and ownership
Support everyone to flourish as learners	Develop resilience within the learning community to embrace challenges and change
Promote a safe and caring culture throughout the community, including online	Ensure strategies are in place to support transitions from class-to-class and school-to-school
Develop safe learning spaces that contribute to a sense of physical, social and emotional well-being	Engage staff in professional learning that promotes health and well-being for everyone
Offer a well-planned and consistent physical and health education programme	Develop the community's understanding of the causes and prevention of ill health and ways to nurture positive mental health and well-being
Promote physical activity both within and outside the school	Early identification of and intervention for students experiencing social, emotional, behavioural and psychological barriers to learning

Support students' participation in extracurricular and community-based activities	Recognize the need for strong nurturing relationships

The attributes of the learner profile support the learning community in exploring and expressing different aspects of health and well-being for everyone. Working together, members of the PYP community are supportive, not competitive; reflect a broad spectrum of society, not an elite cohort; are integrated, not stratified; and inspire lifelong learning to build a better and more peaceful world.

Further reading

The PYP stance on student grouping

One of the IB approaches to teaching states:

> Teaching is inclusive and values diversity. It affirms students' identities, and aims to create learning opportunities that enable every student to develop and pursue appropriate personal goals.
>
> (IBO 2007)

IBO 2017

Schools that value diversity create a learning environment where students of varied backgrounds, abilities, interests and perspectives engage with each other in constructing meaning. Learning as a member of a group, while supporting the learning of others, is a value embedded in the Primary Years Programme (PYP). Social interactions and collaboration are both developmentally important for young learners (Piaget 1928; Vygotsky 1978) and for transdisciplinary learning, where openness to other perspectives supports meaning-making (Augsburg 2014).

A PYP classroom that is committed to inclusivity and diversity is a dynamic learning environment. Students move between individual work and group work, as well as among fluid and diverse groupings, in response to their needs and the needs of the inquiries—both transdisciplinary and subject-specific. Such an environment optimizes student learning and minimizes the impact on student self-concept and motivation associated with ability grouping/streaming/setting—a practice not supported in the PYP. Streaming or setting generally refers to a homogeneous or fixed learning environment where students are permanently assigned to a track based on their ability or achievement levels (Chmielewski 2014). Research on ability-based grouping demonstrates that such practice negatively impacts the academic achievement (Clarke and Clarke 2008; Nunes et al. 2009) and the self-concepts of students of all abilities (Precke and Brüll 2008; Chmielewski et al. 2013). Furthermore, fixed-grouping strategy runs the risk of seeing student learning as static, moving neither upward or downward when new understandings in neuroscience show that brain networks are variable and not fixed (Rose, Rouhani and Fischer 2013).

The PYP perspective on inclusivity and variability shows a commitment to learning where all students are equally valued and supported to the fullest extent possible. In the PYP, one student's learning is not at the expense of another's. Both Fischer (2009) and Immordino-Yang and Damasio (2007) are clear about the significance of the emotional context on motivation to learn, and even on establishing neurological learning pathways. Teachers honour the unique contribution each student brings to the learning environment by committing to diverse and frequent grouping and regrouping techniques—mixed-ability and ability-based, large and small, academic, interest and social—that are fit for purpose. This form of grouping is also known as within-class grouping, which aims to create a heterogeneous (mixed) learning environment and has a positive effect on students' academic achievement (Steenbergen-Hu et al. 2016). Furthermore, through these diverse collaboration opportunities, students develop their learner profile attributes, skills and sub-skills such as being an, initiator, collaborator, facilitator, researcher, communicator, a leader and more.

Within-class grouping offers opportunities for students to interact with a wide range of peers as they move from one group to another and take on different roles to complement the background and skills of those in each group. The teacher's role is to facilitate and monitor these groupings. They provide the necessary scaffolds and prompts to ensure that students build on individual and collective strengths to maximize learning for all. Another advantage is the temporary nature of groups, where students are assessed regularly for growth and regrouped based on their unique learning profiles and development trajectory.

Grouping and regrouping

When deciding on grouping strategies, teachers and students consider the intent of the grouping. Exploring a full range of strategies over time offers students opportunities to socialize and to learn in authentic ways. This is important because learner cognitive ability is variable and not fixed (Rose, Rouhani, Fischer 2013). Students and teachers may choose to group by interest, levels of prior knowledge, demonstrated strength, content, process, product, friendships or student choice. Furthermore, students can be simultaneously grouped by academic ability and by interest. For example, a student might be in one group based on their readiness to explore a specific mathematic concept and in another based on their interest towards a transdisciplinary line of inquiry.

For example, in a typical school day, a student may participate in one group based on interest (in certain questions or actions), another on academic ability (to explore a specific mathematic concept) and a third based on friendships (with open-ended activity in the makerspace).

Involving students in the group composition decision and subsequent development of success criteria is important to removing barriers to learning and participation by all students. Similarly, collaboration among teaching team members and specialist teachers—to consider how best to meet the needs of individual students—ensures that commitment to inclusion and diversity is the responsibility of the entire learning community.

Pair and small-group learning: Teachers and students collaboratively decide pair partnerships. Success in this grouping strategy requires that it is carried out on a regular basis over the year to support the development of communication, self-management and social skills. As students become more self-regulated learners, teachers have increased capacity to observe students and to gain insight about their interests, strengths and needs for further learning.

Literacy and numeracy learning: Whenever possible, the IB advocates language and mathematics learning within the programme of inquiry and in authentic ways. However, there are times when subject-specific skills learning and practice are necessary. Where appropriate, a refined version of the skills-based grouping may take place within the class on a temporary basis; students are regrouped as the content of the learning changes. For example, students might be in one group for geometry but a completely different group for mathematical operations. Teachers regularly monitor, document and measure students' academic growth and regroup accordingly.

Between-class learning: The between-class grouping approach is generally defined as grouping by ability where each class within the same grade serves a different ability group of students (Steenbergen-Hu et al. 2016). A refined version of this grouping approach can be meaningful in PYP schools where there is team teaching. For example, a year level consisting of three classes is inquiring into the central idea "The design of buildings and structures is dependent upon the environment and natural resources". After an initial exploration period that allows the teachers and students to establish prior knowledge and interests, the teachers might decide to set up provocations with varying degrees of challenge in three separate classes and group students between classes to take each investigation further.

Individual learning: Students also have opportunities to work individually, to follow their own interests and inquiries, and to work in a manner that suits them best.

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International-mindedness

Summary

- International-mindedness is a view of the world in which people see themselves connected to the global community and assume a sense of responsibility towards its members.
- The learner profile and approaches to learning provide the dispositions and foundational skills for the development and demonstration of international-mindedness.
- The learning community envisions, creates, articulates, and models a culture of international-mindedness.
- An internationally minded learner takes action for positive change.

Defining international-mindedness

International-mindedness is central to the IB mission and is a foundational principle to its educational philosophy; it is at the heart of the continuum of international education.

International-mindedness is a view of the world in which people see themselves connected to the global community and assume a sense of responsibility towards its members. It is an awareness of the interrelatedness of all nations and peoples, and is a recognition of the complexity of these. Internationally minded people appreciate and value the diversity of peoples, cultures and societies in the world. They make efforts to learn more about others and to develop empathy and solidarity towards them to achieve mutual understanding and respect (Oxfam 2105; UNESCO 2015).

Primary Years Programme (PYP) learners and their learning communities have a range of perspectives, values and traditions. The concept of international-mindedness builds on these diverse perspectives to generate a sense of common humanity and shared guardianship of the planet.

Developing international-mindedness

Education for international-mindedness begins by creating a culture in the school that values the world as the broadest context for learning. To build an internationally minded school culture, schools may consider:

- focusing student inquiries on global human commonalities
- creating opportunities for meaningful cultural exchange and action in the local and global communities
- embracing multilingualism to enhance intercultural dialogue and global engagement.

Figure IM01: International-mindedness

The learner profile attributes and the approaches to learning (ATL) provide the foundational skills and dispositions for the development of international-mindedness. An internationally minded learner:

- is a competent communicator
- is open-minded and knowledgeable
- is a caring and principled thinker
- uses his or her curiosity and research skills to inquire about the world
- thinks and reflects critically about opportunities and challenges
- takes action for positive changes (for example, to promote intercultural understanding, foster caring relationships, to care for self and others)
- takes risks to further self-development and understanding of others

(Boix Mansilla and Jackson 2011; Oxfam 2015; Singh and Qi 2013; UNESCO 2015).

Fostering the development of international-mindedness

The development and demonstration of international-mindedness is complex and nuanced. While there is no single formula for supporting internationally minded development, a 2017 IB-commissioned research project examining how IB World Schools conceptualize and implement international-mindedness identified promising practices.

The study found that IB schools demonstrate international-mindedness based on two interrelated concepts:

- "reaching out", to consider how we interact with others
- "reaching in", to understand ourselves in relation to others.

More importantly, schools in the study considered international-mindedness as a journey rather than an end point. This journey is a constant process of defining, learning, acting, reflecting and redefining. Similar to the programme of inquiry in the PYP, the process of developing international-mindedness is seen as being more important than the product.

Figure IM02: Fostering international-mindedness

The role of school and the learning community

The journeys of IB World Schools include several practices that schools may consider within their own context when fostering the development of international-mindedness (Hacking et al. 2017). Schools are encouraged to modify and expand on these practices based on their own context.

Creating a culture of international-mindedness

The formal leadership team plays a significant role in visioning, creating, articulating and modelling a culture of international-mindedness. This includes:

- ensuring that international-mindedness is embedded in the school ethos through mission statements and policies
- encouraging participation in school decision-making by all members of the learning community
- providing opportunities for the learning community to model, develop and demonstrate aspects of international-mindedness.

The informal leadership team facilitates the adoption of an internationally minded culture by creating a learning environment that:

- conveys diversity through the use and display of languages, images and books

- challenges assumptions through inquiries that honour diversity (for example, writers from diverse cultures, male and female pioneers, inventors from a broad range of backgrounds, public figures/ representatives from local and global communities)
- reinforces desired values, dispositions and behaviours in class and in the playground
- provides ongoing opportunities to discuss and reflect on cultural, linguistic, ethnic and social diversity.

Providing professional development

Having a focus on international-mindedness in staff professional development, as well as induction, is a significant aspect of a school's work on international-mindedness. Staff benefit from opportunities to:

- explore what international-mindedness is
- reflect on what it means to them, both personally and collectively
- share ideas to support students' development of international-mindedness.

Making provisions for language learning

PYP schools actively encourage language learning, both for its communication and cognitive benefits and for its direct links to international-mindedness. Language itself is valued by the community as a window into culture—through learning and understanding how a language works, learners gain insight into their own and other cultures, as well as ways of thinking.

The IB encourages multilingualism as a means to supporting students' self-awareness, perceptions, abilities and actions that are necessary for developing positive interpersonal relationships as well as affirming cultural identity. Encouraging students to speak their home and family languages, and to learn an additional language, demonstrates commitment to international-mindedness. It sends the message to the learning community that language is crucial to deepening understanding of one's own and others' cultures, and alternative and multiple perspectives.

Infusing international-mindedness within the PYP framework

International-mindedness and the learner profile are key elements of the PYP curriculum framework, which focuses on knowledge, conceptual understandings, skills, dispositions and action.

Inquiring about human commonalities, ideas and questions that emerge through discussions and conversations can contribute to the development of international-mindedness. Student-led inquiry—where students pose questions based on their own curiosity, background and interests—also provides rich opportunities for intercultural understanding to develop. Schools provide opportunities for local and global engagement by:

- allotting time for sustained inquiry into a wide range of locally, nationally and globally significant issues and ideas
- exploring global concerns at a developmentally appropriate level, including the environment, peace and conflicts, rights and responsibilities, migration and displacement, and governance across a variety of geographical and cultural dimensions
- critically considering inequalities and power dynamics in inquiry, action and reflection—recognizing the factors that influence the challenges faced by different groups (for example, women, youth, marginalized populations)
- considering sustainable development in inquiry, action and reflection—recognizing that the living hold the earth and its resources in trust for future generations.

