

2. Learning Design Triangle (LDT)

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2.1 Introduction

Introduction to the Learning Design Triangle (LDT)

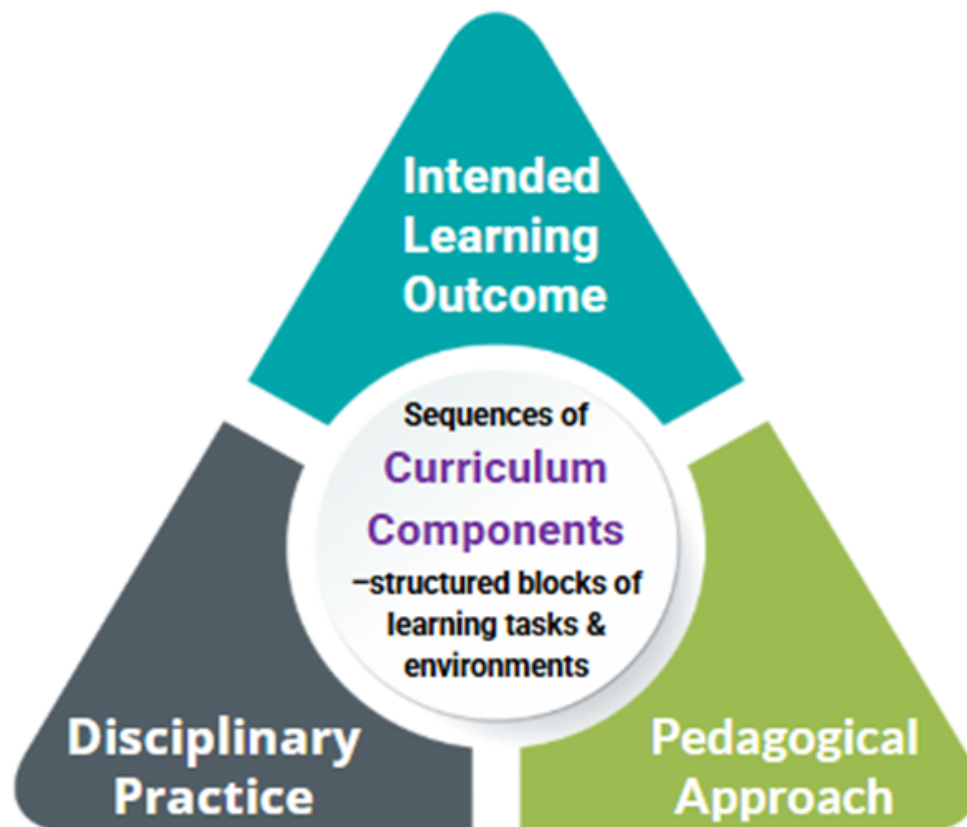


Figure 2.1: The Learning Design Triangle (LDT)

The **Learning Design Triangle (LDT)** is a conceptual framework developed to help educators create effective and coherent learning experiences of learners. It emphasizes the integration and alignment of three core elements:

- Intended Learning Outcomes
- Disciplinary Practice
- Pedagogical Approach

This alignment enables educators to

- Plan purposeful curriculum units
- Reflect on their teaching strategies
- Continuously improve student learning by connecting learning tasks with clear goals and real-world relevance

The details of the three core elements of LDT—**Intended Learning Outcomes**, **Disciplinary Practice**, and **Pedagogical Approach**—along with their application to **Curriculum Components** and **Learning Tasks**, will be explored in the following sections in this chapter.

Reference:

Law, N., & Liang, L. (2020). A multilevel framework and method for learning analytics integrated learning design. *Journal of Learning Analytics*, 7(3), 98-117.

2.2 Intended Learning Outcomes (ILOs)

Intended Learning Outcomes (ILOs)

Intended Learning Outcomes (ILOs) indicate **what students are expected to achieve as a result of the learning process**. They serve as a foundation for the entire learning design process, guiding the design of learning tasks and assessments.

Guide to Writing Intended Learning Outcomes

How to Write Effective Intended Learning Outcomes?

A well-written ILO is essential for effective learning and teaching. Key features include:

Feature	Description	Example
Student-centred	Describe what learners will achieve, not what the teacher will teach.	✗ The teacher will introduce the main stages of the water cycle. ✓ Explain the main stages of the water cycle.
Measurable	Specify outcomes that can be observed and assessed.	✗ Write a good essay. ✓ Write a persuasive essay with a clear thesis and supporting arguments.
Specific	Clearly define the knowledge, skills, values, or attitudes that learners are expected to achieve.	✗ Understand the history of World War II. ✓ Identify the key causes of World War II.
Appropriate difficulty	Achievable but challenging for most target learners.	✗ Provide a summary of all the main arguments discussed in the debate. ✓ Summarize two key arguments presented during the debate.

