Differentiated Instruction Guide for Teachers of Bhutan

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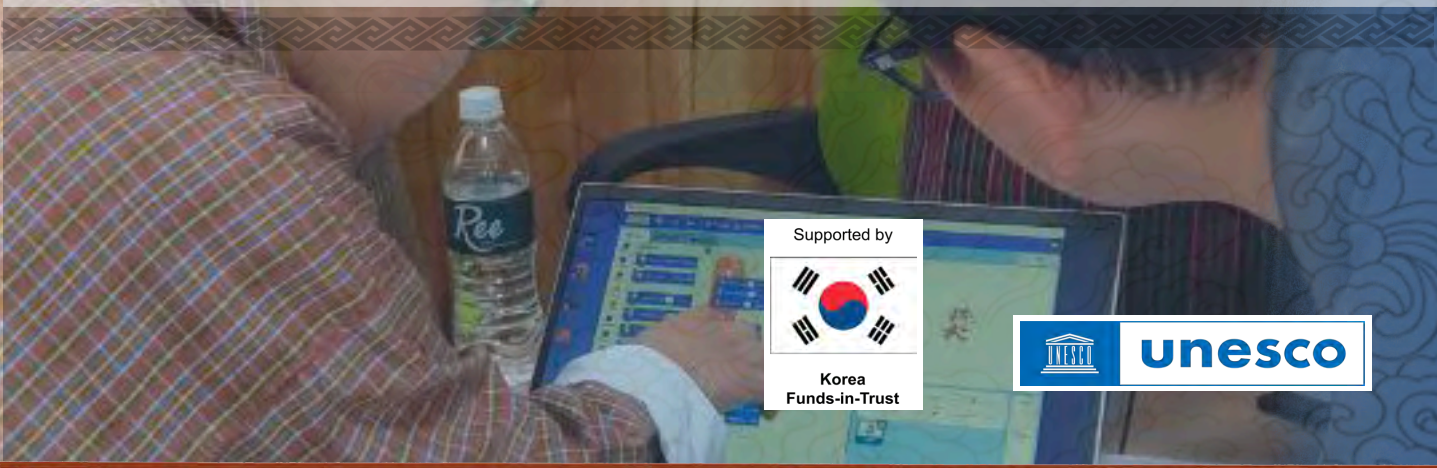
Ministry of Education and Skills Development
Royal Government of Bhutan



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DIFFERENTIATED INSTRUCTION GUIDE FOR TEACHERS OF BHUTAN

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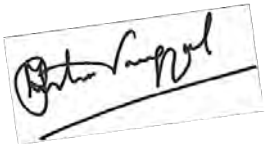
Foreword

In today's educational landscape, ensuring that every child receives a quality education tailored to their unique needs is more important than ever. The "Differentiated Instruction Guide for Teachers of Bhutan" is a crucial resource designed to support educators across Bhutan in creating inclusive, student-centred classrooms. This guide aligns with the Ministry of Education and Skills Development's commitment to fostering equitable learning environments where the diverse needs of all students are recognized and addressed.

Bhutanese classrooms reflect rich diversity, with students differing in readiness levels, learning preferences, interests, cognitive abilities, linguistic backgrounds, and cultural identities. This guide provides practical strategies, models, and tools to help teachers implement differentiated teaching and learning effectively. It emphasizes the principles of flexibility, inclusivity, and responsiveness, encouraging educators to adapt their instructional approaches to engage every learner meaningfully.

The guide covers essential areas such as identifying student needs, planning differentiated lessons, utilizing diverse instructional strategies, and integrating Information and Communication Technology to enhance learning. Real-life case studies and practical examples make it a user-friendly tool that supports teachers in translating theory into classroom practice, ultimately promoting student engagement, equity, and academic success.

I encourage all educators in Bhutan to embrace the principles outlined in this guide, as it will not only enrich your teaching practices but also contribute to nurturing well-rounded, capable, and confident learners. Together, let us continue to build an inclusive education system that reflects our national values and prepares our students to thrive in an ever-changing world.



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Acknowledgement

The Teachers' Guide on Differentiated Instruction for Bhutan is the result of a collaborative project led by the UNESCO Regional Office in Bangkok and the UNESCO Regional Office for South Asia in New Delhi, aimed at supporting countries in equipping teachers and schools with the necessary competencies—such as knowledge, teaching skills, and assessment skills—to identify and address learning gaps and needs. This initiative seeks to ensure that all learners have equitable opportunities to learn and to prevent student dropout. The project was part of a broader project titled "Addressing Students' Learning Gaps to Ensure Quality Education in Asia-Pacific," generously supported by the Government of the Republic of Korea (Korea Funds-in-Trust).

This guide was developed based on the UNESCO generic Teachers' guide on differentiated instruction and incorporates practical examples and tools to assist teachers in identifying students' learning gaps and losses. It also provides strategies for making informed decisions to address these gaps effectively. A detailed outline of the guide was developed during a week-long training workshop, with further refinement carried out by a national core team following the workshop.

We extend our deepest gratitude to the Core Team for their close collaboration with UNESCO and their leadership in drafting the guide under the guidance of Mr. Wangchuk, STEM, Curriculum Developer at the Centre for School Curriculum Development of the Department of School Education, Ministry of Education and Skills Development. Special thanks are also due to the teachers who contributed examples, case studies, and valuable feedback to ensure the guide's relevance and applicability to the Bhutanese context.

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ACRONYM

AI	-	Artificial Intelligence
ALT	-	Adaptive Learning Technologies
AR	-	Augmented Reality
CFA	–	Continuous Formative Assessment
CSCD	-	Centre for School Curriculum Development
DSE	–	Department of School Education
DTL	–	Differentiated Teaching and Learning
ICT	-	Information and Communication Technology
IEP	–	Individual Education Program
ITS	-	Intelligent tutoring systems
LIC	-	Low-Income Countries
LMIC	-	Lower Middle-Income Countries
LMS	-	Learning Management Systems
MCQ	-	Multiple Choice Question
MOESD	-	Ministry of Education and Skills Development
RTI	-	Response to Intervention
UDL	-	Universal Design for Learning
VR	-	Virtual Reality

Table of Contents

Executive Summary

The “Differentiated Instruction Guide for Teachers of Bhutan” is designed to support educators in Bhutan in creating inclusive, student-centred classrooms that address the diverse learning needs of all students. Recognizing the range of differences present in today’s classrooms—such as readiness levels, interests, learning preferences, cognitive abilities, linguistic backgrounds, and cultural identities—this guide provides teachers with practical strategies, models, and tools to implement differentiated teaching and learning (DTL) effectively.

The guide highlights the importance of acknowledging and embracing student diversity as a critical factor in fostering effective learning environments. It outlines key principles of differentiated instruction, focusing on flexibility, inclusivity, and responsiveness, while emphasizing the benefits of inclusive classrooms for all learners. Teachers are encouraged to reflect on their instructional practices to understand how differentiated approaches can enhance student engagement, participation, and academic performance.

This guide offers comprehensive guidance on identifying and addressing student needs through a range of assessment methods, including formative, diagnostic, and pre-assessments. It supports the development of detailed student profiles that consider individual learning readiness, interests, and preferences while addressing cognitive, gender, linguistic, and ethnic diversity. This approach ensures that the unique needs of every learner are identified and met effectively, promoting equity and inclusion within the classroom.

The guide also includes the role of Information and Communication Technology (ICT) as a supportive tool in differentiated instruction. It highlights how ICT can enhance learning experiences by offering alternative formats, improving accessibility, and providing additional opportunities for student engagement. Case studies and practical examples are included to support teachers in applying these concepts in real classroom settings. This guide serves as a comprehensive resource for educators in Bhutan, aimed at promoting inclusive, equitable, and engaging learning environments that support the academic and personal growth of all students.

Introduction

This guide provides an in-depth understanding of differentiated instruction, explaining its significance in addressing student diversity in mainstream education. It explores why differentiated teaching is essential, particularly in the context of inclusive education, and examines how it supports equitable learning for all students. The guide also outlines its structure, presenting a logical progression from foundational concepts to practical strategies. Additionally, it provides clear guidance on how educators can use it effectively, whether as a step-by-step resource for beginners or as a reference tool for enhancing existing teaching practices.

1. Why this guide?

While differentiation is included in the teacher toolkit in many high-income countries' education systems, teachers in developing countries in the Asia-Pacific are seldom trained in it or do not have access to guides and pedagogical support. Although pre-service teachers in Bhutan are generally trained in the principles of Inclusive Education, Universal Design for Learning (UDL), or Differentiated Teaching and Learning (DTL), in-service teachers are regularly faced with structural or unforeseen situations that challenge their ability to recognize the diversity of students in the classroom and respond effectively to their learning needs.

Education systems in many developed countries have developed teachers' guides on differentiation. Teachers use these guides to understand and apply the general principles of differentiated instruction (content, process, product, or learning environment), to apply principles of Response to Intervention (RTI), Diagnostic Teaching, or Universal Design for Learning (UDL) (see Differentiation in Action from Ireland, or the guidelines from New South Wales in Australia). However, these are not adapted to the context of Low-Income Countries (LICs) and Lower Middle-Income Countries (LMICs) in the Asia-Pacific. For example, questions about high student-teacher ratios and limited school resources are not addressed in these guides. The guide designed by the project targets teachers from LICs and LMICs in the Asia-Pacific considering their context, capacity, and training needs.

The originality of this guide lies in the fact that it brings together in a single guide all the practical questions facing teachers who wish to welcome diversity into their

classrooms and use it as a lever to optimize learning for each of their students. This guide presents an operational summary of concrete avenues to support teachers' actions in the field of differentiated teaching and learning in the service of an inclusive education system.

1.1. Differentiated teaching: an effective approach to student diversity in mainstream education

School systems have evolved in the direction of democratization, based on equal opportunities for all learners, as embodied in the right to education for all, built on a fundamental principle of equality (UNESCO, 1990). Significant demographic change leading to a sharp increase in the number of people needing schooling has resulted in a significant need for resources at the national level, not only to provide access to the largest possible quantity of learners at all levels of education but also to guarantee quality education for all. While mass schooling is based on the creation of national curricula and still largely on access to standardized teaching and learning materials, developments in educational science and pedagogy have promoted a diversity of approaches to teaching in order to foster optimal learning for students with different abilities, interests, needs, backgrounds, languages, cultures, and so on.

For some thirty years now, differentiated teaching has been presented as an opportunity to anticipate students' needs and optimize their learning. The ability of teachers to respond to these cognitive, psychological, social, and cultural needs through differentiated teaching implies their competence to plan and provide opportunities for learning for individuals or groups through a principle of educational flexibility.

1.2. Inclusive Education as a trend to meet students' needs in an equitable way

Differentiated instruction is of particular importance in the context of inclusive education.

> The principle of inclusive education aims "to gradually change the whole education system so that every preschool, school, college, vocational training centre or other education setting, and every teacher is able to welcome students from all backgrounds (linked to ability, gender, poverty, ethnicity, linguistic background, or other socio-economic status) and provide them with a good quality education alongside their peers"
>
> (Kaplan and Bista 2022, p. 3).

Indeed, with a few exceptions, in the democratization process mentioned above, education systems have evolved over decades by attempting to maintain relatively homogeneous classes based on students' age, sometimes their gender, and always

on their ability to evolve at the pace prescribed by the school system. Several categories of children have generally been excluded from a general education system, either because of their limited abilities or because they are perceived as such, because of their social, economic, cultural, and religious background, or even for reasons of geographical distance from the places of schooling. In an inclusive perspective, the principle of equity has been put forward as a complement to that of equality, to encourage education systems and their stakeholders to consider students' individual abilities as well as to ensure their chances of success and access.

The care of students with chronic learning difficulties due to their cognitive, psychological, or behavioural conditions (learning disabilities) or to certain impairments has generally been based on the right to education for all. Nevertheless, it still happens that school systems consider that the achievement of the expected educational pathway for these children requires a different learning environment or even a different pathway than that of mainstream classes. Although the integration of students with different types of needs or abilities in mainstream classes is in progress, this can still create conditions conducive to their failure at school, and ultimately to their temporary or permanent exclusion from the system. In South Asia, efforts are increasing to create more inclusive education systems, enabling more children with disabilities to learn alongside their peers in mainstream schools. Beyond that consideration, a broader perspective of inclusion now implies identifying, questioning and confronting all exclusive dynamics in a school system and in the classroom. This principle invites those involved in school systems to think of inclusion as the creation of conditions that favour learning for each student. This implies both a transformation of the school environment and a transformation of teaching practices.

There are still several mechanisms that can cause the temporary exclusion of large groups of learners due to several realities that threaten school continuity and the right of children and young people to education. Episodes of school service disruption and threats to school continuity due to natural and man-made events like wars, conflicts, extreme natural phenomena, and pandemics, combined with crises and policy crises of various kinds, impact school drop-out rates and increase the chronic difficulties of access to schooling for students with or without specific disabilities, particularly in remote and poor areas. This phenomenon leads to growing disparities between students within a class. Inclusion is therefore also based on the principle of continuity of access to school, which remains a major contemporary challenge.

1.3. Implication of inclusive education on differentiated instruction

In this guide, the focus is on transforming teaching practices to address students' needs from a broader perspective.

At a basic level, differentiated instruction represents a way of making teaching more flexible, such as varying the learning content, process, product, and environment according to the students' needs. It involves stepping back from standardized teaching plans and textbooks to create a truly effective learning environment that is attuned to every student's condition.

At a more advanced level (which is promoted in this guide), differentiated instruction is seen as a lever for transforming the education system into a more inclusive one. This approach relies on teachers proactively committing to meet the learning needs of all students and not only those who are marginalized, segregated, or excluded for various reasons.

To better support teachers, this guide proposes approaches to differentiation that are operational. Pedagogical differentiation also relies on collaboration between teachers and, in some cases, requires sharing responsibilities with students in the classroom and support from people outside the classroom.

2. What to expect: Structure of the guide

The guide is structured in five chapters addressing all the topics presented above in a logical order from the point of view of teaching practice.

- Each chapter presents the essential concepts before transitioning to the practical dimension in the form of approaches, questions, case studies or examples.
- These examples serve as a starting point for local contextualization in line with national realities, with particular reference to national professional standards for inclusive education and differentiated instruction.
- Each chapter ends with a reminder of essential concepts and principles.

Chapter 1 presents the basic concepts and principles underlying differentiated instruction, such as differences and diversity, differentiation and flexibility, and differentiated and inclusive classrooms. The chapter tackles the issue of diversity in the classroom with examples and simple case studies.

Chapter 2 focuses on assessment as a means of better understanding students' needs before, during, and after learning. A review of the principles of formative and diagnostic assessment is presented, as well as strategies to identify various needs among students.

Chapter 3 presents models, approaches, strategies, and examples to differentiate teaching. This chapter also presents differentiated assessment strategies and principles.

Chapter 4 presents principles of planning differentiated teaching and learning, considering the availability of resources and the capacity of teachers in different contexts, such as large classes and multi-grade teaching. It also includes decision-making tools, templates, examples, and case studies.

Chapter 5 presents ways of implementing DTL using ICTs and AI.

3. How to Use the Guide

Whether the reader is a beginner or more experienced in differentiated instruction, the guide is intended as a tool for professional development. It is non-prescriptive, and leaves space for teachers' professional judgment and adaptation to context.

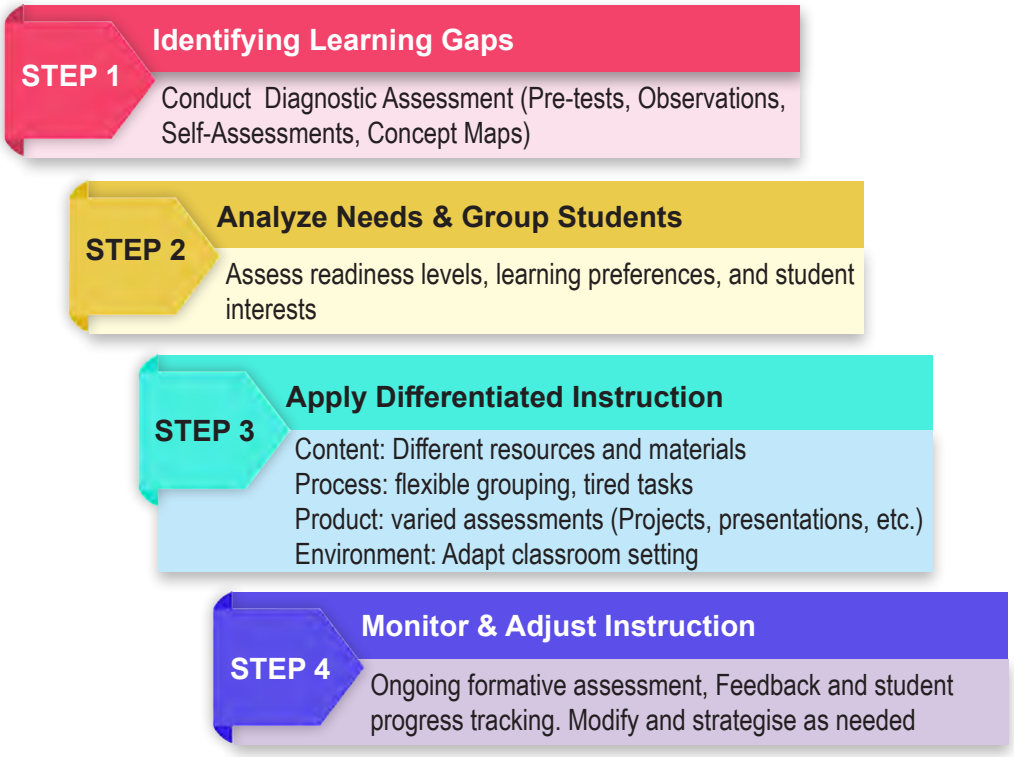
The guide can be used linearly and continuously, chapter by chapter, for those who wish to acquire a basic knowledge of concepts, principles, and practices. The templates can be adapted and modified to suit the needs of an individual teacher or team.

If teachers seek to enhance their existing practices, focus on certain chapters and sections of the guide, check their understanding of the concepts and principles with the key concepts list, and key ideas of the chapter.

The figure below outlines a process that teachers can follow to implement differentiated instruction effectively in diverse classrooms. It begins with diagnostic assessments, which help identify not only learning gaps but also broader differences in students' backgrounds, strengths, and learning profiles. This includes assessing students' readiness levels, learning preferences, and interests. Diversity across dimensions such as language, culture, abilities, experiences, and learning style is recognized as a fundamental source of learner needs. By embracing these differences, teachers can form purposeful student groupings and apply differentiated instructional strategies tailored to varied needs. Process also includes ongoing monitoring and feedback, allowing teachers to continuously adapt and refine their

approaches to ensure that all students are engaged, supported, and included in meaningful learning experiences.

Differentiation in Action



Chapter 1 Introduction to Differentiated Instruction

Key concepts

Differentiation

Most teachers practice some form of differentiation as proactive planning for students' varied needs.

Diversity

People's differences which may relate to their race, ethnicity, gender, sexual orientation, language, culture, religion, mental and physical ability, class, and immigration status (UNESCO, 2017, p. 7).

Differences

Student's characteristics in terms of level of readiness, interests and learning preferences in the differentiated instruction approach.

Flexibility

Refers to the ability to adjust and modify instructional methods, materials, and approaches to meet the diverse needs of students.

Differentiated instruction

A teaching philosophy based on the premise that teachers should adapt instruction to student differences (Tomlinson, 2001).

Inclusion

A process that helps to overcome barriers limiting the presence, participation and achievement of learners (UNESCO, 2017, p. 7).

Mainstream education

The practice of educating students with learning challenges in regular classes during specific time-periods based on their skills.

Inclusive education

Both physical inclusion and inclusion in learning, for wide range of learners – beyond disabilities – generally excluded from mainstream school system.

The terms *Differentiated Learning*, *Differentiated Instruction* or *Differentiated Teaching* refer to an approach consisting of adjusting teaching to the diverse abilities, needs, and interests of students of different ages, backgrounds, aptitudes, and skills, thus enabling them to make optimal progress (Government of Québec, Canada, 2021, p. 2).

In this chapter, teacher will learn about the rationale behind differentiated instruction:

- The ***differences*** to be identified in the classroom for more effective teaching.
- Characteristics of ***diversity*** in the classroom to help you prioritize your teaching choices.
- The principles of differentiated teaching: ***flexibility*** and ***differentiation***.
- An overview of the implications of ***differences***, ***diversity*** and ***differentiation*** in your practice.

Throughout the guide, **Differentiated Teaching and Learning** (DTL) will systematically be

used to emphasise the complementarity of teachers' differentiation decisions and their effects on the students' learning.

Education systems have evolved over decades by attempting to maintain relatively homogeneous classes based on students' age and their ability to evolve at the pace prescribed by the school system and curriculum. However, in such a **mainstream approach**, not all students have the same chances of success due to specific learning needs that the teacher may or may not be able to identify and meet, due to a possible lack of time, resources, and training. However, it is the teacher's ability to detect and respond to these needs that mainly improves the students' chances of success.