Inquiries offer students opportunities to share their knowledge, conceptual understandings and perspectives with peers and teachers, avoiding the potential bias of imposing certain "correct" views. Sharing dialogues with people who are different from oneself, and hearing others' perspectives, are essential to exploring international-mindedness. Cultural similarities and differences and lived experiences, shared through the inquiry process, can broaden and enhance knowledge, understandings and perspectives.

Expanding intercultural understanding to extra-curricular activities

Events and learning experiences, such as the arts (for example, music) and sport, can provide meaningful ways to develop friendships and make connections between students:

- from different cultures, nationalities and social backgrounds
- with different learning styles and perspectives.

These sporting or musical events further promote international-mindedness based on the origins of the sport or the musical instruments or music played. At the same time, music and sport involvements are intensely personal, involve a significant degree of student agency and, therefore, are important in developing the attributes of the learner profile and international-mindedness.

Examples of other school events and activities that recognize and celebrate cultural diversity might be oriented around:

- literature
- cultural festivals
- past and current influential public figures
- food and fashion

These events, activities and experiences are some of the ways in which cultural diversity can be explored. Deeper, more critical and personally involved approaches may involve the learning community:

- going out into the community to engage with another school that is different from their own
- taking appropriate action to support particular groups within the local community.

Schools often take trips and excursions to provide students with the opportunities to learn about themselves and others. Sharing and contributing in reciprocal ways in different settings or cultures enhances intercultural understanding. First-hand experience through language and culture exchanges are also an invaluable and effective means to learn about cultural similarities and differences.

Inviting speakers and visitors to share with the learning community can be equally beneficial and can have a powerful impact on learners. With the advent of technology, students can invite guest speakers, locally and globally, to participate in part of the inquiry process or social activity to provide alternative perspectives.

Celebrating diversity

Schools celebrate diversity by creating a safe school environment where members of the community feel secure, respected and trusted to voice their differences. For example, posting signs or notices and displaying student learning in different languages not only promotes a sense of acceptance of difference but also sends the message that diversity enriches learning.

Teachers play an important role in celebrating diversity through modelling internationally minded values and dispositions. For example, teachers:

- encourage and support students to explore multiple perspectives
- share their own experiences, interests and viewpoints with students
- use artifacts, quotes or pictures to bring subjects to life
- are prepared to respond to, and discuss, difficult topics such as national identity or local and global conflicts
- encourage safe and respectful dialogues
- create opportunities for role play
- encourage independent and collective thinking
- challenge disrespectful or insensitive behaviour and comments
- have no tolerance for bullying

- show respect and kindness to all community members.

Through teachers' actions, students learn both explicitly and implicitly that differences and diversity are the norms, which creates a feeling of respect, tolerance and acceptance.

Engaging with, and building relationships in, the school community

Involving and including parents and legal guardians in learning and teaching in an inclusive way is an expression of international-mindedness. This two-way process raises school and teachers' awareness to home cultures and expectations. This reciprocal process with the student, the learning community and the family supports everyone to have a voice in school decision-making.

Supporting students, families, teachers and staff in transition through thoughtful induction programmes is both critical to helping them establish a sense of belonging and to developing international-mindedness among all community members.

Local engagement, through a collaborative and constructive relationship with the school's local community, is another important expression of international-mindedness.

Towards international-mindedness—the role of the students

Developing international-mindedness begins with a positive mindset about the learning environment, the people within the environment and one's relationship within the community. Many attributes of the learner profile can support the development of this mindset, including being open-minded, principled and caring. Through the development of these attributes, students learn to be:

- tolerant and respectful—understanding that other people, with their differences, can also be right
- empathetic— understanding and sharing the feelings of another.

Figure IM03:Engaging with international-mindedness

Being open-minded is a requisite to intercultural understanding. When students are open-minded, they demonstrate the ability to: • be aware of their own feelings and attitudes towards others • listen to other perspectives without making judgment • value peers and teachers for who they are • let go of their own assumptions or prejudices • be aware that body language can also send messages of inclusion or exclusion • be curious • seek opinions from diverse peer groups.	They also develop the capacity to resolve conflict and to build relationships through caring for, and sharing with, others. For example: • including others in games in the playground and in social activities • engaging with different students in the playground and in inquiry groups • being sensitive to the needs of others • treating everyone with mutual respect, including those who speak a different language, come from a different country or have a different learning need or belief • resolving conflict through dialogue	Students further demonstrate international-mindedness through principled actions. For example: • helping new students feel at home in the learning community • translating for a peer who is at the early stages of developing language capability • taking responsibility for their own actions • sharing own cultural traditions and stories in classroom discussions and assemblies • supporting students who have been bullied • modelling appropriate behaviours when insensitive behaviours are observed

	• using multimodal communication strategies to engage as many people as possible.	

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PYP leadership

Leadership and leaders

Summary

- Effective Primary Years Programme (PYP) leadership acknowledges the agency of all members of the learning community to take on formal and informal leadership roles to advance the school mission.
- To create the culture and conditions necessary for all to take on leadership roles, leaders lead by establishing a shared purpose, encouraging shared responsibilities and building leadership capacity in the learning community.

A large body of research consistently affirms the following two claims about leadership (Leithwood et al. 2008).

1. School leadership is second only to classroom teaching as an influence on student learning.
2. Almost all successful leaders draw on the same repertoire of basic leadership practices.

At the core, effective leaders are individuals who provide direction and exercise influence to achieve a shared vision and aspirations of the school. Effective school leaders acknowledge the agency of all members of the learning community and they motivate, challenge and encourage others in the learning community to take on formal and informal leadership roles to advance the school mission.

Perceptions of effective leadership vary across cultures. Leaders contextualize to fit the culture, context or condition of a school. This creates a shared culture that respects and celebrates diversity, and values it as essential for intercultural and meaningful learning. There are a few basic leadership practices that successful leaders from around the world (Leithwood and Riehl 2003) draw on that PYP schools can adopt and adapt.

- Leaders lead by working with others to create a shared sense of purpose and direction rather than imposing goals on the learning community.
- Leaders view their role as consisting of multiple responsibilities that may be shared by various members of the learning community.
- Leaders work through and with others by establishing the culture and conditions that enable members of the learning community to work towards international-mindedness and the indicators of excellence as described in the IB standards and practices.

Formal and informal leaders exist in PYP schools. Both types of leaders are necessary for the ongoing development and implementation of the PYP framework. Leadership capacity within the learning community sustains the IB programmes.

Formal leadership: The pedagogical leadership team

The pedagogical leadership team are formal leaders who are pivotal in shaping and strengthening the learning community. They support the ongoing development of the PYP by identifying the positions that constitute the leadership team and defining the responsibilities of each member. The team draws from the programme standards, practices and requirements, as well as their school's action plan, to inform decisions for continuous school improvement.

The pedagogical leadership team includes members such as the PYP coordinator, the principal/head of school/director, assistant head. Each school decides how shared leadership works best in their own context.

The pedagogical leadership team structure is transparent and communicated throughout the learning community. This alleviates misunderstandings and clarifies responsibilities and channels of communication.

Informal leadership

Teacher leaders initiate and promote practices for continuous school improvement in their classrooms and in their collaborative planning teams. They model agency, self-efficacy, sense of self-worth and the ability to influence. They inquire into their practice, seeking answers through professional development and reading, and action research.

Ensuring student voice: Student leadership

To develop student agency, all members of the community believe in and commit to students' capacity to lead. In *Student leadership, participation and democracy*, Frost and Roberts (2011) suggest that if leadership activities include influencing and inspiring others, taking the initiative, offering support/service, holding others to account, modelling learning behaviour and valuing/encouraging helpful behaviour, then it is reasonable to expect that all members of an educational community, including students, make a contribution.

Establishing a shared purpose

Leaders build shared understandings and agreements to support programme implementation and ongoing development. Central to this work is establishing shared ownership of the school community's beliefs, values, motivations, skills, knowledge and the conditions in which the learning community operates (Deal and Peterson, 2016). In all IB schools, these beliefs and values are embodied in the IB standards and practices. Leaders in PYP schools:

- share the purpose of the IB's mission
- successfully integrate the IB philosophy with the school's unique context
- develop a learning environment sustained by effective structures, organizational practice and resources
- foster a dynamic school culture centred on an inclusive learning community
- positively affect local and global contexts
- create student learning experiences of the highest quality possible.

Learning communities build shared understandings and agreements for quality learning and teaching, and for the well-being of their members. In PYP schools, these understandings and agreements encourage critical and creative thinking through continual inquiry, action and reflection, which places students at the heart of learning. A clear purpose and shared understandings lead to the outcome of an IB education. PYP schools support children to:

- become internationally minded individuals
- develop the attributes of the IB learner profile
- develop knowledge, conceptual understandings and approaches to learning.

The leadership team plays an important role in aligning purpose to actions. It:

- allocates and distributes necessary resources to support the implementation of the PYP
- fosters a dynamic and inclusive culture that promotes agency and values diversity
- supports ongoing professional development, constructive conversations, planning and reflection
- understands the concepts, values and practices of the programme to ensure its continuous development
- has presence, visibility and participates in programme implementation and review
- develops open, trusting, respectful, collaborative relationships
- encourages collaboration among members of the learning community
- engages with multiple perspectives in their community.

The leadership team evaluates its actions towards achieving the shared purpose using the guidance in the IB standards and practices, internal and external data, feedback from students and parents, and from IB visits to inform and identify actions for improving learning and teaching, and well-being.

Sharing leadership responsibilities

It is commonly believed that the responsibilities faced by modern school leaders are practically impossible to meet by one person (Danielson 2007). This requires seeing leadership through the lens of multiple responsibilities that can be shared between the leadership team and the learning community (Danielson 2007). The best way to create shared ownership of responsibilities is to ensure every member has choice and voice. The formal leadership team supports the decisions of the learning community and are behind them in challenging situations.

The PYP coordinator

The principal/head of school and the PYP coordinator collaborate to guide and to support the implementation of the PYP. They create an effective working balance of responsibilities and clearly communicate their respective responsibilities to the learning community.

All IB World Schools offering the PYP appoint a coordinator. The coordinator plays a pivotal role in a PYP school to ensure the fidelity of programme implementation. Depending on the size of the school, the coordinator may have shared responsibility for teaching or other roles It is, therefore, important that the school provides adequate time, resources and IB professional development opportunities to support the role of the PYP coordinator.

Together with other members of the school's pedagogical leadership team, the PYP coordinator takes action on the shared purpose by supporting and promoting excellence in curriculum development and programme implementation across all year levels. The coordinator works collaboratively with each teaching team to ensure that:

- goals and expectations are clearly documented and communicated
- pedagogical aspects of the programmes are discussed, understood and put into practice
- PYP guidance and updates are disseminated and discussed
- the programme of inquiry is collaboratively planned and taught
- the teaching team has adequate time for collaborative planning and reflection
- professional development is embedded into the culture of the school
- the environment is collegiate and supportive
- there is timely, specific and well-considered feedback to members of the teaching team.

The PYP coordinator contributes to continuous programme improvement by connecting the learning community with the IB global community of educators to support innovative practices.

The governing body

To achieve the shared purpose, the leadership team informs the governing body, such as the board or the school district, about the process of becoming an IB World School and secures its commitment to create the conditions for successful implementation of the PYP.

