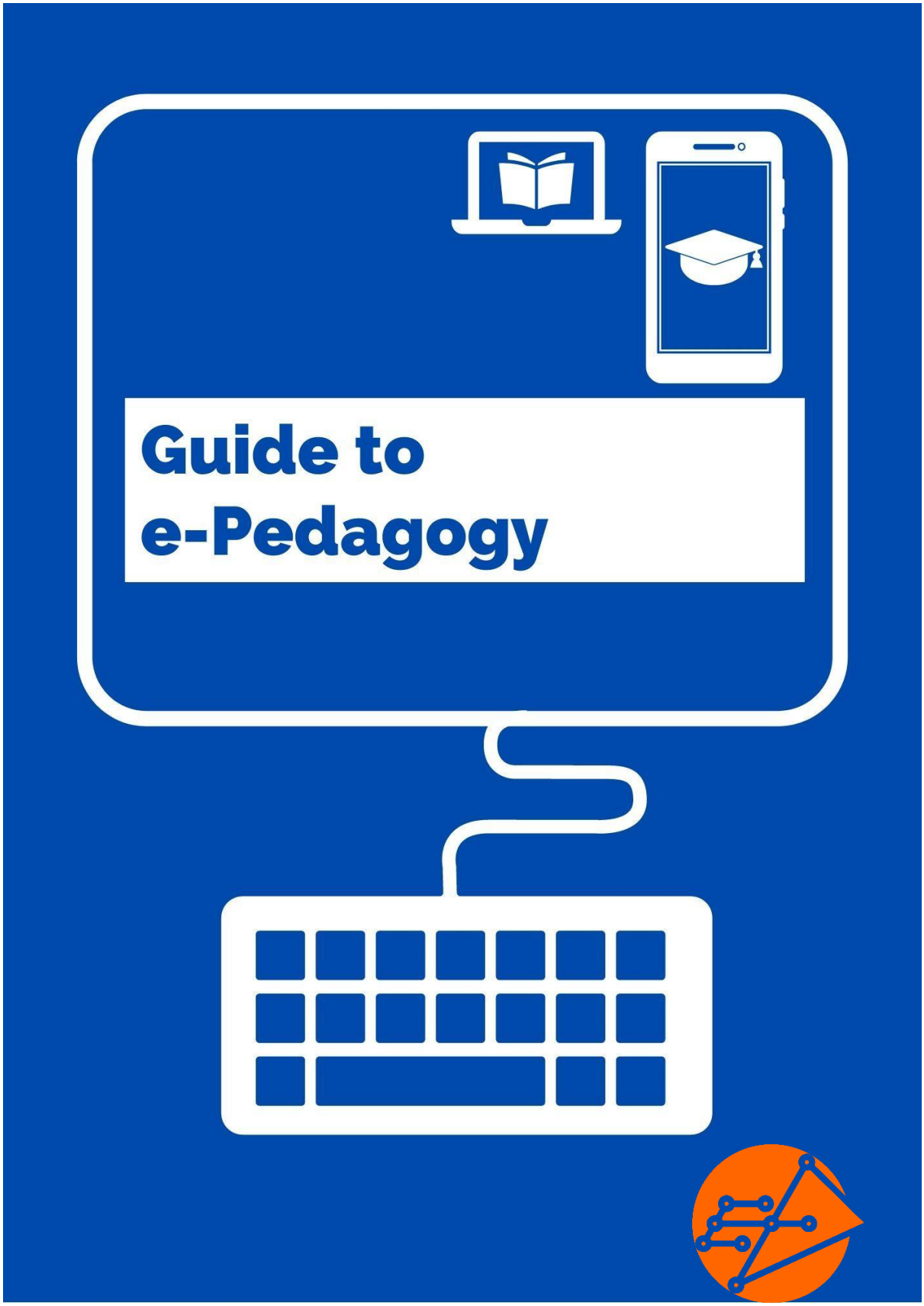


Educational Technology Division
Ministry of Education

Dear School Leaders, Middle Managers, Teacher Leaders and Teachers,

This Guide provides the core ideas and the practice of e-Pedagogy.

We hope this Guide will provide a common language for the teaching fraternity to converse on quality use of technology in teaching and learning.

Teachers can use this Guide as a reference resource when designing lessons with technology to promote active learning. Specific strategies and lesson ideas are included to concretise how e-Pedagogy considerations can be applied.

School Leaders, Middle Managers and Teacher Leaders can use this Guide to support teachers in their professional learning and facilitate learning conversations on the use of technology in professional learning teams. This Guide can also be used to plan for the professional roadmap of teachers in SkillsFuture for Educators (SFEd) for e-Pedagogy.

The Guide contains many ideas and resources such as lesson examples, explanations on lesson design considerations when using technology and information on professional development opportunities. Schools are encouraged to adapt the Guide to suit their own learning needs and purposes.

If you are interested to read up further on e-Pedagogy, please log in to the relevant sections of OPAL2.0:

- In *STP Singapore Curriculum Philosophy (SCP)* to understand how e-Pedagogy is integrated into SCP, where learning today takes place in both physical and digital spaces and technology is harnessed for data-driven assessment practices.
- In *STP Pedagogical Practices (PP)* to understand how e-Pedagogy is mapped onto the teaching processes and teaching actions.
- In *STP Knowledge Bases (KB) Chapter 11 under "Understanding Students and Learning"* to understand the theoretical underpinnings for designing technology-enriched Learning Experiences and lesson examples on e-Pedagogy.

Prepared by
Learning Partnership in Educational Technology Branch
Educational Technology Division

Updates (as of 4 January 2022)

No.	Amendment made	Page Number
1	**[New]** A record of updates to the Guide	3
2	**[New]** Links on the contents page leading to relevant sections in the Guide	4
3	**[Updated]** Paragraph 7 explains how to use the various e-Pedagogy resources	5
4	**[New]** Section on Quick-Start to e-Pedagogy provides teachers with three different tracks to apply e-Pedagogy based on their existing readiness levels in the use of technology in teaching and learning	6 - 13
5	**[Updated]** Paragraph 6, Figure 5 and Figure 6 explain the key elements of e-Pedagogy in SLS PS 2.0	17 – 18
6	**[Updated]** Explanation of the Key Applications of Technology (KAT) and examples of how teachers can apply each KAT	19 – 20
7	**[New]** Link to download the Design Map template	21
8	**[Updated]** Updated y-axis and description of the Design Map	21
9	**[New]** LE templates illustrate the relationship between the Learning Experience types and active learning processes, and updated templates for Practice and Production LE	30 – 35
10	**[New]** A Glossary of Terms	46 - 49
11	**[New]** A list of Frequently Asked Questions	50 - 55

Guide to e-Pedagogy for Designing Active Learning with Technology

(Version 2, 4 January 2022)

Introduction

1. e-Pedagogy is one of the six Areas of Practices (AoPs) identified as part of SkillsFuture for Educators (SFEd) that was launched in 2020.

2. The six AoPs in SFEd have been prioritised as they support teachers in strengthening their classroom practice to nurture future-ready learners in view of certain policy shifts under the MOE 'Learn for Life' movement. For e-Pedagogy, the related policy initiatives include the ***Personalised Digital Learning Programme (PDLP)***, ***National Digital Literacy Programme*** and ***Blended Learning***.

3. Teachers are not expected to undergo professional development in all six Areas of Practice within a single year but over five years to achieve 'Proficient' level for each of the six areas.

4. e-Pedagogy aims to focus teachers' efforts in creating new learning possibilities afforded by digital technologies. The desired outcomes of practice are for teachers to leverage digital technologies to accelerate and deepen learning by making learning more active and personalised.

5. This Guide provides an understanding of e-Pedagogy as a practice and the supporting resources to schools to use and adapt for the professional learning of teachers in e-Pedagogy.

6. This Guide contains a section on Quick Start to e-Pedagogy, which aims to provide teachers who are new to e-Pedagogy with some basic ideas about e-Pedagogy and a baseline set of considerations to design lessons with technology. Teachers can find the detailed explanation of e-Pedagogy in the second section 'e-Pedagogy Explained'.

7. Beside this Guide, other resources have been prepared to support teachers in reflecting on their current level of practice, broadening and deepening their practice, and leading others as they continue to grow their practice in e-Pedagogy:
   - To identify current level of practice: ***Self-Reflection Checklists for SFEd Emergent and Proficient Levels of Practice***
   - To broaden and deepen practice: ***Guide to e-Pedagogy, Design Cards, Self-paced Online Courses on OPAL2.0 and Micro-Learning Units on OPAL2.0***
   - To lead others in their practice: ***Facilitation Toolkit for Coaching on Lesson Design, Criteria for Quality Lesson Design Coaching Tool, Micro-teaching slides, Open Classroom slides and Peer Review Protocol.***

Quick Start to e-Pedagogy

What is e-Pedagogy?

1. e-Pedagogy is the practice of teaching with technology for active learning that creates a **participatory, connected, and reflective classroom** to nurture the future-ready learner.

2. Figure 1 explains e-Pedagogy in a nutshell.

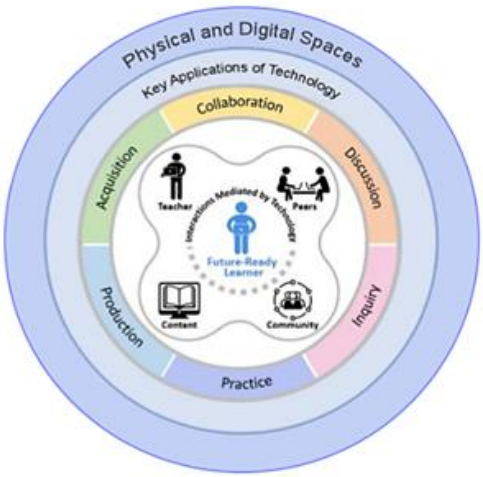


Figure 1: Overview of e-Pedagogy

- **Future-Ready Learners**
  Future-ready learners possess deep subject discipline skills and knowledge, MOE 21st century competencies and digital literacies.

- **Role of Technology**
  Technology supports learning activities by mediating learning interactions between the learner and the *teacher*, *peers*, *content*, and *community*.

- **Learning Experience (LE)**
  Learning activities are pulled together by suitable Learning Experience types to achieve the intended learning outcomes. The following are the LE types that teachers could design with technology: *Acquisition, Collaboration, Discussion, Inquiry, Practice* and *Production*.

- **Key Applications of Technology (KAT)**
  KAT are design guidelines on how learning processes are enhanced with the affordances of technology.

- **Physical and Digital Spaces**
  Learning with technology can occur in different learning contexts, with teachers blending learning seamlessly in both face-to-face and online spaces.

How to Use e-Pedagogy to Design Lessons with Technology?

1. Teachers could be at different levels of readiness in terms of applying e-Pedagogy. Teachers are not expected to achieve the highest level of practice immediately and can be guided to **progressively strengthen their practice in e-Pedagogy**.

2. Figure 2 shows examples of tracks (**A**, **B** and **C**) for teachers based on their existing readiness level in the use of technology in teaching and learning:
   A. I can plan Activities that are enhanced by technology
   B. I can design Activities guided by Active Learning Processes that are enhanced with technology
   C. I can design Learning Experiences enhanced with technology

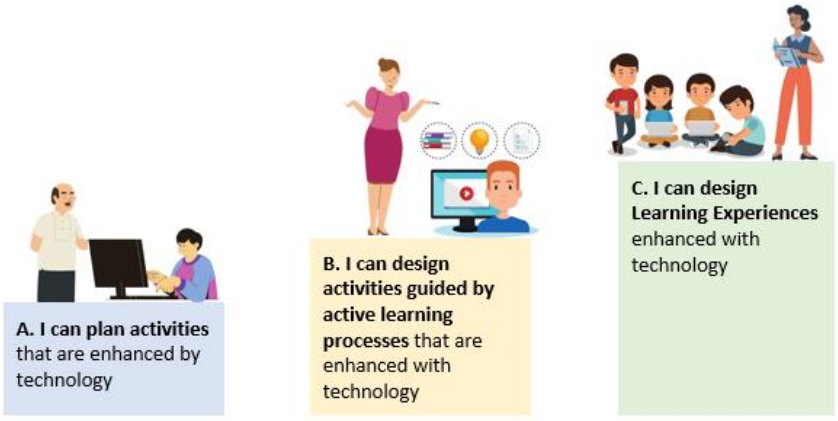


Figure 2: Examples of tracks based on teacher's readiness level

3. Figure 3 explains the relationship between **Activity**, **Active Learning Processes** and **Learning Experience**.
   - An **Activity** refers to what students will be thinking and doing during the lesson, e.g., students recall what they have learnt about number sequence and share via SLS Interactive Thinking Tool.
   - **Active Learning Processes (ALP)** refers to processes by which students make sense of information to achieve deep understanding and/or develop a skill**.** The four ALPs are "Activate Learning", "Promote Thinking and Discussion", "Facilitate Demonstration of Learning" and "Monitor and Provide Feedback". One or more activities could be designed for each ALP.
   - **Learning Experience (LE)** refers to models that stitch activities together to achieve an intended learning outcomes. LEs include "Acquisition", "Collaboration", "Discussion", "Inquiry", "Practice" and "Production". For each LE, activities within the ALP are designed to support specific skills and dispositions specific to that LE type

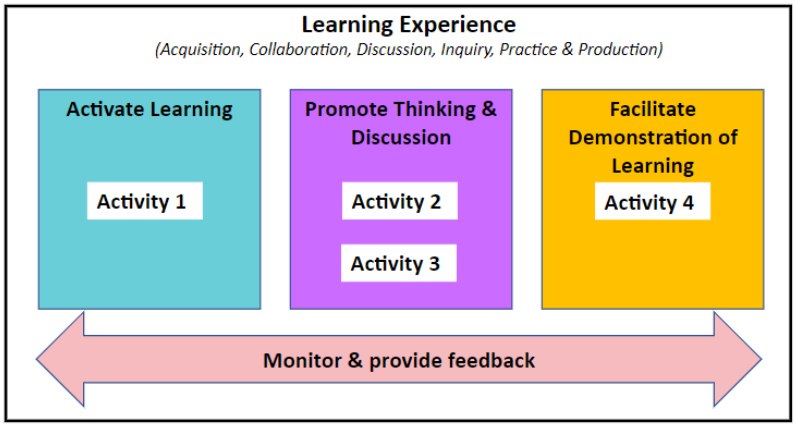


Figure 3: Relationship between activity, ALP and LE

Steps and Guiding Questions

The table below sets out *steps* and *guiding questions* for teachers at each level of readiness.