A better understanding of the **differences** between students and the **diversity** of students in the classroom will enable teachers to respond to their needs in a more targeted way by anticipating them. This will enable the teacher to differentiate his or her teaching to improve learning for all students.

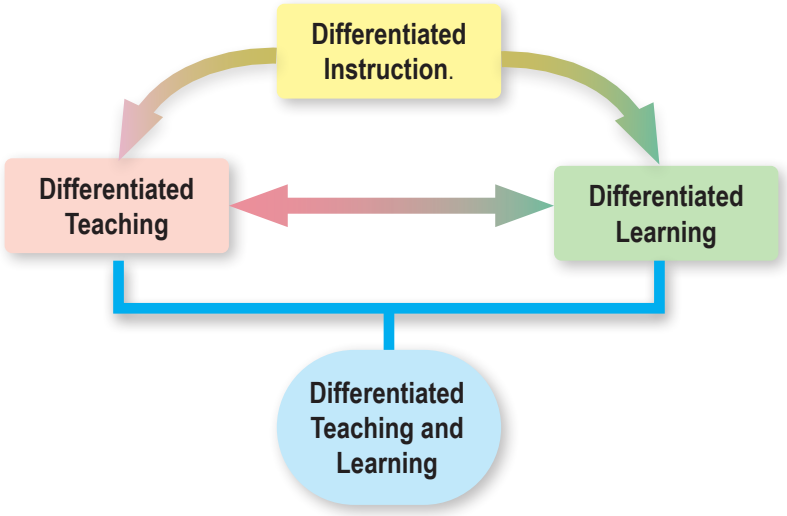


Figure 1: Complementarity between teaching and learning in differentiated instruction (Source: Regional Training Guide (Nizet, I., 2023))

1.1 Differences in the classroom

Three types of differences can generally be identified among the students.

a. The level of readiness

The **readiness** to learn new things is the first difference to consider among students. Does the student have sufficient prerequisites and prior knowledge to learn? Readiness is a student's proximity to the learning goals at a specific point in time (Tomlinson, 2014). The level of readiness impacts on student capacity to bridge the gap between the known and the unknown in a more autonomous way (Tomlinson, 2001, p. 45).

Box 1

A ***difference-sensitive teacher*** should modify instruction to meet students' varying readiness levels, interests and learning preferences (Tomlinson, 2005). Perceiving the differences described below is the first step towards differentiating teaching and learning.

b. The interests

The **interest** of the student is the second difference to consider among students. Meeting the student's interest is a very important lever for his or her motivation and commitment to learning. Interest-based instruction reinforces the student's perception that there can be links between the school and his or her own desire to learn; it also creates a link between skills the student is familiar with and skills he/or she is less familiar with (Tomlinson, 2001, p. 45).

c. The learning preferences or learning profile

The **learning profile** is the third difference to consider among students. There are several **learning preference factors** to identify: 1) learning style preferences like autonomy versus collaboration, silence versus verbal activity, concrete versus abstract, etc.; 2) intelligence preferences like practical, analytic, kinesthetics, etc.; 3) culture preferences related to learning experience and cultural patterns. Combinations of different factors of preferences create constellations of learning preferences in individuals (Tomlinson, 2001, p. 62).

1.2 Diversity in the classroom

Diversity in the classroom refers to the coexistence of students with varied backgrounds, abilities, and perspectives, including differences in culture, language, ethnicity, gender, socio-economic status, and learning styles. It emphasizes an inclusive learning environment that values and accommodates students' needs to enhance educational experiences.

a. Teacher's attitude towards diversity

As a teacher, one could spontaneously adopt certain attitudes toward diversity in one's classroom. Diversity is a reality that may be **prevented, ignored,** or **tolerated**. **It is preferable that you, as a teacher, be aware of your level of acceptance of diversity in the classroom**. Through a positive attitude and a high level of acceptance, diversity may be **welcomed**, like when relevant differences are used to enhance the learning experience in respect for all (Kaplan & Bista, 2022, p. 67).

Box 2

Diversity is normal and valuable. Consideration for diversity in almost all its dimensions broadens the spectrum of differences to be considered in differentiated teaching and learning in a **more inclusive way.**

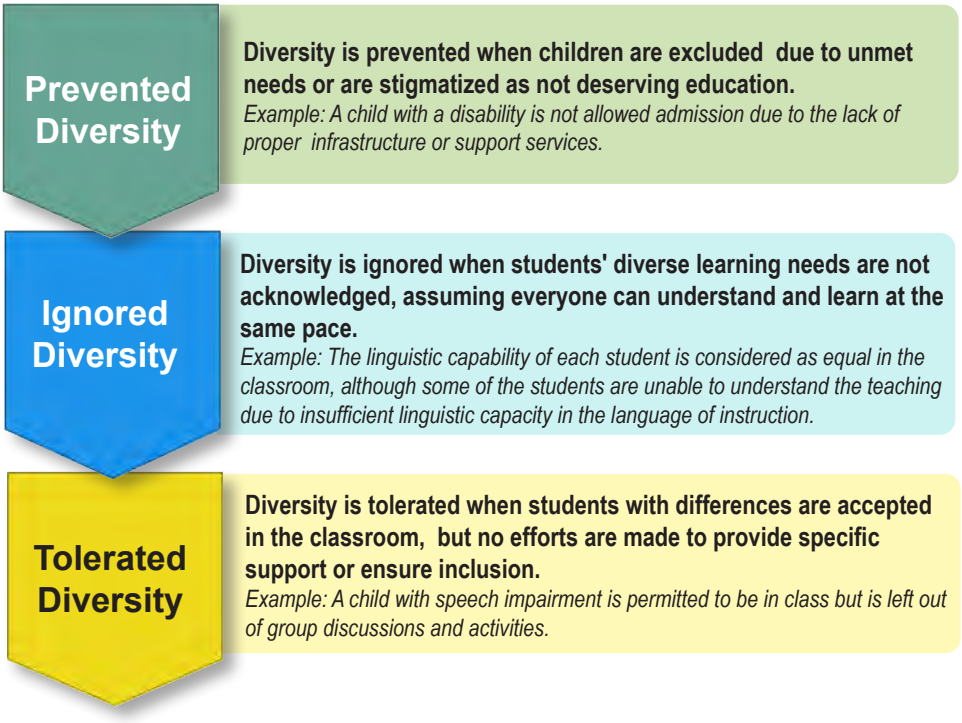


Figure 2: Levels of acceptance towards diversity

b. Factors of diversity

The classroom environment reflects a range of diversity factors that influence student learning and engagement. The key factors that contribute to diversity in the classroom are explained in Table 1.

Table 1: Factors of diversity

Diversity	Description
Ability diversity	Differences in students' physical, cognitive, and learning abilities.
Age diversity	Differences in students' ages.
Gender diversity	Differences in students' gender identity and expression.
Ethnic diversity	Differences in ethnicity, national origin, and languages spoken at home.
Religious diversity	Belonging to and identifying with the values and/or practices of a particular religion or sect.
Socioeconomic diversity	Differences in income, education levels, occupations, and housing security and stability with regard to students or their families.
Experiential diversity	Differences in students' life experiences, such as immigration, military service, adoption, single-parenting or foster care.
Sexual orientation diversity	Differences in students' sexual orientations.
Geographic diversity	Differences in students' local or regional identity and experiences based on where they live, learn, and play.
Linguistic diversity	Differences in student's schooling language, non-native ability and access to second or third language for students who speak a different language at home

Source: Data extracted, and table developed in the regional guide training (Nizet, I., 2023) from oeonline.american.edu/blog/diversity-in-the-classroom/ https://diversity.social/inclusive-classrooms/ 2023

The example below illustrates the various factors of learning diversity in a classroom setting.

> *Mr. Dorji, a Class IV teacher, has students with characteristics resembling an elephant, a fish, a frog, a tortoise, a snail, a monkey, and a rabbit. However, he treats them all the same and assigns a uniform task: "Everyone must climb the tree and collect ten fruits within five minutes."*
>
> *In this scenario, only the monkey successfully completes the task within the given time, while the bird takes ten minutes. Encouraged by these results,*

the teacher overlooks the struggles of the other students. The fish is unable to climb the tree and gathers no fruit, while the rabbit, despite its speed, also fails to collect any. Meanwhile, the snail and the tortoise are still making their way to the tree, leaving the teacher frustrated with the activity's outcome.

By assigning an identical task to all, Mr. Dorji fails to recognize the unique strengths, abilities, and limitations of each student. This example underscores the importance of understanding and catering to diverse learning needs in the classroom.

1.3 Principles of Differentiated Teaching and Learning (DTL)

a. Differentiation

Differentiation is aimed at all students, not just certain groups of students, because this principle is based on the conviction that all students have the potential to achieve success and that each student can develop along a path that takes their individual characteristics into consideration (Gov. of Québec, 2021, p. 2). As differentiated instruction is based on educational values and beliefs, it is important to clarify what **differentiation** is and what it is not.

Box 3

Differentiation is a principle of DTL that makes it possible to reach all students in all their differences and diversity. Differentiation is potentially necessary for all students at some point in their learning process, as no class is homogeneous..

Bringing together the reality of differences and diversity allows you to maximize learning opportunities for the students.

Table 2: Some misconceptions and truth about differentiation

Some misconceptions	What it truly is …
Differentiation is primarily an approach to teaching certain groups of students (e.g., students with Individualized Education Programs [IEPs], English language learners, gifted students) or to teaching in special programs or settings.	Differentiation is necessary for teaching **all students in all kinds of settings**, including the general education classroom.
Differentiation is giving some students low-level tasks and other students high-level tasks.	Differentiation calls for respectful tasks that respond to **students' readiness, interest, and learning preferences.**

Differentiation should happen every day, or differentiation should only happen once in a while.	Differentiation is a potential response to regular and ongoing **analysis of students' characteristics and students' learning**.
Differentiation requires writing individualized lesson plans for every student.	Differentiation calls for i**nstructional adjustments** that respond to patterns in student needs.
Differentiation relies on levelling students through ability grouping.	Differentiation relies on **flexible grouping** for a variety of community-building and instructional purposes.
Differentiation does not allow for whole-class instruction.	Differentiation incorporates a r**ange of instructional strategies**, including whole-class instruction.

Source: Data extracted from Hockett, 2018, p. 5. (Portions adapted from Tomlinson (2014), Tomlinson, Narvaez, & Brimijoin (2008), and Doubet & Hockett (2015; 2017)

b. Flexibility

Box 4

Flexibility is the driving force behind differentiation

The aim of pedagogical flexibility is to allow all students to perform the activities proposed in the classroom, and to progress with their learning in line with curriculum requirements for their group class level. Pedagogical flexibility should be applied in all subjects, as a means of promoting educational success. Teachers can use pedagogical flexibility to provide support or guidance individually or in small groups for students in difficulty, and also to encourage the students to take part in classroom activities and continue to learn
(Gov. of Quebec, 2021, p. 3).

1.4 Levels of Differentiation

a. Differentiated classroom: a basic level of differentiation

In a **differentiated classroom**, teachers could apply the principle of flexibility to **proactively plan and carry out** varied approaches to **content, process, product,** and **learning environment** in anticipation of and response to student differences in readiness, interest, and learning needs. In this case, one contributes to managing a **differentiated classroom** or mixed-ability classroom.

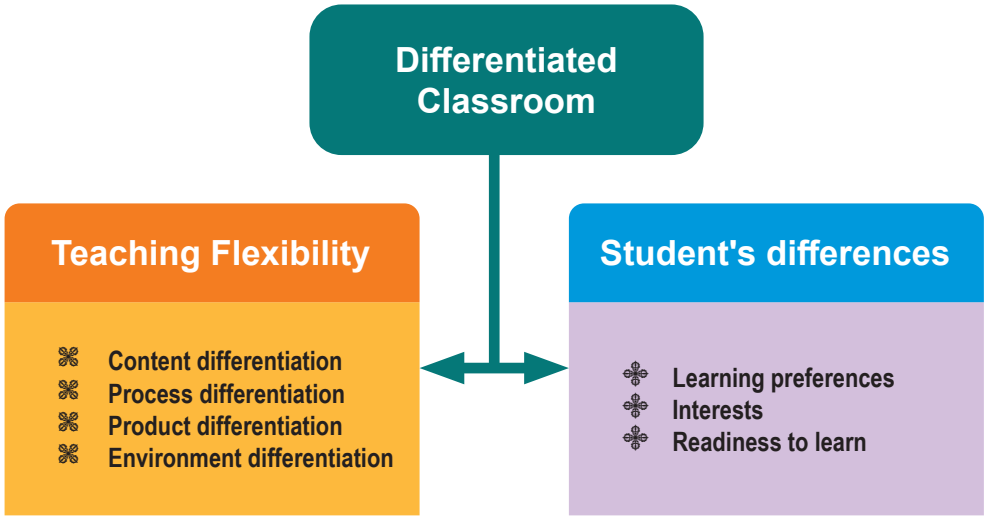


Figure 3: Differentiated Classroom

Source: Regional guide (Nizet, I., 2023)

b. Inclusive classroom: a deepest level of differentiation

Box 5

In inclusive classrooms, the diversity of students is considered as a set of characteristics to be respected in order to achieve differentiation. In this perspective, flexibility remains a basic principle as well as adaptability by modifying/adapting curricula, lesson plans, timetables and activities to fit the needs, abilities and interests of specific learners and groups of learners (Kaplan and Bista 2022, p. 68). So, an inclusive classroom encompasses learning differences as well as factors of diversity that are a possible source of exclusion or discrimination in the mainstream school system.

The challenge for teachers who are sensitive to the diversity of their students is to differentiate teaching and learning on the basis of realities that distinguish them, but that are not always clearly identifiable, such as for students who may have different degree of disabilities (whether or not they have been diagnosed), their past or current life experiences, sexual orientation, geographic origin, socio economic status. In other words, while every diversity factor contributes to a student's identity, their influence can vary in significance from one student to another

Figure 4: Inclusive classroom
Source: Regional guide (Nizet, I., 2023)

1.5 How do inclusive classrooms benefit all students?

Inclusive classrooms provide an enriching learning environment for all students. Research from the Diversity for Social Impact in 2023[1] found that:

- Students in inclusive classrooms exhibit **higher empathy, adaptability, and cultural understanding**.
- Inclusive classrooms **increased high school graduation rates** by 6 %.
- Inclusive education often leads to **improved academic results** in standardized test scores.

[1] *Source: Diversity for Social Impact. (2023). Inclusive education and diversity report. https://diversity.social/resources/*

1.6 Implications of Differentiated Teaching and Learning (DTL) for the teacher's practices

From an inclusive perspective, DTL can be carried out from three different but complementary perspectives (see Figure 5).

Box 6

Differentiated Teaching and Learning proactively addresses students' varied needs to maximize learning opportunities for each student in the classroom. It requires teachers to be flexible in their approach and adjust the curriculum and presentation of information to learners rather than expecting students to modify themselves for the curriculum (Singh & Tandon, 2022, p. 2).

1. Differentiated instruction involves making proactive adjustments to ensure school success. It is generally not sufficient to provide feedback to students while they are learning, or once they have learned, it is also important to prevent the risk of failure by anticipating their needs in teaching planning. By differentiating what students will learn (i.e., content), how they will learn (i.e., process), and how they will demonstrate what they have learned (i.e., product), according to students' individual and shared characteristics, we can maximize learning before assessment in parallel with ongoing, low-stakes assessment (Hockett, 2018).
2. Differentiated instruction can also be used retroactively as a remediation measure following a diagnostic assessment. As such, assessment can also be an object of differentiation.
3. When diversity involves students with learning disabilities duly identified by authorized persons, like dyslexia, dyscalculia, or students experiencing cognitive or mental disabilities such as autism spectrum disorder, the differentiation issues are different. These students are the subject of an Individual Education Plan (IEP), as the degree of effective inclusion through differentiation in the classroom depends on many resources, some of which are external, such as personalized educational support or specialized services for certain disabilities. The IEP calibrates the learning they can achieve and the pace at which they can do it; differentiated teaching and learning require special accommodations in schools or within the classroom.

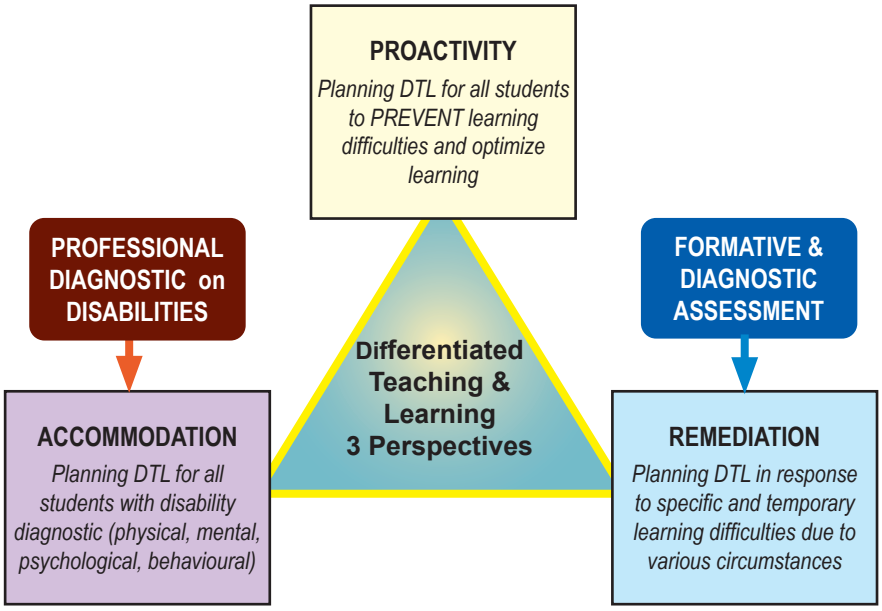


Figure 5: Different types of Differentiated Teaching and Learning (DTL) in the classroom

Source: Addressing learning needs in the Asia-Pacific: Teachers' guide on a differentiated instruction (UNESCO, n.d). (Draft)

Key ideas of the chapter

- *Differentiation works best in classrooms where certain beliefs motivate why, what, and how teachers approach planning for and responding to student differences and diversity (Tomlinson, 2014 cited by Hockett, 2018, p. 6).*
- *Teachers are more likely to adopt a differentiated approach when their personal convictions are based on the principles of inclusion.*
- *The recognition of differences implies the acknowledgement of particularities that can become obstacles to student learning in a homogeneous teaching context.*
- *Diversity is not only made up of visible or formally diagnosed differences, but also above all made up of non-visible psycho cognitive characteristics that need to be investigated in order to be recognized.*
- *It is important to understand students' needs in relation to their particularities in order to adopt a proactive approach to differentiated teaching.*
- *Differentiated instruction can be used retroactively as a remediation measure following an assessment that identifies a student's need or particularity. That is why differentiated instruction can be strongly related to diagnostic assessment and formative assessment.*
- *Differentiated instruction encompasses all dimensions of instruction: teaching, learning and assessment.*

Chapter 2 Identifying Student Needs

Key concepts

Diagnostic/Pre- assessment:
Assessment done prior to the teaching and learning process aimed at identifying a learner's strengths, weaknesses, and readiness or level of achievement to initiate action for learning enhancement.

Formative assessment:
Assessment conducted throughout the educational process to enhance student learning by identifying and addressing learning gaps through feedback and involving students in the assessment and learning process. (Source: CCSSO 2008).

In this chapter, teachers will learn about the ways to identify students needs through their differences (readiness, interests and preferences) and criteria factors of diversity:

- Definitions of key concepts[2]
- Why and how to identify students' readiness?
- Formative assessment and readiness-based differentiation
- Diagnostic and pre-assessment in readiness differentiation
- Identify student's needs related to their profile/preference
- Identify student's needs related to their interests
- Identify student's needs related to diversity factors.

[2] *Source: Definitions provided in Key concepts Box are adapted from UNESCO Curriculum Glossary (2013)*

2.1 Identifying student's needs: a necessity in inclusive classroom

The premise of pedagogical differentiation is the teacher's ability to identify and document the needs of his or her students in relation to their differences and diversity, notably through continuous formative assessment and diagnostic assessment or pre-assessment.

Differentiated Teaching and Learning is a necessity when a class of students is clearly heterogeneous in its composition, such as a multigrade class in a remote area. However, respect for diversity generally implies the acknowledgment that diversity is present even within apparently homogeneous groups (Kaplan and Bista, 2022, p. 66).

The clear understanding of effective and potential students' needs is central to an inclusive classroom approach. DTL might be a response to the needs of students by anticipating them through various ways to collect data related to their differences (level of readiness, interest, profile, and preferences) as well as their needs related to diversity factors.

In order to facilitate effective and appropriate differentiation of the above elements, teachers' understanding of students' levels of readiness, interests, and learning profiles is required on an individual level. Teachers need to understand how each child receives the classroom activities and fits the experiences into his or her own needs so that understanding takes place accordingly (Shareefa et al., 2019, p. 323).