The Four Categories of Intended Learning Outcomes in the Learning Design Studio

Category	Description	Example
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Disciplinary Knowledge	The core concepts, theories, facts, and frameworks that are recognized and developed within a particular field or area of study.	Identify the simple past tense as verbs for past events.
Disciplinary Skills	The specific techniques, methods, and competencies associated with a particular field or area of study.	Construct sentences about yesterday' s activities using the simple past tense.
Generic Skills	The broad abilities that help people succeed in education, work, and daily life, regardless of a particular field or area of study.	Apply effective communication strategies to share ideas with others.
Values and Attitudes	The beliefs, principles, and dispositions that guide a person's behavior, decision-making, and interactions with others.	Demonstrate openness by considering new perspectives and adapting to challenges.

Writing Cognitive Learning Outcomes using Bloom' s Taxonomy

When designing your Intended Learning Outcomes (ILOs), it is recommended to use Bloom' s Taxonomy, a widely recognized framework that aids educators in formulating clear and measurable learning outcomes. Bloom' s Taxonomy categorizes cognitive skills into different levels—such as remembering, understanding, applying, and analyzing—ensuring your ILOs comprehensively address key aspects of student learning.



Figure 2.2: Bloom' s Taxonomy of the Cognitive Domain

Bloom' s Taxonomy breaks learning into six cognitive levels:

Bloom's Level	Example of ILOs
1. Remember - Recall facts	List the main stages of the water cycle.
2. Understand - Explain ideas	Describe how water moves through each stage of the water cycle.

3. Apply - Use knowledge in new situations	Illustrate the water cycle by matching real-life weather events to each stage.
4. Analyze - Draw connections among ideas	Compare the processes of the water cycle in different climates and environments.
5. Evaluate - Make judgments	Evaluate the effects of pollution on the water cycle.
6. Create - Produce original work	Design a simple model to demonstrate the water cycle.

Reference

Arkansas State University. (n.d.). Bloom's revised taxonomy: Cognitive, affective, and psychomotor. <https://www.astate.edu/a/assessment/assessment-resource-links/files/Revised-Bloom%20s-Taxonomy-All-Domains.pdf>

2.3 Disciplinary Practice (DP)

Disciplinary Practice (DP)

Disciplinary Practice (DP) refers to **the specific ways of thinking, doing, and creating that are characteristic of a particular field or profession**. It situates learning within authentic contexts that reflect how knowledge and skills are applied in the real world. Within any discipline, there are explicit **workflow steps that guide how professionals manage and complete tasks**.

To integrate the DP into the K-12 learning context, we have simplified the workflows to create DP Patterns for use in the Learning Design Studio. Please see the examples below.

Disciplinary Practice	Role of Learner	Details
Engineering Design	Engineer, Inventor	<p>Description The disciplinary practice of 'Engineering Design' supports our young learners to apply their knowledge and skills in developing effective solutions to real-world problems. Like engineers and inventors, learners will engage in identifying problems, then ideate, design, create, and optimize solutions to address those challenges.</p> <p>Workflow steps</p> <ol style="list-style-type: none">1. Identify the problem2. Generate ideas for solutions3. Design the solution4. Construct a prototype5. Test the prototype's performance and optimize the product
Writing a News Report	Journalist	<p>Description The disciplinary practice of 'Writing a News Report' supports our young learners in engaging with the inquiry-based process of writing. Like journalists, learners must collect and verify information, organize their findings logically, and write in an objective and impartial tone to create a timely, factual, and engaging report that helps audiences understand current events and issues.</p> <p>Workflow steps</p> <ol style="list-style-type: none">1. Identify the writing purpose, target audience, and key features of a news report2. Research, collect and organize information for the news report3. Draft the news report and fact-check the content4. Conduct peer and self assessment5. Revise and publish the news report
Mock Legislative Procedure	Legislator	<p>Description The disciplinary practice of 'Mock Legislative Procedure' supports our young learners in collaboratively drafting legislation that addresses specific issues. Like legislators, learners engage in researching background information, analyzing the interests and impacts of various parties, and drafting legislative proposals. Through constructive collaboration, they work to reach consensus and develop legislation that incorporates ideas from different stakeholders.</p>