Table 1: *Steps* and *guiding questions* for **Track A**, **B** and **C**

Track			Steps	Guiding Questions[1]	Rationale
A	B	C			
A1	B1	C1	Determine: • learning outcomes including 21st Century Competencies (CC) • success criteria • evidence of learning	• What are the key concepts, skills and 21st CC that I want my students to learn? • What are the success criteria and evidence of learning to indicate that my students are learning?	These considerations guide the teacher in deciding what students will learn, how they will perform the tasks and how they will demonstrate what they have learnt.
		C2	Design Learning Experiences (LE) to achieve the intended learning outcomes.	• What LE (Acquisition, Collaboration, Discussion, Inquiry, Practice and Production) would help my students achieve the learning outcomes?	This step guides the teacher to think about the end-to-end learning experience and stitch together a series of activities meaningfully to achieve the intended learning outcomes.
A2	B2	C3	Select technological tools based on the Key Applications of Technology (KAT) to achieve the intended learning outcomes.	• How can technology be used in this lesson to: ○ support assessment for learning	This step guides the teacher in selecting the technological tool(s) which are most useful to enhance students' learning

[1] These questions are adapted from the **SLS Pedagogical Scaffold 2.0**, which is a design tool that translates e-Pedagogy into a set of considerations that guide teachers in designing lessons with technology. Refer to the sub-section "SLS Pedagogical Scaffold 2.0 in detail" (pp. 15 - 18) to find out more.

				○ foster conceptual change ○ provide differentiation ○ facilitate learning together ○ develop metacognition ○ enable personalisation ○ scaffold the learning	processes for this particular lesson.
	B3	C4	Design activities guided by active learning processes (ALP)	• How would I design activities that promote active learning with technology? • How can I use technology to help students interact, including with their teachers, peers, content or the community?	These considerations guide the teacher in designing activities and tasks to: • activate learning • promote thinking and discussion • facilitate demonstration of learning • monitor and provide feedback Within each activity or task, the teacher selects the technological tool(s) which are most useful to support students' interactions.
A3	B4	C5	Select technological tools to capture students' learning.	• How do I gather the evidence of learning to show that learning outcomes were met?	This guides the teacher in selecting the technological tool(s) to gather learning data, which can inform the teacher if the learning outcomes are met
		C6	Review the effectiveness of the lesson design.	• What went well in this lesson? What could be improved?	This guides the teacher in analysing the learning data to: • check if students are actively constructing meaning • check if the learning activities allow students to achieve the learning outcomes

Examples

The following examples illustrate how teachers can use the *steps* and *guiding questions* based on their readiness levels to design a Primary 4 Mathematics lesson on Fractions.

EXAMPLE A: I Can Plan Activities That Are Enhanced by Technology

- Teachers can use and adapt existing curriculum-aligned resources on **SLS MOE Library** and resources on **SLS Community Gallery.** Table 2 sets out *steps* to guide teachers in selecting and adapting SLS resources.

Table 2: Applying the *steps* for **Track A**

Steps		How to apply the steps
A1	Determine: • learning outcomes including 21st CC • success criteria • evidence of learning.	• The teacher identifies learning outcomes from the syllabus document. • To determine the success criteria, the teacher considers what students will be doing to demonstrate that they have achieved the learning outcomes. • The teacher thinks about the learning activities that would allow students to demonstrate whether they have achieved the success criteria. • For example, the learning activity should allow students to describe how changes in numerator or denominator affect the position of a fraction on the number line.
A2	Select technological tools to scaffold students' learning (KAT) in achieving the intended learning outcomes.	• The teacher selects the most useful technological tool(s) to scaffold students' thinking. • For examples: ○ GeoGebra Applet helps students visualise how changes in numerator or denominator affect the position of fractions on the number line. ○ SLS fill-in-the-blank provides scaffolds to guide students in their thinking and articulate their observations from the Applet.
A3	Select technological tools to capture students' learning.	• The teacher uses the SLS Heatmap to check which questions students have not answered correctly.

EXAMPLE B: I Can Design Activities Guided by Active Learning Processes That Are Enhanced with Technology

- Teachers can use the **ALP Lesson Template** in SLS which provides scaffolds to help teachers design learning activities guided by ALP.
- Table 3 sets out *steps* to guide teachers in using the ALP lesson template.

Table 3: Applying the *steps* for **Track B**

Steps		How to apply the steps
B1	Determine: • learning outcomes including 21st CC • success criteria • evidence of learning.	Same as A1 in Table 2.
B2	Select technological tools to scaffold students' learning (KAT) in achieving the intended learning outcomes.	Same as A2 in Table 2.

B3	Design activities guided by active learning processes (ALP) and use technology to support learning interactions to promote active learning	• The ALP lesson template contains the following sections tagged to each ALP for teachers to use and adapt.
		• To *activate learning*, the teacher gets students to recall what they have learnt previously about number sequence and share their understanding via SLS Interactive Thinking Tool (ITT). ITT supports student-student and teacher-student interactions because students can make their thinking visible to both teacher and peers
		• To *promote thinking and discussion*, the teacher
		  ○ embeds GeoGebra Applet in the learning activity for students to vary the numerator and denominator of fractions.
		  ○ includes SLS fill-in-the-blank questions to guide students in discovering how changes in numerator and denominator affect its position on number line. The scaffolds guide the students in interacting with the content provided by the Applet.
		• To *facilitate demonstration of learning*, the teacher administers an SLS Quiz to check if students are able to represent fractions on the number line.

B4	Select technological tools to capture students' learning.	Same as A3 in Table 2.

EXAMPLE C: I Can Design Learning Experiences Enhanced with Technology

- There are **six LE templates (Acquisition, Discussion, Inquiry, Collaboration, Practice and Production)** on SLS to help teachers create learning experiences.
- Teachers can also use the **Design Map** tool to plan their lessons.
- Table 4 sets out *steps* to guide teachers in using the template on SLS to design for an **Acquisition** LE.

Table 4: Applying the *steps* for **Track C**

Steps		How to apply the steps
C1	Determine the following: • learning outcomes including 21st CC • success criteria • evidence of learning.	Same as A1 in Table 2.
C2	Design LE to achieve the intended learning outcomes.	• The teacher would like students to learn about fractions through studying, analysing, and comparing information to identify patterns and see connection between the numerator and denominator. • The Acquisition LE template on SLS provides a guiding frame for the teacher to design a series of learning activities to achieve this objective.
C3	Select technological tools to scaffold students' learning (KAT) in achieving the intended learning outcomes.	Same as A2 in Table 2.
C4	Design activities guided by ALP and use technology to support learning interactions to promote active learning	• The Acquisition LE template contains a series of activities guided by ALP for teachers to help students understand critical features and structure of a concept by studying the given information. • To *activate learning*, the teacher presents students with number lines and invite them to share what they have learnt previously about number sequence via SLS Interactive ITT. ITT enables students to externalise their prior knowledge and teachers can identify and address the misconceptions (teacher-student interaction). • To *promote thinking and discussion*, the teacher ○ embeds GeoGebra Applet in the learning activity for students to work in pairs to vary the numerator and denominator of fractions and observe how this affects their position on the number line. ○ includes SLS fill-in-the-blank questions to guide students in identifying the underlying patterns from their observations of the

		changes on the number line. The scaffolds guide the students in interacting with the content provided by the Applet. ○ includes ITT in the learning activity for students to express different values on the number line as both an improper fraction and a mixed number and explain their thinking behind their answers. ○ gets students to study their peers' responses (student-student interaction) to reflect on and refine their understanding of the patterns observed. • To *facilitate demonstration of learning*, the teacher administers an SLS Quiz to check if students are able to represent fractions on the number line.
C5	Select technological tools to capture students' learning.	Same as A3 in Table 2.
C6	Review the effectiveness of the lesson design.	The teacher analyses the learning data to: • check if the students are actively constructing meaning through the activities (see step C4) • check if the learning activities and assessment tasks are aligned with the learning outcomes • evaluate the effectiveness of technology in scaffolding students' learning, and helping students interact with teachers, peers and content.

e-Pedagogy Explained

Why e-Pedagogy?

1. Technology in itself cannot transform learning but it can amplify and accelerate sound teaching and learning practices. Therefore, e-Pedagogy is the practice of designing learning with technology premises on a good understanding of what learning is.

2. Based on learning sciences (National Research Council, 2000), approaches to teaching and learning must address three key principles of learning:
   - **Engaging preconceptions**. Students have preconceptions about how the world works and that must be engaged and harnessed for conceptual change.
   - **Developing Schema**. To develop competence in an area of inquiry, students must be supported to understand ideas in the context of a conceptual framework, re-organise knowledge according to their own structures for retrieval and application.
   - **Metacognition**. Students need support to take control of their learning by defining learning goals, monitoring their own progress in achieving them and thinking about their own thinking and actions.

3. Designing lessons with technology is intentional and principle-based, informed by what learning sciences tells us about how people learn. Figure 4 explains how the principles of learning sciences guide the way teachers design for **active learning with technology**.

<table>
<tr><td>Principles from Learning Sciences</td><td colspan="3">Tapping on Prior Knowledge
Students have preconceptions about how the world works. These must be engaged and harnessed for conceptual change.

Building Schema
Students must be supported to understand ideas in the context of a conceptual framework and re-organise knowledge according to their own structures for retrieval and application.

Thinking about Thinking
Students need support to take control of their learning by defining learning goals, monitoring their own progress in achieving them and thinking about their own thinking and actions.</td></tr>
<tr><td rowspan="2">Active Learning Processes</td><td>Activate Learning
How will students' focus and interest be oriented towards the learning objectives?</td><td>Promote Thinking and Discussion
How will students think about ideas and concepts?
What skills and processes will students perform?
How will students build on their current understanding?</td><td>Facilitate Demonstration of Learning
How will students demonstrate their understanding and new learning?</td></tr>
<tr><td colspan="3">Monitor and Provide Feedback
How can students' learning be advanced?</td></tr>
</table>

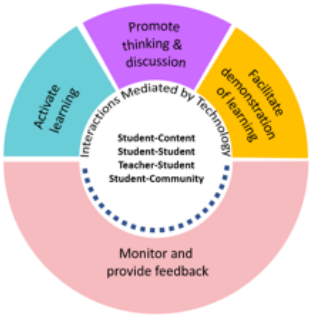
Figure 4: How learning principles inform the lesson design processes

4. Technology when used well can transform the culture of learning to be more participative, reflective and connected by enhancing student engagement, deepening learning and giving greater student agency and ownership of learning.

SLS Pedagogical Scaffold 2.0 in detail

1. SLS PS 2.0 (see Table 5) is a design tool that translates e-Pedagogy into a set of considerations that guide teachers in designing lessons with technology. The use of SLS PS 2.0 is not limited to the tools and features in SLS but any types of technology applications.

Table 5: SLS PS 2.0 guides teachers in designing lessons with technology

Phase 1	Phase 2	Phase 3
Establish Learning Outcomes	**Design & Facilitate Active Learning with Technology**	**Assess Quality of Learning**
1. What are the key concepts, skills, attitudes and values essential to my students' understanding of this topic? 2. What are the 21CC (including New Media Literacies) that are important for my students to develop? 3. What are the success criteria that can inform me that my students are learning? 4. What evidence would I use to know my students are learning? 5. What Learning Experience would help my students achieve the learning outcomes? 6. How can I design with technology to: ▪ support Assessment for Learning ▪ foster Conceptual Change ▪ provide Differentiation ▪ facilitate Learning Together ▪ develop Metacognition ▪ enable Personalisation ▪ Scaffold the learning?	7. How would I design learning activities that promote active learning with technology: ▪ activate learning ▪ promote thinking and discussion ▪ facilitate demonstration of learning ▪ monitor and provide feedback? 8. How can I use technology to support learning interactions for active learning? 	9. How does the evidence of learning with technology show that learning outcomes were met? 10. How effective is the design of the learning activities with technology?

2. SLS PS Version 2.0 was released in 2020 to include more Learning Experience types and the explicit articulation of Key Applications of Technology and learning interactions.

3. The three phases of designing for active learning with technology are further elaborated:

Phase 1	Phase 2	Phase 3
Establish Learning Outcomes	**Design & Facilitate Active Learning with Technology**	**Assess Quality of Learning**

   a. **Phase 1** is about establishing the learning outcomes, including content outcomes, skills, values and attitudes, 21CC and digital literacies.

   b. **Phase 2** is about facilitating active learning with technology. Teachers design learning activities based on the four active learning processes and facilitate the learning interactions during lessons.

   c. **Phase 3** is about assessing the quality of learning. Teachers, as reflective practitioners, tap on technology to collect evidence of students' learning for lesson review and refinement.

4. **While the questions are sequenced to scaffold the lesson design process, teachers may start from any question.** As the process of lesson design is iterative, teachers may also find themselves going back to the earlier questions as they refine the lesson.

5. The questions in each of the phases guide teachers to think systematically about how to design the different learning activities and assessment tasks and select appropriate technologies. Table 6 shows how a teacher can use the guiding questions to design for active learning with technology.

Table 6: How teacher can use the guiding questions in SLS PS 2.0 for lesson design

Design Considerations	Guiding Questions	What does each of the Design Considerations mean?
What are the learning outcomes?	1. What are the key concepts, skills, attitudes and values essential to my students' understanding of this topic? 2. What are the 21CC (including the New Media Literacies) that are important for my students to develop? 3. What are the success criteria that can inform me that students are learning? 4. What evidence would I use to know my students are learning?	It is important at the start of my lesson design that I am clear about the learning outcomes and how I want my students to demonstrate their learning and be able to perform the tasks.
Which Learning Experience?	5. What Learning Experience would help my students achieve the learning outcomes?	Each Learning Experience type can help to achieve certain process learning outcomes more effectively. Process learning outcomes are skills and dispositions that are not content-based but are necessary to prepare students to be future-ready learners. These process outcomes are also articulated in subject syllabuses. Examples of process skills are 21st century competencies such as critical and inventive thinking, communication and collaboration skills, and also digital literacy such as ability to curate information from the Internet. *For example, if I am interested in developing inquiry skills, I would choose an Inquiry LE. Likewise, if my focus is on developing perspective-taking and collaborative skills, I would choose a Discussion LE.*
What technologies should I use?	6. How can I design with technology to: ● support assessment for learning ● foster conceptual change ● provide differentiation ● facilitate learning together ● develop metacognition ● enable personalisation	I need to consider the pedagogical affordances of the technological tools to enhance the learning processes I want to focus on. *For example, collaborative platforms allow for the ease of students to learn together and give peer feedback.*

	● scaffold the learning?	
What learning activities with technology should I design?	7. How would I design learning activities that promote active learning with technology: ● activate learning ● promote thinking and discussion ● facilitate demonstration of learning ● monitor and provide feedback? 8. How can I use technology to support learning interactions for active learning?	Based on the chosen LE type (refer to SLS PS Q5), I need to think about the various types of learning and assessment activities that students will be actively engaged in. I want to tap on technologies to enhance the learning interaction between students and the content so that they are cognitively engaged. I also want students to be learning collaboratively with one another and from the community. I also want to harness technology to enhance my role as a facilitator and assessor of learning in monitoring learning progress and giving feedback.
How do I know my students are learning?	9. How does the evidence of learning with technology show the learning outcomes were met? 10. How effective is the design of the learning activities with technology?	If my students' learning is made visible with technology, I would be able to use my students' works, products, data and responses to assess how well my students have learnt. I also want to use students' data to review my lesson design.