2.2 Formative Assessment, Diagnostic Assessment and Pre-assessment as a Source of Information on a Student's Needs

Educational systems generally offer national guidelines for teacher practices in line with professional standards in which knowing the students' needs, teaching, and formatively assessing are strongly related.

Identification of students' needs based on their differences and diversity implies the use of strategies already employed by teachers in formative and diagnostic assessment, so teaching and learning activities can be differentiated in a flexible way. A summary of formative and diagnostic assessment strategies and principles is provided in Box 7. For further details, please refer to the guide *Addressing Learning Needs: Teachers' Guide on Diagnostic Assessment (2023)*.

Box 7

Formative assessment, also named Assessment for learning or continuous assessment, is generally considered a way to collect data through the learning process and, after it, to identify learning progress and difficulties while the learner is ***still engaged in the learning process***.

Formative assessment may occur ***before*** new learning, ***during*** new learning, and ***after*** new learning (after one or several lessons). Whatever the moment chosen, formative assessment is ***always*** carried out in a perspective of learning improvement.

Diagnostic assessment, also named pre assessment, targets the level of readiness of the students in terms of prerequisites required ***before*** new learning.

Pre-assessment is the process of gathering evidence of students' readiness and interests before beginning a unit or series of related lessons and then using that evidence to plan instruction that will better meet learners' needs (Doubet & Hockett, 2015).

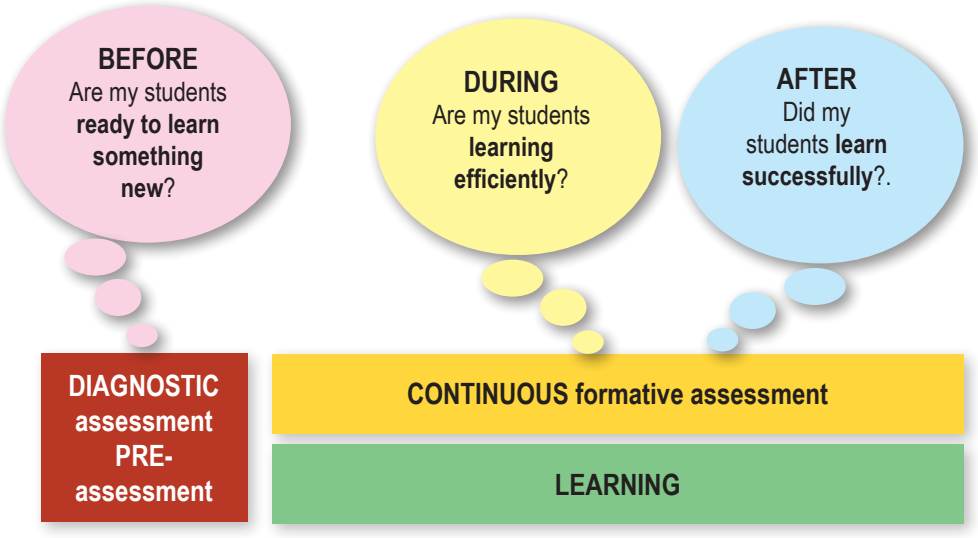


Figure 6: Type of assessment before, during and after learning
Source: Addressing learning needs in the Asia-Pacific: Teachers' guide on a differentiated instruction (UNESCO, n.d). (Draft)

The Continuous Formative Assessment Guide and Diagnostic Assessment Guide extensively discuss continuous assessment. The diagnostic assessment allows the teacher to offer the students more accurate teaching to improve their level of proficiency and chance of success by:

- understanding the difference between what students are expected to learn and what they actually achieve.
- avoiding actions that unintentionally block effective learning.

2.3 The process of assessment

Any formative evaluation process, whether formal or informal, as well as pre-assessment and diagnostic assessment is carried out through various stages.

Although the teacher generally communicates the results of assessments to the students through feedback, grading, or formal and informal messages, from a teaching differentiation perspective, the results of assessments are directly used by the teacher in re-planning teaching involving differentiation models and strategies to meet learners' needs.

Box 8

1. The assessment process starts with a planning phase in which the teacher makes decisions about the purpose of the assessment (why and when?), the target population (who to assess?), the content of the assessment (what to assess?), the format of the assessment (how to assess?) and the administration process (where).
2. Based on this planning, the teacher collects information about students' learning achievements by designing and administering the assessment.
3. Based on the collected data, the teacher then interprets the learning data and uses his or her professional judgment to make sense of the evidence.
4. The teacher uses the information to decide on the appropriate action.
5. The teacher communicates the results to the students in an effort to actively involve them in the learning process. This process is iterative and integrated into the broader teaching and learning process.

2.4 Identifying student's needs related to differences in the classroom

Before presenting different techniques useful to identify students' needs based on their different characteristics (HOW to identify), it is necessary to get a clear view of the objects of teachers' inquiry (WHAT to identify).

Figure 7 indicates the dimensions to be questioned by the teacher to identify

students' needs related to differences in terms of readiness, interests, and profiles or preferences.

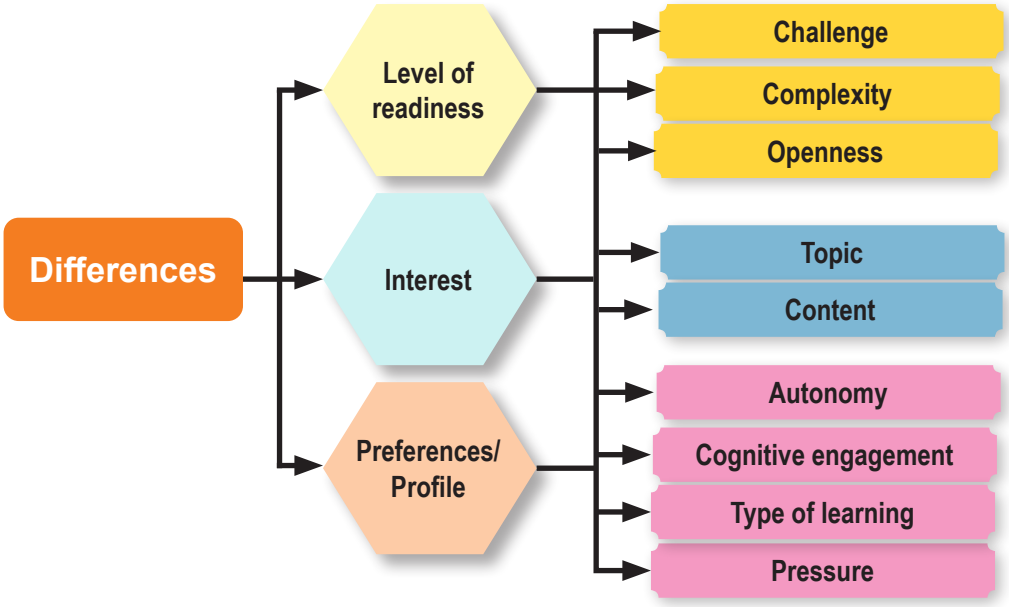


Figure 7: Mapping of differences inquiry
Source: Addressing learning needs in the Asia-Pacific: Teachers' guide on a Differentiated Instruction (UNESCO, n.d). (Draft)

- Assessing students' **readiness, interest**, and **learning preferences** helps teachers tailor instruction for better engagement and growth.
- ***Level of readiness***: The teacher should identify the prerequisites that students effectively mastered or not. Then, the teacher determines their capacity to be **challenged** by new learning, identifies the task's **degree of complexity** adapted to their **level of mastery**, and better understands the extent to which they can or cannot cope with **uncertainty** in their learning process.
- ***Interest:*** The teacher should gather information about students' favourite **topics** (personal interests) and about their life **context** to give priority to tasks that motivate them (situational interests).
- ***Preferences and learning profile***: The teacher should observe their students' level of **autonomy** in different tasks, better understand why they are and are not **cognitively engaged** in some tasks, find out what they're most interested in **learning types** (abstract, practical, etc.), and last but not least, better estimate their **resistance to pressure** to promote optimal learning.

a. Gauging readiness of the students before instruction: diagnostic assessment and pre-assessment

Diagnostic assessment mainly focuses on the prerequisites of the students before embarking on a new learning experience.

Box 9

Pre-assessment and ***diagnostic assessments*** designed by the teachers are the most powerful tools to identify the readiness of students from a differentiation perspective. Assumptions about readiness rely on assessment evidence focusing on learning prerequisites that help the teacher have an accurate idea of the readiness of students to learn new skills or knowledge (Nizet et al., 2023, p. 29).

b. Gauging readiness during instruction: formative assessment

In an inclusive classroom context, formative assessment is the ongoing process of taking regular and varied snapshots of students' learning during or after a lesson (or series of lessons) to inform next steps in instructional planning (Doubet & Hockett, 2015).

Formative assessment can be formal or informal:

Formal formative assessment usually involves more planning on the teacher's part, a set time and process for implementation, and formalized documentation of student thinking and skills.

Informal formative assessment may involve less teacher preparation, be administered on the go (Tomlinson & Moon, 2013), and invite less formalized documentation.

Box 10

Flexibility is the driving force behind differentiation

Through formative assessment, teachers can see what kind of impact their teaching is having on student learning. At its best, formative assessment captures and reveals the nuances of what students are and are not grasping. By studying the results of formative assessment, teachers are able to better detect patterns in student readiness and decide whether to differentiate a lesson or task in response.

For example, a teacher may notice a single overall pattern in student responses. That pattern may align well with the teacher's existing instructional plan, or it might call for adjustments to upcoming lessons. The results may also reveal multiple patterns in student thinking and skill, some of which are significant enough to compel differentiation of content, process, and/or product for student readiness (Hockett, 2018, p. 24).

Table 3: The process of diagnostic, pre-assessment and formative assessment to identify readiness of the students

Process of assessment		Diagnostic assessment and Pre-assessment	Formative assessment
Planning	What	Consider the prerequisite that students at the grade level should already know, understand, and be able to do, but may not.	Design formative assessment items that align with critical learning goals.
	Who	Whole group, small group, or individual.	
	When	Allow time to analyse the results and make up-front adjustments to unit or lesson plans; usually, this means at least several days before a unit begins.	As a unit progresses
	How	Use open-ended prompts that aim to capture what students do know, understand, and can do (versus what they do not).	Decide at what points formative assessment should be conducted formally or intentionally, with analysis of individual students' responses.
		Use natural, grade-appropriate language and aim for quality over quantity. The best items invite students to connect with the content and skills and give them a taste of what they will learn.	

<table>
<tr><td>Collecting</td><td colspan="2">Delivery can be a whole group, small group, or individual.

Assessment can be delivered orally or by reading or displaying prompts, alone or in combination with images and pictures, on paper, with physical materials/manipulatives, or via technology.

Students can respond by speaking, drawing, completing a task, performing, selecting from a set of choices, writing, or using cards, clickers, and other signals. The teacher can gather and document responses using sticky notes, audio-recording responses, taking pictures, or saving responses electronically, including anecdotes.</td></tr>
<tr><td rowspan="2">Interpreting</td><td>Be clear and specific about what the correct responses are, as well as what responses are predictable, considering the age and characteristics of the students.</td><td>In general, formative assessments that are narrowly focused on single correct answers aren't likely to provide information that can drive instruction, including differentiation for readiness.</td></tr>
<tr><td colspan="2">Identify what all students have or have not yet learned or grasped and point the teacher to which area of the pool is best for students to jump in (Tomlinson & Moon, 2013)—which may be in the same place or in different places.</td></tr>
<tr><td>Deciding</td><td colspan="2">The results of diagnostic, pre-assessment and formative assessment can provide teachers a sense of what lessons in the unit might need to be differentiated for readiness, interest, or learning preference.

Review or read through student responses and note the general themes and patterns for the class as a whole. Questions to consider include the following:
• What do all or many students seem to grasp well, or better than expected?
• What do all or many students seem not yet to understand, know, or be able to do?
• What do students' responses reveal about their misconceptions or gaps?
• Are some students' profiles emerging from the analysis of their answers?

What do the misconceptions or gaps imply or suggest that these students need instructionally? How can the misconception(s) be corrected, and the gap(s) closed?</td></tr>
<tr><td>Replanning</td><td colspan="2">Planning from the results: use the themes and patterns to inform or make revisions to the unit plan or specific lesson plans and tasks.</td></tr>
</table>

Source: Author adapted from Hockett, 2018. p. 17; 24-25 in Addressing learning needs in the Asia-Pacific: Teachers' guide on a Differentiated Instruction (UNESCO, n.d). (Draft)

c. Building student, group and class profile with results of pre-assessment, diagnostic and formative assessment

Profiles are a key decision-making tool and are particularly useful for a diagnostic assessment at the transition stages (term or school year); moreover, they allow for planning for remediation and differentiated learning intervention. Interpreting data accurately helps the teacher in decision-making. Using the interpreted results, teachers create individual, group, or class profiles that provide a high-level summary of the learning needs and planned strategies for addressing them. If several students have the same gaps, the teacher may decide to group them together and plan specific differentiation for and with them. If the teacher notices that all the students in the class have the same difficulties, they can plan a collective intervention. For a student with a unique profile, the teacher should propose individualized support (Nizet et al. 2023, p. 57).

d. Identifying student's learning preferences

Different tasks, prompts, and inventories can be used to discover students' learning preferences at the beginning of and throughout the year.

Items can be delivered orally or in writing, even on pre-assessments. Students' responses to questions or prompts can reveal patterns among students in a class or preferences that are unique to individuals.

At the start and/or end of a class session, an entry or exit ticket is a short prompt that can provide teachers with a quick pre- or formative assessment.

An "entry ticket" is an exercise that students do for the first two minutes before the lesson begins. Entry tickets focus student attention on the day's topic or ask students to recall background knowledge relevant to the day's lesson. For example:

- "Based on the readings for class today, what is your understanding of _____?"
- Invite students to make predictions by asking them to write down knowledge they already have about the subject.

The "exit ticket" is an exercise that students do for the last two minutes of the class period. Exit tickets focus on reflection on the students' grasp of the day's concepts and what they have learned. Information obtained from the exit tickets can inform your approach to the next class session. For example:

- Provide a prompt that summarizes a key concept and ask students to select

from a list of statements which one is true related to that concept.

- What is working and what is not working in this class for the students to support their learning?

These exercises can be collected on 3"x 5" index cards, on a small piece of paper, via polling in a student response system, or online through a survey.

Source: https://www.salisbury.edu/administration/academic-affairs/instructional-design-delivery/articles/entrance-exit-tickets.aspx

e. Identifying student's interests

As some students may not want to share personal information with a teacher they have just met, different tasks, prompts, and inventories can be used to discover students' personal interests at the beginning of the year and as students develop new interests throughout the year. It is better to gather data on students' personal interests in more or less formal ways throughout the first weeks of school—as they build trust and community—rather than trying to do so up front or all at once (Hockett, 2018, pp. 71-72).

Box 11

Learning preferences refers to how students seem to learn the best, how they process what they need to learn, or how they think about, remember, and prefer to use what they learn (Tomlinson & Sousa, 2011). Learning preferences are not inherent characteristics or traits of a student and can evolve through learning experiences.

To better understand needs related to situational interest, teachers can use prompts and questions in short surveys or inventories.

- Soon, we will learn about the food chain. Which topics about how animals feed themselves sound the most interesting to you?
- What do you hope we will learn or explore about how animals eat?
- Once the answers are gathered, as in any assessment process, data must be analysed in a qualitative way.
- Are there any interests that are particularly unique, unexpected, or surprising?
- Categorize the data to identify clusters of interest to be integrated into planning to meet students' needs.
- Use a graph, table, or other helpful visual to see the relative number and nature of the interests. Share this depiction with the class; elicit their observations and questions.

- Identify potential connections between those topics and the categories of students' personal interests. Note ideas for collaborative and individual tasks that build on interests.

2.5 Identifying actors of diversity in the classroom

Although some diversity factors are known and formally documented (by the school principal, the school system, or those more specialized in diagnosing certain learning difficulties), other factors of diversity are less perceptible, such as certain learning difficulties or capacity limitations.

For example:

Teachers are generally aware of the presence of an autistic student in his or her class, but some other characteristics of students who require additional support may be less apparent, even though they are equally important to recognize. There may be a few students whose language at home is not that of the medium of instruction used for teaching, and among these students, some could be highly demotivated without daring to show it. In such cases, it's important for the teacher to get to know these students better to prevent them from dropping out or failing.

Source: A guide for ensuring inclusion and equity in education. UNESCO, 2017. p. 18

Box 12

Equity is about ensuring that there is a concern with fairness, such that the education of all learners is seen as having equal importance (UNESCO, 2017, p. 13).

Sometimes spontaneous attitudes reflect a form of behavioural bias towards certain students. Schools and teachers have little experience with, and sometimes little tolerance for diversity (Kaplan and Bista (2022, pp. 50-51).

a. Identifying factors of cognitive diversity

- To inform the **cognitive diversity** of students, teachers should be aware of the presence of students with disabilities and their specific needs related to **time**, **space** and **conditions** of **effective learning**.
- Cognitive diversity also means being aware of students with high intellectual potential.
- Cognitive diversity includes struggling students who may show a lack of interest and confidence in their abilities, sometimes exhibiting avoidance

behaviours. These students generally need more support and a chance to experience success to break out of the spiral of failure.

b. Identifying factors of gender diversity

- To inform the **gender diversity** of students means to be aware of sources of inequities towards and among students based on gender or sexual orientation, including teachers' **prejudices**, peers, as well as other sources of systemic inequity.
- **Awareness raising** allows the teachers to identify prejudices that can cause bullying mechanisms and be aware of harmful consequences of a psychologically threatening and unsafe learning environment, such as devaluation and denigration of people whose body, appearance, gender identity or expression, or sexual orientation do not correspond to culturally defined models. Non-disclosure of private information is crucial to classroom management and is generally governed by standards of professional ethics.
- As discrimination and stereotypes continue to influence learning outcomes, teachers must be aware of interactions between students, signs of mutual respect, and equity in class participation (UNESCO, 2022).

c. Identifying linguistic diversity

Linguistic diversity refers to the existence of multiple languages within a given region or community. It is not simply about different cultures speaking different languages; it also encompasses situations where multiple languages are used within a community, even if some individuals share a common language. This can create both opportunities and challenges.

One key challenge arises when the language of instruction in schools differs from the language spoken at home. This can create a significant barrier to learning for students whose first language is not the dominant or official language.

To inform linguistic diversity, a teacher should first be aware of the challenges that students face when learning school subjects in a language that is not their first language.

- Language can be a fundamental barrier to education. Students struggling to understand the language of instruction may fall behind in other subjects, impacting their overall academic progress.
- Indigenous languages are spoken by smaller, marginalized communities

and are under threat of extinction. Supporting the use and revitalization of indigenous languages is essential for preserving linguistic diversity and cultural identity.

- When teachers are unfamiliar with the local languages spoken by their students and their families, communication can break down. This can lead to misunderstandings, mistrust, and a lack of parental involvement in education. Communication with parents is often primarily in written form, using the national language, which can exclude families who are not literate in that language. This disconnect can hinder a child's educational progress.

- Students who are taught in a language they don't understand face significant challenges. They may struggle to grasp basic concepts, and their parents, who may also be illiterate in the language of instruction, are often unable to provide adequate support with homework. This can lead to frustration for both the child and the parents, and it can undermine the parents' confidence in the school system.

- A key strategy for addressing these challenges is to provide initial literacy instruction in the first language to support learning in the school language. This approach allows students to build a solid foundation in their first language while gradually acquiring proficiency in the additional languages. This can improve learning outcomes and foster a more inclusive and supportive learning environment.

Source: Kaplan and Bista, 2022. p. 51

d. Identifying ethnic diversity

A teacher's cultural awareness encourages him or her to get to know his or her students better, to be culturally sensitive to their realities, and to promote cultural diversity in the classroom. The teacher encourages students to share with the class what sets them apart and should be respected, and what brings them together.

Box 13

A bias causes a prejudice; it may suggest something unfairly negative about an individual or group, perpetuate a stereotype, or favour one group over another. Discrimination, similarly, treats individuals or groups unfairly and unjustly. Many national curricula have some biases and discriminatory aspects (e.g., in regard to language, gender, and religion) which work against inclusive education. These biases may be found in teaching and learning materials, instructional practices, or school policies (e.g., those that are gender-biased or biased against ethnic and linguistic minorities) and

include gender stereotyping (e.g. promoting the stereotype that women are best suited to do domestic work and take care of households instead of working outside the home, or that boys are better in mathematics and science).

- bias against ethnic and linguistic minority groups
- bias against people with disabilities
- bias against rural communities and economically poor communities
- bias against sexual minorities (e.g. stigmatizing gay, lesbian, bisexual and transgender people).

-Kaplan and Bista (2022, p. 55).