		<p>Workflow steps</p> <ol style="list-style-type: none"> 1. Identify aims through exploration: gather background information, understand the functions of the role, and clarify the purposes of the council meeting 2. Research as an expert: search for information and focus on deepening understanding 3. Prepare and share the first draft for mutual understanding, evaluation, and revision: propose measures suggested by stakeholders' representatives 4. Conduct constructive and rational discussions to reach consensus 5. Reach consensus and produce a collaborative output
Performance Production	Performer, Entertainer	<p>Description</p> <p>The disciplinary practice of 'Performance Production' supports our young learners in transforming literature into engaging performances. Like performers and entertainers, learners will engage in reading and analyzing literature, developing scripts, collaborating in rehearsals, and performing for audiences to produce a compelling and expressive performance that effectively communicates the themes and messages of the literature.</p> <p>Workflow steps</p> <ol style="list-style-type: none"> 1. Determine the script 2. Prepare for the show 3. Rehearse 4. Perform the show 5. Receive audience feedback
Scientific Investigation	Scientist	<p>Description</p> <p>The disciplinary practice of 'Scientific Investigation' supports our young learners in exploring the natural world and developing evidence-based explanations. Like scientists, learners will engage in formulating inquiry questions, proposing hypotheses, designing and conducting experiments, and using logical reasoning to draw informed conclusions that deepen their understanding of scientific phenomena and processes.</p> <p>Workflow steps</p> <ol style="list-style-type: none"> 1. Formulate an inquiry question 2. Research and propose a hypothesis 3. Design an experiment 4. Conduct the experiment 5. Analyse data and interpret results

2.4 Pedagogical Approach

A pedagogical approach refers to the method or strategy that a teacher uses to deliver instruction and facilitate learning. It encompasses the underlying beliefs, techniques, and practices employed to help students acquire knowledge, skills, and values. One approach we promote is **Self-directed Learning (SDL)**.

Figure 2.3: Self-directed Learning (SDL)

Self-Directed Learning (SDL) is recognized as an important approach for developing life and career skills that prepare students for further education and the workforce.

SDL has two key characteristics:

Personal Responsibility:

- Students are expected to take ownership of their learning. This means they set their own learning goals and accept responsibility for their thoughts and actions.
- They make decisions about what and how to learn, maintaining control over many aspects of their learning process.

Social Interaction:

- Even though SDL focuses on personal responsibility, learning typically happens in a social setting.
- Students interact with teachers and other learners, which can enhance understanding and spark further interest in the subject.
- SDL involves negotiation between the teacher and learners about learning goals, methods, activities, and assessments.
- This dynamic teaching-learning process empowers students to take charge of their own learning while collaboratively engaging with teachers and peers to achieve deeper understanding and meaningful outcomes.

Key Components and Indicators of SDL

The operational framework of SDL includes five essential components: goal setting, self-planning, self-monitoring, self-evaluation and revision.

SDL Components	Description
1. Goal-setting	<ul style="list-style-type: none">• Students identify own learning goals and learning activities.

2. Self-planning	<ul style="list-style-type: none"> • Students regulate and plan the detailed decisions and arrangements related to their own learning, such as creating a schedule outline and planning tasks.
3. Self-monitoring	<ul style="list-style-type: none"> • Students self - manage their own time. • Students monitor own their own repertoire of learning strategies. • Students adjust their own learning pathway as they progress.
4. Self-evaluation	<ul style="list-style-type: none"> • Students are aware of the assessment criteria. • Students critically evaluate their work according to the set criteria.
5. Revision	<ul style="list-style-type: none"> • Students revise their work based on the feedback received from their teachers or peers at various stages. • Students reflect on their own learning and apply what they have learnt to new contexts.

Reference

Hew, K. F., Law, N., Wan, J., Lee, Y., & Kwok, A. (2016). Self-directed learning in science education: Explicating the enabling factors. In C.-K. Looi, J. Polman, U. Cress, & P. Reimann (Eds.), *Transforming learning, empowering learners: ICLS conference proceeding (Vol. 2, pp. 761–768)*. Singapore: International Society of the Learning Sciences.

Knowles, M. S. (1975). *Self-directed learning: A guide for learners and teachers*. Chicago, IL: Follet.

2.5 Curriculum Component Sequence

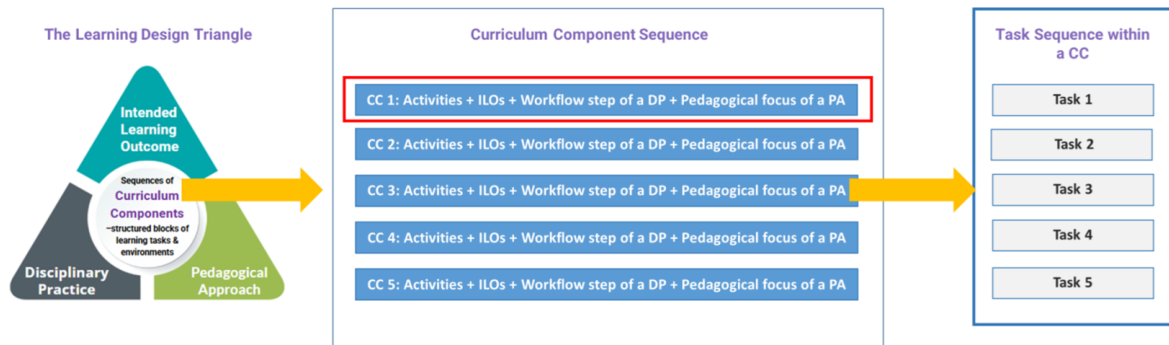


Figure: 2.4 An Illustration of the Learning Design Triangle and the Curriculum Component Sequence

From Sections 2.2 to 2.4, you have explored the three elements of the **Learning Design Triangle**, which together provide the contextual framework for anchoring the entire learning design. In this section, we will examine the **Curriculum Component (CC) Sequence**, which serves as a bridge between the abstract Learning Design Triangle and the concrete learning and assessment tasks. The CC Sequence guides learning designers in gradually transforming overarching design concepts into actionable teaching practices.

