# Assessment

## Assessment in the Primary Years Programme

**Summary**

- Assessment is an ongoing process of gathering, analysing, reflecting and acting on evidence of student learning to inform teaching.
- Assessment involves teachers and students collaborating to monitor, document, measure, report and adjust learning.
- Students actively engage in assessing and reflecting on their learning, acting on feedback from peers and teachers to feed forward to next steps in learning.
- Fostering an assessment culture involves the development of assessment capability among all members of the learning community.
- Learning goals and success criteria are co-constructed and clearly communicated
- Both learning outcomes and the learning process are assessed.
- Assessment design is both backward and forward looking.

### Integrated assessment

All IB programmes are informed by assessment, as indicated in the IB approaches to teaching. While assessments look different in each programme, all IB assessment methods are varied and fit for purpose.

Assessment is central to the Primary Years Programme (PYP) goal of thoughtfully and effectively supporting students through the acquisition of subject-specific knowledge and skills, the understanding of concepts and the development of approaches to learning.

The development of knowledge, conceptual understandings and skills requires that both teachers and students demonstrate assessment capability.

### Purpose of assessment

The purpose of assessment is to inform learning and teaching. It involves the gathering and analysis of information about student learning to inform teaching practice. It identifies what students know, understand and can do at different stages in the learning process.

Effective assessment that achieves this purpose provides valuable information to understand what constitutes learning and how to support it, and is meaningful to all members of the learning community.

Students become effective, self-regulated learners when they are actively engaged in assessment and act on constructive feedback. This helps them reflect on their progress, set goals for their learning and engages them in making decisions about what they need to do to achieve these goals.

Teachers become more effective when they continually learn about what students know and can do. They reflect on their practice, adjust their teaching based on data, and offer timely, specific and well-considered feedback to better support learning.

Parents and legal guardians become more informed when they understand the learning goals their child is working towards, and the progress their child is making. They extend their child's understanding and development of skills when they support learning. They contribute to their child's joy of learning and growth as a successful learner through sharing insights with the learning community.

Schools become more impactful learning communities when they use assessment as a tool to evaluate the depth of their curriculum and the effectiveness of their teaching. They make decisions about targeting resources and support to the most pressing priorities and professional development needs.

### Characteristics of effective assessment

Highly effective assessment shares some key characteristics (Adapted from Clarke 2012).

- **Authentic:** It supports making connections to the real world to promote student engagement.
- **Clear and specific:** This includes desired learning goals, success criteria and the process students use to learn.
- **Varied:** It uses a wider range of tools and strategies that are fit for purpose in order to build a well-rounded picture of student learning.
- **Developmental:** It focuses on an individual student's progress rather than their performance in relation to others.

- **Collaborative:** It engages both teachers and students in the assessment development and evaluation process.
- **Interactive:** Assessment encompasses ongoing and iterative dialogues about learning.
- **Feedback to feedforward:** It provides feedback on current learning to inform what is needed to support future learning (Hattie, Timperley 2007) and raises students' motivation.

The PYP approach to assessment gives the students a vital role in the assessment process and engages the teachers in considering assessment as fit for purpose. Effective PYP assessment practice holistically integrates assessment for, of and as learning (Harlen, Johnson 2014) to support effective learning and teaching.


PYP assessment informs the learner, learning and teaching, and the learning community through the monitoring, documenting and measuring of learning.

## Developing an integrated assessment culture

Strong communication, of the purposes of assessment and reinforcement of the value of assessment in the monitoring, documenting, measuring and reporting of learning, is important in building a shared assessment culture. A school-wide assessment culture acknowledges the role assessment plays in informing the learner, learning and teaching, and the learning community about achievement, progress and in supporting decision-making.

Establishing and fostering a school-wide culture around assessment begins by:

- developing assessment capability within the learning community
- developing a comprehensive assessment policy that emphasizes assessment integration
- creating opportunities for teachers to plan, reflect and moderate assessment collaboratively
- providing school-wide professional development opportunities around integrating effective assessment
- reinforcing the role assessment plays in finding out what students know and can do, and in identifying the next steps for their learning
- reinforcing the links between monitoring, documenting, measuring and reporting of learning.

## Developing assessment capability to support learning

All members of the learning community develop assessment capability (Absolum et al. 2009) to make the "tacit knowledge that is 'hidden' within the learner transparent, explicit and available" (Clark 2012).