6. The **four elements of e-Pedagogy** (see Figure 5) serve as a good guide when designing for:

a. Constructive Alignment
Ensures that students are constructing meaning for themselves through relevant learning activities, and the learning outcomes, learning activities and assessment tasks are coherent.

b. Learning Experience
Consider how the learning activities are pulled together meaningfully to achieve the intended learning outcomes.

c. Active Learning Processes and Interactions
Learning sciences principles tell us that learning interactions are at the heart of the active learning processes, where the focus is on how students learn with teachers, peers, community and resources.

d. Key Applications of Technology
Consider the affordances of technology that can be harnessed to enhance the learning processes.

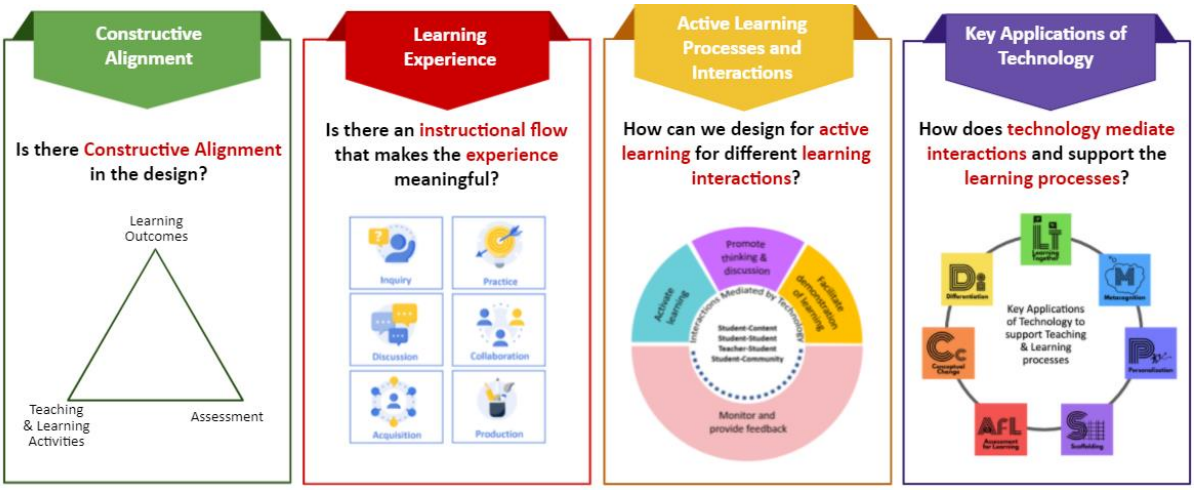


Figure 5: Elements of e-Pedagogy in SLS PS 2.0

7. In using SLS PS 2.0, a teacher is also guided to ensure **<u>Constructive Alignment</u>** in their lesson design. Using **<u>Questions 1, 2, 3, 4, 7, 9 and 10</u>** across the three phases, a teacher will have clarity of the learning outcomes and how the types of learning activities and assessment evidence are aligned to the outcomes. For instance, if developing conceptual understanding is a key learning outcome, the learning activities must include tasks for students to make connections across ideas and concepts, and evidence to demonstrate students' conceptual thinking. Figure 6 explains the key elements of e-Pedagogy when using SLS PS 2.0.

8. In summary, the SLS PS 2.0 guides teachers in systematic lesson design with technology, anchored in sound learning principles.

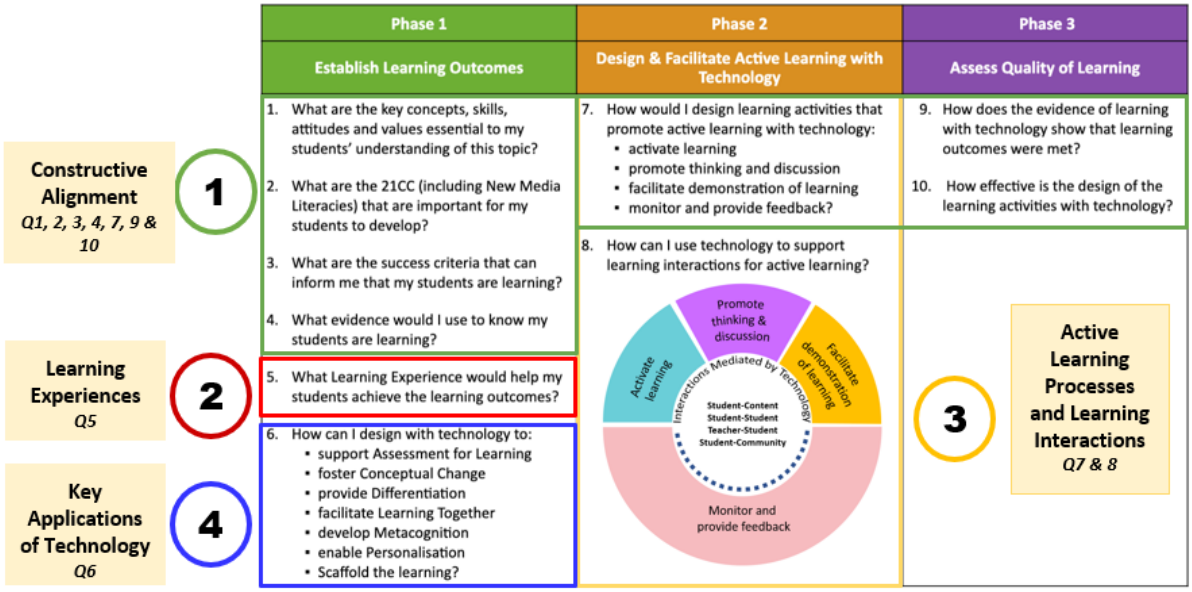


Figure 6: Explaining key elements of e-Pedagogy when using SLS PS 2.0

Key Applications of Technology

Key Applications of Technology (KAT) are design guidelines on how learning processes are enhanced with the affordances of technology. Figure 7 describes how technology can be applied in each KAT to enhance teaching and learning.

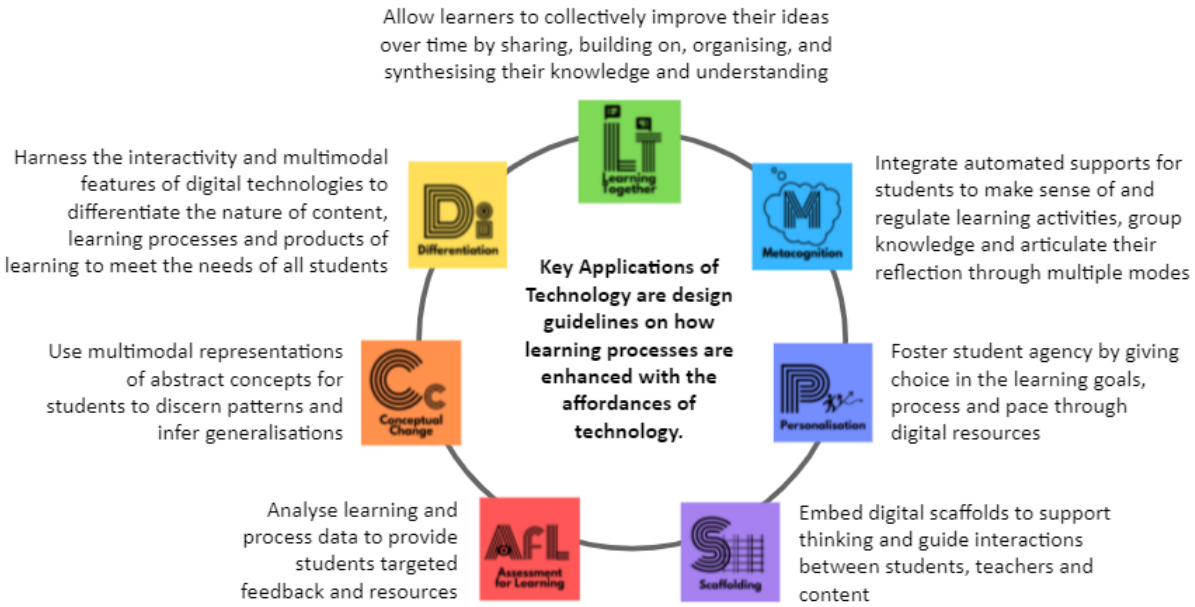


Figure 7: Key Applications of Technology

Table 7 illustrates some examples of how teachers can adopt each KAT, and the impact of using technology on students' learning.

Table 7: How teachers can apply KAT and the impact on students' learning

KAT	Example of Teachers' Actions	Impact on Students' Experiences
Support **Assessment for Learning**	Teachers design for students to attempt a progressive quiz in SLS. Using the data from the quiz results, teachers can monitor the students' learning and close any learning gaps in a timely manner.	Students get timely feedback upon submission, and check on their own understanding based on the feedback.
Foster **Conceptual Change**	Teachers tap on simulations and design tasks for students to draw generalisations from their interaction with the simulations.	Students explore concepts through manipulation of an application to see patterns in information, and form conjectures and explanations to understand abstract concepts.

Provide **Differentiation**	Teachers differentiate learning tasks and assign them to different groups of students based on readiness or interests using Subgroups feature in SLS.	Students can access differentiated learning tasks assigned to them at their own pace and time, based on their readiness, interests and learning profiles.
Facilitate **Learning Together**	Teachers enable Assignment Sharing feature on SLS to allow students to share their written work with their peers to elicit feedback.	Students make their thinking visible, build on one another's ideas and give targeted feedback to each other.
Develop **Metacognition**	Teachers customise the SLS Interactive Thinking Tool to encourage students to document and externalise their thinking and knowledge, and to reflect on their new knowledge for refinement.	Students are guided by teachers' thinking routines to reflect and ask questions, regulate their learning, monitor their progress and direct their actions towards the learning goals.
Enable **Personalisation**	Teachers make use of an intelligent tutoring system to evaluate and respond to learners' actions, provide timely feedback and advise on the next learning steps.	Students interact with an intelligent tutoring system and receive timely feedback for the next recommended learning steps. Students have a choice of the process and pace of learning.
Embed **Scaffold for Learning**	Teachers embed digital scaffolds with the SLS Tooltip and Hint features within an SLS lesson.	Students may access scaffolds when they need additional support.

How to Use a Design Map to Facilitate Lesson Design?

1. While designing lessons guided by SLS PS 2.0, teachers can consider using a **Design Map template (http://go.gov.sg/designmap)** to craft the lesson unit. The Design Map helps teachers visualise the end-to-end Learning Experience which may stretch across a few lessons.

2. The Design Map is useful for teachers in the following ways:

    a. Provide a clear overview of the active learning processes across time and different types of interactions in and out of classrooms.
    b. Clearly indicate the teacher's actions for facilitating student learning during lesson enactment.
    c. Help teachers to identify strengths and gaps in the lesson design.

3. The Design Map has the following features:

    a. It depicts the **sequence of learning activities** designed for a lesson or even an entire unit. It illustrates **how data that is generated from one learning activity is used in the next activity**.
    b. It also **makes explicit the types of learning interactions** between the teacher, student, content and community, as well as the role of ICT.

Figure 8 shows a sample of a Design Map of a lesson on the Primary 6 Science topic "*Interaction within the Environment – Adaptation*".

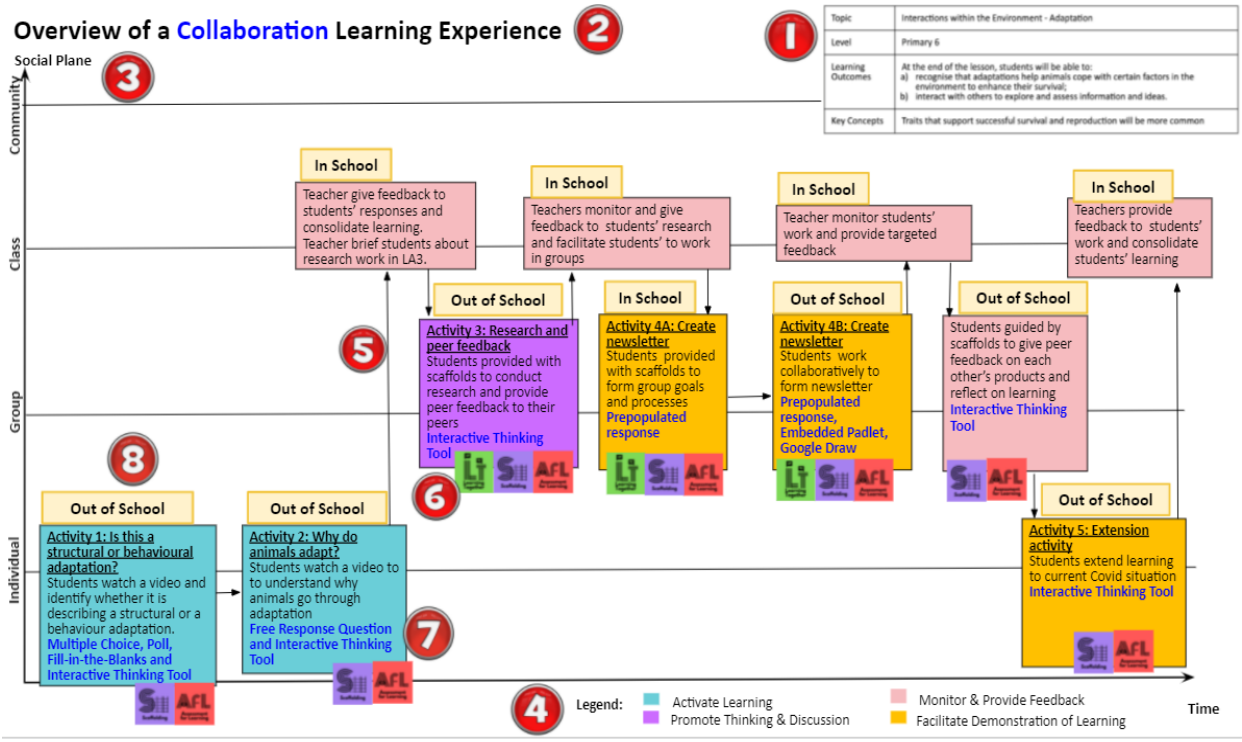


Figure 8: An example of a Design Map

	1. The key learning outcomes are spelt out clearly in the table. These outcomes are aligned to Questions 1 and 2 of the SLS PS 2.0.
	2. The teacher states the type of Learning Experience he is designing in the title.
	3. The y-axis represents the social planes in which the activities take place. 4. At a glance, one can see on the Design Map if the lesson is designed for different learning interactions to take place. 5. The x-axis denotes the time for each activity. The first activity to take place should be on the left, while the last on the right.
	6. Learning activities (in coloured boxes) reflect the active learning processes supported by technology: a. Activate Learning b. Promote Thinking and Discussion c. Facilitate Demonstration of Learning d. Monitor and Provide Feedback
	7. The arrows represent the flow of data from one activity to the next. Every interaction produces a set of data. The teacher needs to be clear what is being done with the data at each stage of the learning. The teacher can use the information to modify the strategy to scaffold students' learning or address the learning gaps.
	8. The teacher thinks about how technology supports a collaborative Learning Experience and the learning process throughout the lesson. Activities are tagged with the KAT to show how interactions are mediated by technology.
	9. The blue words indicate the digital tools that are used in the activity to support the KAT.
	10. The teacher can also make the considerations for the learning environment clear by indicating if the activity is taking place in the physical space (in school) or digital space (Out of School).