The governing body uses its knowledge of the IB standards and practices to inform its decisions. It supports inclusive practice by ensuring that all students, regardless of learning variability, have the opportunity to participate in the PYP.

The learning community

To strengthen the understanding of the shared values of the PYP within the learning community, leaders facilitate common understanding by:

- developing and implementing two-way communication strategies that strengthen the learning community's understandings of the PYP, and are open to feedback from stakeholders; these might include open evenings, workshops, or face-to-face meetings, formal or informal
- modelling inquiry during meetings or workshops in order to better understand the programme and to promote its understanding by others

- modelling, promoting and celebrating the IB learner profile
- building relationships among stakeholders that contribute to school and programme improvement by encouraging feedback and collaboration among the learning community
- collaborating with school stakeholders to achieve goals that promote the culture and values of the learning community
- being alert to opportunities for school improvement and working towards solutions in overcoming obstacles.

With this understanding, members of the community can take action to support the shared purpose. This may include:

- acting as an expert or resource to support student inquiry
- organizing events
- sharing their own background to enrich intercultural understanding
- contributing to networks of relationships.

Nurturing capacity through and with others

Learning communities systematically seek to examine practices, implement and reflect on new ways of learning and teaching. Innovation occurs through inquiring, reflecting, learning, adjusting and inquiring again. A culture of continuous improvement is open and collaborative; it encourages and fosters different ways of thinking and involves developing the school and leadership capacity to support that goal. A school that is committed to continuous school improvement uses solid evidence derived from a range of sources to identify priorities for future development.

Developing the school

Members of a PYP learning community are open to new ideas, commit to capacity-building, seek a broad range of views, opinions and discussions, and follow transparent decision-making processes. They demonstrate agency through collective ownership, responsibility and accountability for learning and teaching, and transform schools into dynamic learning communities.

Cultivating the environment

Examples of what leaders can do to create a positive environment include:

- pursuing positive interactions with the goals of fostering shared understandings
- garnering resources and support to establish collaborative and productive inter-organizational relationships
- involving members of the community in shaping the organization by including their voice in significant decisions
- building collaborative processes for curriculum development and participation in instructional decision-making
- strengthening the community through using the language of the learner profile, honouring and nurturing family languages or celebrating international-mindedness in the school
- experimenting and piloting new ideas.

Prioritizing people and their relationships

Leaders operate through a series of dynamic, integrated and overlapping influences. A key approach to influencing others is to develop mutually rewarding and productive relationships with them (Duignan 2012), as well as creating an opportunity for members of the community to develop relationships with each other.

Trusting, productive and rewarding relationships, regardless of at which level or with whom, begin with being present. Genuine presence fosters quality and authentic relationships, and it is an effective way to

bring out the very best in oneself as well as in others. It is also by being present that members of a learning community understand the shared vision and can work together to advance it (Duignan 2012).

Leaders who value relationships, create opportunities—as well as encourage members of the learning community—to collaborate and to engage with each other beyond their daily routines and responsibilities. Members of the community establish meaningful and inspiring relationships when they interact formally and informally.

Developing formal and informal leadership capacity

Effective leadership aims to create school sustainability by fostering leadership capacity within the learning community to engage in continuous improvement (Fullan 2005). School cultures with a strong emphasis on continuous improvement are more likely to implement and consider innovative practices to support that goal (Deal, Peterson 2016).

Sustainable leadership is best supported by long-term succession planning involving a "distributed leadership" model, whereby "deeper and wider pools of leadership talent" are developed within the school (Hargreaves and Fink 2005). There are multiple ways leaders can build leadership capacity, including the development of leadership capabilities.

IB leadership capabilities

In an IB World School, where members of their learning community are from diverse backgrounds, leaders understand how cultural and organizational factors influence leadership practices. IB leaders are adaptive, and globally and locally engaged to embrace diversity and its inherent contradictions. For example, divergent expectations between local, state and national curriculums, and the PYP framework, may emerge. Leaders draw on a range of capabilities to manage these challenges, as well as leveraging them to enrich their learning communities.

Effective leaders, both formal and informal, understand that what works in one environment or context might not work in another.

The IB has identified seven leadership capabilities that embody the attributes of the learner profile (Richards et al. IB unpublished work). These capabilities shape and nurture the conditions that facilitate quality learning and teaching in diverse settings.

Figure LS01: IB leadership capabilities

Strategic capability
IB leaders are forward thinking, see the bigger picture, recognize emerging trends and translate strategy into action while aligning people and the organization behind a set of shared values and vision.

Cultural capability
IB leaders continually interact with people, institutions and ideas from different cultural traditions to their own. They harness the human potential within diverse school communities and create a shared culture that not only respects and celebrates cultural diversity but also sees it as essential for intercultural learning.

Pedagogical capability
IB leaders develop a school culture that fosters and values professional development. They recognize that they need to build individual and institutional knowledge and understanding so that schools continue to grow as places where knowledge and meaning are discovered and constructed.

Entrepreneurial capability
IB leaders anticipate change and respond in creative, analytical and practical ways. They demonstrate the ability to innovate, develop, communicate, promote and evaluate new ideas and practices, take intellectual risks and support others in these endeavours.

Relational capability
IB leaders influence individuals, groups and systems to achieve a goal or set of goals. They understand stakeholders and support them to achieve their optimum. IB leaders support members of the learning community to learn together to achieve better outcomes for students.

Reflective capability

IB leaders use thinking strategies when engaging with the different experiences they face. The emphasis the IB programmes place on critical thinking, multiple perspectives and constructivist and social-constructivist views of knowledge creation requires leaders to be comfortable in creating an organizational culture that places critical reflection at its core.

Heuristic intelligence (insight) capability

IB leaders develop shortcuts or make logical leaps of the mind to form an inference of what is the best explanation and solution. They self-reflect and are adaptable to new settings. Underpinning heuristic capability is the need to make quick decisions and rapid judgments with the big picture in mind.

Developing teacher leadership capacity

Developing leadership capacity can avoid the stresses and strains often evident when there is a change in school leadership or in the faculty. The school considers:

- capacity-planning based on an understanding of where the school is with its PYP implementation
- sharing responsibility for capacity-building beyond the principal or the coordinator
- sharing understandings of leadership capacity with others
- transparency in framing and establishing leadership standards, capabilities and expectations
- providing opportunities for teachers to become IB workshop leaders, school evaluators or to take on other roles in the IB Educator Network (IBEN)
- how and when teachers are engaged in decision-making processes.

On a day-to-day basis, the development of teacher leadership capacity is supported by:

- considering a range of formal and informal roles within the pedagogical leadership team
- linking teachers' professional development to programme implementation
- regularly setting aside structured in-service days to develop and reflect on the programme
- planning for a variety of interactions across the learning community to support shared understandings and dialogue among its members
- co-planning teacher attendance at upcoming IB professional development workshops, conferences and network events
- providing timely, specific and well-considered feedback to improve learning and teaching
- encouraging teachers to see themselves as researchers, and supporting their inquiries into pedagogy.

A culture of continuous improvement and innovation is open and collaborative; it encourages the practice of "teacher as researcher". When challenges and opportunities are identified, learning teams use their action research skills to generate possible solutions and approaches, experiment and pilot new ideas, and share the data and outcomes of their research with other members of the learning community.

Professional development balances the needs of individuals and the learning community. Professional development might:

- relate to the school’s action plan
- involve small groups of teachers and leaders deciding to conduct literature research on current thinking in an area of identified need or interest
- include action research by individuals or a group of teachers
- be personalized
- draw on the expertise of staff or with the wider network of IB teachers.

Developing student leadership capacity

Learning communities engage and support students as leaders by ensuring they have voice, choice and ownership in both their learning and in an environment that sustains it. The learner profile provides the ideal vehicle to develop and extend student leadership, and offers opportunities for students to develop

the skill sets related to effective leadership—for example, acting with integrity and honesty, and taking responsibility for their own actions and the consequences that accompany them.

Student voice is evident when:

- students' questions, emotions and behaviours guide learning and teaching
- students identify issues and opportunities, and suggest ideas for action
- students are included in decision-making processes
- students' perspectives are given weight in decisions that impact them.

Student choice is evident when:

- students co-construct with peers and teachers a range of different learning activities and assessment options
- students' ideas and suggestions are recognized and built into the school culture
- student perspectives for action are honoured
- students have opportunities to make decisions about learning independently or in groups.

Student ownership is evident when:

- students define their learning goals with support from teachers
- students reflect on their learning
- students' ideas are supported through action.

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Research

Research demonstrates that school cultures with a strong emphasis on continuous improvement are more likely to implement and consider innovative practices to support that goal (Deal, Peterson 2016). Establishing a culture of continuous school improvement requires that leaders enable the school to function as a professional learning community that both supports and sustains the performance of all key members of the learning community (Leithwood, Riehl 2003), including teachers, parents and students.

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A collaborative approach to transdisciplinary learning

Summary

- PYP schools commit to and support collaboration to improve the transdisciplinary learning experiences and student outcomes.
- Teachers collaborate within and beyond year-level teams, the school and the learning community about learning that takes place both inside and outside of the programme of inquiry.
- Students demonstrate agency, and their capacity to take action for their own learning, by collaborating with teachers and peers.
- Collaborative teaching practices between year-level and subject-specialist teachers come in different forms, and include co-constructed, supported and stand-alone learning experiences.

Demonstrating a commitment to transdisciplinary learning

Collaboration demonstrates a commitment to the common goal of supporting and reflecting on a transdisciplinary learning experience and improving student outcomes. Teachers are continually inquiring into and reflecting on learning and teaching as they collaborate with each other and with their students (Claxton, Chambers, Powell, Lucas 2011). A collaborative approach involving sustained dialogue and reflection helps teachers to grow as professionals. They reach deeper levels of understanding together as they inquire, reflect on and make decisions about the process of learning.

This collaborative approach is apparent at a school-wide level as well as in day-to-day and moment-to-moment learning and teaching. The learning community collaborates in policy development, resource planning and allocation, learning space design and culture-building. Collaboration may vary in response to the local context and the needs of the learning community, and will always be based on a commitment to the mission of the IB and the Primary Years Programme (PYP) pedagogy.

Once learning communities reach broad understandings about the curriculum, they go on to:

- design the transdisciplinary programme of inquiry
- support each other by providing feedback on teaching practice
- create and moderate assessment
- reflect on the success of the units and the programme.

Collaborative learning teams also establish systematic and ongoing professional learning and mentoring programmes that build vibrant professional learning communities. They support new teachers to establish inquiry-based learning and teaching practice. Schools extend their collaborative practice to local networks and the wider global IB community through participation in professional development and encouraging teachers to become active members of the IB educator network.

A collaborative approach puts students at the centre and aims to ensure a holistic, transdisciplinary and coherent learning experience for them. Collaboration starts by developing a shared understanding of what students know and can do.

Students are valued participants of the collaborative learning teams. They demonstrate agency and their capacity to take action for their own learning by collaborating with teachers and other students.

Collaboration—a "distinguishing" feature of transdisciplinary learning

The PYP is committed to transdisciplinary learning as an organizing principle of the curriculum. It has relevance across the subjects and transcends the confines of the subjects to connect to the real world.

Transdisciplinary learning cannot happen without collaboration across disciplines. The key aim of collaboration is to:

> fuse knowledge from a number of different disciplines and engage with stakeholders in the process of generating knowledge.
>
> Wickson et al 2006

To achieve this aim, collaboration is intentional and continual. Collaboration supports the learning community in understanding how the expertise and perspectives of individuals contributes to the fusion of knowledge and new discoveries.

Through sustained collaboration, members of the learning community develop:

- openness towards other perspectives
- engagement with ideas different to one's own
- respect for the contribution of other subjects to the inquiry
- appreciation for rigour in debate and discussion
- appreciation for collective interpretation and reinterpretation of knowledge.