Members of the learning community are assessment capable when:

- everyone is aware of, and understands, why and what to assess
- everyone is aware of, and understands, what constitutes quality
- there is a shared understanding of how to assess and what data is being collected, analysed and reported.
- there is a shared language for talking about assessment
- the assessment process is collaborative and inclusive of all members

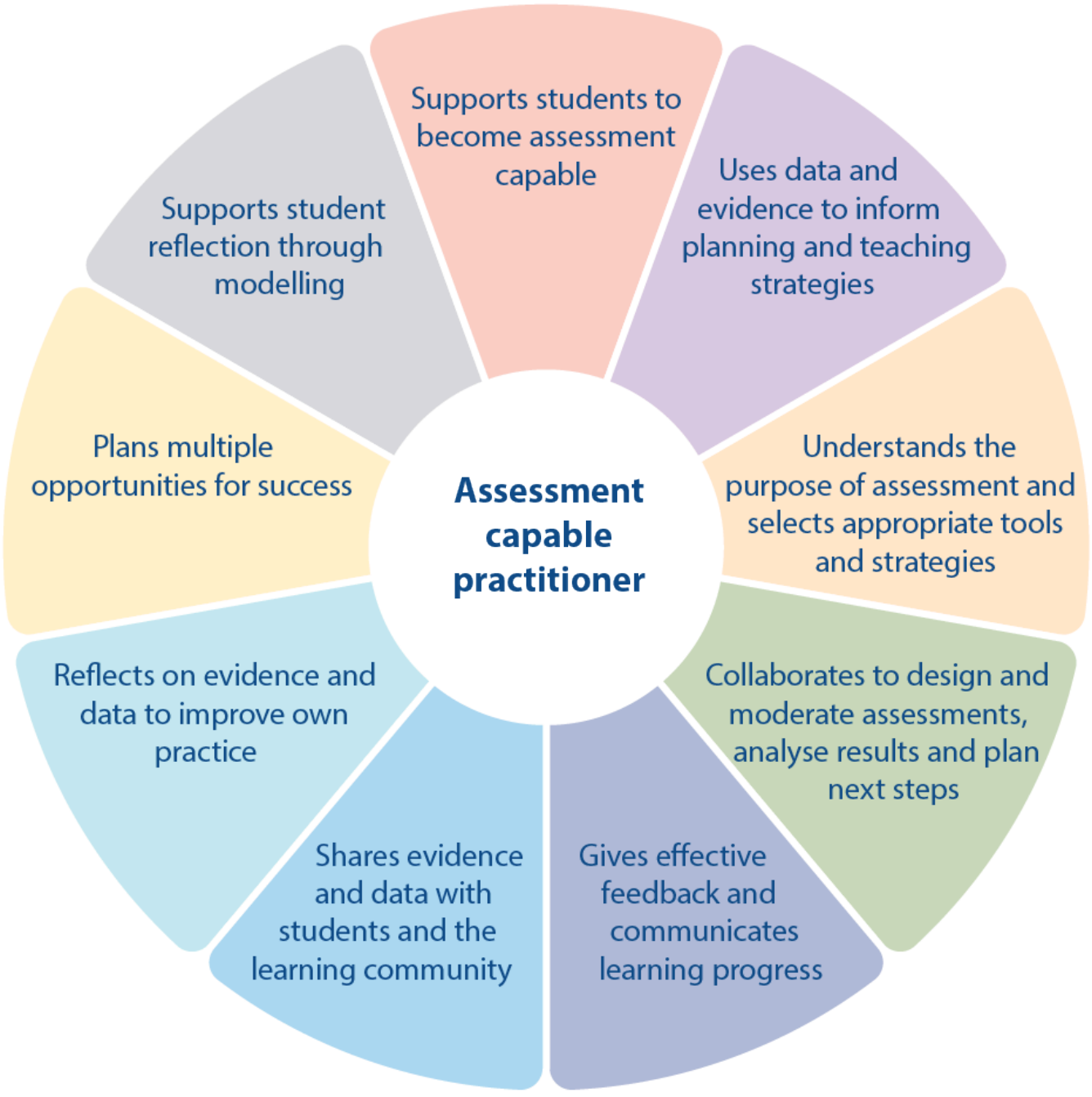
(Hipkins 2009; Booth, Hill, Dixon 2014)

When members of the learning community have a shared understanding and language to monitor, document and measure learning, they can make powerful contributions to learning and teaching.

In an assessment-capable learning community, everyone has a clear understanding of the reasons for assessment, what is being assessed, the criteria for success, and the methods by which the assessment is made. In so doing, the entire school community is involved in the inquiry regarding the efficacy of the programme implementation (Hipkins 2009). This could have a powerful effect on the development of knowledge, conceptual understandings and skills.

### Teachers

An assessment-capable teacher is supported through professional development and a shared assessment culture. As indicated in figure AS02, teachers support students to become assessment capable in the following ways.




Teachers become more effective when they are open to actively learning about student progress by monitoring what they know, understand and can do. Teachers inquire into student learning as a way of assessing their own practice as educators. They continually adjust their teaching to better support individual and group learning.

Teachers in a learning community ask the following questions.

- What awareness and understanding do we have of student learning?
- What is the evidence of what students can do, say, write, create and demonstrate?
- How do we support students to understand what constitutes quality?
- What other contexts can we provide for students to practise their skills?
- What action needs to be taken to develop the learning further?
- How will we know that we have sufficiently supported student learning?
- How can we identify progression in learning across multiple contexts or units of inquiry?
- How do we use evidence of learning to plan the next learning steps with students?