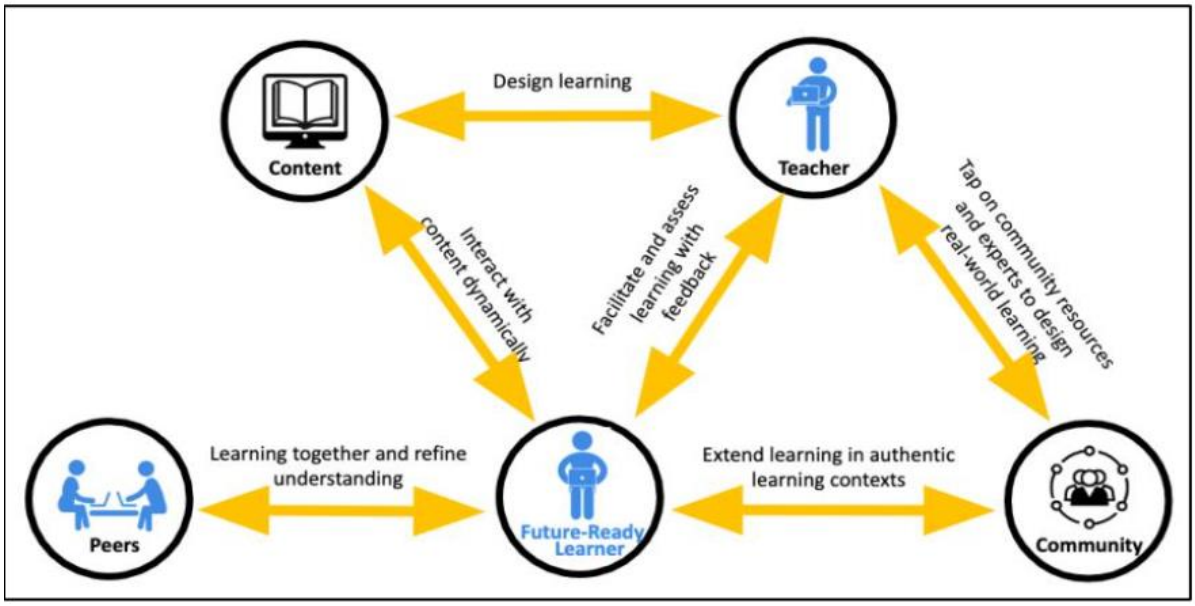
Annex A Technology Mediates Learning Interactions

1. Learning interactions form the core of meaningful Learning Experiences. The instructional core of a classroom typically comprises the interactions between the teacher, student and content.

2. Technology plays an even greater role facilitating interactions beyond the physical classroom, as learners can now engage experts and resources as learning partners in the community to extend learning.

3. Teachers can design for interactions mediated by technology to build a positive classroom learning culture which encourages student empowerment.

4. Technology brings about six types of interactions in the digital learning environment.



Learning interactions facilitated by technology

Type of Interaction		Explanation	An Example of How Teachers can Design for the Learning Interaction with Technology
Student-focused	Student-Student Interaction	• Students' ideas are made visible to others (i.e., peers) through digital collaborative spaces, which in turn encourages collaborative learning. Students are resources to one another, and students connect and learn with peers by sharing and building on the ideas of one another, to refine their own understanding. • Strategies include peer review and peer modelling, group reflection, or consensus building exercises to guide students to refine their ideas and thinking. Students could also be involved in co-creating digital products.	• The teacher designs a discussion task using the SLS Interactive Thinking Tool. The teacher sets the question for the students to think and respond. After the students have responded, the teacher gets their peers to comment and provide feedback, scaffolding their review with a set of rubrics to identify the key content points. The students also learn to practise good netiquette. Once the students receive feedback from their peers, they can continue to ask questions to clarify, before going back to their original post to refine their answers.
	Student-Content Interaction	• Students interact with multimodal content dynamically by manipulating, responding to, and modifying content and could get individual feedback. • Feedback on learning may be intrinsically woven into interactive content. • Students could be provided scaffolds to see patterns in information and learn conceptually. • Students could also curate resources and ideas, as well as create new knowledge and contribute their learning artefacts to community knowledge.	• To activate students' learning, the teacher embeds a YouTube video into an SLS lesson related to the topic and uses the See-Think-Wonder routine to get students to ponder about the theme, and questions related to it. In SLS, the teacher then directs the students to a few blogs, each with a differing view to the topic. As the students read the blogs, they consider questions provided by the teacher to guide them to look for salient points and synthesise the information. Later, the students create their podcasts on what they have learnt and how their prior knowledge has been challenged or reinforced.
	Student-Community Interaction	• Students extend their learning sphere to interact with the community and the world at large, to learn from partners in education to build understanding and ideas. The learning can come in the form of crowdsourced data or from experts in the field. • The community may provide	• The teacher gets the students to explore a topic and prepare questions around it. The teacher then arranges for a virtual meeting with an expert of the topic, so that the students can engage the expert meaningfully. Thereafter, the students write a report and reflections in their online journal. They also extend their learning by

		real-world challenges, authentic fieldwork opportunities or site-specific access to help situate learning in a meaningful authentic context and to apply problem-solving skills.	publishing an online newsletter for the rest of the school to learn about the expert's views on the topic.
	Teacher-Student Interaction	• Teachers instruct, explain, model, facilitate by scaffolding learning to help students acquire, reflect and modulate their knowledge, skills, attitudes and values. • Students themselves also bring with them prior knowledge and insights which could be built on by teachers in co-construction of meaning and knowledge. • Students demonstrate understanding and teachers assess learning, regulate learning pace, and provide feedback.	• The teacher sets a quiz in SLS to elicit prior knowledge of the students on a topic. After analysing the SLS Heatmap, the teacher understands the students' learning gaps, and clarifies those misconceptions. The teacher then sets up differentiated activities for the students to apply the new knowledge. Using the students' responses, the teacher taps on SLS to provide targeted feedback.
Teacher-focused	Teacher-Content Interaction	• Teachers curate resources and lessons, and design interactive content and Learning Experiences to modulate students' acquisition, articulation and application of knowledge and concepts. Teachers can also draw from the pool of content with new data and knowledge created by students, to redesign their lessons or to adjust teaching actions	• The teacher searches for content and interactives on MOE Library in SLS to illustrate to students' key content. The teacher also adapts existing SLS lessons on Community Gallery, to have a rough understanding of the level of difficulty her questions for her students should be pegged at.
	Teacher -Community Interaction	• Teachers interact with the community and the world to learn from partners and experts in education to build their practice. They may draw from community resources and expertise for lesson ideas. • Teachers may work closely with the community to source for real-world problems to enhance students' learning.	• The teacher goes onto the Singapore Learning Designers Circle on Facebook to gather ideas, share lessons and hear feedback from fellow educators. The teacher also works with community partners and experts to craft research problems for students to work with.

Six types of learning interaction with technology

Annex B Active Learning Processes

Activate Learning

When the teacher activates students' learning, their prior knowledge and conceptions are surfaced. Students are guided towards the learning objectives of the lesson, so that they can self-regulate and move intentionally towards the learning goals.

With technology, the teacher can provide multimodal stimuli such as videos, infographics and interactive media to trigger students' prior understanding of the topic and identify any misconception that he may need to address. Digital tools like online journals can also help students to plan their own learning goals, encouraging them to take ownership of their own learning.

Promote Thinking and Discussion

At this stage, the students achieve understanding in the key concepts of the subject matter through the different interactions.

The teacher presents the new knowledge and guides the students in using thinking strategies and routines to deepen their learning. He also creates opportunities for the students to learn from each other, having them discuss and critique their peers' work, or collaborate to co-create knowledge.

Technology can be leveraged to scaffold students' learning and offer personalised learning pathways. Students can leverage online tools and resources to collaborate and research. Digital simulations can be used for students to test out and explore concepts.

Facilitate Demonstration of Learning

As students construct their understanding, it is paramount that they can consolidate their knowledge and apply them by creating learning artefacts. They are making their thinking visible, not only to their teacher and peers, but to themselves as well, so that they can reflect on the feedback received, and the learning processes they were previously engaged in.

Technology affords the students to express themselves in a myriad of media forms, offering autonomy. They can receive automated feedback on their work, or feedback from the teacher and peers synchronously or asynchronously, depending on the digital tool used.

Monitor and Provide Feedback

Throughout the learning process, the teacher must be able to use learning data to monitor students' understanding, review their progress and provide timely and relevant feedback. The learning data is also useful to the students themselves to perform reflections and take corrective actions to reach their learning goals.

The lesson design should account for the ways to collect data and how the data will inform the students' learning progress. Technological affordances bring out efficient and effective means to data collection, providing meaningful visual representations for analysis and insight.

Annex C Learning Experiences

Learning Experiences (LE) are types of instructional models that pull together the learning activities and tasks into technology-mediated, orchestrated and meaningful pedagogical patterns, to develop specific skills and learning dispositions in students (Laurillard, 2012).

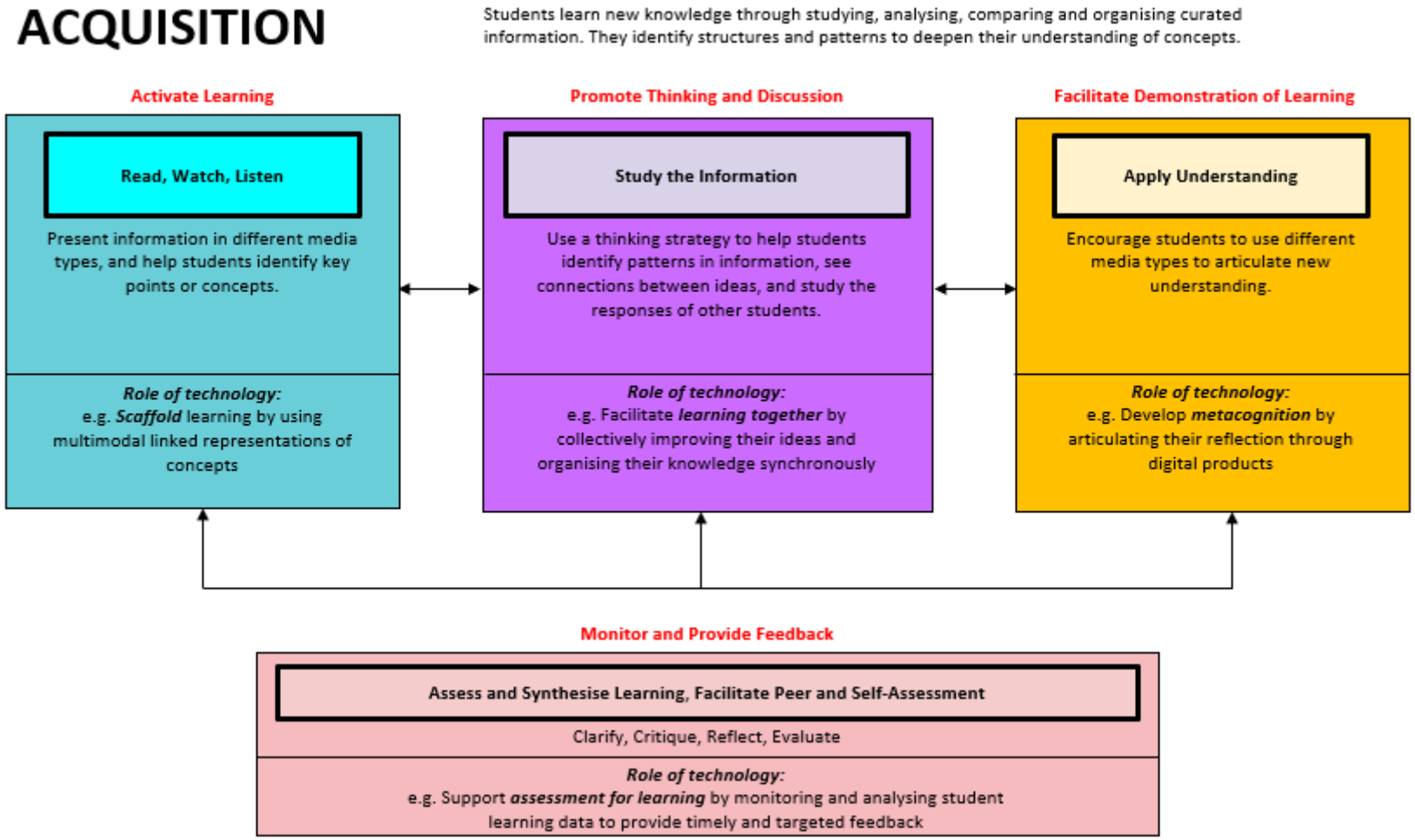
Each LE is guided by the active learning processes so that students are actively constructing and co-constructing meaning from knowledge and the activities they go through. They are guided to activate prior knowledge, and assimilate and accommodate new knowledge through exploration, and interaction with others.

Teachers can design for six different types of LE according to their intended learning outcomes. The six LE types are further explained in the next page, and the LE types can be adapted for any subject-specific pedagogy or practices. Each LE type can develop specific learning dispositions and process skills in students.

The table below illustrates these, as well as the student's actions that take place during the LE to develop these dispositions and skills.