In the following section, we will explore examples of learning designs for both a **STEAM subject** and a **language subject**. This will help you gain a better understanding of what a Curriculum Component Sequence is and how it connects to the Learning Design Triangle.

2.5.1 Curriculum Component Sequence Example - A STEAM Course

In this section, we will explore how to transform the elements of the Learning Design Triangle (LDT) into a Curriculum Component (CC) Sequence for a STEAM course. Considering that we are designing a course titled "**Factors affecting Rate of Photosynthesis: Learning through Scientific Investigation**".

1. The Learning Design Triangle

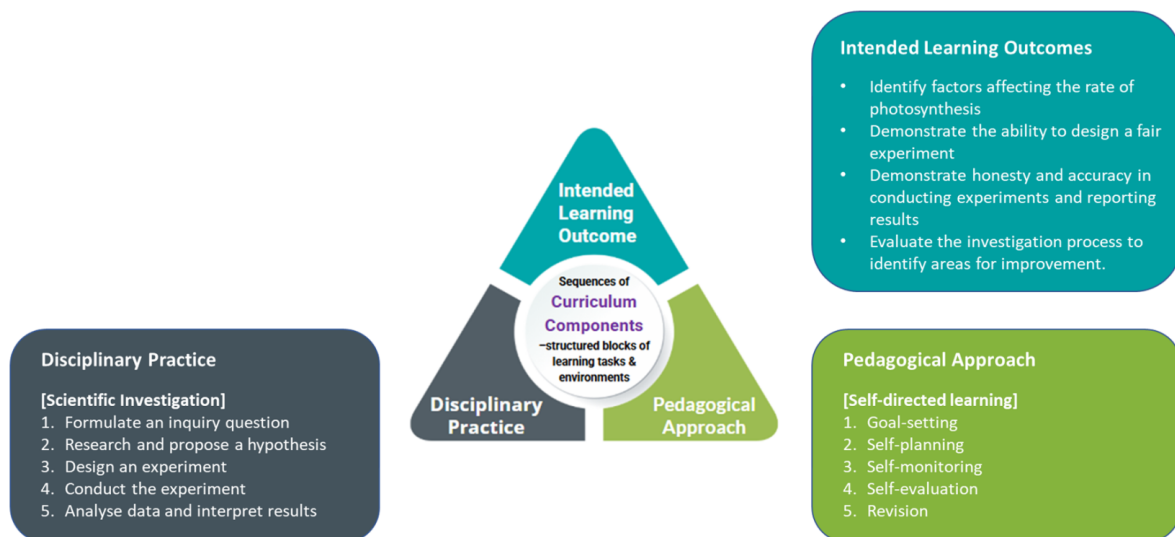


Figure 2.5: The Learning Design Triangle of "Factors affecting Rate of Photosynthesis: Learning through Scientific Investigation"

- To anchor the learning design within a contextual framework, we will use the Learning Design Triangle to define the intended learning outcomes, disciplinary practices, and pedagogical approach.

2. The Curriculum Components Sequence

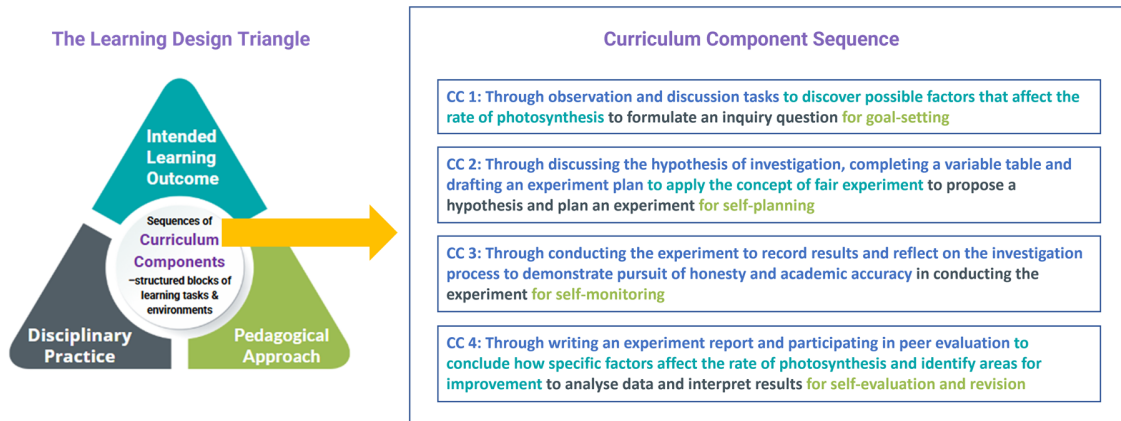


Figure 2.6: The Curriculum Component Sequence of "Factors affecting Rate of Photosynthesis: Learning through Scientific Investigation"