**Students**

Students develop assessment capability when teachers provide them with multiple supported experiences in reflecting on their learning and how to make improvements. Using specific language to describe, discuss and evaluate learning, students demonstrate their assessment capability by:

- partnering with teachers to design their learning goals and success criteria
- being able to self-assess and discuss their progress towards achieving learning goals
- selecting evidence, such as samples of their learning, that best demonstrate the intended learning goals
- developing the metacognitive skills to reflect on their learning and to plan next steps
- drawing on feedback and multiple strategies to adjust their learning and identify where and when to make improvements.

TSM: Supporting student agency

From self-assessing to self-adjusting

By taking an active role in their own assessment, students analyse how they think and learn. They develop skills to move from being self-assessors to self-monitors, with the aim of becoming self-adjusters.

Self-assessment involves students reviewing and evaluating their knowledge, conceptual understandings and skills. It then leads to students monitoring and adjusting their behaviour and planning, making corrections and implementing improvements in their learning. Self-adjusters use the feedback they are given to modify and improve their learning. Self-adjusting therefore requires both thought and action and supports students' self-efficacy.

Assessment is a powerful tool to support students in becoming self-adjusting learners. As they reflect on their progress and set goals for future learning, they may consider the following questions.

- What do I need to know?
- What knowledge and skills do I need to develop in order to answer my questions?
- What steps do I need to take to ensure that my learning exemplifies quality?
- What further possibilities do I see?
- How do I incorporate feedback to achieve my learning goals?

**Co-constructing learning goals and success criteria**

Students and teachers set and reset learning goals to answer the questions "Where am I going in my learning?" and "What do I need to get there?" These are personalized for each student and connect new learning to prior learning. Learning goals are revisited throughout the learning process to monitor progress.

In PYP schools, personal learning goals support the creation of high expectations by:

- making learning transparent to the teacher, the student and their families
- building a shared understanding of what learning is to be achieved
- encouraging reflection and focused feedback
- inviting students to take ownership of their own learning.

Success criteria describe what quality and achievement will look like. They are specific and measurable. Students and teachers co-construct success criteria to answer the questions "What does successful learning look like?" and "What are we looking for during learning?"

Co-constructed success criteria support learning by:

- building a common understanding of what constitutes quality
- allowing for specific feedback on learning and feed forward into next steps of learning
- providing the structure and language for reflection, self-assessment and peer feedback
- providing the criteria against which learning is measured.

Young students' learning is measured against individual developmental milestones and celebrates achievements at times that are pertinent to them. Students in the early years learn about the role of learning goals and success criteria over time. Teachers support students' development of goal and success criteria setting skills by modelling the skills and by offering multiple opportunities for students to practice them.

## Designing assessment to inform learning and teaching

> "There are no year level expectations in a series of achievement standards. No one is at, on, above or below expectations. Every student is simply at a level of development defined by what learning is developmentally appropriate.""(Griffin 2009)"
>
> *— Griffin 2009*

Assessment in the PYP has generally followed the "backwards by design" process (Wiggins and McTighe, 2005). This assessment philosophy encourages teachers to design assessment by first identifying the desired knowledge, conceptual understandings and skills, followed by the design of the assessment, and finally planning learning activities to ensure acquisition of knowledge, conceptual understandings and skills.

"Forward by design" takes into consideration what other learning may have occurred beyond what has been planned. This design approach supports the development of "soft" skills, that are not immediately measurable, and that can emerge through the learning process. Forward by design is particularly relevant in supporting the development of approaches to learning and for the learner profile. This encourages student participation in assessment design, inviting them to evidence what else they know or can do.

In the PYP inquiry learning environment, the learning process is valued as much as the learning outcomes. Designing assessment that are both backward by design and forward by design will ensure that knowledge, conceptual understandings, skills and attributes of the IB Learner profile are monitored, supported and valued.

In designing a holistic assessment, teachers consider the following questions.

- What learning goals will be achieved?
- How can I involve students in the assessment design?
- How could students engage in dialogues with teachers about the development of learner profile attributes?
- What data or evidence should be gathered?
- What tools or strategies should be used to gather data?
- How will the evidence be monitored, documented and measured?
- How could students be asked to evidence any additional learning?
- How will the results be shared to feed back to the student?
- How will the results be used to inform next steps in learning and teaching?
- How will the results of the assessment be used to inform the learning community?

## What to assess

The significant content identified by the school supports the outcome of students becoming internationally minded. Once this content is identified, teachers plan multiple opportunities for their students to develop knowledge, conceptual understandings and skills to support self-regulatory learning. In determining what to assess, teachers might ask the following questions.

- Is it the process or product of learning we aim to evaluate?
- Is it to understand prior knowledge—what the student already knows and can do?
- Is it to check if learning is on track or if the student is ready for extension?
- Is it to elicit depth and breadth in understanding?
- is it to extend students' learning?

- Is it to understand how the student makes connections and applies learning?

The criteria for assessment must be known to students at the beginning of the inquiry and should be documented in one of the PYP planners, an adapted planner or the PYP planning process. The criteria accommodate a wide range of knowledge, conceptual understandings and skills. They are revisited and modified during the course of the inquiry, ensuring that they also reflect emergent knowledge, understandings and skills.

Note: the revised PYP outlines a planning process which schools can follow. They have the flexibility to not use a planner, PYP or adapted, as long as all the elements are documented accordingly.