Supporting transdisciplinary learning requires time and a commitment to collaboration. This includes students, classroom teachers, single-subject teachers, librarians, media-specialist teachers, inclusion specialists, and so on. Teachers and students learn from each other as they share knowledge, perspectives and experiences; discuss how to design, plan, facilitate and assess learning and teaching; and consider how to transcend knowledge. Teachers co-learn with students when inquiries take them beyond subject boundaries, exploring a potentially infinite number of opportunities to address the transdisciplinary themes.

Collaboration that supports transdisciplinary learning also engages the learning community in ongoing reflection. Through reflection, members of the teaching team consider the impact of their own frames of reference (which includes subject knowledge, experience, beliefs, values and assumptions) as well as the

collective frames of reference. These considerations are central to transdisciplinary learning and are only possible through collaboration.

Effective collaboration

Providing a meaningful PYP transdisciplinary learning experience requires collaboration before, during and after an inquiry from all members of the school community to:

- establish a clear purpose
- identify shared values and understandings around the benefits of collaboration
- consider how to organize planning meetings
- have access to the people and materials that inform and support the process
- agree on ways to document, communicate and share the ongoing process of planning and reflection.

Making time for collaboration

Finding time for collaboration requires creative thinking on the part of schools. The following examples provide a starting point, although local and national regulations governing each school will influence decisions of this nature.

- Schedule early release or late start days so that teams can plan together; build these into the yearly and/or weekly calendar.
- Build in time for planning together during orientation days.
- Build in shorter school days by making these up with a longer school year.
- Allocate extra budget for substitute teachers to release teams for collaborative planning and reflection.
- Organize staff retreats away from school for collaborative planning and reflection.
- Alternate the focus of staff meetings; professional development, collaborative planning and other needs.
- Release some teachers during assemblies.
- Members of the leadership team (principal, PYP coordinator and so on) covers classes so teachers can meet to plan and reflect together.
- Support face-to-face planning with technology (shared online collaboration spaces; digital meeting platforms to enable broader participation).

Supporting ongoing and effective collaboration

The following questions provide a starting point for schools to consider ways to support ongoing and effective collaboration.

Does collaborative planning and reflection:

- take place regularly and systematically?
- include all teachers, including librarians, IT/ media and inclusion specialists, on a consistent basis?
- respect student agency, include student voice and consider student well-being?
- make room for meaningful dialogues?
- provide a safe space for debating ideas?
- consider all participants' perspectives and experience?
- provide opportunities to reflect on prior experience and future goals?

- address vertical and horizontal articulation of subject knowledge, skills, concepts and attributes of the learner profile?
- ensure that all teachers have an overview of students' prior knowledge and learning experiences?
- respect teacher agency and consider teacher well-being?

The collaborative planning process

Whole-school involvement in developing the programme of inquiry is professional development for all. It can strengthen each teacher's understanding of underlying educational theories and is an opportunity to share experiences, ideas, processes and imaginings to transcend subjects. Through collaboration, teachers develop:

- the capacity to look beyond their own disciplinary boundaries
- the capacity for self-reflection
- the ability to reflect on knowledge integration processes
- the ability to take on new ideas.

Members of the pedagogical leadership team support collaboration by creating opportunities for teachers to develop mutual trust and collegiality (Augsburg 2014). They ensure that teachers:

- collaborate throughout planning, implementation and reflection
- collaborate to connect subject-specific knowledge and approaches to learning
- share responsibilities for helping students make connections across, between and beyond subjects for transdisciplinary learning
- review the programme of inquiry for vertical and horizontal articulation
- collaborate to integrate national, regional and state curriculums in ways that promote understanding of the transdisciplinary themes.

Collaboration between year-level and subject-specialist teachers

Some PYP schools have year-level teachers with full responsibility for their students and responsibility for all subjects. In schools with a single class per year level, teachers from different year levels plan together.

In schools with more than one class per year level, teachers working with a particular year level form a team to plan inside and outside of the programme of inquiry with input from the students. Through such collaboration, teachers offer and present different perspectives and ideas that enrich the learning and teaching experience. Some schools, including those with mixed-aged settings, may plan the programme of inquiry over a two-year cycle.

Note: A four- or six-unit requirement per year still applies to a two-year cycle.

Some PYP schools have year-level teachers, single-subject teachers (for example, arts, personal, social and physical education, music, additional languages, mathematics, and so on) and support teachers. In these schools, everyone views themselves as a PYP teacher contributing to, and planning for, student well-being, transdisciplinary learning experiences and the overall outcomes of the programme.

Collaborative teaching practices can come in different forms. Figures CP01–03 provide some examples. Schools are encouraged to adapt collaborative practices from these examples or from other examples that work in their contexts. The following practices apply to all teachers—year-level teachers, learning support teachers or subject-specialist teachers.

Figure CP01: Co-constructed learning experiences

Collaborative practice	Supported learning experiences
Ways of working	Year-level and single-subject teachers collaboratively plan and independently deliver learning experiences inside and outside of the programme of inquiry. Learning experiences occur in parallel in homeroom and in single-subject settings during the duration of an inquiry. Students construct new knowledge by integrating their learning experiences gained from multiple perspectives
Scenarios	**Scenario 1** In a unit of inquiry under the transdisciplinary theme "How we express ourselves", with the central idea "Throughout history, people have interacted with each other and communicated using arts", students explore with the year-level teacher how images interact with text in literature and, with the arts specialist teacher, how forms of art as communication have changed over time.
	Scenario 2 An investigation to develop the conceptual understanding that "Patterns repeat and grow" in mathematics is co-constructed between the year-level or mathematics specialist teacher and the visual arts and PE specialist teachers. Strong connections are made by applying the mathematics patterns and sequences presented in visual arts and through dance and gymnastics movements.

Figure CP02: Supported learning experiences

Collaborative practice	Supported learning experiences
Ways of working	The year-level or single-subject teacher(s) takes a leading role in delivering learning experiences inside

Collaborative practice	Supported learning experiences
	and outside a collaboratively planned unit of inquiry. This support could occur before, during or after the unit of inquiry on which the teachers had collectively decided. The support could be related to assisting the acquisition of a skill or providing further opportunities for skills practice or application, or for student action.
Scenarios	**Scenario 1** Under the theme "How the world works", with the central idea of "The values and beliefs of a culture are expressed through its languages", the language specialist teacher leads an inquiry into the languages and cultures of the learning community; the year-level teacher supports this throughout the year by providing students with opportunities to use their family languages in investigations, inviting parents to read stories in their own language(s) to the class, or encouraging students to use their own language(s) on the playgrounds.
	Scenario 2 Under the theme "Sharing the planet", with the central idea of "Over time, living things may need to adapt in order to survive", the year-level teacher leads an inquiry into the rights and responsibilities in the struggle to share finite resources with other people and with other living things. The year-level teacher calls on the science specialist teacher to provide a scientific lesson on the impact of environmental changes on habitats.
	Scenario 3 In a unit of inquiry, a librarian supports students to acquire research skills or annotation skills. An IT specialist teacher assists students in using different forms of media for communicating research findings.

Figure CP03: Supported learning experiences

Collaborative practice	Stand-alone learning experiences
Ways of working	A language or mathematics specialist teacher, a support/enrichment teacher or a bilingual teacher co-teaches alongside the classroom teacher—or in a separate setting—to support acquisition or mastery of a specific skill or subject knowledge directly or indirectly related to a unit of inquiry. Teachers ensure that these stand-alone learning experiences are authentic, relevant to the programme of inquiry and reflect the core elements of the IB Learner Profile, conceptual understandings and approaches to learning.
Scenarios	**Scenario 1**

Collaborative practice	Stand-alone learning experiences
	A mathematics specialist teacher supports students to understand basic multiplication and division facts.
	Scenario 2 A year-level teacher supports students in the acquisition of grapheme–phoneme correspondences.
	Scenario 3 A physical education specialist supports students to develop a wide range of movement skills by using a variety of equipment and a range of play experiences.
	Scenario 4 A music specialist teacher supports students' understanding of the elements of music: beat, rhythm, pitch, tempo, dynamics and tone colour.

Collaboration within and beyond the learning community

Students, as agents of their own learning, are fully engaged throughout the unit of inquiry. They define their learning goals, lines of inquiries and success criteria with teachers. They collaborate with teachers to modify learning as new information or interests emerge. They reflect on their learning individually and collaboratively with peers and teachers throughout the inquiry.

When learning is connected to real-life contexts, students see the relevance of their learning beyond the school. There are valuable experts and resources within and beyond the learning community that can be used to support and enhance learning. For example, the following community members might be able to help with learning inside and outside of the programme of inquiry.

- Other students who have a particular passion or interest
- Colleagues working in a different section of the school
- Parents and extended family members
- Experts and professionals in various fields within the local and global community

Collaboration with members outside the learning community is key to providing students with an authentic learning experience and in helping students making connections from their learning to the real world.

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Creating learning environments

Summary

- A learning environment encompasses multiple learning spaces–built and natural, outdoor and in, formal and informal.
- Students actively participate in the design and co-construction of learning spaces including the learning opportunities that occur within those spaces.
- Learning spaces are flexible, inviting, and engaging.

Contexts for learning

A learning environment is the context in which learning happens. Learning occurs in environments that promote collaboration and a shared sense of purpose and belonging. An environment respects the agency of "rich and powerful learners" (Edwards, Gandini and Forman 2012), inspires creativity and innovation, and recognizes experimentation and failure as an integral part of the learning process. The child impacts the environment (Bronfenbrenner 1979) and is, in turn, impacted by the environment. Every action in the environment brings about a reaction, and it is through this reciprocal process that learning occurs. For example, while the ground does not "teach" a child, he learns about the breakability of a glass object when he drops it on the ground and sees and hears the glass crack.

Students also define their identity in learning environments (Edwards, Gandini and Forman 2012). They do so by being active members of the learning community, providing inputs in decisions that affect them and making choices about materials and other learning opportunities to make sense of the world. It is important that consideration of learning environments includes all members of the learning community, together with the components that can improve outcomes for learning and for life. This includes pedagogy, safety, social and emotional well-being, as well as the virtual and physical spaces where learning occurs.

Characteristics of learning environments

Safe and inclusive learning environments recognize and reflect diverse ways of knowing, being and thinking. Primary Years Programme (PYP) schools take a broad view of learning; the curriculum is the entire learning experience that the school offers. Learning may occur anywhere and anytime, in real and in virtual spaces, both inside and outside the programme of inquiry.

Engaging learning environments inspire the imagination and creativity of learners, and encourage the process of inquiry, action and reflection. These environments provide opportunities for emerging inquiries; students may take their learning in new and unexpected directions, developing and demonstrating the attributes of the IB learner profile.

Learning environments include multiple learning spaces. They can be built and natural; physical and virtual; indoors and outdoors; and formal and informal. Beyond spaces, environments also include the relationships among and between the people, the materials, the agreements and the schedule. Students learn through formal and informal experiences, through involvement in everyday learning and school events.

Learning spaces are flexible, allowing for planned and spontaneous opportunities for quiet, independent learning, interactive group learning and spaces for students to make and create. Flexible learning spaces take into account students as individuals and are responsive to diverse needs, backgrounds, abilities and interests. Students who are involved in designing their learning spaces feel greater ownership and influence over their learning. Learning spaces can be designed with different combinations of resources that interact to support learning and teaching.

Digital connectivity plays a key role in the learning environment as it broadens learning beyond the local community to the world stage. Technology offers unlimited opportunities for students to enter worlds far removed from their own, to explore challenges and opportunities from many perspectives and to collaborate with people worldwide on projects of shared interest. Through these connections students learn what it means to be a participant in a global community. They learn to use technologies in ways that are socially and ethically responsible and that contribute to the global learning community.