- To make the learning process more manageable, we divide it into distinct phases within the learning design, guided by the workflow steps of disciplinary practice. Each phase targets a specific set of learning outcomes and is supported by the pedagogical focus of the chosen approach, such as self-directed learning.
- In the Learning Design Triangle framework, we use Curriculum Component to structure and organize each phase of learning around targeted outcomes. The collection of curriculum components that represents all phases of learning in a course is called a **Curriculum Component Sequence**.

3. Assign learning tasks to each Curriculum Components

- To put the Curriculum Components into practice, we need to assign learning tasks and assessments to enhance and evaluate learners' development in knowledge, skills, or values.

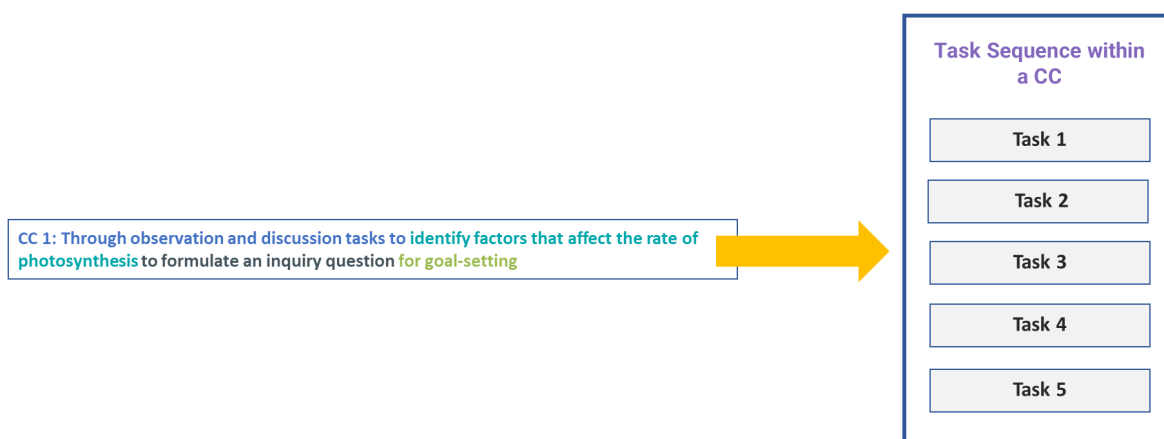


Figure: 2.7 Task Sequence within a Curriculum Component

- Now, we will explore an example of a Curriculum Component (CC) focused on the "goal-setting" phase.

CC Name	<p>A CC name is formed by combining four components.</p> <ol style="list-style-type: none"> Focal task(s): Observation and discussion tasks Main intended learning outcome: Discover possible factors that affect the rate of photosynthesis Workflow step(s) of a disciplinary practice: Formulate an inquiry question Focus or foci of the pedagogical approach: Goal-setting <p>E.g. Through observation and discussion tasks to discover possible factors that affect the rate of photosynthesis to formulate an inquiry question for goal-setting</p>										
Linked Intended Learning Outcomes	<ul style="list-style-type: none"> • ILO1: Understand factors affecting the rate of photosynthesis • ILO2: Understand the mechanism of of photosynthesis • ILO3: Apply the process of scientific investigation to construct scientific knowledge 										
Workflow Step of Disciplinary Practice	Scientific Investigation—Formulate an inquiry question										
Pedagogical Focus	Self-directed Learning - Goal-setting										
Learning Tasks	<p>* Each task type has a representative color.</p> <table border="0"> <tr> <td data-bbox="488 1160 938 1294"></td> <td data-bbox="948 1160 1386 1294">Observe plant growth conditions and interview others about environmental factors affecting plant growth</td> </tr> <tr> <td data-bbox="488 1317 938 1451"></td> <td data-bbox="948 1317 1386 1451">Share outcomes and discovery after observations and interviews</td> </tr> <tr> <td data-bbox="488 1473 938 1608"></td> <td data-bbox="948 1473 1386 1608">Compare findings with peers and consolidate new insights</td> </tr> <tr> <td data-bbox="488 1630 938 1765"></td> <td data-bbox="948 1630 1386 1765">Watch a video about photosynthesis</td> </tr> <tr> <td data-bbox="488 1787 938 1921"></td> <td data-bbox="948 1787 1386 1921">Synthesize the information collected to propose factors affecting rate of photosynthesis and formulate an inquiry question for further investigation</td> </tr> </table>		Observe plant growth conditions and interview others about environmental factors affecting plant growth		Share outcomes and discovery after observations and interviews		Compare findings with peers and consolidate new insights		Watch a video about photosynthesis		Synthesize the information collected to propose factors affecting rate of photosynthesis and formulate an inquiry question for further investigation
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	Compare findings with peers and consolidate new insights										
	Watch a video about photosynthesis										
	Synthesize the information collected to propose factors affecting rate of photosynthesis and formulate an inquiry question for further investigation										

The tasks in a CC:

- A task can be both a learning task and an assessment.
- A well-formulated task sequence helps build knowledge and skills step-by-step while enabling ongoing assessment of student understanding.
- The introduction of the task types will be covered in [Chapter 2.6 - Task Taxonomy](#).