## Inquiry

PYP assessment recognizes the importance of monitoring and documenting the process of inquiry. Through careful observation of the inquiry process, teachers monitor students' ability to make connections across subjects and to apply skills to construct new knowledge.

When monitoring and documenting student learning, the teacher considers:

- the nature of students' inquiry over time—observing for depth and breadth
- students' awareness that authentic challenges require solutions based on the integration of knowledge that spans and connects different subjects
- how students demonstrate and develop subject knowledge
- how students apply their conceptual understandings to further their inquiries successfully
- how students demonstrate and develop the approaches to learning
- how students demonstrate both independence and an ability to learn collaboratively.

## Conceptual understanding and approaches to learning

Monitoring, documenting and measuring conceptual understandings focus on how concepts are recalled, explained, applied and transferred through a range of learning experiences. Skills are monitored and documented for growth over time; they manifest at different points in time and in

different ways, are closely interconnected and are open to interpretation. It is, therefore, important that teachers allow for flexibility to monitor and document conceptual understandings over time.

TSM: Solo taxonomy

Progress in conceptual understandings is evident when:

- the use of abstract concepts increases
- connections are made between multiple concepts to explore the central idea
- understandings are transferred to more complex contexts
- actions are informed and taken based on existing and new understandings of the central idea.

Students increase their depth of understanding through adding to, expanding on, testing and adjusting their ideas. Strategies to support conceptual understandings include the following.

- Increase **wait time** strategy for students to answer questions so they can move beyond factual understanding to make connections and discuss deeper understandings*.
- Encourage students to use and add to **concept maps** to show connections and relationships between concepts.
- Use **exit cards** strategy for students to list their understandings of the concepts and questions they may still have.
- Use the **bus stop strategy** to post concepts around the learning space. Students individually or collaboratively record, challenge, expand or add their ideas using symbols or words as they move around the "bus stops".
- Provide opportunities for students to **think in pairs or small groups** to encourage deeper discussions.
- Ask **open-ended questions**: For example, "What do you think?", "How could you change the issue?", "What other alternatives are there?".

*(Sackstein 2016)

## Supporting self-regulated learning

Assessment is a powerful tool to support lifelong learning. Whenever and wherever possible, teachers provide opportunities for students to practise self-assessing and self-monitoring so they can internalize their own learning and develop strategies to adjust their learning. To develop students' assessment capability, teachers:

- are mindful of the well-being of students to ensure self-assessment promotes a positive sense of agency and self-efficacy
- provide timely, specific and well-considered feedback that students can act upon
- provide students with opportunities to experience success
- challenge students to take risks to extend their learning
- challenge students when there are misconceptions or misunderstandings so they can self-correct
- support students in viewing mistakes as learning opportunities.

Students and teachers are actively engaged in assessing students' progress as part of the development of knowledge, conceptual understandings and skills. Recognizing that self-regulated learning is not a fixed personality trait (Clark 2012) and that students learn in diverse, complicated and sophisticated ways, teachers call on a variety of strategies and tools to support assessment of students' work.

Teachers:

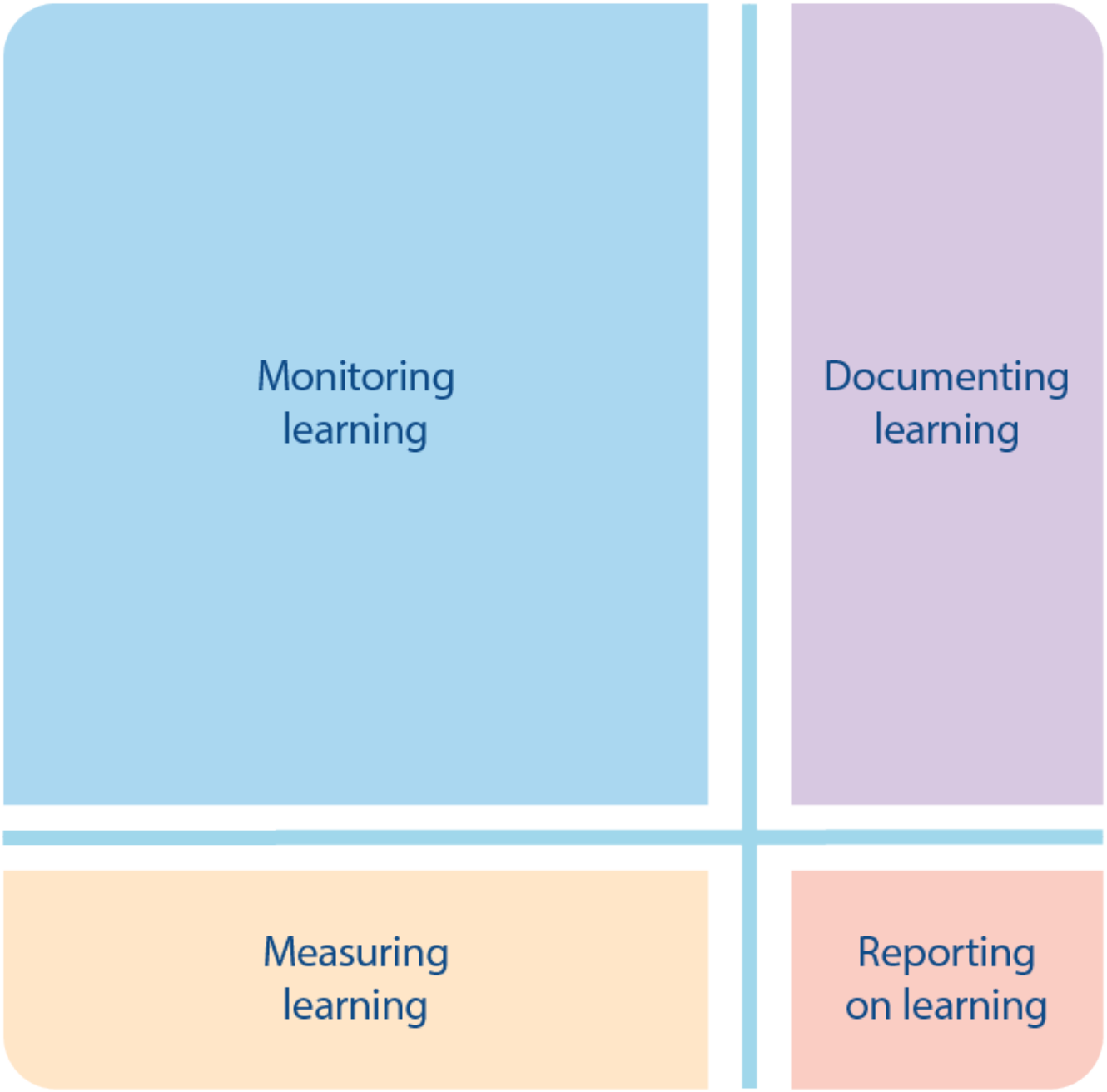
- provide multiple opportunities and contexts for students to practise their skills
- clearly define and communicate learning goals and success criteria with students and parents
- design guided and open-ended learning experiences that allow for a range of opportunities to demonstrate skills in different contexts
- collect and use observable learning evidence that can be seen, heard or touched
- identify where and when students are most ready to learn and be challenged.

# How to assess

## The four dimensions of assessment

Assessment provides evidence to inform learning and teaching. Both students and teachers are continually asking themselves the questions "Am I making progress? How do I know?" They gather evidence of learning to answer these questions.

PYP assessment has four dimensions: monitoring, documenting, measuring and reporting on learning. Each of these aspects has its own function, but all aim to provide evidence to inform learning and teaching. Although the four dimensions of assessment are not weighted the same; each dimension has its own importance and value. The PYP chooses to put emphasis on monitoring and documenting learning as these dimensions are critical in providing actionable feedback for the learner.




**Monitoring learning**

Monitoring of learning aims to check the progress of learning against personal learning goals and success criteria. It occurs daily through a variety of strategies: observation, questioning, reflection,

discussing learning with peers and teachers, and well-considered feedback to feed forward for next steps in learning. Tools used for monitoring include open-ended tasks, written or oral assessment, and a learning portfolio.

### Documenting learning

The documenting of learning is the compilation of the evidence of learning. Documentation can be physical or digital, and can be displayed or recorded in a variety of media forms. Documentation of learning is shared with others to make learning visible and apparent. It reveals insights into learning and provides opportunities to reconnect with learning goals and success criteria.

Students and teachers can document learning goals, questions, reflections and evidence of learning using a variety of formats.

- **Learning logs or journals:** These are used to record feedback and reflections of ongoing learning.
- **Learning stories:** Narratives that document an instance when the learner shows knowledge, conceptual understandings or skills.
- **Portfolios:** A collection of artifacts that can also contribute to reporting.

Documentation tools could include exemplars, checklists, rubrics, anecdotal records, portfolios.

### Measuring learning

The measuring of learning aims to capture what a student has learned at a particular "point in time". Not all learning can be, or needs to be, measured. Measurement tools can be school-designed or commercial, but each measurement tool used provides further data to support a larger picture of student achievement and progress in learning.

Some IB World Schools may administer government or commercially available standardized tests to measure their students' performance. When standardized achievement tests are used, administrators and teachers are encouraged to carefully consider:

- how to minimize the impact of testing on student well-being
- how to effectively use this data point to add to the comprehensive view of student learning.

## Analysing learning

Teachers use multiple data points to evaluate student progress. The aim is to organize, aggregate and disaggregate data to derive information to support evidence-based decision-making. The PYP supports collaborative analysis of data undertaken for individual learners, student cohorts and across the school to identify patterns and trends in student learning. The outcome of this analysis informs and guides decisions about learning and teaching.