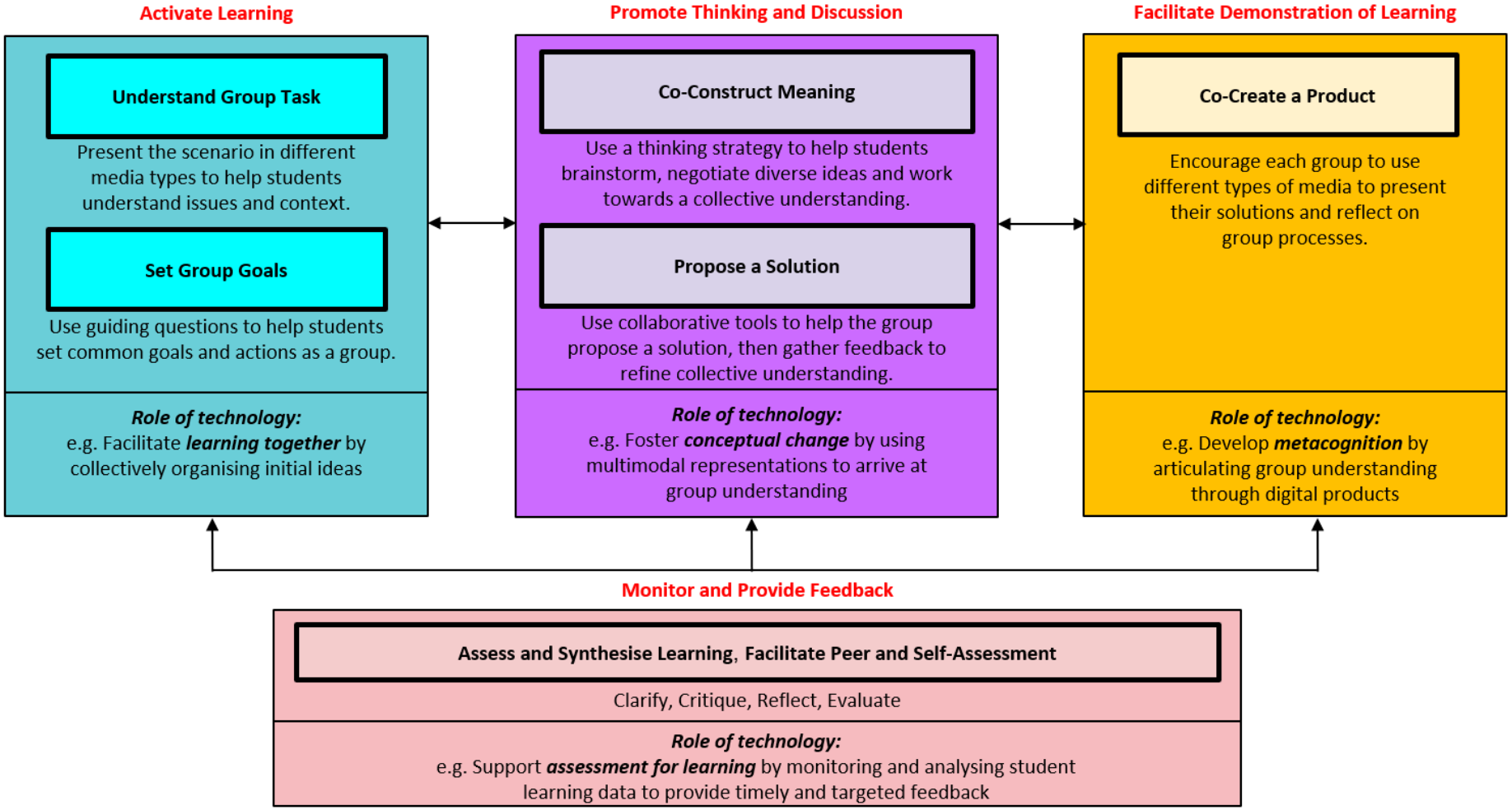
Types of LE	Learning Disposition / Process Skills	Learner Actions
Acquisition 	Understand critical features and structure of a concept by studying given information	Students learn new knowledge through studying, analysing, comparing and organising curated information. They identify structures and patterns to deepen their understanding of concepts.
Collaboration 	Group knowledge construction of a shared output (construct idea, challenge, modify, defend or redevelop)	Students plan and establish group goals and processes. They collectively ideate, discuss, negotiate diverse ideas and co-construct meaning that contributes towards the production of a shared output.
Discussion 	Relate and communicate with others to see different perspectives and refine own understanding	Students generate and exchange ideas and perspectives, supported by evidence and explanations. They engage in peer critique to refine understanding of their ideas.
Inquiry 	Fosters fundamental skills of developing own knowledge (continually adapted and refined)	Students form an informed prediction to an inquiry task. They investigate by exploring, clarifying and analysing information sources and data. They formulate an explanation based on evidence and evaluate and reflect on their findings and new learning.
Practice 	Develops the practice and mastery of the subject's ways of thinking and doing	Students are involved in tasks to develop the practice of subject discipline in an immersive environment. Through feedback gathered, they can improve their subsequent actions in an iterative manner and acquire a better grasp of relevant knowledge and skills in any subject.
Production 	Motivates students to propose solutions to a real-world problem and generate a consolidated expression of knowledge via a tangible artefact	Students explore a real-world problem and produce tangible artefacts (video, built structure etc) iteratively to solve them. Their thought processes and decision points are captured online, allowing the teacher to track student growth and provide timely feedback.

The LE Design Cards describe the characteristics of each LE and show how the characteristic can be mapped to the active learning processes. Considering the **cyclic nature** of the active learning processes, the "double headed" arrow means that students can move between the two processes in **either direction** as a result of the feedback mechanism.



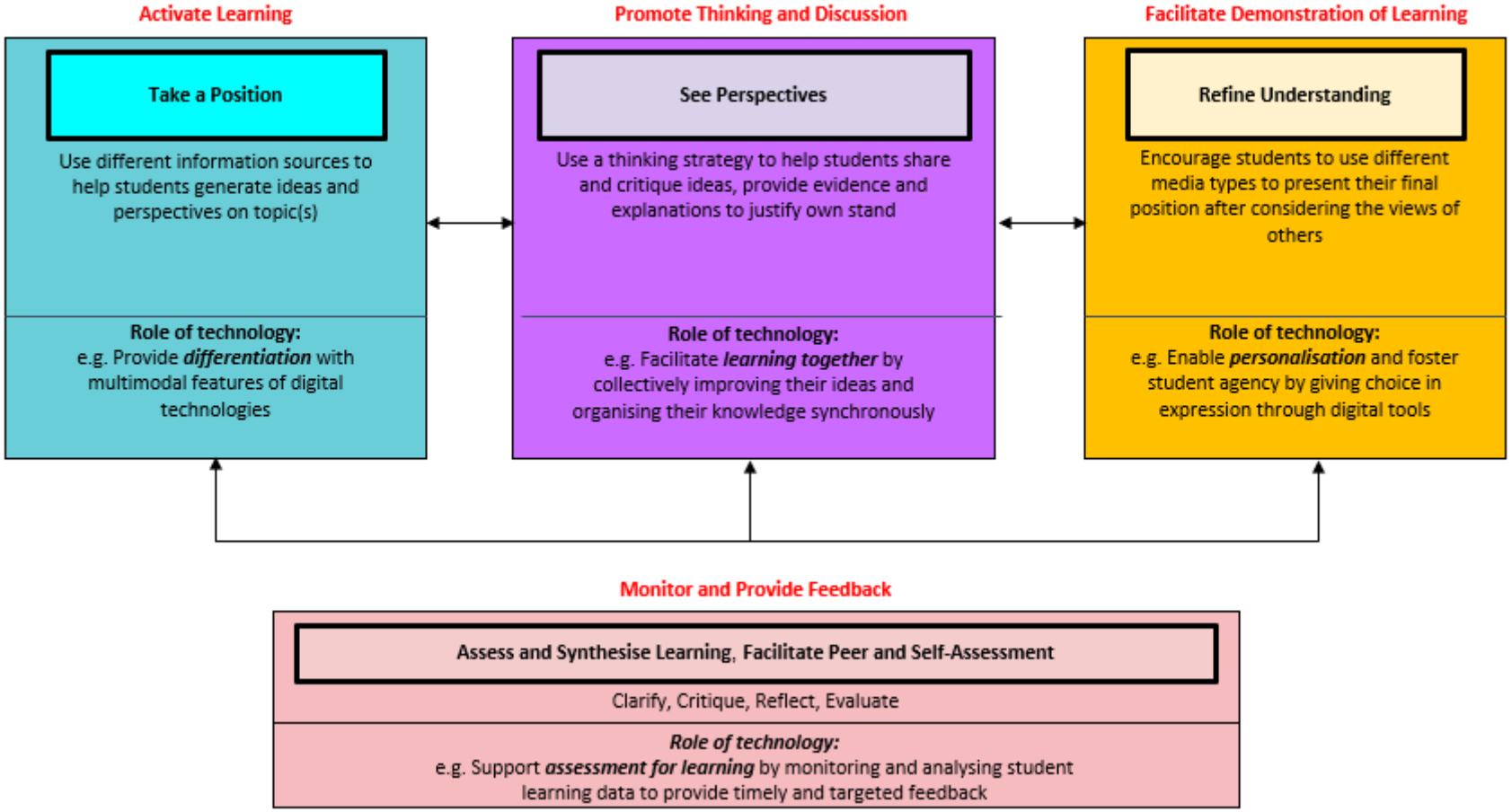
COLLABORATION

Students plan and establish group goals and processes. They collectively ideate, discuss, negotiate diverse ideas and co-construct meaning that contributes towards the production of a shared output.



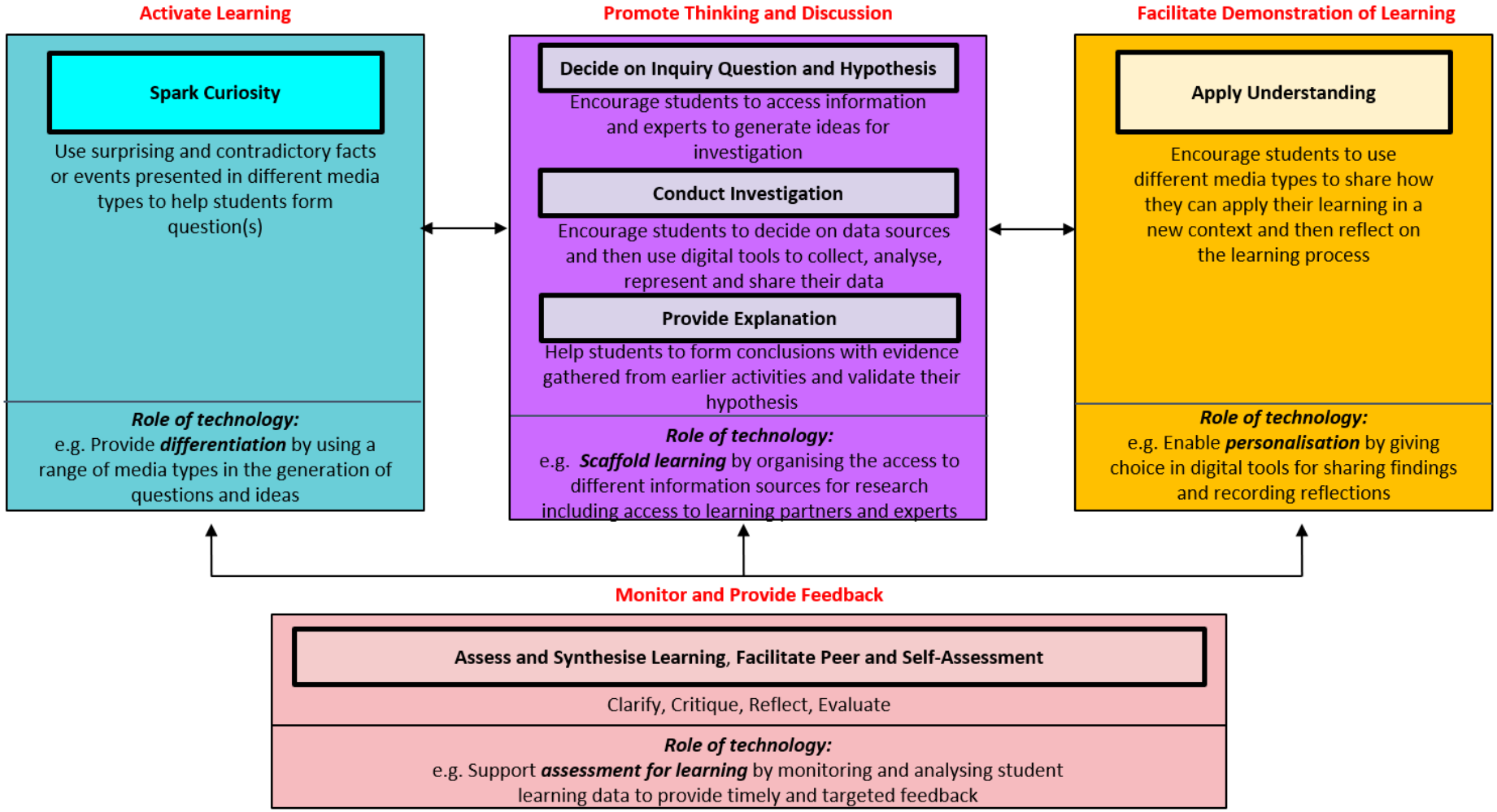
DISCUSSION

Students generate and exchange ideas and perspectives, supported by evidence and explanations. They engage in peer critique to refine understanding of their ideas.