The link to the [learning design](#) of this sample course.

2.5.2 Curriculum Component Sequence Example - A Language Course

In this section, we will explore how to transform the elements of the Learning Design Triangle (LDT) into a Curriculum Component (CC) Sequence for a language course. Considering that we are designing a course titled "**Inquiry-based Curriculum Unit that Cultivates Students' Expository Skills and Creativity**".

1. The Learning Design Triangle

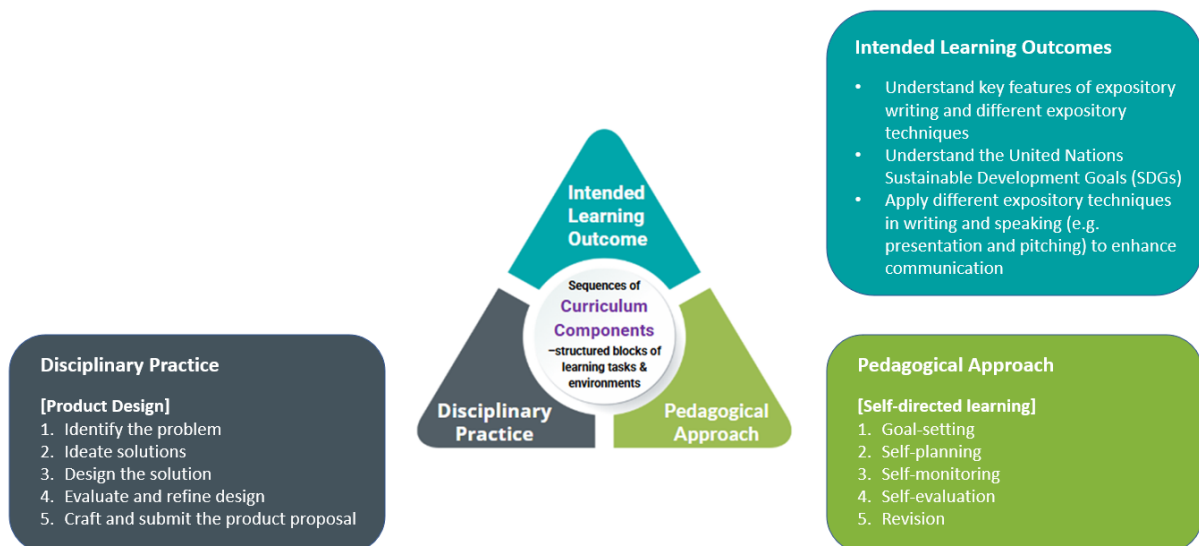


Figure 2.8: The Learning Design Triangle of "Inquiry-based Curriculum Unit that Cultivates Students' Expository Skills and Creativity"

- To anchor the learning design within a contextual framework, we will use the Learning Design Triangle to define the intended learning outcomes, disciplinary practices, and pedagogical approach.

2. The Curriculum Components Sequence

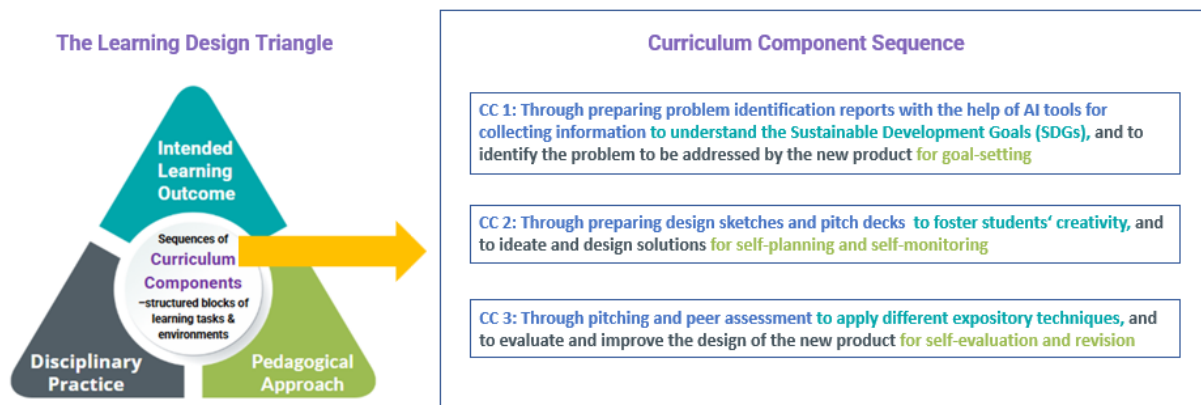


Figure 2.9: The Curriculum Component Sequence of "Inquiry-based Curriculum Unit that Cultivates Students' Expository Skills and Creativity"