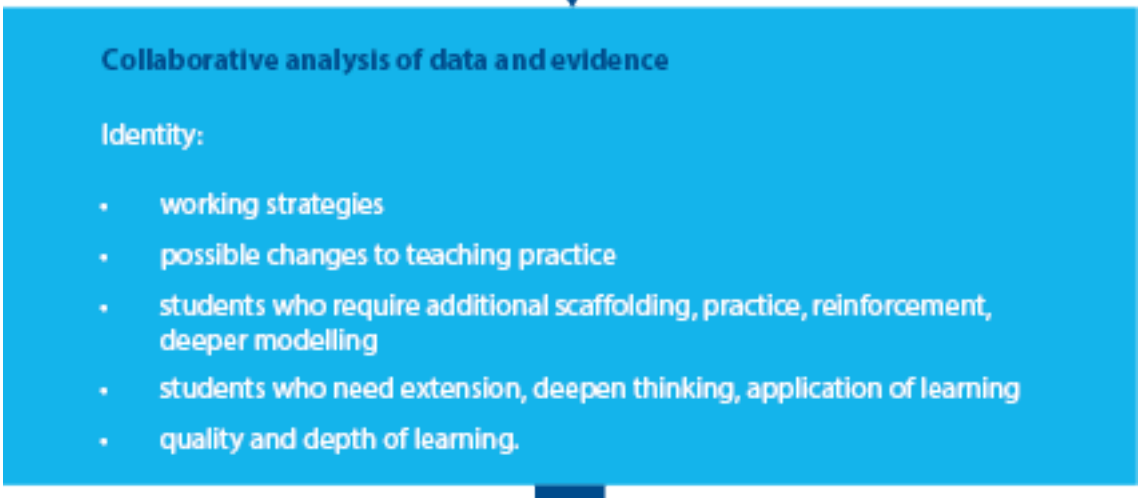
Teachers use a range of assessment tools and strategies to compile the most comprehensive picture of student progress and achievement over time. This includes the participation of the student within the process, which builds their assessment capability. Each tool and strategy chosen provides the learning community with accurate and accessible data on each student's learning.

## Teacher moderation

It is necessary to have a shared understanding of what quality and success looks like for diverse learners before, during and after learning. Teacher moderation through professional discussions around student samples is an effective strategy.

After any documenting and measuring of learning is complete, teachers collaboratively ask further questions.

- Have the learning experiences provided ample information to allow an evaluation to be made about whether the purposes or learning goals have been met?
- What does a student's performance reveal about their level of understanding?
- Have any unexpected results occurred?
- How could the learning and teaching process be modified as a result of the assessment?
- Should any changes be made to the assessment design or procedure?


## Reporting learning

Reporting on learning informs the learning community and reflects the question "How well are we doing?" It describes the progress and achievement of the students' learning, identifies areas for growth and contributes to the efficacy of the programme. Reporting is perhaps the most public aspect of assessment, and therefore needs careful consideration in order to provide clear information that is useful to students and parents. If a school awards and communicates grades or other indicators of achievement, it should ensure that these processes are open, transparent and understood by all stakeholders.

No specific formats are preferred by the IB for reporting. The following ways have been used by schools offering the PYP that may be considered or adapted.

- Parent/teacher/student conferences
- Student-led conferences
- Reports
- Learning progressions

Self-audit framework for teachers: Integrating assessment

Assessments are designed to produce data and/or evidence of learning and teaching. This optional tool offers considerations, when designing assessment for knowledge, conceptual understandings and skills, both individually and with collaborative planning teams.

| | Conceptual understandings | Skills | Knowledge |
|---|---|---|---|
| **Monitoring learning** | | | |
| The monitoring of learning occurs daily through a variety of strategies: observing, questioning, reflecting, discussing, and learning with peers and teachers to form meaningful feedback and feedforward for next steps in learning. | What conceptual understandings am I planning for and monitoring? How will my students know the purpose of monitoring learning? | How am I modelling the skills I want my students to build? How am I monitoring the skills I want my students to build? | What relevant prior knowledge might my students already have? How do I plan to find out? |
| **Documenting learning** | | | |
| The documenting of learning is shared with others to make learning visible and apparent. It reveals insights into learning and provides opportunities to reconnect with learning goals and success criteria | How am I documenting feedback and reflection on new understandings? How am I using this information? | Are/how are my students identifying connections to others learning and prior experience? In what ways are my students and I documenting skill developing? | How have my students and I identified and documented their learning? |
| **Measuring learning** | | | |
| The measuring of learning gathers "point-in-time" data | How have I given multiple opportunities for my students | How might my students use their strengthened skills in | Have I got the right balance between challenge and |

| | | | |
|---|---|---|---|
| on achievement and progress. Not all learning can be, or needs to be, measured. | to access, use and demonstrate new understandings? | other contexts? What will support them to do so? | knowledge? How do I know? |

Figure AS05 *Self-audit framework for teachers: Integrating assessment*

## Assessing early learners

Students in the early years acquire key learning milestones that are fundamental for future school success. This includes their cognitive ability to reflect on their knowledge, conceptual understandings and skills. A wide range of assessment strategies informs learning and teaching of young learners.

Early years teachers observe how students monitor and adjust their own behaviour, especially at play, in order to:

- build a clear picture of the student and their interests
- identify what and how the student is thinking and learning
- assess the effectiveness of the learning environment on the student's learning
- plan learning engagements for individuals and small groups.