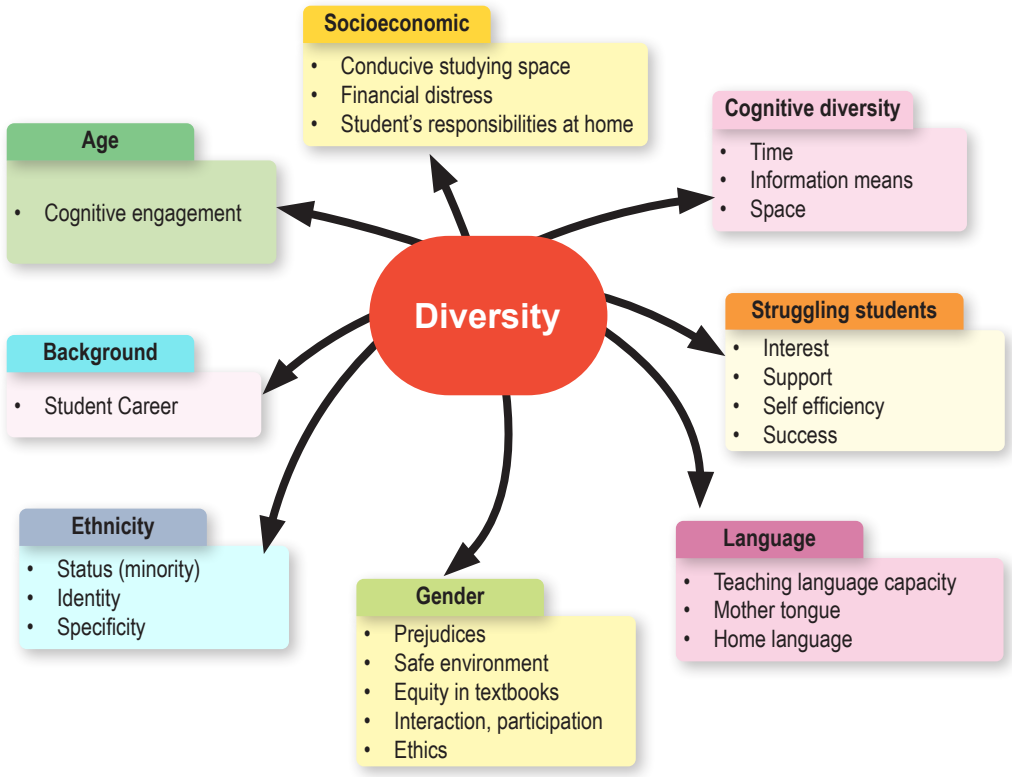


Figure 8: Mapping of diversity

Source: Addressing learning needs in the Asia-Pacific: Teachers' guide on a Differentiated Instruction (UNESCO, n.d). (Draft)

Example On Differences and Diversity in the Classroom: Identifying the needs of the students

Context

Tshomo is an English teacher in Samtse, a southwestern district of Bhutan. She teaches English in Class VII and IX. Her classes comprise of students from diverse linguistic backgrounds: Lhotshampa, Tshangla, Dzongkha,Lhopkha, etc.

She initiated a classroom language policy of speaking or talking only in English in her classes. A class observation revealed minimal participation from students, and upon inquiry, students reported aspects of foreign language anxiety. Some may struggle to express themselves confidently in English, making them less likely to participate in the class. At first sight, Tshomo noticed that some of the students don't pay much attention, are passive, seem distracted, and are shy. Trying to understand why, she knows that one of the major challenges students face in adopting English as a spoken language is its perceived low utility in their daily lives. Since students come from diverse linguistic backgrounds, their primary mode of communication outside the classroom is in their first languages. As a result, they do not see English as an essential tool for daily interactions within their community.

The teacher's intention was to give adequate exposure and practice to make children use the target language. After a few days, she noticed that not all students were 'ready' to engage in the initiative. Tshomo observed that their proficiency levels in English can vary significantly, as students may have different spoken language competencies. She also observed that some students seem to prefer a gradual, scaffolded approach to language learning, requiring support in their first languages before confidently using English.

Examples of Differences

Tshomo's understanding of the differences between students with high and middle levels of proficiency in English and the students who are struggling in English shows that the latter are not interested and not motivated to learn English. Students were also not intrinsically motivated to speak in

English, supposedly because of a lack of 'interest'. Tshomo knows that a lack of motivation leads to a lack of learning, and these students never seem sufficiently prepared (low level of readiness) to learn because their previous knowledge (of prerequisites) of English varies widely. Moreover, Tshomo understands that students' lack of motivation also influences the way they learn (learning preferences). For example, some students may prefer a gradual, scaffolded approach to language learning, requiring support in their first languages before confidently using English.

The example highlights how linguistic background influences learning preferences among students, individual readiness to learn, and interest levels.

Example of Diversity

In Tshomo's classroom, various forms of diversity are evident. Linguistic diversity is significant, as students speak different first languages that differ from the language of instruction, making it more challenging for them to use the language confidently. Ability diversity is seen in the different levels of spoken language proficiency, as not all students have the same command of English. Age diversity might emerge in a classroom where students of varying ages are at different stages of their language acquisition. Gender diversity could influence participation patterns, with potential gender differences in confidence or willingness to speak in English. Ethnic diversity is evident, with students from Lhotshampa, Tshangla, Dzongkha, and Lhopkha backgrounds, which may affect their comfort and familiarity with the target language. Socioeconomic diversity may play a role in access to language-learning resources or previous exposure to English outside the classroom. Experiential diversity highlights that students come with varying levels of exposure to English, impacting their willingness and ability to engage. Geographic diversity reflects the students' rural or urban backgrounds in Samtse, which may influence their opportunities to interact with English speakers.

Since students come from diverse linguistic backgrounds—Lhotshampa, Tshangla, Dzongkha, Lhopkha, etc., Tshomo's understanding of the differences between students with high and middle levels of proficiency helps her tailor her teaching strategies to meet their varying linguistic needs effectively. At first sight, Tshomo noticed that some of the students do not pay much attention, are passive, seem distracted, and are shy.

Lesson Example to identify needs of the learners

Below is an example tool and lesson plan that illustrate how Tshomo can effectively identify the needs of the learners.

Learners' differences can be assessed through learner's readiness, learning interest and learning preferences.

Pre-Assessment Tool: Readiness and Preferences for Learning

Nutrition	
Teacher:	Ugyen Tshomo
Subject:	Science
Grade:	VI
Class Size:	24 students

Purpose

To assess students' readiness, interest, and learning preferences for the topic of nutrition, this assessment will identify prior knowledge, openness to new ideas, and individual learning preferences to help the teacher group students by profiles to adapt teaching methods or differentiate teaching.

Section 1: Readiness Check

Objective: *Determine prior knowledge, skills, and openness to learning about nutrition.*

1. Prior Knowledge Quiz

Multiple Choice: Which nutrient is especially important for bone health in growing children and older adults?

- ☐ Vitamin C
- ☐ Calcium
- ☐ Iron
- ☐ Vitamin K.

Short Answer: Describe how nutritional needs change for men and women as they age.

Answer: _____

Problem Solving: A mother is concerned that her 5-year-old child is not eating enough vegetables. What advice would you give her to improve the child's nutrition?

Answer: _____

Section 2: Interest Inventory

Objective: *Identify students' specific interests within the broader topic of nutrition to tailor activities accordingly.*

1. Topic Preference

Which area are you most interested in exploring further?

- ☐ Sports & Performance Nutrition
- ☐ Child & Adolescent Nutrition
- ☐ Cultural & Traditional Diets.

2. Learning Activity Preference

Choose the learning activity you feel most interested in:

- ☐ Hands-on experiments
- ☐ Lecture method and reading handouts or textbooks
- ☐ Problem-solving exercises
- ☐ Group discussions.

Section 3: Openness and Cognitive Engagement

Objective: *Gauge students' openness to new learning formats and readiness for exploratory and autonomous learning.*

1. Openness to New Ideas

Are you comfortable participating in open discussions and sharing ideas about new science concepts?

- ☐ Very comfortable
- ☐ Somewhat comfortable
- ☐ Not comfortable.

2. Self-Assessment of Engagement

How would you rate your engagement in a learning activity like reading and discussion?

- ☐ Do you tire quickly?

- ☐ Do you achieve the required outcomes?
- ☐ Are you eager to showcase what you have achieved?

3. Autonomy Level

Rate your interest in independently exploring resources like the internet, books, and simulations to learn more about nutrition:

- ☐ Very interested
- ☐ Somewhat interested
- ☐ Not interested.

Section 4: Preferred Learning Context

Objective: *Identify preferred learning environments to align with students' learning preferences and ease of learning.*

1. Learning Environment Preference

Choose your preferred learning setting:

- ☐ Laboratory
- ☐ Computer lab (for simulations)
- ☐ Outdoor learning activities.

2. Personal interest for creating Balanced Diet menu

Would you enjoy creating a physical or digital model to represent a balanced diet menu?

- ☐ Yes, very interested
- ☐ Somewhat interested
- ☐ Not interested.

3. Adaptation to Task Complexity

Which type of task do you find more engaging?

- ☐ Basic concepts review (low complexity)

- ☐ Applying concepts to problem-solving tasks (medium complexity)
- ☐ Advanced projects requiring critical thinking (high complexity).

Section 5: Self-Reported Comfort with Pressure

Objective: *Assess students' comfort with various levels of challenge and pressure in learning situations.*

1. Comfort with Challenge

How comfortable are you when working on complex science problems under time constraints?

- ☐ Very comfortable
- ☐ Somewhat comfortable
- ☐ Not comfortable.

2. Preferred Level of Guidance

When learning new topics in science, do you prefer:

- ☐ Step-by-step guidance from the teacher
- ☐ Initial guidance with some independence
- ☐ Complete independence.

Evaluation and Grouping

The teacher could use the information to group students by needs profile and combine different types of needs to group students. For example:

1. Readiness Levels profiles or grouping:

- *High Readiness:* Demonstrates prior knowledge, comfort with pressure, and high engagement with advanced tasks and independent learning.
- *Moderate Readiness:* Shows basic understanding, openness to guidance, and interest in engaging with medium-complexity tasks.
- *Low Readiness:* Requires foundational support, prefers a structured learning environment, and benefits from lower-complexity tasks.

2. Learning Preference profiles or grouping:

- *Hands-on or Interactive Learners*: Group in laboratory or hands-on settings.
- *Simulation or Technology-Engaged Learners:* Group in computer labs with simulation-based tasks.
- *Independent or Autonomous Learners:* Assign autonomous research and exploratory tasks.

For example: low level of readiness students with low personal interest for a diet menu could be grouped to discuss their individual nutrition with guidance to increase their interest, commitment and prior knowledge of the subject.

Key ideas of the chapter

- *The premises of pedagogical differentiation is the teacher's ability to identify and document the needs of his or her students in relation to their differences and diversity.*
- *Educational systems generally offer national guidelines for teacher practices in line with professional standards in which knowing the student's needs, teaching and formatively assessing are strongly related.*
- *Formative assessment, diagnostic assessment and pre-assessment are accurate to identify student's readiness and learning preferences.*
- *Identification of student's interest is made through observation, discussion and survey.*
- *To inform cognitive diversity in the classroom, teacher should be aware of the presence of students with disability and their specific needs related to time, space and conditions of effective learning.*
- *Bias and prejudice suggest something unfairly negative about an individual or group, perpetuating stereotype, or favouring one group over another.*
- *Awareness raising allow the teachers to identify prejudices that can cause discriminatory mechanisms among students.*
- *To inform linguistic diversity, a teacher should first be aware of the challenges that students face when learning school subjects in a language that is not their first language.*

Chapter 3 Models, Approaches and Strategies of Differentiated Teaching and Learning

Key concepts

Tiered approach
An approach that sequentially increases the intensity of instructional interventions to support early identification of learners' needs and prevent further learning difficulties.

Universal design for Learning
A set of pedagogical principles that can be applied to any discipline or domain to ensure that all learners can access and participate in meaningful and challenging learning opportunities.

Diagnostic Teaching
Diagnostic teaching is a dynamic process in which teachers make their instructional decisions based on the evidence of learning difficulties.

Scaffolding:
Scaffolding refers to a variety of pedagogical approaches used to move students progressively toward stronger understanding and ultimately, greater independence in the learning process.

The principle of differentiation refers to classroom management as well as to specific strategies and is applied to teaching, learning, and assessment in a coherent vision.

In this chapter, teachers will learn about the different models, approaches, and strategies of differentiation in teaching, learning, and assessment and become familiar with:

- models of differentiation like Universal Design for Learning, Diagnostic Teaching, Response to Intervention, and Tiered Instruction;
- basic strategies of differentiation: differentiating content, process, product, and learning environment.
- differentiation strategies focusing on students' readiness, interests, and profile or preferences.
- differentiation strategies focusing on classroom organization and environment.
- differentiation strategies to respond to various diversity needs.

3.1 Basic differentiation strategy: Differentiating Content, Process, Product, and Environment

Basic practices to differentiate specify WHAT teachers can do differently in their planning and interventions: vary learning content, learning process, learning product, and learning environment. That general strategy remains relevant as it is easy for the teachers to plan differentiation through that framework.

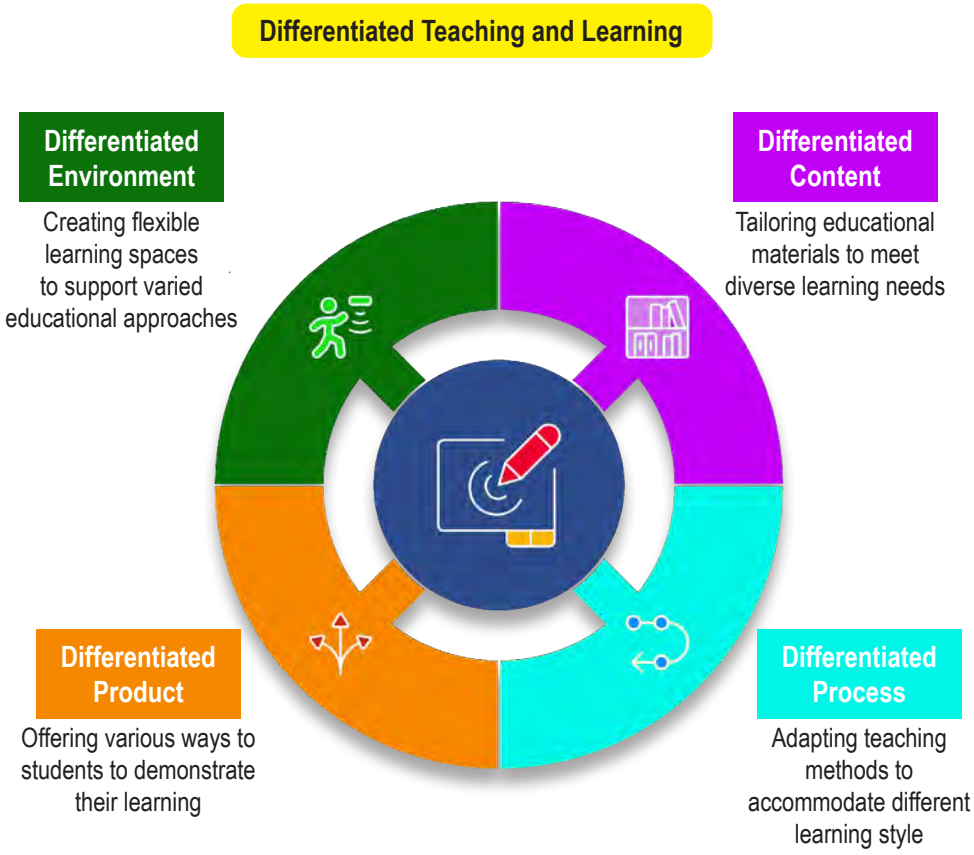


Figure 9: Different dimensions of differentiation in DTL
Source: Nizet et al. (2023, p. 71)

- **Differentiating content** means that the teachers select the most appropriate content for learners, considering their level of readiness. The content can be scaffolded with a progressive degree of complexity for some students to help them experiment with success on small pieces of learning. The content refers to the concepts and skills the teacher plans to teach and what students

need to learn. Teachers must focus on the concepts, principles, and skills that students should learn. The content of instruction should address the same concepts with all students, but the degree of complexity should be adjusted to suit diverse learners. The content should be relevant to each learner, speak to her or his interests, and be informed by her or his current knowledge and interests, and pitched at the 'right level' – neither too difficult nor too easy – based on an assessment of the learner's learning levels» (Singh and Tandon, 2022, p. 11).

- **Differentiating process** means that the teachers enable students to achieve learning outcomes in different and varied ways: for example, by proposing an inductive approach that starts from the concrete for some students with a kinesthetics learning style and reserving deductive approaches that start from theory for students who are more analytical. It also refers to modes of classroom organization like flexible grouping or tiered instruction, interest/ activity corners, etc.

- **Differentiating products** means that the teachers allow students to demonstrate their learning by creating evidence of various kinds - for example, by letting a student show his or her reading comprehension skills verbally rather than in writing.

- **Differentiating the learning environment** means that the teachers promote optimal learning conditions by organizing the classroom spatially and materially in such a way as to optimize learning - for example, by allowing students to group their desks or tables together to work in teams.

3.2 Models and approaches supporting inclusive classroom

Box 14

Differentiated Teaching and Learning can take place in more global approaches centred on inclusion in the classroom. These models refer to the four dimensions of differentiation and also to differentiation strategies based on specific principles. These may be principles derived from a better understanding of learning and human cognition, as in Universal Design for Learning (UDL), or from a systematic cyclical approach starting from assessment, as in Diagnostic Teaching, or from principles of structuring student support according to the complexity of their needs, as in Tiered Learning. Some models are more specifically dedicated to students with disabilities, while others can be used in mainstream classrooms.

a. Universal Design for Learning

Universal Design for Learning is a systematic approach to designing learning environments, curricula, learning activities, and materials to accommodate the needs of students with the widest possible range of abilities to ensure that all learners can participate in meaningful and challenging learning opportunities (Singh and Tandon, 2022, p. 4). Universal Design for Learning (UDL) is a framework to improve and optimize teaching and learning for all people based on scientific insights into how humans learn.

In UDL, teachers are encouraged to design:

Multiple means of representation:

- Provide students with multiple ways to access information and content (text, audio, video).
- Offer different modes of perception in the classroom by designing verbal, written, pictorial stimuli, and activities.

Multiple means of action and expression

- Allow students to demonstrate what they know in different ways.
- Provide options for students to express themselves through writing, speech, or other forms of communication.

Multiple means of engagement

- Provide students with multiple ways to engage with content, activities, and assessments by welcoming interests, efforts, persistence, and emotional capacity.
- Offer choices in how they approach and interact with learning materials, as well as create opportunities for motivation and self-reflection.

Source: https://a11y.canada.ca/en/universal-design-for-learning-udl/

Together, UDL and differentiated instruction provide a powerful combination of strategies to reach the needs of all students as they work to reach the goals of instruction successfully (CAST, 2013). This requires a shift from teacher-centred, lecture-based pedagogy to child/learner-centred pedagogy, with tailored instruction

and teaching strategies based on the current level of understanding, knowledge and skills. This will allow children to take more control of their learning by giving them opportunities to show what they know. In turn, this will contribute to the decisions taken by the teachers on the instructional activities that build upon students' level of knowledge, responding to their interests and needs (Singh and Tandon, 2022, p. 12).

b. Diagnostic Teaching

Diagnostic teaching is a dynamic process in which teachers make their instructional decisions based on the evidence of learning, and these instructional decisions change during the teaching–learning cycle, as per the evolving needs of individual children. It requires teachers to be flexible in their approach to adjust the curriculum and presentation of information according to the learners' needs, strengths, and preferences, rather than expecting students to make all the adjustments (Singh and Tandon, 2022, p. 7).

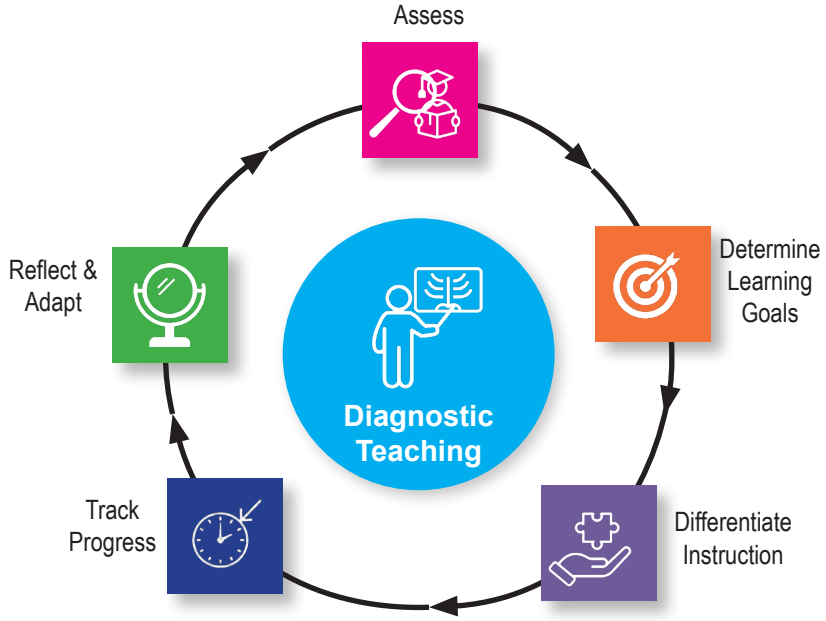


Figure 10: The process of diagnostic Teaching

Source: Addressing learning needs in the Asia-Pacific: Teachers' guide on a Differentiated Instruction (UNESCO, n.d). (Draft). Adapted from Singh, R., and Tandon, A. (2022. p. 7), Guidance on Diagnostic Teaching with a Focus on Children with Disabilities, United Nations Children's Fund Regional Office for South Asia, Kathmandu.

c. Tiered Learning Approach or Response to Intervention (RTI) –Tiered Instruction

The tiered learning approach or RTI approach allows teachers to group students in the classroom according to the intensity of the support they need for their learning. The relative effectiveness of differentiated teaching in each tier enables teachers to allocate resources according to the needs of their students.