- To make the learning process more manageable, we divide it into distinct phases within the learning design, guided by the workflow steps of disciplinary practice. Each phase targets a specific set of learning outcomes and is supported by the pedagogical focus of the chosen approach, such as self-directed learning.
- In the Learning Design Triangle framework, we use Curriculum Component to structure and organize each phase of learning around targeted outcomes. The collection of curriculum components that represents all phases of learning in a course is called a **Curriculum Component Sequence**.

3. Assign learning tasks to each Curriculum Components

- To put the Curriculum Components into practice, we need to assign learning tasks and assessments to enhance and evaluate learners' development in knowledge, skills, or values.

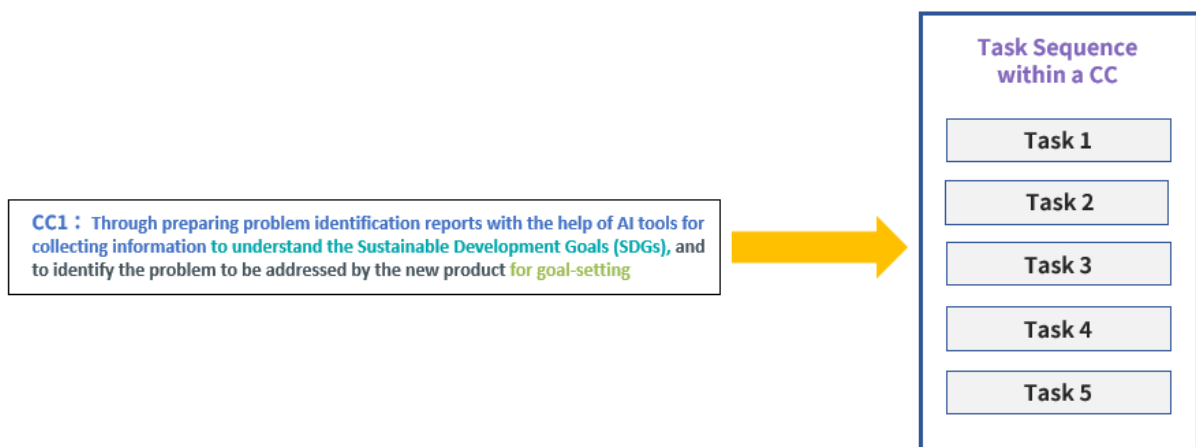







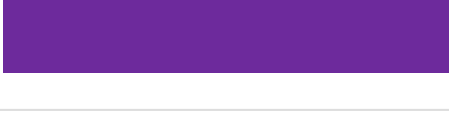


Figure: 2.10 The Task Sequence within a Curriculum Component

- Now, we will explore an example of a Curriculum Component (CC) focused on the "goal-setting" phase.

CC Name	<p>A CC name is formed by combining four components.</p> <ol style="list-style-type: none"> 1. Focal task(s): Preparing problem identification reports with the help of AI 2. Main intended learning outcome: Understand the United Nations Sustainable Development Goals (SDGs) 3. Workflow step(s) of a disciplinary practice: Identify the problem to be addressed by the new product 4. Focus or foci of the pedagogical approach: Goal-setting <p>E.g. Through preparing problem identification reports with the help of AI to understand the Sustainable Development Goals (SDGs), and to identify the problem to be addressed by the new product for goal-setting</p>
Linked Intended Learning Outcomes	<ul style="list-style-type: none"> • ILO 1: Understand key features of expository writing and different expository techniques • ILO 2: Understand the United Nations Sustainable Development Goals (SDGs) • ILO 3: Apply different expository techniques in writing and speaking (e.g. presentation and pitching) to enhance communication
Workflow Step of Disciplinary Practice	Engineering Design – Identify the problem
Pedagogical Focus	Self-directed Learning - Goal-setting

Learning Tasks	* Each task type has a representative color.	
		Watch a video about the Sustainable Development Goals and answer questions
		Read and discuss sample problem identification reports
		Use different AI tools to collect information
		Write problem identification reports
		Discuss and improve the assessment criteria provided by the teacher
		Present the problem identification in groups
		Peer evaluate group presentations and problem identification reports
	Reflect on the learning process	

The tasks in a CC:

- A task can be both a learning task and an assessment.
- A well-formulated task sequence helps build knowledge and skills step-by-step while enabling ongoing assessment of student understanding.
- The introduction of the task types will be covered in [Chapter 2.6 - Task Taxonomy](#).