When observing, teachers also document what the students say and do. By listening carefully to the dialogue between students, teachers learn about their current interests, existing knowledge, level of involvement and social skills. Teachers share these observations with students and parents. Collaborating with colleagues, they analyse group interactions, discover strengths, identify learning goals and reflect on the effectiveness of teaching practices.

## Giving and receiving feedback

Feedback has been identified as one of the most effective teaching practices (Hattie, Timperley 2007) and should, therefore, form the core of assessment. Effective teacher feedback offers opportunities for reflection and action. It encourages learning adjustment, promotes continuous improvement and celebrates success. Effective feedback is timely, specific and well considered to provide students

with opportunities to practise metacognitive skills (Booth, Hill, Dixon 2014). It helps students develop strategies to self-adjust and has a powerful influence on engagement and self-efficacy towards learning.

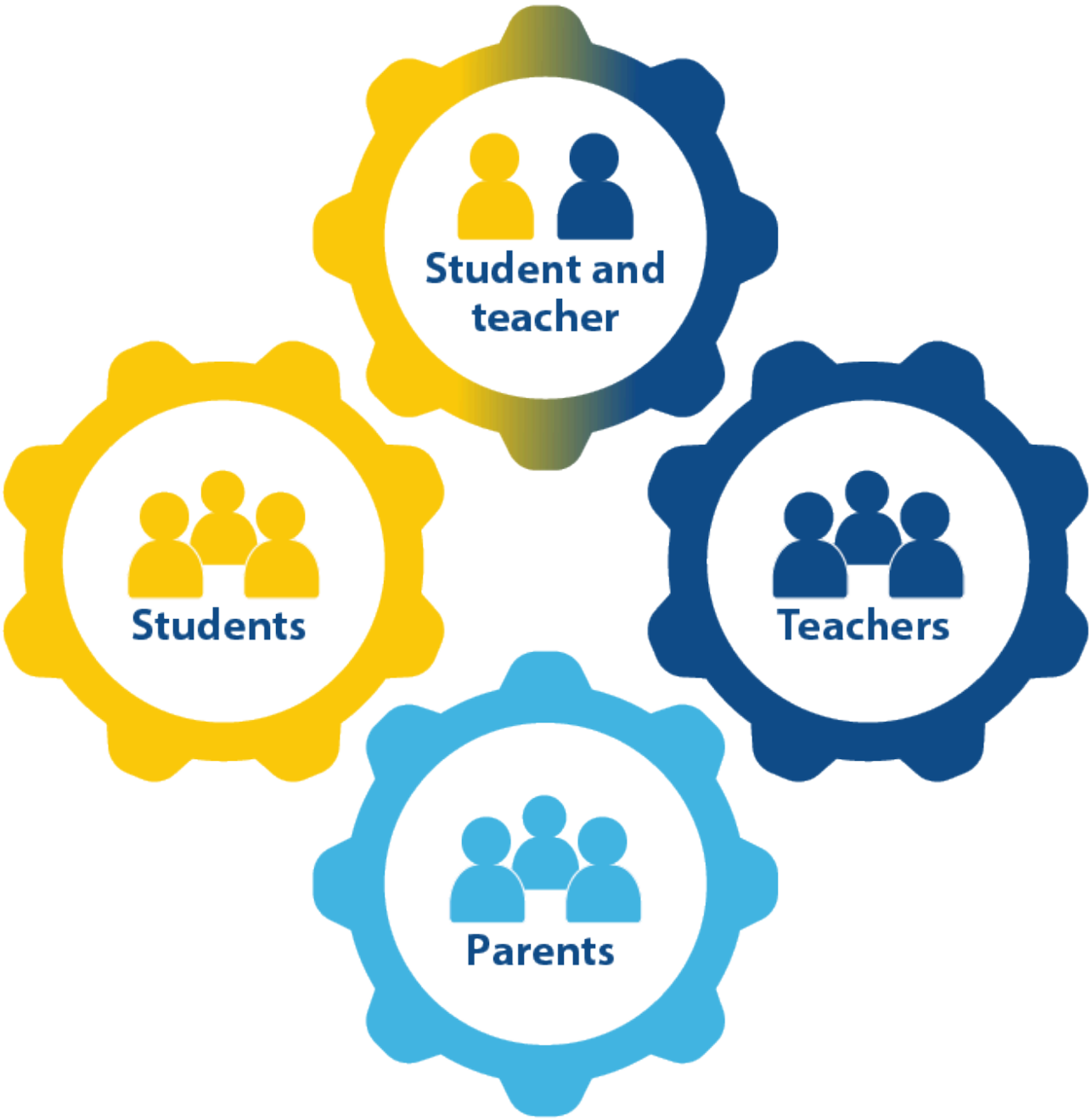
In providing feedback, teachers may also consider whether to focus on knowledge or skills, on the learning process or on self-regulation skills (Hattie 2012). All three types of feedback are necessary; however, students benefit most from feedback that is based on their learning progression. For example, a learner who is learning a skill for the first time might require more feedback relating to that skill or knowledge. At the same time, another learner who has had multiple opportunities to practise that skill will benefit from feedback relating to self-regulatory skills (Hattie 2012).