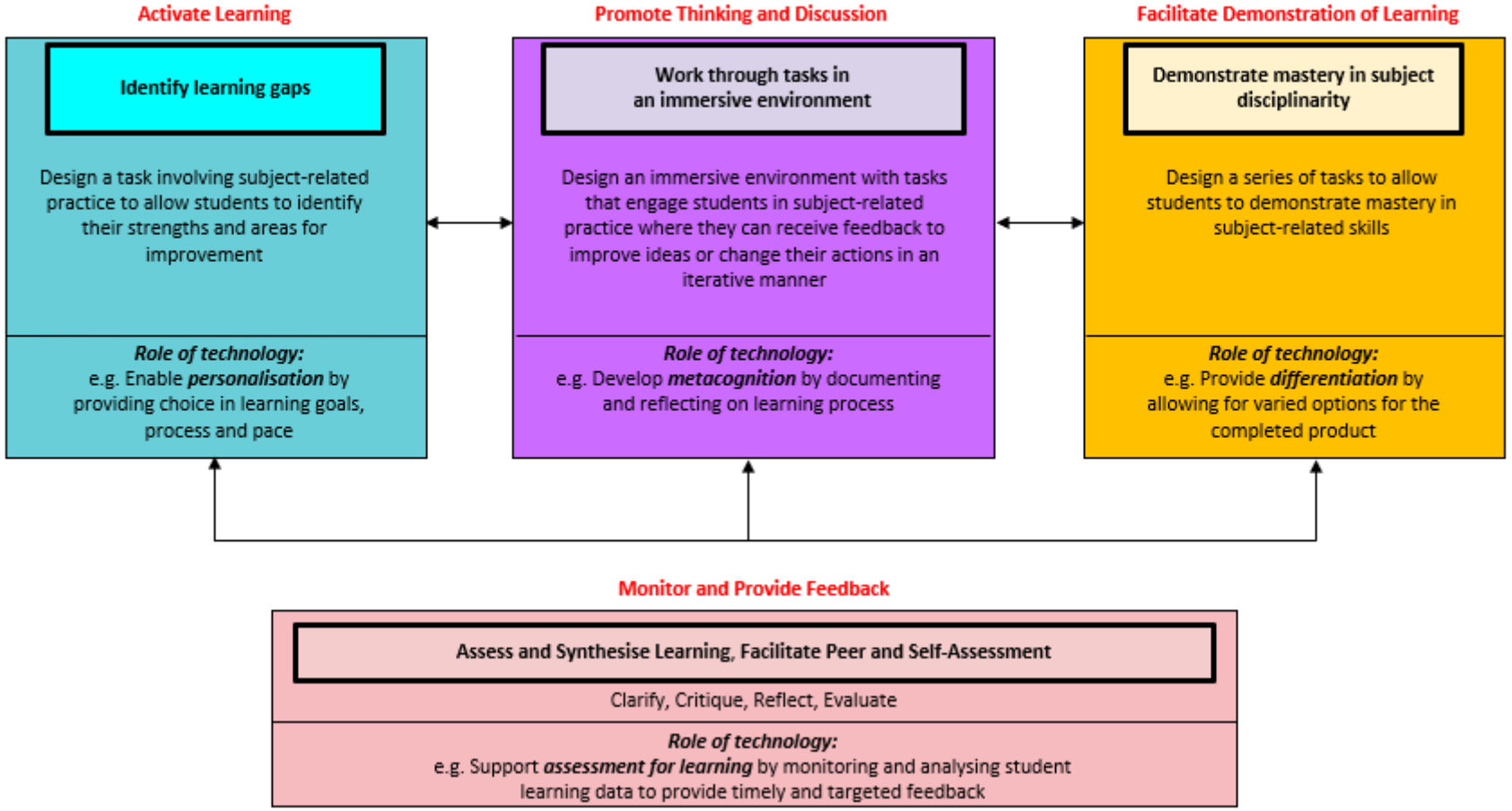
INQUIRY

Students form an informed prediction to an inquiry task. They investigate by exploring, clarifying and analysing information sources and data. They formulate an explanation based on evidence, and evaluate and reflect on their findings and new learning.



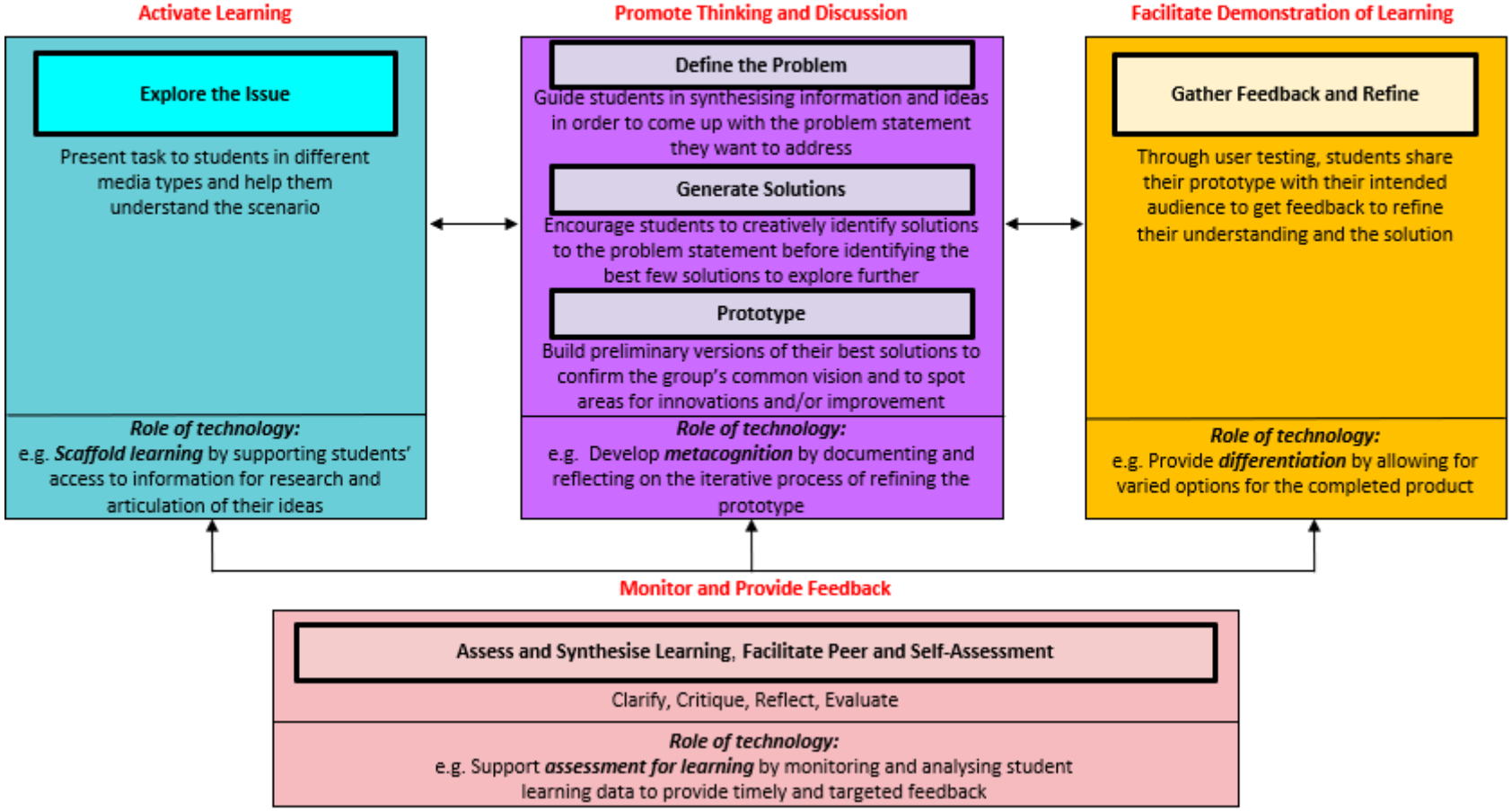
PRACTICE

Students are involved in tasks to develop the practice of subject discipline in an immersive environment. Through feedback gathered, they can improve their subsequent actions in an iterative manner and acquire a better grasp of relevant knowledge and skills in any subject.



PRODUCTION

Students explore a real-world problem and produce tangible artefacts (video, built structure etc) iteratively to solve them. Their thought processes and decision points are captured online, allowing the teacher to track student growth and provide timely feedback.

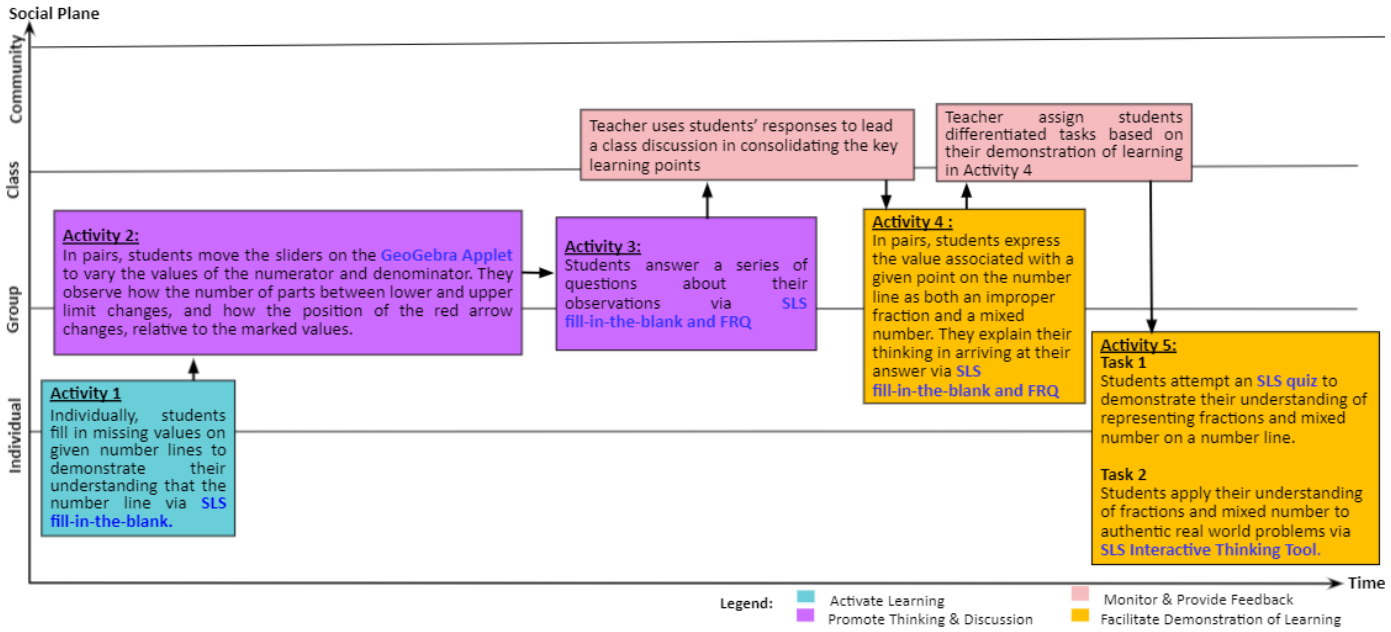


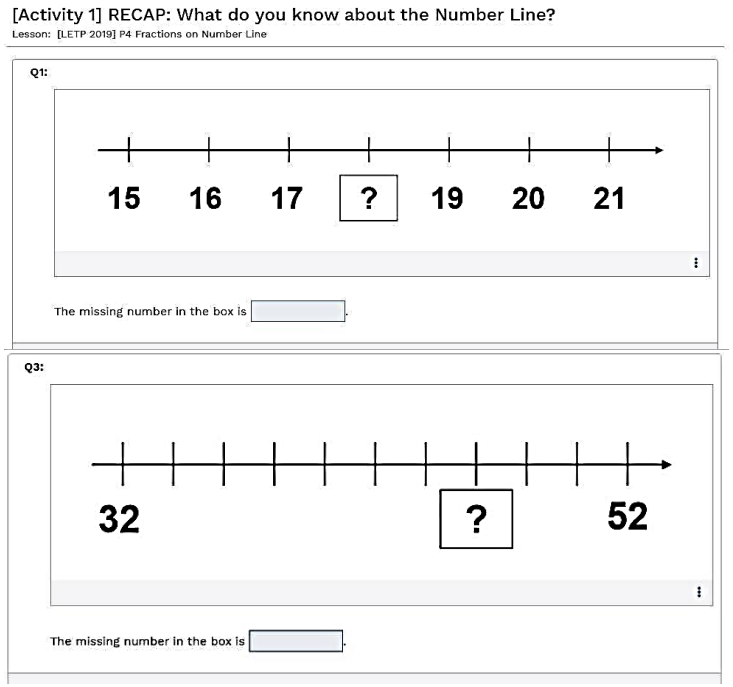
The lesson below is an example of an Acquisition Learning Experience for a Primary 4 Mathematics lesson.

An Acquisition Learning Experience

In an acquisition Learning Experience, students learn new knowledge through studying, analysing, comparing and organising curated information to identify structures and patterns to deepen understanding of concepts.

Lesson Title:	Fractions on a Number Line
Level/Subject:	Primary 4 / Mathematics
Learning Outcomes:	At the end of the lesson, students should understand how fractions as numbers can be represented on a number line.
Success Criteria:	I can ● explain how the numerator and denominator are related to the position of fractions on the number line; ● identify position of given fractions on the number line and fractions when given positions on the number line; and ● identify and explain common mistakes related to fractions on the number line.

Design Map:	
Design Guidelines for Technology-enhanced Learning:	i) Scaffolding students' thinking and understanding of fractions In this lesson, explicit scaffolds are embedded in the digital learning environment to guide students towards developing deeper understanding of fractions by observing patterns across numerical and pictorial representations. ii) Assessment for Learning – Providing targeted feedback to students Technology here is used to capture and analyse assessment data throughout the lesson to provide students with feedback about their level of understanding of proper fractions, improper fractions and mixed numbers. iii) Foster Conceptual Change through multimodal representations

	The lesson design makes explicit for students the positions of proper and improper fractions on the equal intervals of a number line, relative to whole numbers. This allows students to interact with a concrete representation of fractions and mixed numbers.	
Activity 1 <u>Task</u> Individually, students fill in missing values on given number lines to demonstrate their understanding that the number line a. represents a number sequence on a graduated scale; and b. the interval between adjacent markings on the number line represents a constant value.		<u>Instructional Strategy</u> Activating Prior Knowledge <u>Technology</u> SLS provides students with automated *feedback* on their responses. Teacher uses the Heatmap to gather learning data to check students' prior knowledge.

Activities 2 and 3

Task

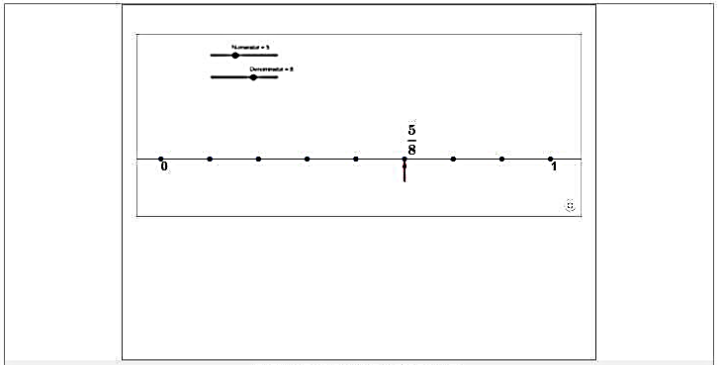
In pairs, students move the sliders on the GeoGebra applet to vary the values of the numerator and denominator.

They observe

a. how the number of parts between lower and upper limit changes, and
b. how the position of the red arrow changes, relative to the marked values.