In Tier 1, all students receive similar instruction. Students who fail at this level then receive targeted support in small groups on specific skills for a limited period of time at Tier 2 a and b. Then, after a period of assessment, students who are still experiencing difficulties will be accompanied by an interventionist or special education teacher (Tier 3).

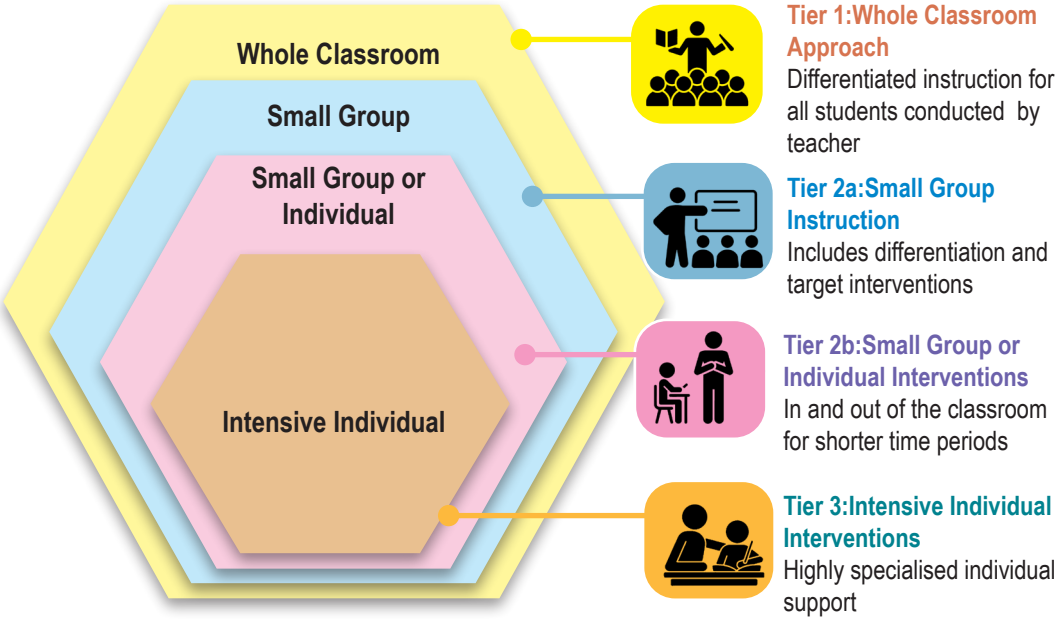


Figure 10: Tiered Learning

Source: Addressing learning needs in the Asia-Pacific: Teachers' guide on a Differentiated Instruction (UNESCO, n.d). (Draft). Adapted from MDIRS (2019). Access: https://sites.google.com/a/mdirss.org/curriculum/response-to-intervention-rti

d. Strength and limits of DTL models

Box 15

As the application of DLT models is either long-term or extensive within a school and across several learning subjects, it generally requires a high degree of collaboration between all teachers in a school, or between teachers and different stakeholders in a school, which is not necessarily the case in your professional environment. These models perform very well when implemented systematically. However, under normal conditions of practice, they are referred to as a framework for positioning pedagogical choices and are used to meet specific needs.

This is why teachers need to master a set of strategies that can be extracted from these models, complement them, or replace them. This combination provides the teacher with a repertoire of strategies that can be organized to structure differentiation in the classroom according to student needs.

3.3 DTL strategies

a. Differentiation strategies based on the readiness of the students

In textbooks, many decisions are made on the teacher's behalf, from a ready to use perspective. When teachers want to differentiate teaching and learning, they have to make teaching choices and ask themselves questions on different dimensions of learning to make relevant decisions and balanced choices (Tomlinson, 2001, p.47). Every dimension of learning can be calibrated progressively. For example, considering the low proficiency level of a group of students, teachers may choose to start with concrete learning for them and abstract learning for others. But in between, a whole variety of possibilities exist. Table 5 shows the dimensions on which teachers can make decisions to meet students' needs based on readiness for new learning.

As the degree of readiness is one of the criteria for differentiation, it must allow for variation in content, process, or learning product. The environment can also be modified according to this level of readiness.

Table 5: General principle of differentiation in relation to readiness

Use readiness to differentiate	
Content	Vary level of complexity of learning input: reading text at a level of complexity adapted to the level of readiness.
Process	Vary the type of activities offered to students: for example, in math, propose different types of home assignments so the students can choose a task that challenges them at the right level.
Product	Let the student choose the way to prove his or her learning effectively, for example, by limiting the assessment to criteria that seem at or above the student's proficiency level to help the student in "working up" through self-selected goals.
Environment	Choose resources adapted to the degree of readiness to help the student to realize sustainable learning instead of experiencing failure within textbooks exercises that exceed his or her capacity.

Source: Addressing learning needs in the Asia-Pacific: Teachers' guide on a Differentiated Instruction (UNESCO, n.d). (Draft)

Tiered tasks or assignment strategy

Tiered tasks or assessments are tasks calibrated according to different degrees of complexity or openness. For example, teachers can design simple tasks, so the solution is generally closed, or more complex tasks, so the solution is generally more open (see Table 12). It is then possible to present the class with different types of tasks in parallel, depending on the students' abilities. The progression of tasks will enable them to move successfully from one level to the next.

Example:

Students are given one of two tasks following a scientific investigation (e.g., lab, experiment, demonstration) to assess their understanding of what the investigation shows. Task assignment is based on students' grasp of the scientific concepts under study and their skill in completing the investigation.

A simple way to calibrate progressive task's complexity is to carefully select a level of taxonomy for the task. Generally, low-level taxonomy actions are less complex.

For example, generate is more complex than analyse. Define is less complex than explain.

Another way is to provide more or less information to the students to accomplish the task. For example, it is easier to identify errors among a list of errors provided to the students than to identify errors without any clues.

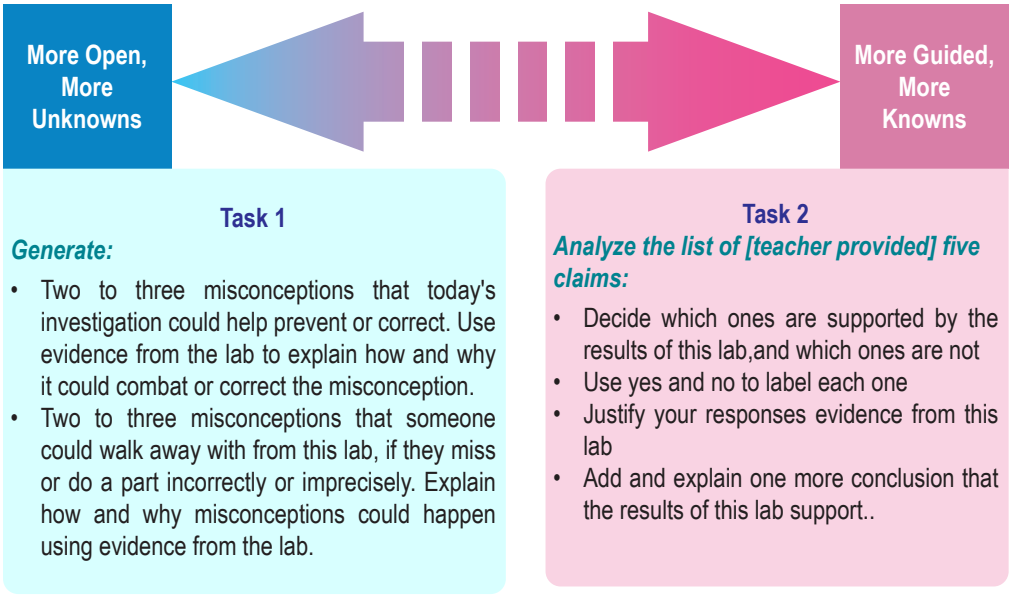


Figure 12: Open and guided tasks

Bloom Taxonomy can also be used to tier tasks and assignments as seen in figure 13 (a) and (b).

Bloom's Taxonomy is a useful tool to guide you in designing activities of increasing levels of complexity that meet the students where they are in their cognitive learning journey. This structure includes six levels of cognitive complexity ranked from the lower-order of complexity to the higher-order of complexity

BLOOM'S TAXONOMY AND DIFFERENTIATED LEARNING

Increasing levels of complexity using Bloom's Taxonomy

Bloom's Taxonomy is a useful tool to guide you in designing activities of increasing levels of complexity that meet the students where they are in their cognitive learning journey.

This structure includes six levels of cognitive complexity ranked from the lower-order of complexity to the higher-order of complexity. These are:

You can design activities using Bloom's Taxonomy in a scaffolded manner. For example:

In a language class at the primary level, the class is learning to 'write a fictional story'. Based on the results of a diagnostic assessment, the teacher prepares the following scaffolded activities for students based on their needs.

Figure 13a: Bloom taxonomy and differentiated Teaching and Learning

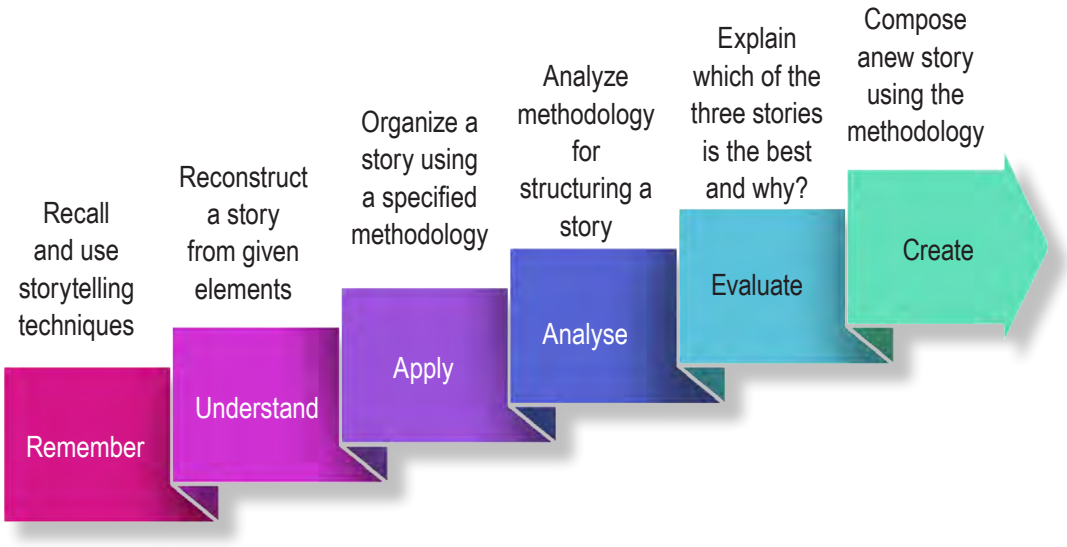


Figure 13b: Bloom taxonomy and differentiated Teaching and Learning
Source: Nizet, I. (2023). Training guide. Adapted from Hockett (2018, p. 76)

Scaffolding

Scaffolding means that while all students are to forecast attain the same final expected learning outcome, some will require additional support and building on their current level (Nizet et al., 2023, p. 72). Different levels of scaffolding can be proposed to students.

In the example below, three tasks are proposed with various levels of scaffolding (more to less). Less scaffolding means that students have to answer more open questions and have fewer points of reference with which to respond. In Bloom's taxonomy, their cognitive engagement is higher since the task requires analysis, evaluation, and comprehension. More scaffolding means that the student can achieve the assignment with more support, closed questions, and direct support to answer. In Bloom's Taxonomy, their cognitive engagement is lighter since they have to answer closed questions and demonstrate basic understanding.

Task	Description
Task 1 Least Scaffolding	Students analyse another student's work to identify and correct any errors. They must annotate the problems to show how they determined whether or not there were errors and generate 2–4 questions to help others detect or avoid similar mistakes.
Task 2 Moderate Scaffolding	Students are told that there are a total of four errors in the set of problems. They need to find and correct these errors, annotate their thinking, and come up with 1–2 helpful questions that could guide another student in identifying these errors.
Task 3 Most Scaffolding	Each problem contains two known mistakes. Students use the provided analysis questions to identify and fix the errors. They should be prepared to explain their thinking, including which analysis questions were the most helpful.

Figure 14: Different level of scaffolding for a task
Source: Nizet, I. (2023). Training guide. Adapted from Hockett (2018, p. 46)

b. Differentiation strategies based on student interests

Students need to discover common interests by interacting. Connect students who share interests with one another.

Teachers might help students identify common interests and develop their motivation

to share them in learning through informal conversations or questioning.

- Show how curricular content is related to general or specific personal interests. You might increase your students' engagement and sense-making by presenting them with explicit links between their interests and the curriculum. You don't need to connect every student to the subjects, but simply introduce or evoke a few common meaningful interests.
- Use interests as a basis for random and intentional grouping. You might help your students share interests by pairing or grouping them. Intentional grouping allows them to engage in tasks with common goals or perspectives.
- Offer choice. Offering choices to students is generally appreciated, as it "can quench their desire for autonomy and increase engagement as students can also generate their own ideas for a project or task."
- Create Situational Interest. You might create situational interest by planning and implementing tasks with intriguing, choice-based elements. For example, teachers can create situational interest by letting students choose an animal to research, asking students to express an opinion about a book they enjoy, allowing students to play a role in a skit, or selecting a real-world context for solving a problem.

Source: Hockett (2018, pp. 72-73).

Jigsaw

Jigsaw is a cooperative learning strategy that involves putting students in small groups and having each member become an expert on a different piece of the puzzle (i.e., content) before sharing his or her expertise with other group members as they work together toward completing an interdependent task. Jigsaw is ideal for conceptual topics and for addressing large amounts of information in a short timeframe (Aronson & Patnoe, 1997, cited by Hockett, 2018, p 75). Jigsaw is a strategy that can be used to differentiate according to interest or readiness.

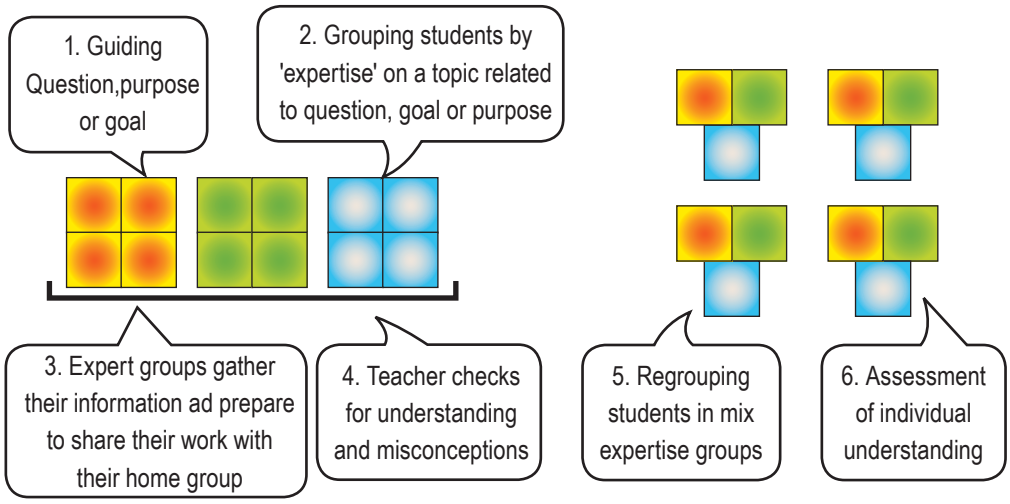


Figure 15: Jigsaw strategy process

Source: Addressing learning needs in the Asia-Pacific: Teachers' guide on a differentiated instruction (UNESCO, n.d). (Draft). Adapted from Hockett (2018, p. 76)

Keep home and expert group sizes small (e.g., two to three students). This might mean having more than one expert group for a topic (e.g., two expert groups who are researching animals that live in desert habitats). Home groups can be composed of students with complementary strengths and/or formed according to the expert group topics that students have selected ahead of time.

Example of Differentiated Teaching and Learning

Mr. Karma is a mathematics teacher in a rural school in Eastern Bhutan. He teaches Class VII, where students come from diverse backgrounds, including linguistic, ability, socioeconomic, and geographic diversity. His students have varying levels of mathematical understanding, with some excelling while others struggle with basic concepts.

To improve learning outcomes, Mr. Karma implemented a one-size-fits-all teaching approach, where he taught at a uniform pace, assigned the same exercises, and expected all students to complete assessments in the same way. However, a class observation revealed that students were disengaged, some lacked confidence, and others were not challenged enough. Upon inquiry, students reported struggling with the teaching method, as it did not cater to their individual learning needs.

After training on DTL, he decided to experiment with something more

engaging for students by planning DTL through the four components of learning: content, process, product, and environment.

c. Model Lesson Plan on Differentiated Instruction Based on Content, Process, Product, and Learning Environment: Fractions ()

Grade:	VII
Subject:	Mathematics
Topic	Understanding and Applying Fractions
Duration	60 minutes

Lesson objectives:

i) Understand the concept of fractions, including proper, improper, and mixed fractions.

ii) Apply fractions in real-life scenarios.

iii) Solve fraction problems using addition and subtraction.

iv) Demonstrate understanding through differentiated learning tasks.

3.4. Differentiation Approach

Component	Differentiation strategy
Content	To ensure that each student learns effectively, content differentiation tailors instruction to accommodate diverse abilities, interests, and learning styles in the classroom. • Use visual aids (fraction bars, number lines, pie charts). • Provide levelled materials: • Basic (identifying fractions) • Intermediate (adding and subtracting fractions) • Advanced (word problems & real-life applications)

Process	Group Activities Based on Readiness Level: • Beginner: Use fraction bars and visual aids to identify fractions. • Intermediate: Solve simple addition and subtraction fraction problems. • Advanced: Solve real-world fraction word problems (e.g., adjusting recipes).
Product	Students choose how to demonstrate learning: • Create a fraction model using cut-out shapes. • Solve 5 fraction problems (basic or advanced based on skill level). • Explain a real-world fraction scenario through a short paragraph or drawing.
Environment	• **Pair-Share:** Students explain their solutions to a partner. • **Self-Assessment:** Rate their understanding using a fraction scale (e.g., "I understand ¾ of the topic"). • **Teacher's Check-in:** Provide individual feedback based on students' work.

Learning Menus

Learning menus are a delivery system for planning and implementing common tasks as well as those that differentiate content, process, or product for interest or learning profile.

A learning menu presents interest-based task options in the framework of a restaurant menu. Like a choice grid, tasks are arranged by goals or purpose. Unlike a choice grid, the teacher can incorporate both required and choice-based elements. Learning menus can be simpler or more complex, depending on the age and readiness of the students, and can be modelled after menus at a range of restaurant types (e.g., fast food/quick service, full service, fine dining) (Hockett, 2018, p. 98).

Learning menus are great for organizing tasks that students can do alone or with others throughout a unit. They can be used during dedicated menu time, when the teacher is meeting with students, or as an anchor activity. Learning menus help

manage tasks that are hard to fit into a regular day or week and are useful for multi-part tasks or text studies. They can also support readiness-based differentiation by offering tiered versions (e.g., more advanced and less advanced). Tasks in learning menus can be designed using various strategies.