Feedback on knowledge, conceptual understandings and approaches to learning supports students moving towards their desired learning goals. When giving feedback, teachers should therefore focus on:

Feed**back**: How am I doing?

Feed**forward**: Where to next?

(Hattie and Timperley, 2007)




Teacher feedback can also aim at challenging students' reflection on misconceptions. Supporting students' correction of misconceptions removes potential barriers to learning and enhances deeper conceptual understanding (Hattie 2012).

### Peer feedback

Peer feedback is a key activity through which students use the structure and language of success criteria to appraise and provide feedback on the learning of others. It emphasizes the importance of learning in the context of relationships by providing opportunities to communicate and be listened to. Peer feedback contributes to learning adjustment because:

- it is given in language that students naturally use
- students are more ready to accept feedback from one another.

(Black et al. 2004)

Students who provide feedback to peers also benefit: in giving feedback, they increase their assessment capability. Peer feedback also gives teachers information about how a student's understanding of a learning experience is similar to, or different from, their peers.

To support this, teachers model how to provide effective peer feedback by:

- using language that shows respect for the learning of others
- referring to shared understandings of what quality and success looks like for diverse learners
- providing authentic and ongoing experiences in giving meaningful feedback
- supporting students to interact with the learning of others
- conferencing in small groups.

## Further reading

### Types of assessment

While school accountability reforms in many countries have put a spotlight on standardized assessments, education scholars are increasingly calling attention to the need to focus on assessment that connects student learning in a meaningful way (Stiggins 2002; Absolum et al. 2009). Firm evidence supports the efficacy of assessment **for** learning and assessment **as** learning on student outcomes, for they are an essential component of what students and teachers do in the classroom (Black, Wiliam 2010).

The three assessment practices—for learning, of learning and as learning—serve different purposes. Of these practices, assessments for learning and of learning strongly align with the centrality of the PYP inquiry process and can support students' cognitive, social emotional and behavioural development (Harlen, Johnson 2014). These practices may be formal or informal and internal or external. PYP students' learning is evaluated through a combination of these practices.

| | Assessment for learning | Assessment of learning | Assessment as learning<br><br>(Clark 2012; Earl 2012) |
|---|---|---|---|
| **Purpose** | Also known as formative assessment. Its goal is to inform teaching and promote learning. | Also known as summative assessment. Its goal is to certify and to report on learning progress. | As part of the formative process, its goal is to support students in learning how to become a self-regulated lifelong learner. |
| **Timing** | It is conducted throughout the learning process. It is iterative and interactive. | It is typically conducted at the end of a unit, year level or developmental stage, or programme. | It is conducted throughout the learning process. It is iterative and interactive. |
| **Features** | Student involvement<br><br>Quantitative and qualitative data<br><br>Written and oral artifacts<br><br>Observations and feedback<br><br>Questionnaires<br><br>Teacher/student dialogues/conferences | Limited student involvement<br><br>Quantitative data<br><br>Tests, exams, standardized tests<br><br>Indication of skills and knowledge acquisition or mastery<br><br>Based on teacher judgment | Students are active agents in their own learning by developing and using meta-cognitive strategies to:<br><br>• plan learning goals<br>• monitor goals<br>• reflect in order to modify learning and to adjust learning. |

| | | | |
|---|---|---|---|
| | Context-based<br><br>Informal<br><br>Indication of process<br><br>Indication of knowledge/skill application | Norm- or criteria-referenced | |

## Figure AS07 *The three assessment practices*

**Assessment for learning** is learner-centred, forward thinking and involves the entire learning community. It is a collaborative effort that starts with assessment of prior knowledge to determine what students already know and what they are able to do with further guidance (Griffin 2014). Using pre-assessment data, teachers design opportunities for students to test and revise their models, and support them in making connections between their previous and current perceptions.

Assessment produces evidence of student learning. Continuously monitoring, documenting and measuring learning, and then analysing assessment data, provides insights into students' understanding, knowledge, skills and dispositions. Assessment is a means for teachers to personalize learning and for students to self-adjust based on emerging data and feedback from teachers and peers.

**Assessment as learning** promotes learning by helping students to take responsibility, while developing enthusiasm and motivation for their learning. By encouraging students to actively design, manage and measure their own learning, they develop the skills to use assessments to self-assess, to reflect on and to make adjustments in future learning.

**Assessment of learning** is an integral part of learning. At appropriate points of the inquiry, it provides students with the opportunity to gauge their acquisition of knowledge, development of conceptual understandings and skills during the inquiry.

## Assessing understanding using SOLO

Many taxonomies outline the different levels of knowing and thinking, and can be used to design learning experiences and measurement tools for a deeper level of thinking. The structure of observed learning outcomes (SOLO) taxonomy (Biggs and Collis 1982) outlines five levels of thinking: one level where students have no prior knowledge or understanding, two surface levels of knowledge and two deeper levels of thinking (conceptual understandings). This model can be used to develop rubrics, observations, design learning experiences, and assessment tasks. Students require opportunities to acquire both surface and deep knowledge equally.

TSM: Solo taxonomy

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