The link to the [learning design](#) of this sample course.

2.6 Task Taxonomy

The Learning Design Studio (LDS) provides a **well-structured ontology of 12 task types**, grouped under **four categories: 1) Directed Learning, 2) Exploratory Learning, 3) Productive Learning, and 4) Reflective Learning**. These task types help make explicit the nature and intent of the learning experiences planned for students, ensuring a balanced and purposeful approach to learning design.

Directed Learning

Receiving & Interpreting Information

Students undertake prescribed activities to acquire information and develop an understanding of a topic.

STEAM Subject:

- Watching a video on photosynthesis
- Reading a textbook chapter about photosynthesis

Language Subject:

- Reading a news report
- Watching a micro movie

Practice

Students work through prescribed tasks to apply learnt content/ skills.

STEAM Subject:

- Labelling the parts of a plant cell with flash cards
- Completing the questions about photosynthesis in the H5P interactive video

Language Subject:

- Practicing pronunciation of new vocabularies in pairs
- Writing sentences using newly learned past tense verbs

Test / Assessment

Students take part in assessment activities.

STEAM Subject:

- Completing a lab report
- Taking a quiz on photosynthesis

Language Subject:

- Analysing an article and respond to questions about its content
- Having a spelling test on the week's vocabularies

Exploratory Learning

Information Exploration

Students seek out and gather existing information from various sources to deepen their understanding of a topic.

STEAM Subject:

- Asking an AI chatbot for information about the rate of photosynthesis
- Benchmarking existing thermal bags online to inform a new design

Language Subject:

- Researching common vocabulary in news reports online
- Using AI tools to analyze the tone and style of a news report

Explorations through Conversation

Students engage in exploration of issues with others through conversations.

STEAM Subject:

- Interviewing clients to identify product needs
- Discussing variables for a fair photosynthesis experiment

Language Subject:

- Interviewing stakeholders about community issues
- Discussing findings from the interview script

Tangible / Immersive Investigation

Students conduct hands-on investigations in physical or virtual settings, generating new data through experiments, surveys, or direct observation.

STEAM Subject:

- Conducting an experiment to collect data on the rate of photosynthesis
- Playing with simple circuits to explore electricity flow

Language Subject:

- Exploring a virtual museum with VR to learn about history and related vocabulary
- Visiting the supermarket to learn vocabulary related to daily life

Productive Learning

Construction: Conceptual / Visual Artefacts

Students work individually or together to construct a conceptual, visual artifact.

STEAM Subject:

- Creating a mind map on photosynthesis using information from the internet
- Designing an experiment plan

Language Subject:

- Creating the writing outline of the news report
- Using AI to develop evaluation criteria for a news report

Construction: Tangible / Manipulable Artefacts

Students work individually or together to construct a tangible, manipulable artifact.

STEAM Subject:

- Building a prototype of a thermal bag
- Building a digital thermometer with a micro:bit.

Language Subject:

- Writing a news report based on an outline
- Creating a storybook using generative AI

Presentation, Performance and Illustration

Students present, illustrate or perform individually or in group.

STEAM Subject:

- Presenting scientific findings from experiments
- Displaying a thermal bag prototype in a competition

Language Subject:

- Presenting a news report
- Screening a post-edited micro movie

Reflective Learning

Reflection

Students engage in reflecting on the learning process & experience and making the thoughts explicit.

STEAM Subject:

- Reflecting on the previous scientific investigation process and identifying its shortcomings
- Writing a journal entry about challenges faced during the prototype development

Language Subject:

- Reflecting on the pros and cons of using AI to create a storyboard for a micro movie
- Writing a reflection on the process of composing a news report

Revision

Students are given an opportunity to re-submit a piece of work, hence giving them a chance to reflect and improve.

STEAM Subject:

- Revising the thermal bag prototype
- Revising the experimental plan for a scientific investigation

Language Subject:

- Revising the content of a news report
- Revising the script of a micro movie before final filming

Self- / Peer- assessment

Students engage in peer- and/ or self- assessment (using self-generated or teacher-provided rubric)

STEAM Subject:

- Using well-designed criteria to self- and peer-assess prototypes of thermal bags
- Using well-designed criteria to self- and peer-assess experimental plans for scientific investigations

Language Subject:

- Using well-designed criteria to self- and peer-assess news reports
- Using well-designed criteria to self- and peer-assess storyboards for micro movies

2.7 Supplementary Learning Resources

Publications

Chen, D., Liang, L., & Law, N. (2022). Navigating Multilevel Challenges in Learning Design: An Investigation of Novice Designer Teams' Learning Trajectory International Journal of Mobile Learning and Organisation. Retrieved from <https://www.inderscience.com/admin/ospeers/getInProduction.php?id=106381&fid=15028&fromonsusy=yes>

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