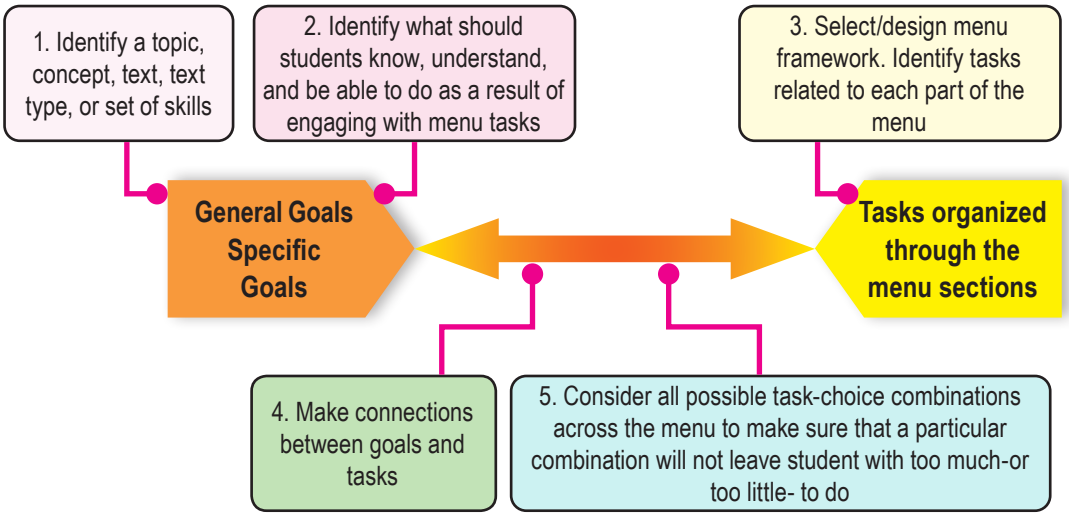


Figure 16: Process of Learning menu design

Source: Addressing learning needs in the Asia-Pacific: Teachers' guide on a Differentiated Instruction (UNESCO, n.d). (Draft). Adapted from Hockett (2018, p.99).

Strategies based on student profile/preferences

A student's background, religion, language, geographic location, and ethnicity can influence their learning preferences. These are now considered diversity indicators in the classroom.

Preferences can vary widely, such as how we view time, express emotions, learn (whole-to-part or part-to-whole), prefer contextual or impersonal material, work in groups or individually, value creativity or conformity, and whether we are reflective or impulsive. These preferences can greatly affect learning.

Learning patterns can differ between cultures, and there is significant variation within each culture. Teachers should not assume that individuals from a particular culture learn in a specific way. Instead, they should understand the diverse learning preferences in any group and create a flexible classroom that accommodates these preferences.

Culture and gender combinations create unique learning preferences in individuals. Learning preferences are complex, influenced by learning style, intelligence, culture, and gender. A sensitive teacher recognizes that students may have different learning preferences and strives to provide options that make everyone comfortable (Tomlinson, 2001, p. 62).

Table 6: Struggling students characteristics and differentiation strategies

Struggling student's characteristics	Teacher's attitude	Differentiation strategies
Lack of persistence and interest	Pay attention for relevance	Content, examples, subjects
Lack of self-efficiency	Enhance the student's strength instead of remediating flaws	Process, content, product. Scaffolding
Difficulty with important bodies of knowledge	Encourage powerful learning on small sets of concepts or essential concepts	Process, content, product
Need to experience success	Set individual goal that allows self-efficacy consciousness	Process, product
Need more time to learn in general and to process information	Teach tasks that are chunked a little bit more difficult than you think they can accomplish	Grouping or individual Content, product
Need various means to get information	Choose specific means: by sight, by listening, by movement, by abstraction, by concreteness, by lone working, and by interactivity	Grouping or individual. Process, products environment
Need ongoing support and attention to keep them in the right frame of mind for learning, and to limit the risk of dropping out	Be clear, set reachable goals, clarify success criteria, make connections with real life, reinforce legitimate success	Plan teaching and learning through many modalities.

Source: Addressing learning needs in the Asia-Pacific: Teachers' guide on a differentiated instruction (UNESCO, n.d). (Draft).

Learning Profile Strategy: Entry Points

Entry points is a strategy developed by Howard Gardner for inviting students into a topic, concept, or text through one of six doorways. The idea is to leverage a learning preference to pique students' interest in what they are about to study. Each entry point is derived from Gardner's multiple intelligences. The Figure 17 below shows each entry point in Gardner's strategy, some student-friendly names, and a brief description.

Dimension	Student Friendly Name	Brief Description	Potential Task Starters
Logical	Giving Reasons	Use reasoning, argument, or cause-and-effect relationships	"Give a good explanation for…", "Find the connection between…"
Quantitative	Looking at Numbers	Provide or examine data; examine numerical relationships	"What do these numbers say about…?"
Existential	Thinking Big	Pose or think about big questions about life and the world; consider big ideas; make meaning	"Here's a big question for you…"
Aesthetic	Activating Senses	Emphasize sensory or surface features; activate the five senses	"Use your five senses to…", "Describe how it looks, tastes, smells, feels, or sounds…"
Experiential	Using Experience	Use a hands-on approach; interact directly with materials (physically or virtually); explain personally	"Sort…", "Classify…", "Give a personal explanation for…

Figure 17: Entry point frame

Source: Addressing learning needs in the Asia-Pacific: Teachers' guide on a differentiated instruction (UNESCO, n.d). (Draft). Adapted from Hockett (2018, p. 109)

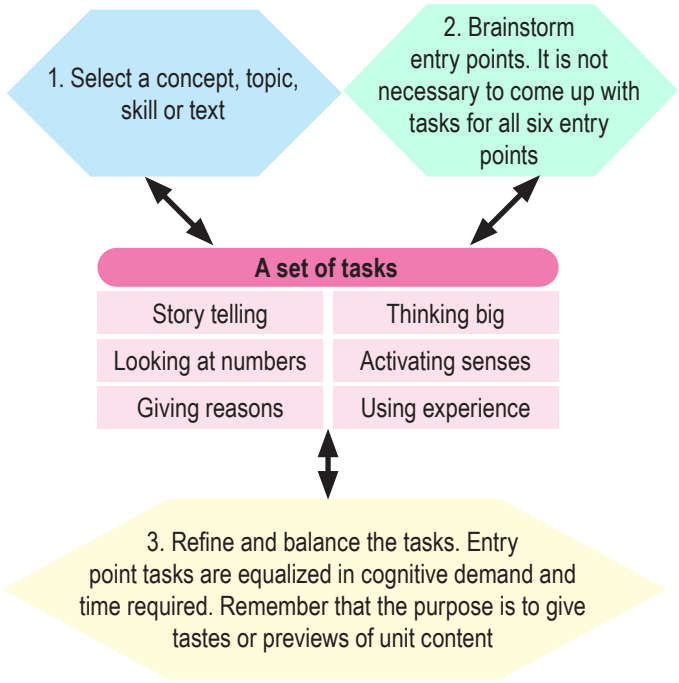


Figure 18: Design of entry point strategy

Source: Addressing learning needs in the Asia-Pacific: Teachers' guide on a Differentiated Instruction (UNESCO, n.d). (Draft). Adapted from Hockett (2018, p. 110).

Strategies based on classroom organization

i. Flexible seating

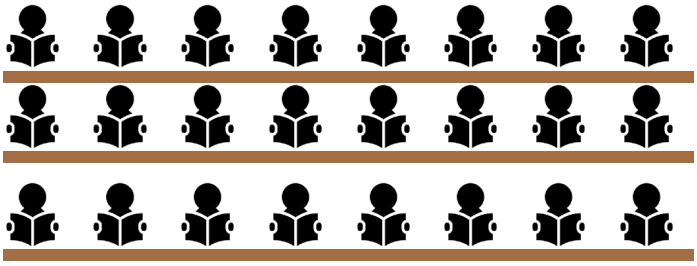
Deciding how to arrange seating and group students is crucial for differentiation. Flexible spaces and seating, like lightweight, movable chairs and desks, or open areas in the classroom, help teachers create various seating arrangements, groupings, and activities (Kaplan & Bista, 2022, p. 80). Flexibility allows for a wide range of activities, which is the goal of differentiation.

However, if the classroom has fixed desks, attached chairs, or limited space, teachers need to be creative. They might use other spaces like the library, gym, auditorium, or even outdoor areas. In differentiated teaching and learning (DTL), multiple classroom setups can coexist.

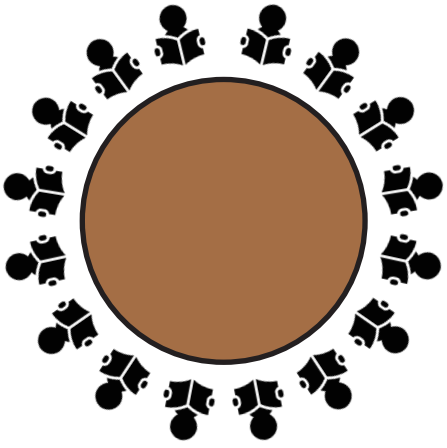
(Kaplan & Bista, 2022, p. 80).

The seating can be arranged as the following:

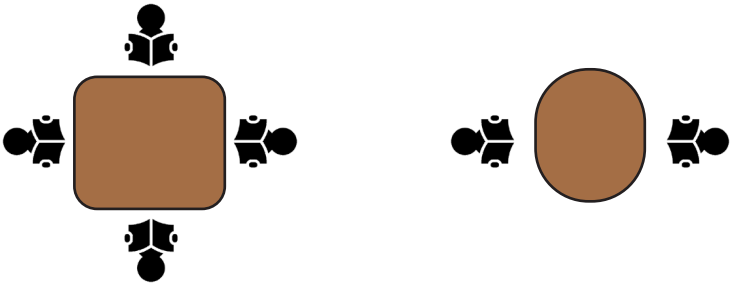
Seating students in row – lecture style



Seating students in a circle (at desks, or in chairs, or on the floor)



Seating students in groups or pairs (either by moving chairs/desks together or on the floor)



Source: Addressing learning needs in the Asia-Pacific: Teachers' guide on a Differentiated Instruction (UNESCO, n.d). (Draft).

ii. Flexible Grouping

> A key strategy in differentiated instruction is the use of flexible groupings, which allow teachers to assign different tasks to different students, individually or in small groups, based on strengths, interests, learning styles, or learning levels
>
> (Nizetet al., 2023, p. 75).

You can choose from several ways to regroup your students.

Table 7: Types of grouping, principles, strength and limits

Type of grouping	Principle	Strength and Limits
Homogeneous grouping	Students are grouped according to their similarities: • common needs • common interests • common goals • same tasks • same level of ability, etc. For example: Teachers put students who read quickly in one group and slower readers in another group.	Note that regrouping students by similarities should be a temporary setting because students can benefit from having other partners. In addition, grouping by skill similarity carries the risk of stigmatizing over- or under-performance. This choice must always be made to maximize learning opportunities and achieve success only.
Mixed ability grouping	Students are grouped according to significant and complementary differences or levels of differences. For example: Teachers decide to mix students with an appropriate level of readiness in math with students with a lower level of readiness, so students can engage in peer instruction.	Mix-ability grouping is an excellent way to enhance mutual support among students.

Pairing up Peer to peer Learning	Grouping students that way allows them to interact strongly, whether they are of similar strength or different levels. **Peer-to-peer** learning can be very effective as long as the student helping the other is not overwhelmed by his or her own responsibility. What's more, if new learning is involved, the student teaching the other must be trained beforehand. Examples: Deki and Dechen are paired for a mathematics exercise. As Deki succeeded, he can explain individually to Sam how to do it. Deki and Dechen are at the same level of comprehension and are doing a transfer exercise together.	On the other hand, peer working is very effective in allowing students to deepen their understanding and learning, potentially increasing their autonomy.
Small to medium group	Students are put in groups of three to eight. **Groups of investigation** foster cooperative learning for helping students decide on a topic of personal interest, find out about the topic in defensible ways, work collaboratively, and present findings with confidence. The strategy details the role of the teacher and students in each phase of the investigation (Sharan & Sharan, 1992, cited by Tomlinson, 2001, p. 58). For example: a group of 4 students is trying to solve a problem of low complexity together with the help of the teacher, while another solves a problem of a higher level of complexity in an autonomous way.	Groups of more than 4 students seem to be less effective, since speaking is less evenly distributed and encourages some students to remain passive, which can be counterproductive.

Large groups	Groups are formed of more than eight students. In large classrooms, making most students work individually is not a way of grouping them together. It is, however, a way of organizing work. For example: a group of ten students simulate a decision-making activity centred on ecological values based on a local problem.	For activities requiring larger groups (simulations, games, etc.), teachers should always manage the activity. Large groups cannot be managed by students unless responsibility for leadership is shared by a pair of students or a single student. The process, tasks, expectations, and roles have to be defined previously.
Independent autonomous work	Plan work for the majority of the class: By planning ahead self-led or independent activities for students who do not face difficulties, you will be able to provide more personalized support to the smaller group of students who are at the greatest risk of not meeting learning expectations (Nizet, et al, 2023, p. 79)	

Sources: Addressing learning needs in the Asia-Pacific: Teachers' guide on a differentiated instruction (UNESCO, n.d). (Draft)

iii. Learning Centres, Learning stations and Rotational teaching

Multilevel centre activities are teacher-planned tasks that are designed at three different levels —beginner, intermediate, and advanced, enabling students with diverse learning needs to challenge themselves accordingly. Learning centres are designed by combining the strategies described above.

Today's classrooms are not taught with "one-size-fits-all" teaching. Differentiated instruction—and learning stations specifically—allow you to meet the needs of all learners while maintaining high standards within groups or individually.

For example: An **open-ended activity** is where **all students** in the group tackle the same assignment, but the end **product will differ** for beginner, intermediate, and advanced

clusters. It's a great technique because students will feel comfortable writing within their level.

Example: Ask your students in a reading group to draw a picture of the main character. Afterwards, instruct them to write speech bubbles around the character describing what they might say.

- A ***tiered activity*** is when students are doing the same activity, but it's tiered according to their difficulty level.

Example: Have your students play a game of memory. This game is easy to differentiate because you can have beginner students try to match a letter with its sound, while more advanced children can try to match a letter to a word. To differentiate this station, assign different bags of cards for each level and direct specific students to the cards they should choose.

- ***Learning menus,*** or choice boards, are varied activities that give students options on how they want to learn a concept. They often mimic a tic-tac-toe board where your classroom picks three activities to complete (one from each row) to form a line. Differentiated instruction menus benefit all students because you can tailor each board to students' readiness, learning styles, or interests, and kids think they are a lot of fun!

Example: Set up an exciting learning menu for math with items like "design math flashcards" and "measure five things in the room," or write math facts in expanded form and pay attention to how each of your students prefers to learn.

Source: https://www.teachhub.com/teaching-strategies/2014/09/differentiated-instruction-strategies-learning-stations/

iv. Learning stations

Learning stations are physical locations in the classroom where students are asked to explore a topic, solve a problem, or answer questions using the materials provided. The students are allowed to work individually or with others..

Stations free up the teacher and create time for them to work with children in small groups or one-on-one.

Students who need more practice or to process information in a different mode receive a more individualized experience than a whole-class lesson can provide,

thus helping students learn and explore in their own way, style, and time.

- Learning Stations provide students with engaging and interesting experiences to practice, enrich, reteach, and enhance their learning. Often, stations may contain loose parts, manipulatives, tech tools, art and writing materials, books, and other instructional tools chosen by the teacher to engage learners in exploration around a specific learning goal or topic.
- Well-designed learning stations help learners engage in the curriculum in real-time, hands-on ways.
- For students to work successfully in stations, students are always pre-taught the expected behaviours as well as how to complete the tasks or activities therein before they are allowed to work independently.

Source: https://www.stf.sk.ca/professional-resources/stf-professional-learning/curriculum-resources/process-cards/early-learning-1/

v. Rotational Model of Learning

Rotational learning is a form of blended learning that combines digital self-paced learning and interactions with traditional place-based classroom methods. Students rotate between courses or subjects and among learning modalities, one of which is online. The rotation occurs on a fixed schedule or at the teacher's discretion[3].

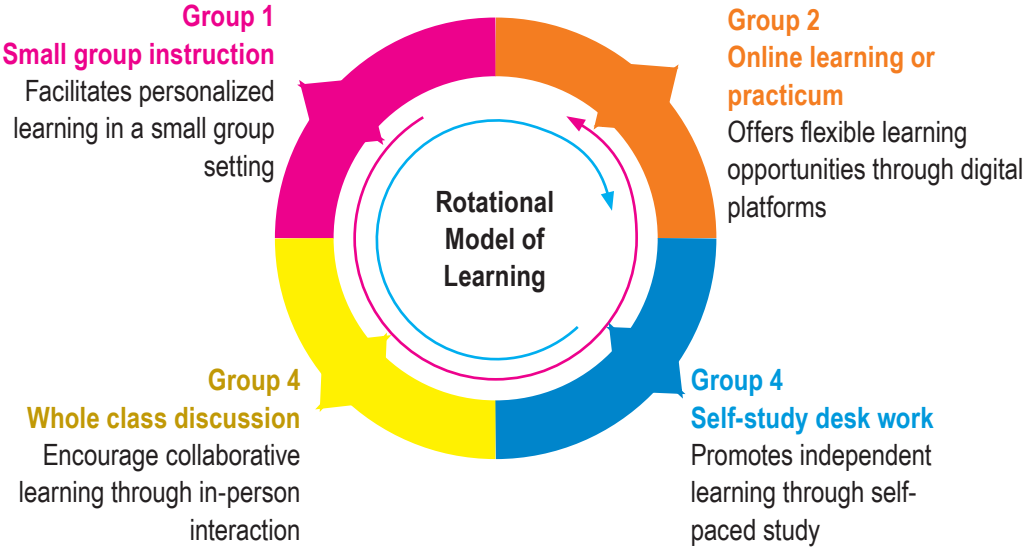


Figure 19: Rotational Model of Learning

[3]*Source:https://www.plsclasses.com/blog/best-practices-for-educators/understanding-the-rotational-model-of-learning*

For example, the cycle might look like this:

After adequate grouping, students are working on one of four different activities simultaneously. The teacher decides when it's time to rotate, and students shift to the next rotation segment to allow each student to experiment with different subjects, learning modalities, etc. Here are the four models of rotational learning:

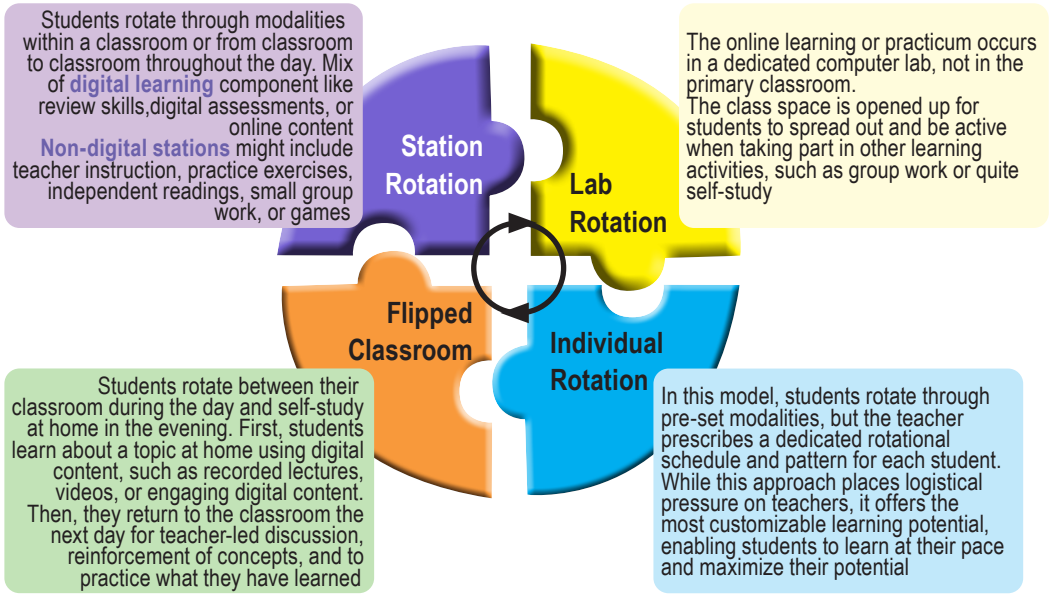


Figure 20: Different types of rotational learning

A repertoire of differentiated strategies considering classroom diversity

i. Students with disabilities

It is important to note that the same strategies will not work for all students with the same disability – since each student has a unique learning style. Each strategy can be applied to individual students with and across different disabilities, and, importantly, may also benefit the students without disabilities in the classroom. A teacher may use a combination of strategies in the classroom. As each child is unique, it is important to use strategies/approaches that build upon a student's unique learning preferences, strengths and needs (Singh and Tandon, 2022, p. 12).

An **Individualized Education Plan (IEP)** is a written plan that sets learning goals for children with disabilities and addresses the services or accommodations that will be provided by the school. IEPs are an important, fundamental tool that can help teachers support children with disabilities in the classroom.

There are seven essential characteristics of a high-quality IEP goal:

1. *It explains how the child will demonstrate the skill being taught.*
2. *It is observable, measurable, and time bound.*
3. *It outlines the conditions under which the child will show progress.*
4. *It details the child's participation in age-appropriate activities in their natural setting.*
5. *It specifies how the skill will be generalized across different settings and materials.*
6. *It is written in clear, jargon-free language.*
7. *It highlights the positive aspects of the child's abilities.*

IEPs should be developed collaboratively, involving teachers, parents/caregivers, resource teachers, other educational support staff, and the student with a disability. It is crucial to engage students with disabilities in the IEP process according to their readiness (Hayes & Bulat, 2017).