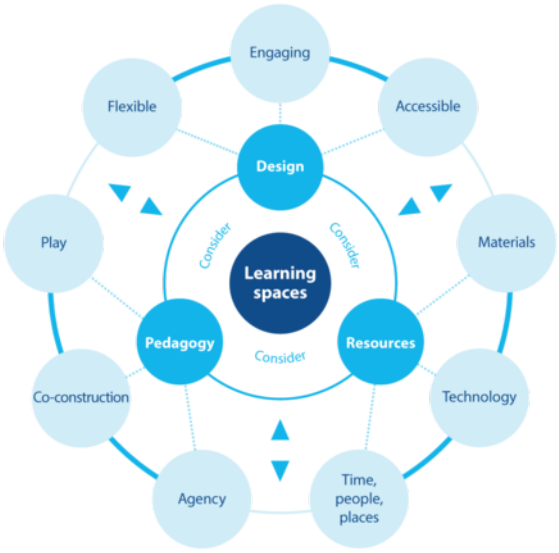
Connecting pedagogy and design

PYP learning spaces affect and reflect values and beliefs about learning. They play a role in shaping the culture of the learning community by facilitating certain ways of acting and interacting. They support a constructivist and social-constructivist (Vygotsky 1978) approach to learning and teaching. They are multifunctional, emphasizing personalization of learning, promoting independence and engagement.

The learning community consider the connections between pedagogy and design, and how spaces are best used by members of the learning community to meet the stated goals.

Figure LE01 helps guide community decisions regarding learning spaces. This may be used to facilitate the conversation in the design of new spaces or modification of current learning spaces involving teachers, administrators, business managers, architects and students. The figure may also be used by teachers and students in considering how they can optimize the design of their learning spaces.

LE01: Connecting pedagogy and design



Pedagogy

Learning spaces that align with the PYP pedagogy support the development of approaches to learning and enhance connections between, across and beyond subjects within and outside of the transdisciplinary programme of inquiry. They support investigation and research, and provide opportunities to revisit earlier inquiries to build understanding. They also invite critical and creative thinking, and represent different cultures and contexts.

Play supports the acquisition of social, cognitive and physical skills. Learning spaces are designed with play in mind. Through play, students experience and practise the skills of conflict resolution, cooperation, sharing and problem-solving (Steinhagen, Iltus 2004).

For early years students, learning spaces also offer opportunities for symbolic exploration and expression, with teachers adapting space and materials to support young students' evolving needs, developing interests and theories.

Teachers co-construct learning spaces with students, providing voice, choice and a sense of ownership. This supports well-being, a sense of familiarity and belonging, and pleasure in inhabiting those spaces, for teachers and students alike.

The entire learning community shares responsibility for caring for the learning spaces. Regular reflection considers how spaces are kept dynamic, purposeful and responsive to learning.

Design

Learning spaces need to be flexible, both pedagogically and physically, in ways that reflect the nuances of different knowledge areas, cognitive and social skills development, as well as personalizing learning (Blackmore, Bateman, Loughlin, O'Mara and Aranda 2011). The design also fosters encounters and encourages relationship building and communication.

Design considerations

Learning spaces are designed to be accessible to all members of the learning community. These spaces support learning and well-being by identifying areas for socializing, reflecting, and for planned and incidental learning. Learning spaces are designed so that materials for student use are stored, organized and labelled for easy access. There is intentionality in how and where resources, furniture and materials are placed and presented, and how they are modified and adapted. When thinking about the learning environment and the spaces within it, teachers consider whether it:

- respects and reflects students' individual and group identities—backgrounds, interests, needs
- encourages student voice and choice
- supports inquiry—students as inquirers/researchers
- supports the development of approaches to learning and the learner profile
- promotes independence and self-motivation
- connects strongly with communities
- fosters a sense of belonging, safety and ownership.

Flexible learning spaces

Flexible learning spaces support varied learning experiences and provide opportunities for individual learning and collaboration. Within spaces, there are zones for different activities: collaborative group work, small group learning with adults, reading, creative learning, experiments and testing, and dramatic play. They enable a balance of experiences to facilitate the approaches to learning and promote choice, decision-making and independence.

Flexibility is also supported with furniture that can be arranged in different ways, for example, movable storage units, varied seating options and multipurpose pieces.

Inviting learning spaces

Learning spaces welcome the learning community. They reflect the culture of the school, the kinds of learning and thinking that are valued and celebrated, and help to foster the development of the learner profile attributes. The general ambience and aesthetics of all spaces require consideration.

Engaging learning spaces

The arrangements of displays and materials invite engagement, meaning-making, exploration and reflection. In a PYP classroom, materials are varied and open-ended, with learners using their creativity to manipulate and use the materials.

Displays in classrooms and shared spaces make student learning visible. In a classroom that values the learning process, displays of learning in progress are equally as visible as the final product. What is on display—and how it is displayed—inspires, invites and informs. Students co-create displays to share their ideas and thinking with other members of the learning community. The documentation and presentation of learning allows students to see the processes others use to demonstrate their understanding, thereby inviting discussion, reflection and feedback to enhance learning.

Connected learning spaces

The learning community ensures relevance and connection between the classroom and the lives/family life of the students. Displays reflect the multilingual nature of the learning community and help build intercultural understanding (Callaghan 2013). They also reflect the lives of the students outside of the classroom so they see learning as an integrated experience between school, home and the community.

Figure LE02 provides examples of some of the design elements discussed.

Considerations and ideas for displays		
Feedback process is made visible	Photos of student engagement in learning	Images and artifacts to generate curiosity and questions
Questions—teacher- and student-generated questions linked to units of inquiry and other learning	Connections to previous learning—from both this year and previous years	Books—fiction and non-fiction—linked to units of inquiry and of general interest
Photographs connected to students' identities, families and localities	Evidence of current and ongoing learning—written, visual	Class-generated learning
Signage and descriptions that explain what is happening in pictures, for experiments set up, for artifacts, and so on	Agreements for learning	Learning goals and success criteria for learning
Evidence of connections to the learner profile co-created with students	Links to single subjects	Transdisciplinary themes and subjects represented

Figure LE02: Design elements

Space design for early years learners

Young students learn through sustained time for play and discovery. PYP early years spaces need to provide opportunities to play independently and in groups. To develop a sense of ownership both indoors and outdoors, routines, rituals and shared understandings are developed to support being and learning together. Learning spaces reflect young students' social–cultural worlds where family, identity and languages are represented through the use of pictures, artifacts and displays.

At this age, students rely on sensory input to make sense of the world. Materials and resources for young students invite play so that they have multiple opportunities to manipulate objects, build and test theories to construct meaning both indoors and outdoors.

Library/multimedia centres

PYP libraries are increasingly flexible multimodal spaces. They provide people, places, resources and services that aid and extend learning and teaching. As libraries evolve to meet the needs of their learners, they develop different combinations of real and virtual resources. Libraries consider universal design principles to ensure that knowledge is accessible for all learners.

The outdoors

The outdoors extends the range of learning experiences. The possibilities depend on the size of the outdoor area, noise level, access for movement, and the degree of connection to the natural world.

Time spent outside is viewed as an important time for authentic inquiry, learning and play, social interaction, movement and relaxation. Consideration is given to different stimuli the outdoors provides and the availability, arrangement and rearrangement of materials. Observations in the outdoors, such as seasonal changes or local bird migration patterns, can be integrated indoors for further inquiry and meaning-making.

Outdoor spaces also have the potential for extending inquiry, risk-taking and supporting well-being through socializing, negotiating and communicating in both planned and incidental learning activities.

In urban environments, natural outdoor environments may be "by design. Schools consider factors such as time, resource and usage policy in the design process so that students so that students experience a balance of indoor and outdoor environments.

Resources

Adequate resourcing complements learning space design. Effective pedagogy and design are influenced by thoughtful use of resources: time, people and places, materials and technology.

Time

Extended blocks of time deepen student inquiry and collaboration. Teachers consider multiple opportunities for students to revisit, practise and reflect on their learning, and build in time for cognitive and social skills development. Time is provided to share, reflect on and celebrate learning, and for students to take action when and where appropriate. In allocating time, the learning community considers whether the schedule supports thoughtful and sustained engagement with the inquiry, resources and materials, and collaboration with peers and teachers.

People and places

People and places play an important role as local and global resources for learning inside and outside of the programme of inquiry.

Inviting experts, such as parents, people in industry, historians, artists and scientists, to speak about areas of relevance connects students to learning in authentic ways. Visiting places in the community connects inquiry to local contexts and can spark new investigations. Peer-to-peer collaboration and feedback enhance student understanding. Pairing younger students with older students enables friendships to form across the year levels and provides students with leadership opportunities and role models.

Materials

Obtaining materials to support and enhance learning requires planning. Resources can be commercially sourced, created from the environment, and made by the teacher or student. The reuse and recycling of materials as a sustainable practice is a shared responsibility of the learning community. Considerations for material sourcing include:

- the open-ended nature of materials to invite exploration and encourage innovation
- a variety of materials in terms of form, texture and size to appeal to all senses
- authenticity of the materials to connect to the real world
- the connection between materials and the programme of inquiry.

Technology

Digital and non-digital technology literacies are considered when designing learning spaces as they extend when, where and how learning and teaching takes place. Effective design provides space for students to safely learn about technology and through technology. Adequate access to digital technologies and the internet is increasingly important to support student inquiries as they develop in the classroom or other learning spaces.

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Technology in the PYP

Summary
• Technology includes both digital and nondigital tools and resources that facilitate and expand learning possibilities • Schools provide students with multiple, authentic and purposeful opportunities to learn technology, learn about technology and learn through technology. • The learning community supports students to be responsible and ethical digital citizens.

Technology integration and implementation

Technology brings change to our world and our schools, and evolves our ways of thinking and doing. Technological change brings new environments to navigate, new skill sets to learn, new tools to innovate, and new opportunities to connect learning communities worldwide.

Similar to language, technology has the power to bring the learning community closer together and overcome boundaries. It is a means to investigate ideas, communicate findings, connect people and innovate solutions. Purposeful technology integration and implementation in authentic contexts can excite, invite, support and extend learning in multiple ways.

Integration is about pedagogy and ways of thinking, and is practised most often by teachers and students. Implementation is about the tools, infrastructure and other resources used to support learning and teaching. For more ideas on integration and implementation, see *Teaching and learning with technology: A guide of basic principles* (International Baccalaureate Organization 2015). Effective integration and implementation of technology considers:

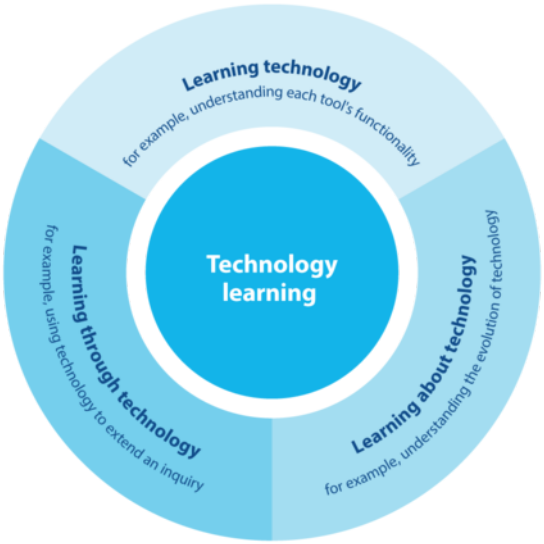
- the shared understanding about the value of technology in learning and teaching
- the agency of all members in technology decisions
- its accessibility to all learners
- its adaptability across contexts—cultural, physical and educational
- its support of intercultural understanding, global engagement and multilingualism
- its enhancement in the collection, creation, design and analysis of significant content.