Students describe how changes in the numerator or denominator affects the position of fraction on the number line.

Fractions on Number Line [0,1]



Q1: The starting point of the number line is _____ and the ending point of the number line is _____

SAVE AS DRAFT SUBMIT

Q2: Look at the fraction $\frac{3}{7}$. (Fix the denominator to be 7 and numerator to be 3.)
There are _____ spacings/parts between 0 and 1.

SAVE AS DRAFT SUBMIT

Q3: Look at the fraction $\frac{6}{7}$. (Fix the denominator to be 7 and numerator to be 6.)

There are _____ spacings/parts between 0 and 1.

SAVE AS DRAFT SUBMIT

Q4: Suppose that the denominator is fixed.

(a) What happens to the position of the red arrow as the numerator changes?

(b) What makes you say that?

SAVE AS DRAFT SUBMIT

Instructional Strategy

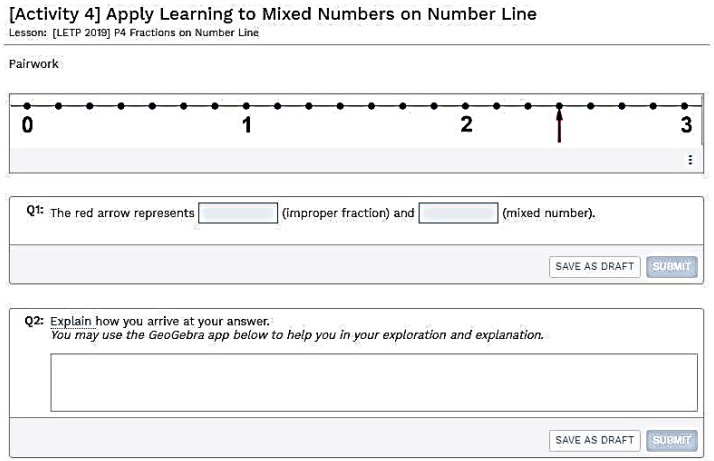
Using Questions to Deepen Learning

Technology

The questions (Q1 - Q4a) scaffold students' thinking about their observations. The automated *feedback* guides students towards forming a general rule or pattern.

The reflection question (Q4b) encourages students to articulate their thinking behind formulating the rule.

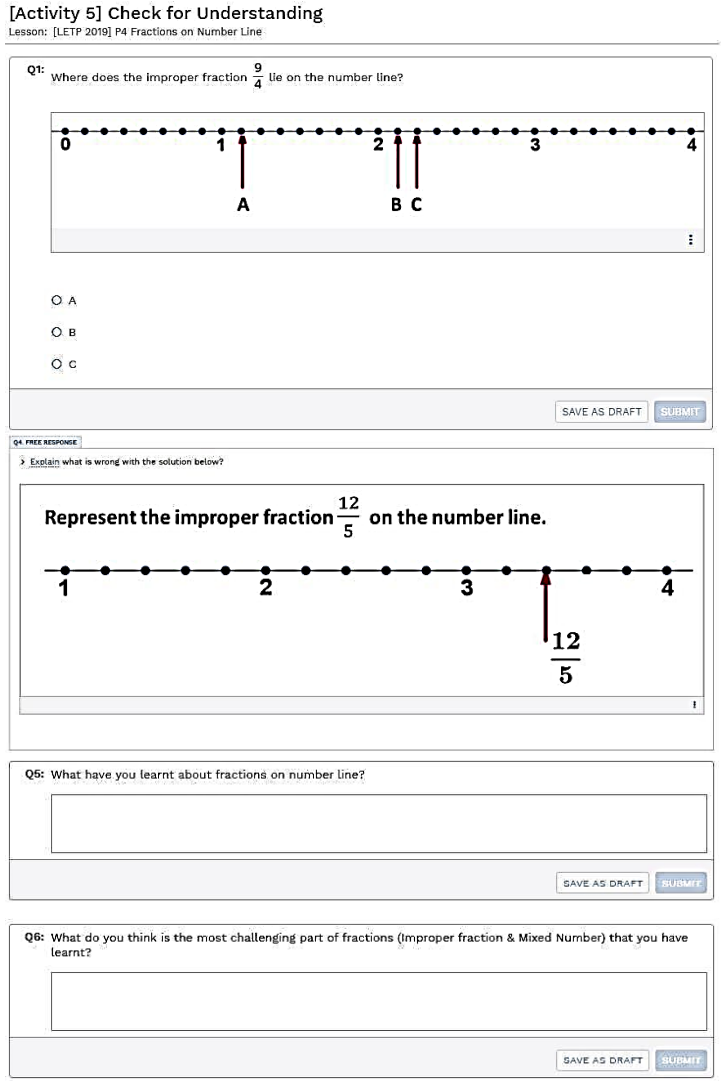
The Heatmap allows teachers to monitor students' understanding.

Activity 4 <u>Task</u> In pairs, students express the value associated with a given point on the number line as both an improper fraction and a mixed number. They explain their thinking in arriving at their answer.		<u>Instructional Strategy</u> Setting Meaningful Assignments – Explaining my Thinking in Answering Two-Part Questions <u>Technology</u> SLS provides students with automated *feedback* on their responses to Q1. Q2 allows students to make their thinking visible to their teacher. The Heatmap allows teachers to gather learning data to monitor students' understanding and consolidate key concepts for the lesson.

Activity 5

Task

Students are grouped based on their responses in Activity 4. Students attempt the specific task assigned to their respective sub-group to demonstrate their learning.



Instructional Strategy

Setting Meaningful Assignments – Practice for Mastery

Technology

The SLS quiz allows students to demonstrate their understanding and articulate the challenges faced in this topic.

The Heatmap allows teachers to gather learning data to check students' understanding and provide targeted feedback to address learning difficulties.

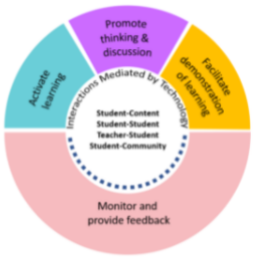
Annex D SLS Pedagogical Scaffold 2.0 Design Considerations and Guiding Questions

The main questions are further unpacked as sub-questions which could be used by school leaders, middle managers or teacher leaders to facilitate learning conversations in teams on lesson design using e-Pedagogy or by individual teachers to reflect on their own lesson designs.

Phase 1: Establish Learning Outcomes	
Considerations	**Guiding Questions**
1. What are the key concepts, skills, attitudes and values essential to my students' understanding of this topic? 2. What are the 21CC (including New Media Literacies) that are important for my students to develop?	(A) What are the big ideas that are important for this topic? (B) What are the difficulties that my students may experience in understanding this topic? (C) What are my students' learner profiles that may require differentiation in my lesson design? (D) Which learning outcomes would be better achieved using asynchronous or synchronous learning in school or via Home-based Learning (HBL), or through a blended model?
3. What are the success criteria that can inform me that students are learning? 4. What evidence would I use to know my students are learning?	(E) What will my students say, do or write to show that they have achieved the learning outcomes? Are my success criteria specific, observable and measurable? (F) Based on the success criteria, what learning tasks will allow my students to demonstrate they have learnt or acquired the skill?
5. What Learning Experience would help my students achieve the learning outcomes?	(G) Consider the following when determining the Learning Experience: • Do I want my students to be able to understand the critical features and structure of a concept by studying given information? **Acquisition** • Do I want my students to be able to construct new knowledge by collectively ideating and co-constructing a shared output? **Collaboration** • Do I want my students to be able to generate and critique multiple perspectives on an issue? **Discussion** • Do I want my students to investigate and analyse data to validate the hypothesis and apply their understanding in a new context? **Inquiry** • Do I want my students to attain mastery in the subject's knowledge and skills through performing a task, receiving feedback and refining their subsequent actions in an iterative manner? **Practice** • Do I want my students to propose solutions to a real world problem and represent their ideas by producing a tangible artefact that would consolidate their learning? **Production**

Phase 1: Establish Learning Outcomes	
Considerations	**Guiding Questions**
6. How can I design with technology to: ▪ support **Assessment for Learning** ▪ foster **Conceptual Change** ▪ provide **Differentiation** ▪ facilitate **Learning Together** ▪ develop **Metacognition** ▪ enable **Personalisation** ▪ **Scaffold** the learning?	(H) Based on learning science research, technology is most effective when applied in these seven ways to enhance learning. Consider the following when determining the Key Applications of Technology (KAT): • Which KAT is aligned to my school/dept's key learning focus(es)? • Which KAT might support the learning needs of my students and help them overcome the difficulties in understanding this topic (SLS PS Q1)? • Which KAT can help me develop the process outcome(s) identified earlier in SLS PS Q2? • Which KAT will help me to better support my students in achieving the LOs, given the learning environment (in school, HBL) and mode (asynchronous learning, synchronous learning) (SLS PS Q1)? (I) After I have identified the KAT, how can technology help my students learn? • To support **Assessment for Learning**, capture learning and process data to allow me or my students to provide targeted feedback and resources to the learner. • To foster **Conceptual Change,** use multimodal representations of abstract concepts for my students to discern patterns and infer generalisations. • To provide **Differentiation**, harness the interactivity and multimodal features of digital technologies to differentiate the nature of content, learning processes and products of learning to meet the needs of my students. • To facilitate **Learning Together**, integrate supports for students to collectively improve their ideas over time by sharing, building on, organising and synthesising their knowledge and developing understandings. • To develop **Metacognition,** integrate automated support for my students to make sense of and regulate learning activities, group knowledge and articulate their reflection through multiple modes. • To enable **Personalisation,** give choice in the learning goals, process and pace through digital resources to foster student agency. • To **Scaffold the learning,** embed digital scaffolds to support thinking and guide interactions between my students and the content.

Phase 2: Design & Facilitate Active Learning with Technology	
Considerations	**Guiding Questions**
7. How would I design learning activities that promote active learning with technology: ▪ activate learning ▪ promote thinking and discussion ▪ facilitate demonstration of learning ▪ monitor and provide feedback?  	How can technology be harnessed in the learning activities to achieve the intended learning experience and the success criteria: (J) **Activate Learning:** What activities should I design for my students to: • surface their current understanding of the concept to be taught? • identify key points or concepts from information presented? (Acquisition LE) • understand issues and context, and set common goals? (Collaboration LE) • generate ideas and perspectives from different information sources? (Discussion LE) • orientate their focus and interest towards the topic? (Inquiry LE) • apply their knowledge and articulate their learning gaps? (Practice LE) • understand the real world scenario? (Production LE) (K) **Promote Thinking and Discussion:** What activities should I design for my students to: • study the information to identify patterns and see connections between ideas? (Acquisition LE) • co-construct meaning and propose a solution? (Collaboration LE) • critique ideas, provide evidence and explanations to justify own stand? (Discussion LE) • decide on inquiry question and hypothesis, conduct investigation and provide explanation? (Inquiry LE) • engage in practice of subject discipline and receive feedback to make improvements? (Practice LE) • define the problem, generate solutions and build a prototype? (Production LE) (L) Which of these activities will be conducted in class? How will I scaffold my students' learning for activities that are conducted asynchronously via HBL?

Phase 2: Design & Facilitate Active Learning with Technology	
Considerations	**Guiding Questions**
7. How would I design learning activities that promote active learning with technology: ▪ activate learning ▪ promote thinking and discussion ▪ facilitate demonstration of learning ▪ monitor and provide feedback?  8. How can I use technology to support learning interactions for active learning?	(M) **Facilitate demonstration of learning:** What activities should I design for my students to: • articulate new understanding? (Acquisition LE) • present their solutions and reflection on group processes? (Collaboration LE) • present their final position after considering the views of others? (Discussion LE) • apply their learning in new context and then reflect on the learning process? (Inquiry LE) • demonstrate their mastery in the subject's knowledge and skills? (Practice LE) • share their prototype and gather feedback to refine? (Production LE) (N) **Monitor and provide feedback:** What activities should I design for my students to receive feedback, self-evaluate and modulate their actions? • How can I use the AfL data from the HBL activities to provide feedback and close learning gaps in class? (O) How can technology mediate the range of learning interactions (Student-Content, Student-Student, Student-Community and Teacher-Student) in my learning activities, as intended in Q6?

Phase 3: Assess Quality of Learning	
Considerations	**Guiding Questions**
9. How does the evidence of learning with technology show that learning outcomes were met?	Based on students' work: (P) What is the evidence of learning (from Q4) that shows students have achieved the success criteria (from Q3)? (Q) How did the use of technology provide data of students' learning for me to check if they have learnt?
10. How effective is the design of the learning activities with technology?	Based on students' work: (R) Is there constructive alignment between the outcomes and the assessment tasks? (S) How effectively is technology used to support the teaching and learning processes (from Q6) and mediate the learning interactions (from Q8) to achieve the learning outcomes?

Annex E Additional Resources for e-Pedagogy

For quick and easy access to the ideas of e-Pedagogy, teachers can refer to the **e-Pedagogy Design Cards** (**https://go.gov.sg/epedagogyinfographic**).

Teachers can refer to the **SkillsFuture for Educators (e-Pedagogy) on OPAL2.0 (http://go.gov.sg/sfedeped)** to understand how they can strengthen their classroom practices, including the relevant Level of Practice (LoP) for e-Pedagogy that teachers can attain through professional learning.

The following are professional development opportunities and resources for teachers to learn more about e-Pedagogy and how to design lessons for active learning.

1. Self-paced Online Courses on OPAL2.0

S/N	Course Title	Course Code in OPAL2.0
1	Introduction to e-Pedagogy	EP-000035
2	Introduction to SLS	ICT-000064
3	Developing Future Ready Learners with Technology	EP-000037
4	Assessing Learning with Technology	EP-000033
5	Designing Learning Experiences with Technology	EP-000036

2. Micro-learning Units on OPAL2.0

S/N	Micro-learning Unit Title	Course Code in OPAL2.0	Category
1	Elements of e-Pedagogy: Facilitating Scaffolding with Technology	EP-000018	Key Applications of Technology
2	Elements of e-Pedagogy: Facilitating Metacognition with Technology	EP-000010	
3	Elements of e-Pedagogy: Facilitating Differentiation with Technology	EP-000015	
4	Elements of e-Pedagogy: Facilitating Learning Together with Technology	EP-000016	
5	Elements of e-Pedagogy: Fostering Conceptual Change with Technology	EP-000023	
6	Elements of e-Pedagogy: Fostering Assessment for Learning with Technology	EP-000040	

7	Elements of e-Pedagogy: Fostering Personalisation with Technology	EP-000039	
8	Elements of e-Pedagogy: Designing an Acquisition Learning Experience	EP-000012	Learning Experience
9	Elements of e-Pedagogy: Designing a Discussion Learning Experience	EP-000009	
10	Elements of e-Pedagogy: Designing an Inquiry Learning Experience	EP-000011	
11	Elements of e-Pedagogy: Designing a Collaboration Learning Experience	ICT-000002	
12	Introduction to SLS: Features that support Differentiated Instruction (DI)	EP-000019	SLS
13	Introduction to SLS: Embedding Functions	EP-000021	
14	Introduction to SLS: Features that support Self-Directed Learning (SDL)	EP-000022	
15	Introduction to SLS: Features that support Assessment for Learning (AfL)	EP-000024	

3. Singapore Learning Designers Circle (https://go.gov.sg/sgldc)

The SgLDC closed Facebook group is home to MOE educators, where they come together to share, learn and design Learning Experiences with technology. Teachers can sign up and join the community to source for lesson ideas, share lessons for feedback, and to learn more about e-Pedagogy and technology through the curated resources.