Source: Guidance on Diagnostic Teaching with a Focus on Children with Disabilities (UNICEF. (2022, p. 10) https://www.education.gouv.qc.ca/fileadmin/site_web/documents/dpse/adaptation_serv_compl/19-7053A.pdf

ii. Strategies to reduce bias and discrimination in the curriculum

Although it is not the job of teachers to revise curriculum, special attention should be given to implicit bias instructional material and interactions in the classroom.

iii. Differentiating learning content to avoid biases towards gender and sexual orientation

When you encounter bias and discrimination in the educational materials you're required to use, such as textbooks, you can often address these issues through your teaching. For example, if a textbook story promotes a racial or gender stereotype, you can point this out to your students, explain why it's problematic, and offer a more inclusive story as an alternative.

iv. Differentiating process to meet background experiences, geographic and socioeconomic situations of the students

Textbooks often lack examples that reflect the lives and experiences of people in rural communities, ethnic and linguistic minorities, persons with disabilities, and other marginalized groups. In the worst cases, when these groups are included, they may be depicted as weak, illiterate, uneducated, or even primitive and pitiable.

Textbooks and examples are essential in the learning process, and most teachers and students use textbooks provided by national education ministries. While helpful, these textbooks often reflect the experiences of a limited group, usually those in urban and elite settings. For example, language textbooks might include scenarios like taking buses or airplanes, crossing busy streets, or ordering in restaurants.

As a teacher, one can enhance one's lessons by adding local examples, stories, case studies, and scenarios. This adaptation can involve colleagues, students, and even parents and families, who can help create local content to supplement the textbooks. Developing local materials is a learning experience that encourages creativity and innovation.

Source: Kaplan and Bista, 2022, p. 62

e. Differentiating assessment

To create effective and coherent differentiated instruction, teachers need to adapt their assessment practices to meet the needs of their students, both formatively and summatively. Some differentiation methods, especially for students with learning difficulties, are integrated, such as diagnostic teaching.

For example, when assessing a student with a disability, it's important to:

- ensure proper positioning, such as good posture for a student with cerebral palsy or sufficient light for a student with a visual impairment.
- use appropriate materials, such as large print, tactile graphics, or Braille for students with visual impairments.
- allow different ways to respond, such as gestures or sign language for students with hearing impairments, a writer or peer for students with hand function difficulties, or an AAC device for students with speech impairments (Singh and Tandon 2022, p. 9).

Table 8: Assessment differentiation frame

Assessment flexibility	Assessment adaptation	Assessment modifications
• Vary assessment modalities for all students throughout the school year. • Allow students to choose how to produce evidence of learning. • Use formal and informal formative assessment. • Do not use standardized tests to "teach to the test."	• Adaptation is an indispensable adjustment that enables a student with major difficulties (or limitations) to overcome or cope more easily with an obstacle encountered during learning or evaluation. • It does not modify what is expected of the student. Without adaptations tailored to the student's needs, the student will be impeded in developing their competencies and demonstrating their learning. • The decision to implement such a strategy for one or more subjects is based on an analysis of the student's situation with regard to their individualized education plan.	• Curriculum expectancy modifications • Criteria modifications • Task and nature of evidence modifications • Strong connection with IEP

Source: Addressing learning needs in the Asia-Pacific: Teachers' guide on a Differentiated Instruction (UNESCO, n.d). (Draft).

i. Assessment flexibility

It is generally recommended to align assessment with teaching and learning, meaning that content, tasks, and assessment intentions are consistent with what has been taught and ideally learned in a targeted and formal way by students. Flexibility also means that assessment tools are varied and adapted to the learning goals and tasks.

It's generally recommended to align assessments with teaching and learning. This means that the content, tasks, and assessment goals should match what has been taught and ideally learned by students. Flexibility also means using a variety of assessment tools that are adapted to the learning goals and tasks.

ii. Assessment adaptations

Teachers need to adapt assessment methods to meet the needs of individual students. For example, when assessing a student with a disability, it's important to:

- Ensure proper positioning, such as good posture for a student with cerebral palsy or enough light for a student with a visual impairment.
- Use appropriate materials, such as large print, tactile graphics, or Braille for students with visual impairments.
- Allow different ways to respond, such as like gestures or sign language for students with hearing impairments, a writer or peer for students with hand function difficulties, or an AAC device for students with speech impairments.

(Singh and Tandon 2022, p. 9).

iii. Assessment modifications

In cases of students' severe learning difficulties or disabilities, curriculum expectancy might be reduced or modified at an administrative upper level (national decision). In this case, IEPs generally indicate modifications regarding content, criteria, and assessment modalities.

Example on Differentiated Lesson Plan: assessment differentiation with flexibility

Planning Template: Social Studies

Teacher: Pema Wangmo	Grade: IV	Quarter: 50 minutes Date: 14/11/2024
Differentiated Lesson Plan		
Expected learning standard: Evaluate the influences of the spiritual leaders to understand the importance of spiritual practices for the promotion of community well-being. ***Learning objectives:*** 1. Narrate the brief history of Lord Buddha. 2. Write the teachings of lord Buddha. 3. Apply the teachings of Lord Buddha in everyday lives. 4. Explain the Four Noble Truths to understand the meaning of life.		
Grouping decisions and strategies		
To ensure effective teaching and learning, students are grouped into three categories: struggling, intermediate, and autonomous. The struggling group consists of students who require additional support, scaffolding, and targeted interventions to grasp fundamental concepts. The intermediate group includes those with a basic understanding who benefit from reinforcement through guided practice and peer collaboration. The autonomous group comprises students who can work		

<table>
<tr><td colspan="3">independently and benefit from advanced tasks and self-directed learning. This grouping allows for differentiated instruction, ensuring that each learner receives the appropriate support and challenge to enhance their progress effectively. It consists of three activities: 1, 2 and 3.</td></tr>
<tr><td colspan="3">Activity 1

This activity will check the readiness of the learners.

Use of Scaffolding and Learning Menu -Strategy to check the readiness of the diverse learners.

Prior Knowledge: They have seen the statues of Lord Buddha in temples and have watched animated movies.</td></tr>
<tr><td>Group 1: Struggling Learners

Assessment: Image-based quiz</td><td>Group 2: Intermediate Learners

Assessment: short MCQ quiz</td><td>Group 3: Autonomous Learners

Assessment: Ask a few open-ended questionnaires to the autonomous group.</td></tr>
<tr><td>To check the prior knowledge of the struggling learners, the following questions are asked by showing visual aids and letting them identify the figures in the life story of Lord Buddha.
1. Who do you think the picture displayed here is of?
2. Who is Lord Buddha? Have you heard of his name?
3. Do you know where Lord Buddha was born?
4. Have you heard of the word ‘peace’? What does it mean to you?</td><td>To check the prior knowledge of the intermediate learners, following questions are asked:
1. Display a picture of a peaceful place, like a forest, and ask: Why might someone go to a place like this to feel calm or peaceful?
2. What does it mean to be kind to others?
3. .Lord Buddha taught that we should care for all living things. Can you name one way we can care for animals or plants?
4.
4. Why do you think it's important to be honest, as Lord Buddha taught?
5. What might happen in a community if people are kind to each other?</td><td>To check the prior knowledge of the autonomous learners, the following questions are asked:
1. .List all the national holidays related to Lord Buddha and his teachings.
2. What might happen to the community if people are not kind to each other?</td></tr>
</table>

ACTIVITY 2		
Group 1: Struggling Learners ***Assessment:*** Image-based quiz	***Group 2:*** Intermediate Learners ***Assessment:*** short MCQ quiz	***Group 3:*** Autonomous Learners ***Assessment:*** Ask a few open-ended questionnaires to the autonomous group.
The struggling learners have to place tick marks to agree or disagree with the statement below. 1. We should love and care for all living beings. 2. Suffering in life includes sickness, old age, and death. 3. There are ways to free ourselves from suffering. 4. The world is always peaceful. 5. One should be greedy and jealous to be happy in life. We should 6. tell lies, steal, and hurt others. **Assessment: Journal writing on values and morals.**	Why do you think the important dates related to Lord Buddha are declared as holidays? **Assessment: Self -reflection based on personal application.**	How would the life of Bhutanese people be if Lord Buddha had not imparted his teachings? **Assessment: Short PPT presentation on the life of Bhutanese people without the teachings of Lord Buddha.**
Activity 3		
Group 1: Struggling Learners ***Assessment:*** Image-based quiz	***Group 2:*** Intermediate Learners ***Assessment:*** short MCQ quiz	***Group 3:*** Autonomous Learners ***Assessment:*** Ask a few open-ended questionnaires to the autonomous group.
Strategy used: Jigsaw Technique and ICT tools (video lesson) Note: Assign learners into home groups and expert groups after watching the video lesson on the Four Noble Truths.	Scenario-based question 1. Sangay feels unhappy because she compares herself to others. According to the Four Noble Truths, what advice would you give Sangay to find her peace within herself?	1. Compare the Four Noble Truths to modern ideas about happiness and well-being. Do you think Buddha's teachings are still relevant today? Explain why or why not using examples.

1. Match the pairs of terms. Column A A. Suffering B. Desires C. End of suffering D. Four Noble Truths Column B i. The truth that suffering can be stopped ii. Life involves pain and unhappiness iii. The reason why suffering exists iv. Buddha's Teachings **Assessment: Peer assessment of the above activity by giving model answers**.	2. Explain how understanding of the Four Noble Truths can help people live a better life. **Assessment: Sharing of their thoughts and understanding in the group.**	3. Explain the Four Noble Truths and their meanings. Describe how you would apply each of the Four Noble Truths in your daily life to find peace and reduce suffering. **Assessment: Students will create a short video summary reflecting on the relevance of Buddha's teachings to today's global challenges.** Each group presents its findings to the class, and the teacher supplements the whole lesson to reach every diverse learner in the classroom. (Inclusive Classroom.

Key ideas of the chapter

- *Different models or approaches rely on differentiation from an inclusive perspective. Models provide a general perspective on inclusive differentiation but are difficult to implement due to their systemic nature.*
- *Differentiation strategies can be regrouped into categories as solutions to meet various types of student needs related to readiness, interest, profiles and preferences, classroom organization, and the level of disability for some students.*
- *Strategies can be combined.*
- *Adapting curriculum, textbooks, and assignments in an inclusive way implies identifying the various biases that are potentially prejudicial to certain students in the class.*
- *Differentiated assessment can be made at three different levels: flexibility, adaptation, and modification.*

Chapter 4 Planning Differentiated Teaching and Learning

Key concepts

Purpose of Planning DTL
Planning for differentiated teaching and learning aims to meet diverse student needs by considering learners, classroom realities, and teacher capacity. It supports proactive, inclusive instruction rather than reactive adjustments.
Importance of Planning in Inclusive Education
Effective planning ensures all learners, including those with special needs, are supported through thoughtfully designed learning experiences that promote equity and inclusion.
Factors Influencing Differentiation
The success of DTL depends on time flexibility, adaptable resources, teacher knowledge, manageable class sizes, available support, and realistic workloads.
Criteria for Differentiation Feasibility
Teachers assess feasibility by analysing student diversity, available resources and support, teaching conditions, and their own professional preparedness.
Differentiation Compass
This tool helps teachers make informed instructional decisions by evaluating classroom realities across key dimensions such as student needs, resources, and teacher capacity.
Instructional Planning Flow
Planning involves assessing learner profiles, selecting appropriate content, grouping strategies, and designing varied instructional activities to support all learners.

In this chapter, teachers will learn about the planification of differentiated teaching and learning and become familiar with:

- a set of tools that will help the teacher plan differentiated teaching and learning according to 1) the needs of students, 2) teaching conditions, and 3) professional development.
- the Differentiation Compass
- examples of differentiation planning
- practical examples of planning for each scenario.

The set of tools that guide differentiation decisions from an inclusive perspective are identified here with reference to the elements discussed in Chapters 1 and 3.

The implementation of inclusive teaching in the classroom relies on differentiated instruction by the teacher, as long as the teacher's professional environment, including colleagues and management, allows for it. Consequently, adopting a differentiated

approach requires careful planning and design of various learning schemes that effectively meet the diverse needs of all students.

This reality can bring an additional burden to the teacher's task. Proactive planning, therefore, does more than simply respond to a student's needs after assessment; it anticipates those needs in order to foster more direct success. Work prior to teaching thus takes on greater importance in the teacher's task. A good knowledge of the school curriculum, together with an appreciation of the school materials available, implies adequate training in the curriculum.

4.1 What are the challenges teachers face in implementing DTL in inclusive classrooms?

Limited educational resources create conditions that are generally unfavourable for differentiated teaching. This situation is intensified by the high number of pupils in a class, which leads to greater heterogeneity in students' needs. In light of this diversity, teachers often have to prioritize certain students, ultimately limiting the inclusive nature of their instruction.

a. Identifying the factors that foster and limit differentiation

Research shows that there are several factors that lead to differentiation not being applied effectively (Shareefa et al., 2019). The following factors were found to be decisive in this implementation, and their limitations indicate that differentiation planning should take these factors into account.

Table 9: Factors of fostering and limiting differentiation in the classroom

Factors	Fostering	Limiting
Time	Managing classroom time is a major challenge for differentiation because it depends on the school's schedule, which often has fixed and short periods. Flexibility in managing time and space is essential for increasing differentiation in a more inclusive classroom. Providing extra teaching hours can help children who have delays or difficulties in reading or math, or those who have missed parts of the curriculum due to long absences. *Kaplan and Bista 2022, p. 47-48*	Learning time is an important discriminating factor for students with special needs due to their abilities and realities. The absence of temporal flexibility is likely to increase this discrimination. The absence of accommodation in learning time and assessment is a basic element of differentiation.

Resources	Availability of inclusive resources: teaching/ learning resources which are locally relevant, engaging for learners, adaptable, culturally and gender sensitive, and, where possible, in the mother tongue(s) of the students. *Kaplan and Bista 2022, p. 47*	Non-flexible and non-adaptable standardized resources. Low level of adaptability and flexibility in teachers' practices.
Knowledge on DTL	Pre-service and in-service training on DTL and inclusive education includes professional standards referring to DTL, such as learner diversity, classroom management, planning, learner centred philosophy of education, assessment (formative and diagnostic), and effective teaching.	Absence of training or professional development in an inclusive classroom could lead to the maintenance of prejudices, unconscious discriminatory attitudes, and obstacles to the success of all students. Lack of training also leaves teachers powerless in the face of classroom realities, which could lead to professional disengagement.
Class size	Although class size is a determining factor in the teacher's ability to differentiate, differentiation doesn't necessarily mean doing away with all activities for the whole class. Certainly, flexibility implies the possibility of learning in small groups, but a well-planned, flexible organization based on specific activity models, such as stations, is a good way forward.	In the mainstream schooling system, the large size of classrooms can increase the degree of variance among students, which implies a possible increase in the need for diversification. This is the most important limitation to the implementation of DTL from an inclusive perspective, as it has major effects on workload, time management, and the need for support.

Support	Inclusive resources like assistant teachers, mentors, physical therapists, counsellors, and other specialized support staff (e.g., those who have training and experience in supporting learners with disabilities) are necessary in inclusive classrooms. Providing areas in schools that can offer a calming environment to learners with socio-emotional challenges (e.g., hyperactivity and autism) is also essential. Specific resources to support learners' needs, such as providing assistive devices (i.e., to support the needs of learners with disabilities) and resources (e.g., textbooks) in non-dominant languages, are also examples of useful resources that allow the teacher to successfully plan differentiation. Additional support and instruction individually or in small groups outside of the classroom are important as well.	The lack of resources is more common than the presence of resources in many countries. Differentiation could therefore be limited to certain priorities, for example, in relation to certain pupils who are more systematically excluded and newly welcomed into the system, or at more collective levels such as readiness or learning profiles, which can give rise to collective or repeatable responses like reuse of resources, scaffolding, or grouping.
Workload	A reasonable workload maintains the teacher's commitment to students and colleagues. A climate of collaboration, exchange, and benevolent professional development makes it possible to pool professional resources and lighten the teacher's burden as he or she begins to differentiate teaching and learning.	In the absence of resources, support, and time flexibility, it's best to start with limited differentiation actions that will increase the autonomy or success of certain students. The workload in the classroom is due to the simultaneous supervision of students working on different task. Sharing responsibilities with the students helps to lighten the load. Outside the classroom, differentiation planning should be limited to what is feasible for the teacher.

Source: Addressing learning needs in the Asia-Pacific: Teachers' guide on a Differentiated Instruction (UNESCO, n.d). (Draft).

Planning differentiated teaching and learning implies decisions based on a set of criteria:

i. **Characteristics of students** in terms of the degree of difference and diversity of the students in your class, as well as the need for more individual or collective interventions.

ii. **Teaching conditions**,such as resources, support, class size, and time management.

iii. **Professional development**, such as your knowledge of differentiated pedagogy and your actual workload.

Table 10: Criteria of differentiation feasibility

Criteria of feasibility	Analysis of the situation
Needs of the students	• Differences (3 factors)? • Diversity (9 factors)? • Individual intervention? • Collective interventions?
Factors related to teaching conditions	• Resources? • Support? • Class size? • Time management? • Location? • Numbers of grade (age diversity)?
Factors related to professional development	• Knowledge of DTL? • Workload? • Collaboration?

Source: Addressing learning needs in the Asia-Pacific: Teachers' guide on a Differentiated Instruction (UNESCO, n.d). (Draft).

b. The differentiation compass

The **differentiation compass** can help teachers make some instructional decisions by taking into account all the criteria that can influence their choices.

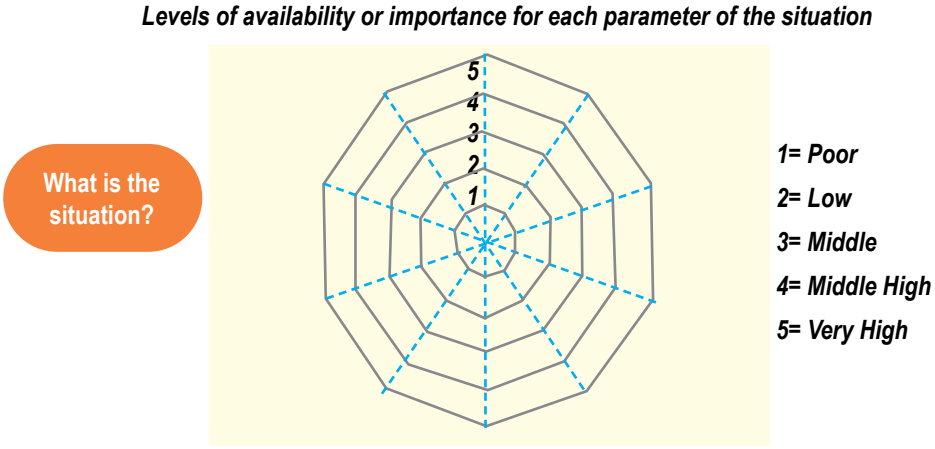


Figure 21: Differentiation compass, a tool to analyse the teaching situation
Source: Addressing learning needs in the Asia-Pacific: Teachers' guide on a Differentiated Instruction (UNESCO, n.d). Draft.

Analysing the situation helps the teacher make realistic choices by identifying the levels of availability, importance, or necessity linked to different parameters of the situation.

Example and case study of analysis of a teaching situation requiring differentiated teaching and learning

Manju teaches Mathematics in grade 3 in a school in the district of Dagana. After carrying out a short assessment before the start of a chapter on fractions, she realizes that 12 out of 38 students have not mastered the Grade 2 prerequisites for starting this new chapter.

Manju teaches in a mainstream school that accepts some students with disabilities, as there are no schools with specialized services for these students in the region. There are no resources yet to get someone to support the teaching of students with disabilities. So she knows she will have to find help for herself to help these students achieve academic success this year until they can access specialized education services like Individualised Education Programs and a teacher trained in disability-inclusive pedagogy. So, there is no support to help her for now.

In spite of this, a team of teachers decided to revise the mathematics curriculum two years ago to identify the essential notions to be acquired in order to recover from the pandemic. As a result, Manju can now use a streamlined curriculum to teach fractions to her students with mild autism.

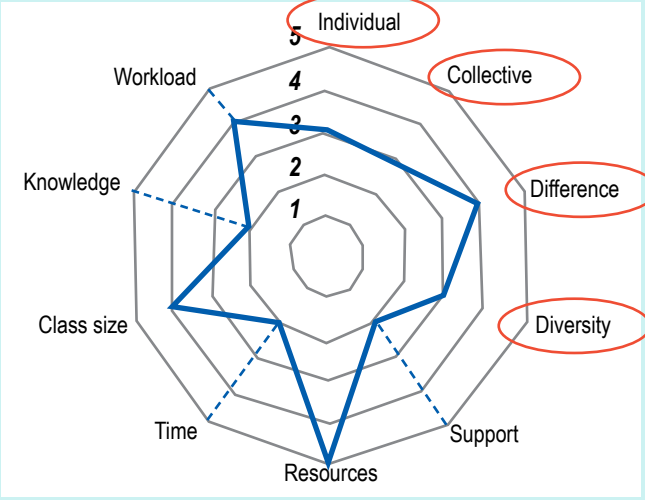
She knows she can utilize teaching materials provided by schools with disability-inclusive education programs to create differentiated activities that support both these students and those experiencing challenges in mathematics.