Technology learning

Building on the IB's technology guidance, the Primary Years Programme (PYP) focus of technology aims to support students in developing:

- literacy
- competency
- confidence

Figure TE01: Technology learning and teaching



PYP technology learning and teaching immerses students in the interplay between learning technology, learning about technology and learning through technology.

Viewed broadly, as a tool or resource, technology facilitates and expands learning possibilities. It refers to devices such as a pencil, a laptop, an iPad, a camera, as well as resources such as a book, a website, a game, an interactive story. As a concept, it incorporates coding, communication, information, design and innovation. As a learning extension, it supports the development of critical, creative and transfer thinking, in addition to systems and computational thinking.

Technology learning and teaching in the PYP is best supported, strengthened and extended within the transdisciplinary programme of inquiry where students can apply technology in purposeful and authentic contexts. Seamless integration of technology enhances student agency, enabling students to learn in any context—formally and informally, through individual and social learning, and in any time and place (Looi et al. 2010). Therefore, all members of the learning community are technology teachers responsible for both the learning and teaching of technology, as well as its integration.

Technology, learner profile and approaches to learning

Children are often avid users of technology. However, this does not signify that they understand the implications of technology use on societies or environments. Learning communities support students in becoming responsible digital citizens, who make informed, ethical choices while acting with integrity. In a globally connected digital world, students are responsible for their actions, value the rights of others, exercise academic integrity, and practise safe and legal behaviours. Effective integration and implementation of technology aids the development of the attributes of the learner profile and approaches to learning (ATL).

Technology and young learners

Young learners in a play- and inquiry-based environment approach technology in a similar way to how they approach any novel objects. According to Bird and Edwards (2015), they begin engaging with the object/device—digital or non-digital—with exploration in mind to investigate, learn and test their theories about

its functionalities. When they believe they have understood its functionalities, they move to the innovation phase where they use the object/device in a new context.

Teachers can support young learners' understanding and use of technology by making appropriate technological devices available in order to appeal to their natural curiosity. Such devices could include an old camera, radio, smartphones, tablets, recorder, colouring applications, and so on. The aim for young learners is not so much about mastering technology, but about using technology to extend their investigations through touching, seeing and hearing. During this exploration process, young learners develop thinking skills and learn to make connections in subsequent play activities.

Technology in learning and teaching

Technology in an inquiry-based programme

Technology plays a key role in an inquiry-based programme that aims to support the development of international-mindedness and attributes of the learner profile. Schools offering the PYP create opportunities for students to develop explicit knowledge and skills relating to technology, apply technology to facilitate and extend learning, and adapt it in new ways to create solutions to challenges and opportunities.

- understanding the functionalities of different technological tools/resources
- operating technological tools/resources
- using technology to communicate, solve problems and create new opportunities
- understanding and applying social and ethical protocols surrounding the use of technology.

Technology poses unique opportunities for the learning community to co-construct knowledge and develop conceptual understandings with members and experts within and outside the school community.

Learning technology

Technological tools have intended functionalities. For example, cameras are for picture-taking. Developing general capability in technology involves learning and understanding the functionality of available technological tools and resources. Supporting students in developing technology capability enables them to make use of traditional and digital technologies to effectively engage with opportunities and challenges, and find creative solutions in school and beyond. The table below provides examples of technology-related capabilities that schools may choose to focus on, modify or add to—based on their contexts.

Skill categories	Sub skills
Managing and operating technology	Understand: • functionality of a range of hardware or software • components, commands and safety operating procedures, and so on • how to store, save and share digital information.
Understanding and applying social and ethical technology use	Be aware of: • ownership rights of all manually and digitally created information, and cite sources accordingly • online security protocols and apply them in all learning contexts • the legitimacy of online resources • the distinctions between different types of information.
Researching with technology	Learn how to: • formulate and plan how technology could be used to investigate and deepen inquiries

Skill categories	Sub skills
	• gather and record data using a variety of primary and secondary digital resources • use various technology tools to document learning, create charts, surveys and presentations, and so on.

Explicit demonstration of technology and its functions are most effective within the programme of inquiry or subject-specific inquiry, as in the following example.

Learning example 1

A class of 5–6 year olds inquires into the central idea:

"Awareness of our characteristics, abilities and interests supports learning".

As part of the inquiry, students collect data from their peers about sporting interests, after-school activities, and the kinds of activities they enjoy. They use tally sheets and make pictographs. The teacher takes this opportunity to introduce them to software applications with graphic functionality on an iPad. Students then explore the applications on their own to determine how to enter and represent their data. They collaborate with each other about how they might display this data in multiple ways (pie chart, bar graph, and so on). Analysing the results presented in graphical formats, students discuss similarities and differences in characteristics, abilities and interests of their class. They use this collective data to suggest to the teacher how and what they might be interested in learning as a group, and individually, to support all variabilities.

Technology learning: managing and operating with technology, literacy, design

ATL: research, communication skills

Learner profile: inquirer, thinker, caring

Learning about technology

As a concept, technology helps learners inquire into the world. Just as learning about biology helps students understand how the human body functions, exploring the evolution of existing technologies helps to make sense of how things work. For example, "electricity" is a technology with which people found ways to advance society by creating generators and light bulbs. This reinforces the definition of technology as a concept and acknowledges that technologies change as well as emerge.

There are multiple opportunities for students to learn about technology concepts, both digital and non-digital, for example, through robotics, machining and coding, or non-digital advancements in the sciences, individuals and societies, arts and physical, social and personal education (PSPE), such as papers, sports equipment telescopes, textiles and transport.

Technology literacy

Technology literacy is achievable irrespective of the tools available and is demonstrated through ways of thinking when exploring the transdisciplinary themes or subject-specific inquiries. What technology may be depends on school context. For example, protractors and rulers may be more appropriate for learning about measurement than digital measuring tools; colouring pencils for early learners to colour with may be more appropriate to support fine motor development than a colouring application on a tablet.

Members of the learning community actively choose and use multiple technologies in the classroom. This supports a key aspect of technology literacy: the capability to discern appropriate technologies based on the desired outcomes of the learning activity or inquiry (Davies 2011).

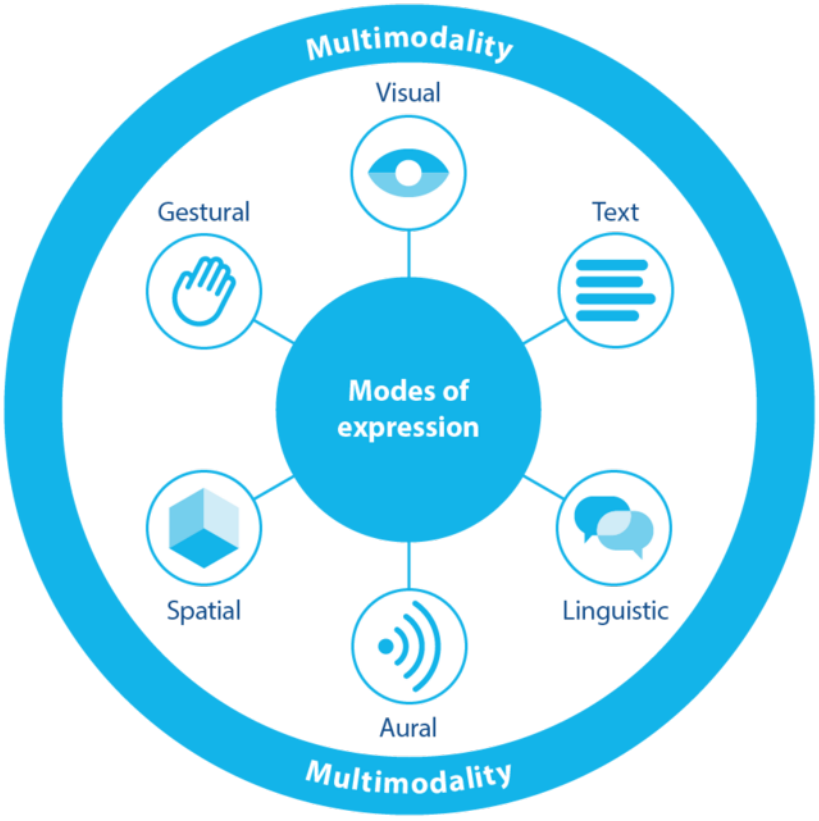
Multiliteracies

Technology supports the IB position on language, literacy and multiliteracies, that develop students' ability to engage with multiple texts in multiple modes.

Examples of multiliteracies include:

- **digital literacy:** knowing and using a range of digital devices, including networking, as well as computing devices such as tablets, laptops, smartphones, and so on
- **media literacy:** knowing how to access, analyse, evaluate and create media
- **information literacy:** collecting, exploring and using information, data and evidence
- **critical literacy:** critical thinking through digital technologies, questioning and comparing what aids, extends and hinders learning
- **design literacy:** knowing that the world has been designed to aid and extend. For example, maintaining the focus on play by structuring early learning spaces with technological design choices that aid or extend children's play.

Figure TE02: Multimodality



Multimodality

Technology literacy also encourages multimodality. This is the ability to understand and communicate effectively using universal design "modes" of expression, including visual, textual, linguistic, spatial, aural and gestural. With technology, today's classrooms are considered multimodal. Teachers and students call upon many modes of expression (prints, images, sounds, gestures and animated images) in the process of learning and teaching to make meaning of, and communicate, content (Ryan et al. 2010). See learning example 2.

Learning example 2

A class of 8–9 year olds inquires into the central idea:

"Changes in the Earth and its atmosphere influence the way people live their lives".

The students decide to investigate monsoons and their influence on families in their town, which had experienced serious flooding in the previous year.

One group of students is interested in how and whether monsoons could be predicted. These students decide to look at weather patterns, and connect the monsoons to the difference in temperature over the land and sea. They collect temperature data and graph the difference over several weeks using Excel spreadsheets.

Another group is interested in learning about weather changes over the years from people who have lived in the area for a long time. They decide to visit elderly people in the community centre and interview them about weather changes overtime, and how those changes affect the way they live. They record these interviews using an MP3 recorder.

A third group decides to learn from an expert—a meteorologist—about how monsoons work. The students request an interview with a professor in a nearby university through email and conduct the interview using Skype. After the conversation, the professor also shares video footage of the damage left by past monsoons with the students.

The final group wishes to learn about the possibilities of lessening the damage from flooding. These students find a parent who is involved in planning engineered solutions. Learning and collaborating with this parent, they take pictures of the local rivers, use them to draw a flow chart of their local river to suggest places where flooding could be controlled. They also find a parent who does relief work to learn about safety tips for families during a monsoon.

At the end of the inquiry, students from all four groups work collaboratively to consolidate their learning by creating a joint presentation that includes:

- a timeline of facts represented graphically (visual)
- short recordings of the stories from the elderly (audio)
- short clips of past monsoon damage (video)
- a poster of safety tips for families (print).

Through this inquiry, students learn about multiple technologies and their functionalities when the opportunities arise. They also exercise their agency to discern and select which form of technology is most appropriate to aid their learning.

Technology learning: operations, multiliteracies, multimodality

ATL: thinking, research, communication, social skills

Learner profile: inquirer, thinker, knowledgeable, caring, reflective, risk-taker

Computational thinking

Technology literacy also includes an understanding of the fundamental concepts of computational thinking. This is a term coined by Wing (2006) and adapted here for early and primary learners. It refers to the thought processes involved in formulating a problem and expressing its solution in precise steps that a person or a machine can effectively carry out. For example, exploring coding to determine how to move a robot in different directions. The steps involved in computational thinking are quite similar to those involved in solving a mathematic challenge (Sedlacek 2016).