4. Singapore Teaching Practice (STP) in OPAL2.0

The STP webpages on OPAL2.0 provides the knowledge base for teachers to have a deeper understanding of the learning principles and theories that undergirds e-Pedagogy. Teachers can refer to e-Pedagogy and the Singapore Teaching Practice (https://go.gov.sg/moe-stp-pp).

GLOSSARY OF TERMS

The key terms in this Guide are listed in alphabetical order as a source of quick reference.

Acquisition Learning Experience	Students learn new knowledge through studying, analysing, comparing and organising curated information. They identify structures and patterns to deepen their understanding of concepts.
Activate Learning	It is one of the active learning processes where the learner's prior knowledge and conceptions are surfaced.
Active Learning	It is a process in which students make sense of information and knowledge to achieve deep understanding and/or develop a skill, through doing relevant activities and thinking about their own thinking.
Collaboration Learning Experience	Students plan and establish group goals and processes. They collectively ideate, discuss, negotiate diverse ideas and co-construct meaning that contributes towards the production of a shared output.
Constructive Alignment	The 'constructive' aspect refers to the idea that students construct meaning through relevant learning activities. That is, meaning is not something imparted or transmitted from teacher to learner, but is something learners have to create for themselves. The 'alignment' aspect ensures coherence between the intended learning outcomes, learning activities and assessment tasks.
Design Map	Design Map allows users to visualise the end-to-end Learning Experience which may stretch across a few lessons. It depicts the sequence of learning activities designed for a lesson or even an entire unit. It also makes explicit the types of learning interactions between the teacher, student and content, as well as the role of ICT.
Develop Metacognition	Teachers promote metacognition by integrating automated support for students to make sense of and regulate their learning activities and group knowledge, and articulate their reflection through multiple modes.
Discussion Learning Experience	Students generate and exchange ideas and perspectives, supported by evidence and explanations. They engage in peer critique to refine understanding of their ideas.
e-Pedagogy	e-Pedagogy is the practice of teaching with technology for active learning that creates a participatory, connected and reflective classroom to nurture the future-ready learner.

Embed Scaffold for Learning	Teachers embed digital scaffolds to support thinking and guide interactions between students, teachers and content.
Enable Personalisation	Teachers foster student agency by giving choice in the learning goals, process and pace through digital resources.
Facilitate Demonstration of Learning	It is one of the active learning processes. Students consolidate their knowledge, and apply them by creating learning artefacts.
Facilitate Learning Together	Teachers sustain collaboration by integrating supports for students to collectively improve their ideas over time by sharing, building on, organizing, and synthesizing their knowledge and developing understandings.
Foster Conceptual Change	Teachers use multimodal representations of abstract concepts for students to discern patterns and infer generalisations.
Immersive	Immersive refers to situated learning where students learn by participating in routine activities of a particular community, working on the problems that the community is working on. An immersive environment can enhance learning by allowing students to interact in an environment that practitioners and experts in the area work in. It allows students to work with resources and knowledge artefacts of the discipline / community.
Inquiry Learning Experience	In Inquiry LE, students form an informed prediction to an inquiry task. They investigate by exploring, clarifying and analysing information sources and data. They formulate an explanation based on evidence, and evaluate and reflect on their findings and new learning.
Key Applications of Technology	Key Applications of Technology are design guidelines on how learning processes are enhanced with the affordances of technology.
Learning Activity	Learning activity is defined as specific interaction(s) with other people (e.g., peers, teachers and community) using specific tools and resources (e.g., videos, simulations, embedded scaffolds etc.), oriented towards specific outcomes (e.g., improving knowledge, skills and competencies).
Learning Experience (LE)	LE are instructional models that pull together the learning activities and tasks that are technology-mediated and intentionally sequenced to develop specific skills and learning dispositions in students.

Learning Interactions	Learning interactions refer to interaction between student-content, student-student, teacher-student and student-community. Technology plays a mediating role in enhancing and augmenting these learning interactions.
Monitor and Provide Feedback	It is one of the active learning processes where the teacher makes use of the learning data to monitor students' understanding, review their progress and provide timely and relevant feedback.
Practice Learning Experience	Students are involved in tasks to develop the practice of subject discipline. Through feedback gathered from immersive experiences, they can improve their subsequent actions and acquire a better grasp of relevant knowledge and skills in any subject.
Process Learning Outcomes	Process learning outcomes are skills and dispositions that are not content-based but are necessary to prepare students to be future-ready learners. These process outcomes are also articulated in subject syllabuses. Examples of process skills are 21st century competencies such as critical and inventive thinking, communication and collaboration skills, and also digital literacy such as ability to curate information from the Internet.
Production Learning Experience	Students explore a real-world problem and produce tangible artefacts (video, built structure etc) iteratively to solve them. Their thought processes and decision points are captured online, allowing the teacher to track student growth and provide timely feedback.
Promote Thinking and Discussion	It is one of the active learning processes. The teacher presents new knowledge and guides the students in using thinking strategies and routines to deepen their learning. The teacher also creates opportunities for the students to learn from each other, having them discuss and critique their peers' work, or collaborate to co-create knowledge.
Provide Differentiation	Teachers harness the interactivity and multimodal features of digital technologies to differentiate the nature of content, learning processes and products of learning to meet the needs of all students.
SLS Pedagogical Scaffold	SLS Pedagogical Scaffold 2.0 is a design tool that translates e-Pedagogy into a set of considerations that guide teachers in designing lessons with technology.
Success Criteria	Success criteria identify what learners have to do in order to reach the learning outcomes. They are specific, manageable and assessable.

Support Assessment for Learning	Teachers use technology to analyse learning and process data to provide students with targeted feedback and resources.

FREQUENTLY ASKED QUESTIONS

A. e-PEDAGOGY

B. SLS PEDAGOGICAL SCAFFOLD 2.0

C. DESIGN MAP

D. LEARNING EXPERIENCE

A. e-PEDAGOGY

Q1. How different is e-Pedagogy and SLS PS 2.0 from the SAMR model and TPACK?

SAMR model explains the roles of technology to support learning and teaching. Technological Pedagogical Content Knowledge (TPACK) describes teachers' technology integration expertise as a combination of their technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK). Both SAMR and TPACK are useful frameworks in helping teachers to understand how technology can be integrated to support teaching and learning. However, SAMR and TPACK do not tell teachers how to go about designing for active learning with technology.

Building on SAMR and TPACK, e-Pedagogy in the form of SLS PS 2.0, guides the practice of teaching with technology for active learning by making explicit the teacher's practices aligned to the Singapore Teaching Practice. With the use of SLS PS 2.0, teachers are guided to design end-to-end technology-mediated Learning Experiences to support the learning processes, thus placing students at the centre of learning. In short, e-Pedagogy in the form of SLS PS 2.0 helps to close the theory-practice gap because teachers are guided to integrate the knowledge learnt into the actual practice. It is recommended that schools use e-Pedagogy for alignment to SkillsFuture for Educators.

B. SLS PEDAGOGICAL SCAFFOLD 2.0

Q2. Phase 1 in SLS PS 2.0 contains a number of guiding questions. What is the purpose of these guiding questions?

Phase 1 of the SLS PS 2.0 focuses on establishing the learning outcomes, including content outcomes, skills, values, 21CC and digital literacies. Q1 to Q4 help teachers to be clear about the learning outcomes and how the teacher wants the students to demonstrate their learning and be able to perform the tasks. Considering that different Learning Experience types can help to achieve certain process learning outcomes more effectively, Q5 guides teachers in selecting and designing the Learning Experience that will guide the design and sequence of the learning activities within each lesson. Q6 is meant to guide teachers in considering the pedagogical affordances of the technological tools to enhance the learning processes the teacher wants to focus on.

Q3. Why is Q6 in SLS PS 2.0 placed under Phase 1 rather than Phase 2?

Q6 is placed under Phase 1 (Establishing Learning Outcomes) because it guides the teacher in considering how the pedagogical affordances of technology can be best leveraged to support students' learning in meeting the learning outcomes that have been established. It is important for teachers to think through the pedagogical considerations behind the choice of technological tools before they start designing the learning activities with technology in Phase 2 (Design and Facilitate Active Learning with Technology) because these considerations will inform the teacher in his/her design of the learning activities with technology.

For example, if the teacher has the intent to develop metacognition in students to deepen students' understanding of a certain concept, Q6 would guide teachers in selecting technological tools (e.g., SLS Interactive Thinking Tool) to support students in externalising their thinking, monitoring and regulating their learning. These technological tools will then be taken into consideration in the design of the learning activities and learning interactions (Q7 and Q8).

C. DESIGN MAP

Q4. Is the design map meant to replace the traditional lesson plan that teachers are used to doing?

Design map is not meant to replace the traditional lesson plan. It provides an overview of the learning activities designed for one lesson or a Learning Experience taking place over a series of lessons. It contains fewer details compared to a lesson plan which may contain other information such as specific teacher moves, rationale, duration of activity, the resources being used etc, for the specific lesson period.

Q5. Do we recommend schools to use a design map to plan lessons instead of the traditional lesson plan template?

Schools can decide which document best serves their purpose and needs. For instance, Beginning Teachers are encouraged to start with the lesson plan first because they might want to consider their facilitation moves, questions to ask during lessons and rationale for each learning activity while planning for the lesson. For teachers who are more experienced or working within a PLT, they may choose to represent their lesson unit using a Design Map with information such as learning outcomes, success criteria and assessment tasks for standardisation across the level.

Once the team comes to a consensus on the sequence of the learning activities across the entire lesson unit, the individual teachers may then choose to write out the lesson plan to provide more details about the lessons.

Q6. There are many elements in a design map. For teachers A out, what are the most critical elements that they must include in their design map?

Teachers could start applying e-Pedagogy based on their readiness levels. For teachers who are starting out, they can refer to the section "Quick-Start to e-Pedagogy" (pp. 8) and focus on the selected questions (Q1, 3, 4, 6 and 9) of SLS PS 2.0. They can refer to Figure 11 (pp. 20 - 21) for the explanation of the corresponding features in the design map.

Feature of Design Map	Guiding Questions in SLS PS 2.0
	Q1, 3 and 4 of SLS PS 2.0 guide teachers in identifying the key learning outcomes which can be used to complete the table.
	The arrows are used to represent the flow of learning data as teachers collect evidence of students' learning. This is aligned to Q9 of the SLS PS 2.0.
	Activities are tagged with the KAT to show how interactions are mediated by technology. This is aligned to Q6 of the SLS PS 2.0.
	The blue words in the coloured boxes indicate the digital tools that are used in each learning activity to support the KAT. This is aligned to Q6 of the SLS PS 2.0 which guides the teachers in considering the affordances of the digital tools in enhancing the learning processes.

When teachers progress to the next level of practice in e-Pedagogy, they can think about active learning processes and designing for Learning Experience, using technology to provide a wider range of learning interactions and support the transition between physical and digital learning environments.

D. LEARNING EXPERIENCE

Q7. What is the difference between Collaboration and Discussion LE? Can we have discussion within a Collaboration LE?

Collaboration LE is meant to provide students with the opportunity to plan and establish group goals, culminating in the creation of a shared output. This is done through a process of ideation, discussion and negotiation in an attempt to converge diverse ideas in order to co-construct meaning in a final product. This final product will demonstrate the group's collective learning and the collaborative effort towards the completion of a final group goal.

The key outcomes of Discussion LE are not focused on students establishing group goals and processes and producing a shared output. The focus of Discussion LE is for students to develop skills and dispositions associated with generating and exchanging ideas and perspectives and engaging in critiquing or building upon one another ideas to refine their own initial understanding of the issues presented.

However, within the Collaboration LE, teachers can still design some tasks to engage students in a discussion. This is with the intention that they will generate ideas and perspectives and will justify their points of view with evidence and explanation. These discussion tasks are meant to support the entire collaboration process which is designed to be aligned to the intended learning outcome of the Learning Experience.

Q8. The four active learning processes inform the instructional flow within the Learning Experience. Will there be a case of a lesson design not following this sequence?

The instructional flow of the active learning processes is based on learning principles. However, we acknowledge that other considerations such as lesson context and students' profile may also determine the instructional flow of the lesson. Considering the cyclic nature of the active learning processes, the teacher can choose to start at any one of these processes depending on the intent and learning outcomes of the lesson. The "double-headed" arrow refers to the fact that teachers can move between two processes in either direction based on the results of the feedback mechanism. For instance, teachers, who are at the ‘Proficient’ Level of Practice for e-Pedagogy, can explain lesson design decisions based on e-Pedagogy considerations and may choose to re-sequence the instructional flow of the active learning processes to cater to the unique context of the class.

Q9. A teacher designed for Acquisition LE and elements of discussion process outcomes are evident in the lesson design. Is it still considered an Acquisition LE?

There is a need to differentiate between acquisition at the activity level and Learning Experience level. Learning activity refers to a single activity that learners may engage in to achieve a very specific outcome. However, a Learning Experience refers to the intentional design and sequencing of a series of learning activities (within or across lessons), typically intended to achieve the development of a dominant set of process skills and learning dispositions alongside the subject disciplinary outcomes.

The overarching LE is determined by the overall intent of the lesson - each LE has a specific intent that needs to be the predominant experience for the lesson unit. For example, the Acquisition LE has a very specific intent – "Students will learn new knowledge through the studying, analysing, comparing and organising of curated information. The students will identify structures and patterns to deepen their understanding of concepts." So, whilst the lesson unit focuses on explicating these process skills, the teachers may include tasks that involve discussion and collaboration among students for them to exchange perspectives and work together. However, this does not form the predominant experience of an Acquisition LE. In short, it is possible for the teacher to include activities that involve discussion within an Acquisition LE and the overall LE type would be dependent on the process skills and learning disposition that the teacher aims to develop in the students.

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