- State a problem clearly.
- Break the problem down into a number of well-defined smaller problems.
- Devise a step-by-step solution to solve each of the smaller problems.

(Adapted from Lee et al. 2014.)

Supporting young learners' development of computational thinking skills begins with algorithmic thinking —the ability to follow a series of ordered steps to solve a problem. For early learners, teachers and parents might consider introducing students to algorithmic thinking using tangible objects, which students could manipulate by following symbols or sounds or basic coding principles (Futschek and Moschitz 2011). For primary years learners with a slightly more developed algorithmic skill, the learning community might consider suitable programming environments such as Logo, Alice, Scratch, and so on.

By applying computational thinking, learners "become not merely tool users but tool builders" (Barr and Stephenson 2011). They also innovate as they use critical and creative thinking skills to combine, adapt to and develop new technologies, as needed, to identify solutions and to create real and virtual artifacts.

Learning example 3

Students aged 11 and 12 in a state school are required to complete a course in computer coding. The specialist teacher collaborates with the year 6 team to identify a mathematics central idea to consolidate students' understanding of "shape and space" through the context of programming Lego robots:

"Consolidating what we know of geometric concepts allows us to interact with our world".

The inquiry focuses on computational thinking: how to change descriptions of shape, position and direction into mathematical symbols and then "translate" the algorithm into coding. Individually, students devise criteria for moving the robot in circles, squares, rectangles and triangles of different sizes. In teams, students work through a design process to meet the criteria in innovative ways.

Technology learning: computational thinking, design thinking

ATL: thinking, research, communication, social skills

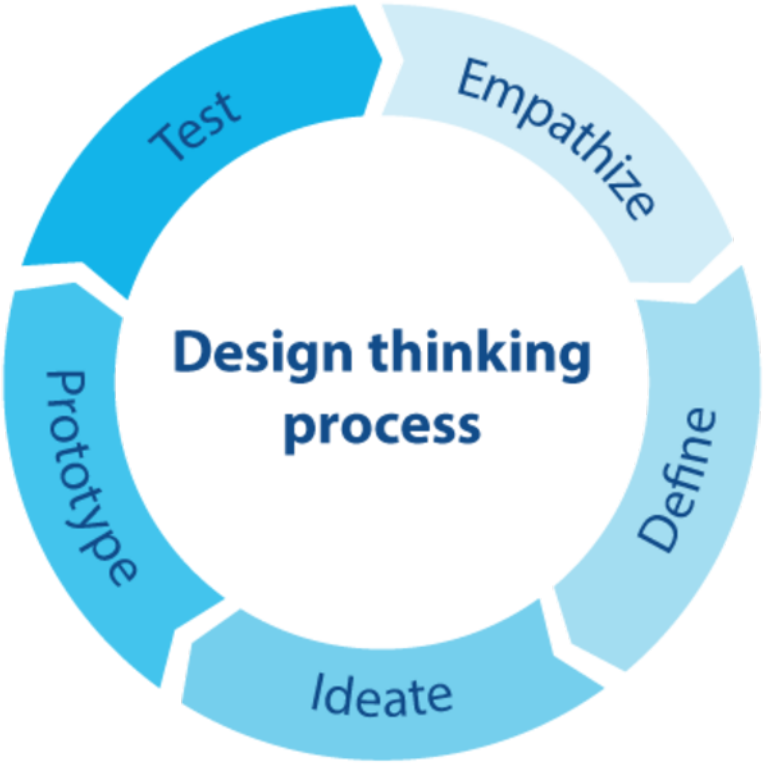
Learner profile: inquisitive thinker, knowledgeable thinker

Design

Design involves ideating and creating products or artifacts relating to an inquiry. Design thinking, an approach integral to the design process (Koh et al. 2015) moves students beyond following directions and replicating a given procedure to applying their knowledge and skills to find creative and innovative solutions to address opportunities and challenges. Characteristic of constructivist learning, the process of design encourages students to explore and to be open to new ideas (Scheer et al. 2012). Through the process, students build metacognitive skills (Koh et al. 2015).

Figure TE03 shows the steps involved in a design thinking process (Institute of Design at Stanford University).

Figure TE03: Design thinking process



The design thinking process develops the skills to construct a solution based on:

- analysis of information and evidence
- logical and critical reasoning
- collaboration to negotiate solutions
- self-organization to internalize understanding.

These skills support student agency as they develop confidence to find workable solutions to issues through design. Because the design process encourages independent and group thinking, it builds trust and reciprocity between students and teachers.

There are multiple ways the learning community might consider creating a design spaces. Makerspaces, junk yards, design corners and robotics rooms can be incorporated into the curriculum to connect "real-world" experiences with conceptual learning. In these spaces, members of the learning community make available digital and non-digital tools, an array of purpose-made materials and open-ended materials for prototyping. Sample materials include the following.

Sample materials
Bottle caps, boxes, buttons, pipe cleaners, popsicle sticks, wires, hand and power tools, electric circuits, consumable art supplies, solar panels, batteries, toy motors, and so on.

Inquiring designers ask questions and analyse the opportunity or challenge to determine parameters and the criteria for success. They reflect, collaborate and develop those ideas and act to create products, processes or systems. Design decisions are supported by research, investigation and collaboration. Students reflect upon their final solution against the original description of the problem and the indicators for success.

Returning to "Learning example 2", students may decide to extend their learning using the design thinking process to minimize damage to people's homes from monsoon flooding.

Learning example 4

A kindergarten class listens to a story entitled *In the Night Kitchen* by Maurice Sendak. The students are fascinated by the creative solution of the main character, Mickey, to get milk for the bakers. They discuss Mickey's approach in depth and the teacher wonders out loud if there are other approaches Mickey could use to solve the bakers' problem. Students take on the teacher's challenge and begin to consider alternative solutions using the design thinking process to prototype their solutions.

Technology learning: technology literacy, design thinking process

ATL: thinking skills, social skills

Learner profile: communicator, reflective thinker, risk-taker

Technology in a global society

Technology can transform, enrich or cause harm to cultures and environments. By supporting students in their understanding of the evolution of existing technologies, and the rights and responsibilities of being a digital citizen, students are better able to make informed and ethical choices about the technologies they use.

Evolution of technology

Through learning about the evolution of technology, learners develop systems-thinking capacity. While less applicable to early learners, supporting primary years learners to understand the complexity of systems, both natural and technological, prepares them to solve tomorrow's challenges.

Systems can be static or dynamic, simple or complex. Exploring the concept of systems enhances students' understanding of connection and causation—everything is connected to a single system or multiple systems. A solution or an action carried out in one community may create problems for another or for the environment—some problems may be on a small or personal scale, while others may be far-reaching. For example, exploring the evolution of the automobile, students will come to understand its contribution to commerce as well as its detrimental effect on the environment.

By learning about the systemic impact of technology, learners:

- develop an appreciation of the impact of technological innovations for personal and community well-being, cultures and environments
- appreciate past, present and emerging technology within cultural, social, historical, aesthetic and environmental contexts
- develop respect for others' viewpoints and appreciate alternative solutions to problems
- act with integrity and honesty, and take responsibility for their own actions.

The PYP transdisciplinary themes provide a powerful basis from which students can develop their systems-thinking skills. These themes support learning about non-digital advancements in the sciences, individuals and societies, arts and physical, social and personal education (PSPE) not as a set of stand-alone events but as interconnected ones.

The basics of digital citizenship

Technology offers unprecedented opportunities to connect schools and learning communities locally and globally. These opportunities also come with responsibilities. Digital citizenship refers to the norms of appropriate and responsible behaviours when engaging with technology (Ribble 2011).

To support learners in becoming digital citizens of character and integrity, the learning community works collaboratively with parents and students to define and implement a shared understanding of appropriate digital practices, including:

- codes of conduct

- policies
- rights and responsibilities
- health and well-being
- protection.

By learning about these elements of digital citizenship, students not only become responsible users of technology but they can recognize inappropriate technological behaviours that might impact themselves or others.

Learning through technology

Through technology as a tool, resource and infrastructure, students understand information and find solutions to seize opportunities and address challenges that transcend subjects to which the opportunities/challenges are related. It is "through" these digital and traditional devices that students explore and extend their questions and inquiries. Technology offers boundless opportunities to seamlessly integrate subjects, extend inquiries beyond the confines of the school, and communicate and share newly constructed knowledge and understandings in innovative ways.

Approaches to learning

Through technology, students have unlimited opportunities to develop and practise the approaches to learning (ATL). For example, communication skills include the sub-skills of:

- participating in, and contributing to, digital social media networks
- collaborating with peers and experts using a variety of digital environments and media
- sharing ideas with multiple audiences using a variety of digital environments and media.

The following sample technology sub-skills are relevant to all learners which schools may choose to focus on, modify or add to—based on their contexts.

Examples of technology sub-skills	
Investigating	To carry out a purposeful inquiry or research to test existing understanding, discover new information and create new understanding. Through investigation, students access digital resources, critically evaluate a variety of primary and secondary sources, make connections and synthesize findings to apply knowledge to real-life contexts.
Ideating	A process through which students are provided with an opportunity to innovate and test boundaries. Students construct meaning, apply critical thinking and original ideas to real-world situations, and share ideas through a variety of media for self-expression, problem-posing and problem-solving, and reflection.
Communicating through multiliteracies	The exchange of information with various audiences using a range of media and formats, including physical, digital and virtual. Effective communicators contribute to cross-cultural understanding, make informed choices when deciding on tools to articulate meaning, and provide relevant, significant feedback to others.
Collaborating in online spaces	The process through which students validate and negotiate ideas, and reach a deeper understanding and a global perspective. This is the active participation of creating and sharing knowledge through digital media and online spaces.

Examples of technology sub-skills	
Organizing	The ability to structure or arrange connected items. Students understand that technology can be used to inform, adapt, manage and problem-solve during their creative, communicative, collaborative and investigative processes. Students make connections, transfer existing knowledge and independently explore new technologies.

Inside and outside the programme of inquiry

Technology, particularly digital technology, affords myriad opportunities for networking, sharing of initiatives and partnerships, to learn, to connect and to transcend subject knowledge. Digital media gives users the opportunity to interact, not only with peers and adults but also with content, in order to further their understandings. Text, images, videos and audio files are not only consumed and shared, but are also integrated and re-purposed (Palfrey and Gasser 2013) to create new knowledge and conceptual understandings.

Through technology, students learn about multiple perspectives, the origins of a concept or even experience a concept through modelling, simulation or visualization technology—all forms of experiential learning (Kolb 1984). For example, students can experience the effect of a 6.5 Richter-scale earthquake through simulation at a local museum.

Learning example 5

A year 5 class explores the central idea:

"Digital media changes the way in which people access information and connect to each other".

From the perspective of individuals and societies they look at the history of how people accessed information prior to, and after, the invention of the personal computer. From the perspective of mathematics, they consider the rise in individual computer ownership and graph the data by global region. They also inquire into the meaning of "digital" and why the numbers describing the power of computers is related to the binary numeral system. Through the computer science lens, they look at network maps and nodes, and how these have changed in the students' lifetime. In language, they analyse text from twitter, emails and blogs, and consider how meaning can be misunderstood. Well-being and issues of cyber-bullying are also researched and reflected on. Finally, they apply the concept of multimodality to share what they find by making connections among various aspects of technology and media to determine their impacts on how people access information and connect with each other today.

Technology learning: technology literacy, multiliteracies, multimodality, design

ATL: research, creative thinking, communication

Learner profile: knowledgeable, reflective thinker

Conceptual understandings

Through technology, students have the opportunity to develop conceptual understandings. In technology, there are clusters of ideas relating to the seven key PYP concepts and the six PYP transdisciplinary themes. Figure TE04 provides examples of key and related concepts, and gives suggested questions that may be adapted to guide inquiries. There are many other possibilities for related concepts and these may also be sourced from national/state curriculums.

In the following questions, "technology" may refer to digital applications, but it could equally include technology relating to medicine, transport, food and textile production, electricity, and so on.

	Examples of related concepts	Sample learning considerations
Form	Materials, coding, product, components	• How can I describe and classify the characteristics of different materials?

	Examples of related concepts	Sample learning considerations
		• What can we learn from a tool's component? • Why are there different symbols and words in coding? • How can I break this big problem into bits I can understand?
Function	Inventions, algorithm, coding, logic	• What is this mathematical rule telling me to do? • Can I "read" this coding and work out what the robot will do? • Can I "debug" this coding so that it does what I want it to do?
Change	Development, systems	• How has this particular technology developed since it was invented? • What are the changes as a result of this technology innovation? • How has this technology changed social or environmental systems?
Connection	Systems, communities, communication	• How has this technology met the needs of a community? • What systems were important in the development of this technology? • What systems will my design solution affect? • How can I plan multimodal communications to meet a range of audiences?
Causation	Development, innovation, process, needs, opportunity, challenges, consequences	• What provoked the development of this technology? • What needs did an innovation meet? • What were the immediate benefits or consequences of the solution?
Perspective	Safety, consequences, communication	• What are the safety issues with this technology, and what are the consequences if it is not used properly? • What were the different points of view of designers? • Did the prototype meet the initial design brief? • How did our team communicate through the product development?
Responsibility	Safety, ethics, sustainability	• How does this technology affect the health and well-being of a community? • What was my responsibility as a designer? • Did I consider issues of culture, health, well-being and the environment when I used this technology? • How do we interpret "caring" and "principled" when collaborating with others who are not in the same place or who may not have access to the same information?

	Examples of related concepts	Sample learning considerations
		• What does responsible digital citizenship look like when we step outside our boundary?

Figure TE04: Concepts in technology

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Glossary

action	The act of engaging individually and/or collaboratively with local, national and global challenges and opportunities.
action plan	An organized plan detailing steps for continuous school improvement.
action research	Inquiry carried out to inform improvement and refinement of learning and teaching.
additional language	The language offered in addition to the language of instruction in a PYP school.
advocacy	Advocacy is supporting and committing to action for positive change for oneself and others.
affective skills	Affective skills are the skills of behaviour and emotional management underpinning attitudinal factors such as resilience, perseverance and self-motivation, which often have a large role to play in educational achievement.
agency	Agency is a philosophical, sociological and psychological idea that acknowledges humans as active participants in their own lives with the capacity to initiate intentional action.
agent of change	A person who acts on behalf of themselves or others in connection with action for positive change.
approaches to learning	Approaches to learning refers to a range of skills that help students guide, support and structure learning.
approaches to teaching	Approaches to teaching refers to the key pedagogical approaches and constructs that inform and support teaching. These are inquiry, conceptual understanding, local and global contexts, collaboration, inclusion and assessment.
assessment	Assessment is the monitoring, documenting, measuring and reporting on learning. Assessment involves reflection and feedback that occur at all stages of learning and teaching.
assessment capable practitioner	A practitioner's ability to collaborate with others using data and evidence to inform learning and teaching.
assessment capable student	A student's ability to collaborate with others to set learning goals, monitor progress and adjust learning.
autonomy	The freedom to decide for oneself and pursue a chosen course of action.
Backwards by design	Backwards design is a method of designing educational curriculum by setting goals and designing assessment to meet these goals before planning learning experiences.
capacity	Capacity is the actual or potential ability to achieve something, either individually or collectively. Capacity is connected to agency and self-efficacy.
central idea	A central idea is a conceptual understanding, written as a statement, that invites inquiry and reflects the transdisciplinary theme.
challenging	Challenging refers to learning and teaching that encourages critical and creative thinking, and goes beyond current understanding and capabilities.

collaboration	Collaboration is the act of purposefully achieving something together through shared understandings and active participation.
cognitive skills	Cognitive skills include all the information-processing and thinking skills.
concepts	Concepts are powerful, broad and abstract organizing ideas that may be transdisciplinary or subject-based in nature.
conceptual understandings	Conceptual understandings are generalizations that learners develop about the nature or properties of a particular concept or concepts.
constructivist	Constructivist theories recognize that knowledge is actively constructed by learners. Learners actively build on their existing knowledge to make connections and new meanings.
content	Content refers to subject knowledge and conceptual understandings that are identified and included in the curriculum.
context	A context is a situation, setting or group of conditions in which something exists or happens.
critical literacy	The ability to question, challenge, evaluate and compose texts, understanding that they are created for particular purposes and represent certain perspectives, values and attitudes about the world.
curriculum	A curriculum is an overall plan for learning that is broad, balanced and coherent. It describes the entire learning experience in a school.
data and evidence	Data and evidence is information gathered qualitatively or quantitatively, at specific points in time, measuring learning to accurately gauge progress and achievement against agreed learning goals and success criteria.
diversity	Diversity refers to difference and uniqueness. Valuing diversity is about acceptance and recognition.
documenting	Documenting of learning is the compilation of evidence to inform learning and teaching.
early years	The early years apply to ages 3–6. These years represent the foundational period for the development of positive social, emotional, cognitive and physical outcomes in future years as a result of the rapid rate of brain development occurring at this time.
engaging	Engaging means learning and teaching that is reflective and responsive to personal and collective interests.
exhibition	The exhibition is a culminating and consolidating learning experience or inquiry project in which students, with the support of a mentor, demonstrate their understanding of an issue or opportunity that they have selected and investigated, both individually and with their peers.
feedback	Feedback is information given, from either a teacher or a student, in response to a student's learning, and is to be used as a basis for improvement.
feedforward	Feedforward is information given, from either a teacher or a student, which offers next steps and guidance for improving a student's learning.
Forwards by design	Forwards design is a method for considering what other learning can occur in social constructivist learning settings outside of prescribed learning.
framework	The PYP framework provides a structure for organizing parts of a curriculum and the relationships between them.
holistic	An all-encompassing educational experience that considers students' intellectual, physical, social and emotional learning and development.

home and family language	The language learned first, or known best, or used most, or all of these. As language learning occurs within a context, learners may have a "home" language and/or a "family" language, which is different to the language of instruction in the current school.
identity	Identity is the state of being oneself; the qualities, beliefs and values that make a person.
identity text	Texts produced by students that express their cultural identities. They are self-selected, shared with an audience and include positive statements made by students about themselves.
inclusion	Inclusion is an ongoing process that aims to increase access to, and engagement in, learning for all students by identifying and removing barriers.
inclusive	Inclusive education means increasing access to, and involvement in, learning and teaching for all students. Being an inclusive school means removing barriers to learning and involving everyone in the life of the school.
innovation	Innovation is implementing new ideas generated through examining practices and putting forward different ways of doing things with the aim of improvement.
inquirers	Inquirers actively construct meaning through interacting with and interpreting the world around them.
inquiry	Inquiry is a perspective on learning, emphasizing that meaning is actively constructed.
intercultural understanding	Intercultural understanding is about having mutual understanding and respect for one's own and others' cultures. It recognizes our common humanity, diversity and interconnections.
internationally minded	Being internationally minded is characterized by being aware of oneself and others. It refers to a sense of belonging to broader communities and a common humanity. It involves being engaged with local and global issues and taking action for positive change. Developing and demonstrating the attributes of the IB learner profile provides an important foundation for international-mindedness.
knowledge	Knowledge is information, facts or principles gained through learning.
learning community	The learning community refers to everyone involved in the life of the school, locally and globally.
learning environment	The learning environment is the context in which learning happens, including the school culture and ethos, and the organization of resources and learning spaces, both indoor and outdoor.
learning goal	A learning goal is a statement which describes what students know, understand and are able to do at the end of a certain time frame or learning experience.
learning spaces	Learning spaces are physical or virtual areas within a learning environment.
lines of inquiry	Lines of inquiry are statements or phrases that define the scope of a unit of inquiry.
literacies	Literacies refer to multiple modes of communication and meaning-making, including linguistic, visual, audio, gestural, spatial and digital.
measuring	The act of ascertaining "point-in-time" data to determine progress and achievement.
metacognition	Metacognition is thinking about thinking. It is the ability to be aware of, reflect on and understand one’s own thought processes.

metacognitive skills	Metacognitive skills are the skills that students can use to monitor the effectiveness of their learning skills and processes, to better understand and evaluate their learning.
metalinguistic awareness	An awareness of the way language works, its rules and codes.
monitoring	The process of gathering data through a variety of strategies, including, but not limited to, observation, questioning, discussion and reflection.
multilingualism	The knowledge of two or more languages at any stage of acquisition or proficiency, reflecting the dynamic interplay between languages and the social behaviours associated with language.
multiliteracies	The ability to read, interpret and create oral, print and multimodal texts in multiple modes. Multiliteracies enable students to understand, use and critically evaluate multimodal texts with an understanding of their social context.
multimodality	The ability to understand and communicate with multiple modes of expression. Examples of modes include visual, textual, linguistic and spatial (Jewitt et al. 2000).
outcome	Outcome in the PYP refers to the overall impact of an IB education and the totality of experiences for PYP students as they develop and demonstrate the attributes of the learner profile and international-mindedness.
pedagogy	Pedagogy is the art and science of teaching as a professional practice.
play	Play describes a range of student-initiated activities that involve freedom and choice.
portfolio	A portfolio is a comprehensive collection of student learning.
principled action	Principled action means taking action that is informed, responsible and ethical.
programme of inquiry	The programme of inquiry is an overview of the transdisciplinary themes and units of inquiry across year levels.
progressions of learning	Progressions of learning refers to the sequencing of learning across developmental stages.
provocation	A provocation is an open-ended stimulus to engage student thinking.
reflection	Reflection is a cognitive act that considers past experiences in order to improve, modify and plan for the future.
relevant	Relevant refers to meaningful learning and teaching that makes connections to prior knowledge and experiences.
scaffolding	Scaffolding is the use of a variety of teaching strategies and tools to support a student's progression in their learning. Scaffolding is temporary, appropriate and responsive.
self-assessment	Self-assessment is the review and evaluation of learning in order to make adjustments and improvements for future learning.
self-efficacy	Self-efficacy refers to a person's beliefs and confidence in their own abilities to act, succeed and to reach valued goals.
self-regulated	Self-regulated describes the ability to manage oneself in order to reach one's own goals.
significant	Significant refers to an understanding that is contextually and universally important and has personal, local and global implications.
skills	Skills describe the abilities we use to guide, support and structure learning.

social-constructivist	Social-constructivist theories recognize that knowledge is actively constructed through interacting with others and the environment.
stakeholder	A stakeholder is a person with an interest or investment in something. PYP stakeholders include students, teachers, staff, families and caregivers, as well as other significant adults in students' lives.
student language portrait	A collection of information concerning the language background and experiences of a student.
subject	A discrete area of knowledge. PYP subjects include language, mathematics, science, social studies, arts, physical, social and personal education.
success criteria	Success criteria describe what quality looks like at the end of a certain time frame or learning experience. They are specific and measurable.
text	Artifacts through which we access or present information. These might be oral, written, musical, artistic or multimodal, for example, a story, song, message or website.
theories	Hypotheses and ideas that are constructed by learners in order to explain something.
transdisciplinary	Transdisciplinary is an approach to learning and teaching that is integrated— going across, between and beyond subjects.
translanguaging	A process in which students draw on known languages naturally and flexibly, combining their elements to meet communicative and social needs. Examples in practice might be switching languages mid-sentence or reading a text in one language and talking about it in another.
unit of inquiry	A unit of inquiry is a method of organizing the learning that takes place within a transdisiplinary theme.