Two main limitations to differentiation appear to be the size of the class (38 students) and the lack of overtime to support students with important needs. Standardized assessments are coming soon, putting pressure on teaching time.

Intending to apply DTL to her classroom, Manju reflects on her situation and assesses the feasibility of effective differentiation, considering her reality. Her analysis reveals the following facts.

- Among the 12 students who don't have prerequisites, three have had difficulty in mathematics since the start of the academic year. Some students need **individual intervention**, as one has problems with **dyscalculia, and the other two are diagnosed with mild autism**.
- The other nine seem to have more difficulty remembering certain concepts, such as numerators and denominators in simple fractions. For these 12 students, she notes, it will be necessary to consider certain factors of difference, such as **readiness to learn**, and factors of diversity, such as the **limits of ability** for others. Let's represent that analysis on a differentiation compass:

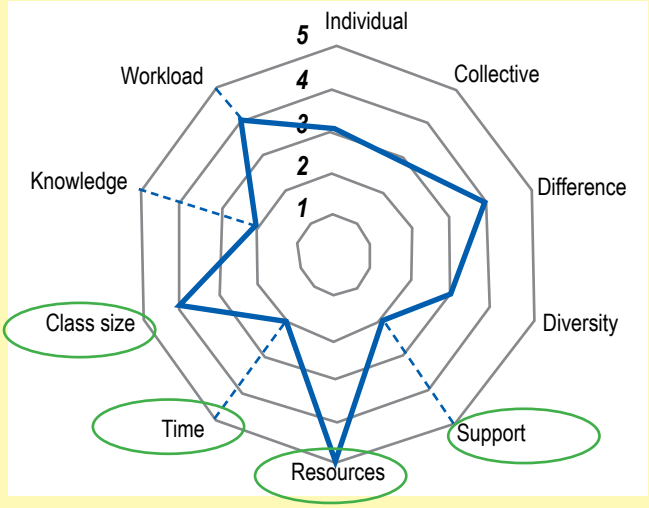
Manju's Differentiation Compass



From the Manju's Differentiation Compass, we can see that Manju considers:

- *some student requires individual intervention (score 3/5)*
- *group interventions are of average importance (score 3/5)*
- *some factors of difference are present, but not all (score 4/5)*
- *only one factor of diversity is present (or recognized by him) (score 3/5)*

Manju's Differentiation Compass



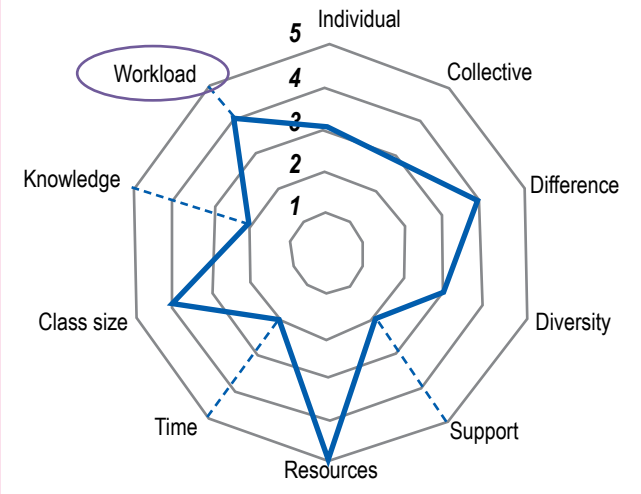
From the Manju's Differentiation Compass, we can see that Manju considers:

- *she can't count on any support from outside or inside the classroom (score 2/5)*
- *she has a lot of adequate resources at his disposal (score 5/5)*
- *she has little time to carry out a differentiated sequence and no overtime at all (score 2/5)*
- *she has many students in his class to take care of (score 4/5)*

Manju feels a certain anxiety because even though she has been trained as a teacher, the recommendations on the inclusive classroom did not yet exist when she started teaching. She is therefore a beginner in the field of DTL, but as she is autonomous, she is confident that she will be able to plan differentiated activities for her students. In addition, as she teaches math in three other primary 1 and 2 classes, she thinks she'll have to prepare her differentiated planning quickly and efficiently enough to keep up with

her other duties.

Manju's Differentiation Compass



From the Manju's Differentiation Compass, we can see that Manju considers:

- *she knows little about DTL (score 1/5)*
- *her workload does not allow her to plan many interventions (4/5)*

In conclusion, Manju's case shows us that differentiation planning in this specific case requires teachers to target the following differentiation choices:

- Content differentiation for students with chronic difficulties (in small groups)
- Individualized differentiation of content and process for the three students with disabilities.
- Content differentiation for the majority of students who have the necessary prerequisites to begin the chapter on fractions.

Manju's planning was based on a choice of strategies:

- *Flexible grouping*
- *Differentiate content: textbooks and a slimmed-down curriculum*
- *Stations for students with chronic difficulties (scaffolding)*

Planification 1

- *Independent work for the rest of the class*
- *Correction of exercises in cooperative pairs*

Planification 2

- *Transfer at various levels of complexity*
- *Peer instruction*

Planification 3

4.2 How to plan Differentiated Teaching and Learning?

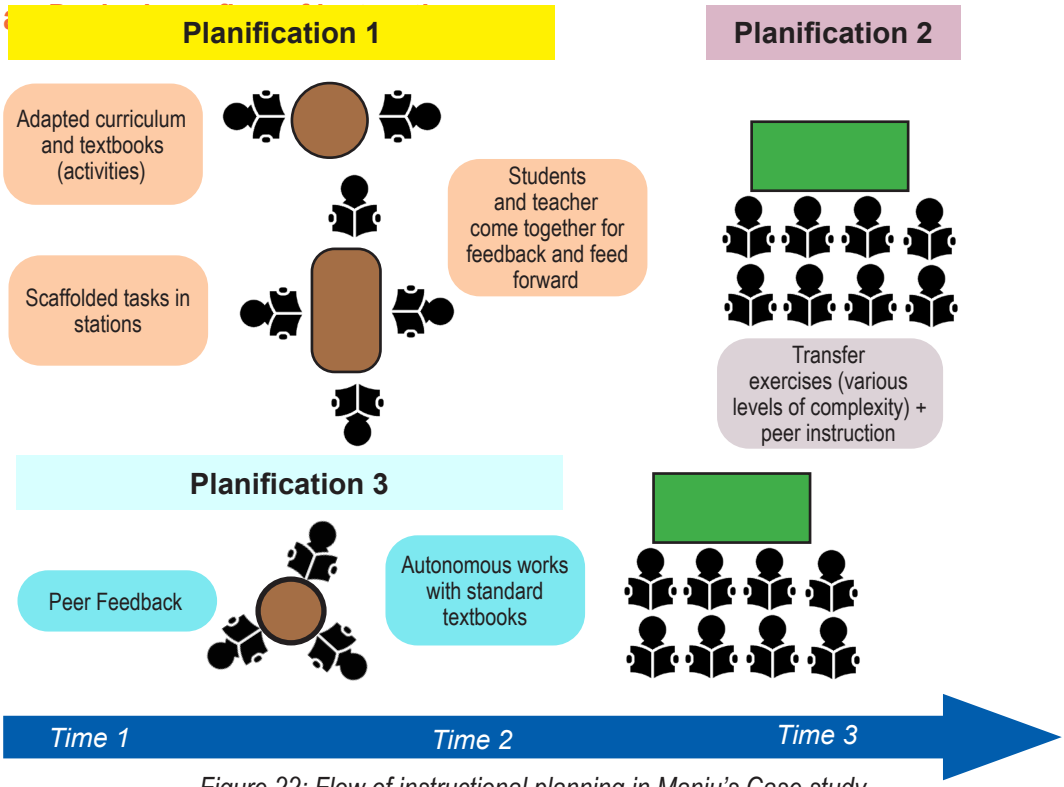


Figure 22: Flow of instructional planning in Manju's Case study
Source: Addressing learning needs in the Asia-Pacific: Teachers' guide on a differentiated instruction (UNESCO, n.d). Draft

b. Planning Templates

The following template allows teachers to plan for a differentiated learning strategy in their class using students' profiles produced in the need for inquiry (see Chapter 2).

Table 11: Differentiated Planification Template

<table>
<tr><td colspan="2">Teacher:</td><td colspan="2">Grade:</td><td colspan="2">Quarter:

Date:</td></tr>
<tr><td colspan="6">Differentiated lesson plan</td></tr>
<tr><td colspan="6">Expected learning standard

Learning objectives</td></tr>
<tr><td colspan="6">Grouping decisions and strategies</td></tr>
<tr><td colspan="2">Students with IEP</td><td colspan="2">Students with readiness needs</td><td colspan="2">Others</td></tr>
<tr><td>Activity 1</td><td>Adapted curriculum and textbooks (activities)</td><td>Station 1</td><td>Scaffold level 1</td><td>Activity 1</td><td>Autonomous work, textbook</td></tr>
<tr><td>Activity 2</td><td>Adapted curriculum and textbooks (activities)</td><td>Station 2</td><td>Scaffold level 2</td><td>Activity 2</td><td>Peer feedback</td></tr>
<tr><td>Activity 3</td><td colspan="5">Students and teacher come together for feedback and feed forward</td></tr>
</table>

Source: Addressing learning needs in the Asia-Pacific: Teachers' guide on a Differentiated Instruction (UNESCO, n.d). (Draft).

Key ideas of the chapter

- *Proactive differentiated planning implies more than simply responding to a student's needs after assessment; it anticipates those needs to foster more direct success.*
- *Implementing differentiated teaching and learning strongly depends on situational factors related to teaching conditions and professional teacher development.*
- *The practical consequence of introducing a differentiated approach in the classroom is the need to plan and design different learning schemes that respond effectively to the needs of students in all their diversity.*

Chapter 5 Differentiated Teaching and Learning with ICT

Key concepts

ICT and Inclusion in Differentiated Learning
ICT and artificial intelligence enhance inclusive education by enabling personalised, flexible, and accessible learning experiences that respond to diverse learner needs, especially during disruptions or crises.
Differentiating Learning Environment
Technologies like Augmented and Virtual Reality create immersive and interactive environments that engage learners by adapting to individual sensory and cognitive preferences.
Differentiating Products
Digital creation tools (e.g., Canva) enable students to express their understanding through diverse formats like videos, infographics, or presentations, promoting creativity and accommodating varied learner strengths.
Monitoring and Management with ICT
Digital tools enable teachers to monitor academic progress and student well-being efficiently, manage classrooms, and support learners' self-regulation and independence in both online and blended settings.
Collaboration and Interactivity
ICT fosters collaborative learning through real-time communication platforms, shared digital workspaces, and interactive systems that promote peer feedback and teamwork.

In this chapter, teachers will learn about the use of ICT in differentiated teaching and learning.

- How ICT and artificial intelligence contribute to differentiation and inclusion.
- ICT use in remote learning during crises and educational disruptions allows students who are more at greater risk of being marginalized and struggling students to remain in contact with a teacher, circumstances permitting.

5.1 The contribution of ICT to differentiation

ICT tools provide valuable support in implementing differentiated learning strategies (see Chapter 6, Nizet al., 2023) by offering flexibility, personalization, and engagement opportunities. Through differentiated content, process, environment, and products, these tools enable teachers to meet the diverse needs of students and create more inclusive learning environments.

Here are the main contributions of ICT use to differentiated teaching and learning. Each contribution will be described below.

- **Personalized learning:** By leveraging ICT tools, teachers can create differentiated personalized learning experiences for each student based on their individual needs, interests, and learning styles (Nizet et al., 2023); they can work on challenges appropriate to their abilities, from low abilities to high ability (Hilkemeijer, 2024).

- **Flexibility:** ICT tools can be used in a variety of settings, such as in online or blended learning environments, providing greater flexibility and accessibility for students. Teachers can be assisted in the creation and distribution of learning materials at different levels of scaffolding and complexity.

- **Improved accessibility:** ICT tools enhance learning access for students with disabilities, ethnolinguistic minorities (through language translation), and those unable to attend school, such as refugees or migrants. They provide alternative assessment formats and accommodations like text-to-speech and speech-to-text tools. Additionally, ICT allows flexible access to learning materials and assessments anytime, enabling students to learn at their own pace, which is especially beneficial for those facing health, location, or other constraints.

- **Monitoring and management:** Digital monitoring tools and well-being software can be useful for effective classroom management. Through these tools, teachers can find out if students are in need of any academic or social-emotional support (Singh & Tandon, 2023, p. 18). Learning self-monitoring is also a possibility for autonomous students who can work independently with ICT resources.

- **Collaboration and interactivity:** In flexible grouping strategies, collaborative and cooperative work between students is central. Numerous applications exist to facilitate the visualisation of ideas and the written connection for students learning face-to-face or at a distance. The most prominent feature of ICT is that a device that allows interactivity enables a student to explore and receive immediate feedback, which is an essential factor in effective learning.

- **Planning:** Artificial generative intelligence offers great potential for differentiated planning. For example, specific activities can easily be planned for students who need to recover prerequisites (insufficient level of readiness) or for students who quickly exceed curricular expectations.

5.2 Addressing the needs of students with ICT

Using ICT requires the teacher to think critically about it. Here are some suggested questions to ask yourself when considering the use of ICT.

The "4Es" (Kilbane & Milman, 2014). The 4Es can help determine whether a tool might make learning more:

- ***Equitable:*** Does the use of a certain technology promote more equitable opportunities without adding additional barriers?
- ***Efficient:*** Does the technology save time, energy, or other resources?
- ***Effective:*** Does the technology make learning more effective for all or some students?
- ***Engaging:*** Does technology stimulate students' attention and motivation?

5.3 Personalized learning

Type of Differentiated learning	Strategies and benefits
Differentiating the contents	• **Diagnostic assessment** • **Flexible grouping with tailored content** based on level of readiness. • **Personalized learning experiences** respecting the student's pace and abilities by **scaffolding**. • **Immediate feedback** and support.
	Learning Management Systems (LMS) allow teachers to provide **customized content modules, assignments, and resources based on individual student's abilities**. The teacher can create **different groups** within the LMS and assign specific tasks or resources based on students' abilities or learning needs. CANVAS

	Adaptive Learning Technologies (ALT) use intelligent algorithms to a**djust the difficulty and progression of content** based on individual student performance. https://www.aleks.com/about_aleks
	Intelligent tutoring systems (ITS) provide step-by-step tutorials, **individualized for each student in topics in structured subjects** (mathematics, physics). The system determines an optimal pathway through learning materials and activities. https://www.alefeducation.com/
	Learning apps offer interactive and adaptive learning experiences, catering to diverse learning preferences. KAHOOT youtube
Differentiating the learning environment	• **Create** a conducive **learning environment** by providing **flexible setups** and accommodating an **individual student's learning styles**. • Provide dynamic and **interactive learning environments** that cater to individual needs and preferences. • Enhance **student engagement, facilitate collaboration**, and promote **meaningful learning experiences**.
	Augmented Reality (AR) and Virtual Reality (VR): Virtual field trips and simulations provide immersive experiences that can be tailored to different learning styles, thereby enhancing student engagement and understanding. **Example AR and VR:** Google Expeditions GOOGLE EXPEDITION YouTube
Differentiating the products	• Provide opportunities for students to d**emonstrate their learning** in diverse ways, allowing them to display their strengths and preferences. • Provide opportunities for teachers to create their own content. • Provide students with creative outlets to express their understanding and engage in self-directed learning. • Foster **critical thinking, creativity, and communication skills**.

	Digital Content Creation Tools empower students to create multimedia presentations, videos, or infographics as alternative ways to present their knowledge. **Example of digital creation tools:** Canva CANVA (YouTube)

5.4 Improved accessibility

Type of Differentiated learning	Differentiating strategies and advantages of ICT use
Differentiating the processes	• **Augmented and virtual reality** add a gaming dimension to learning and engagement. • **AI technology** can benefit learners by enabling them to learn outside the classroom with virtual feedback, making learning more engaging and tailoring material to suit the individual. • While edtech can prove to be an invaluable teaching tool, particularly in the virtual classroom, it can be rendered redundant in countries or regions with limited or no internet access.
	Example of virtual reality Curiscope Virtualy Tee **Example of AI technology** Sparx Maths Sparx Maths uses statistics and machine learning – a simple form of AI – to support teachers in providing personalized math homework. Sparx can also help disadvantaged children progress at the same rate as their more advantaged counterparts, reducing the attainment gap. Roiby Robot **Example of wireless technology** Wireless technology enables users to download material onto a device in the learning environment and take it home with them, meaning educational providers can loan out devices to people who may not otherwise have access to them.

	Zaya's ClassCloud is a plug-and-play device that can support up to 40 laptops or tablets in the classroom over Wi-Fi and provides the same standard of user experience whether it is connected to the internet or not. It has been used to improve access to high-quality education in rural locations in India. ZAYA STORY The offline learning app Kolibri, meanwhile, enables content to be seeded onto devices in areas where there is an internet connection – such as a school or a factory – and shares it with others over an offline local network KOLIBRI *Source: https://www.weforum.org/agenda/2021/01/education-technology-accessibility-learning*

5.5 Providing alternative formats

Type of Differentiated learning	Differentiating strategies and advantages of ICT
Differentiating the Process and products	Textbooks work with a limited number of stimuli, which also limits students' cognitive action: words and images in two or three dimensions, and sometimes hinders their engagement in learning tasks. The introduction of moving, auditory, and three-dimensional stimuli, as well as conceptual visual stimuli, enables students to diversify their cognitive activity, such as recognising, comparing, and locating the essential, etc.
	Gamification, graphic organizers, and mapping are solutions to be explored from the perspective of differentiating the learning process and product. *https://www.youtube.com/watch?v=JD06MTTvAD4&list=PLB7pbNktGmfT7pVCzDdiaCTYJB8QcuDd4* *https://www.microsoft.com/en-us/translator/education/* *https://www.youtube.com/watch?v=fwRwEEPhhVg* *https://www.microsoft.com/en-us/translator/education/*

5.6 Monitoring and management

Type of Differentiated learning	Differentiating strategies and advantages of ICT use
Differentiating the Process and products	Online class management refers to the way instructors use their skills, tools, and technology to facilitate the organization and administration of classes conducted over the Internet. The features and options provided by each management system can vary significantly depending on the one you choose. Common features include a dashboard for teachers and students, user profiles, file storage, activity tracking, and student discussion and messaging. More premium services can come with LMS capabilities.
	To manage an online classroom effectively, the platform must be carefully selected, the instructor must be experienced in teaching online, and the students should be dedicated to learning *Source: https://www.educate-me.co* *https://www.youtube.com/watch?v=3BXCkJO58Bk* *GOOGLE CLASSROOM* *https://www.youtube.com/watch?v=UEFgW--0094&list=PLP7Bvyb3ap44G3Gt_mTxOHoCcIYTBIixg* *https://www.youtube.com/watch?v=MtgiPV6nADs*

5.7 Collaboration and Interactivity

Type of Differentiated learning	Differentiating strategies and advantages of ICT use
Differentiating the Process and products	Collaborative learning is an approach where learning thrives on close interaction among learners or between learners and teachers. Through active joint exploration, discussion, and comprehension of meanings, participants in the process acquire knowledge. *Source: Educateme. https://www.educate-me.co/blog/lms-features*

	Interactivity means that learners can interact within the system with the content provided by choosing activities, responding, and receiving feedback, but also that interactivity between learners is encouraged by real-time communication. ICT tools can support the differentiation of processes and products considering students' **preferences and learning styles**. The platform should provide • Discussion forums • Integrated live sessions like Zoom • Collaborative project spaces • Peer review tools • Community interactive spaces like white boards LUMIO

5.8 Planning

Type of Differentiated learning	Differentiating strategies and advantages of ICT use
Differentiating the Process, products, content and environment	Course management is central to differentiation. Given that teachers have to propose several parallel plans depending on the needs of their pupils, which they wish to take into account, the tools that can support their planning work are essential. https://clickup.com/teams/education

Example on Differentiated Teaching and Learning with ICT

Ms. Dema's approach to teaching photosynthesis using ICT tools aligns with the diversity factors in her classroom by accommodating students' varied learning preferences, language proficiencies, ICT skills, and access to technology. Given the linguistic diversity in Bhutan—where students speak Lhotshampa, Tshangla, Dzongkha, Lhopkha, and other languages—she can integrate visual aids, bilingual subtitles, and interactive simulations to ensure comprehension across different language backgrounds.

Additionally, students with different ICT skill levels may require differentiated support, such as guided tutorials for beginners and advanced tasks for tech-savvy learners. To address disparities in technology access, she

can implement a blended learning approach, using both digital tools and offline resources, ensuring that every student can engage with the lesson effectively. Through these strategies, Ms. Dema creates an inclusive learning environment that respects and responds to the diverse needs of her students.

To ensure inclusive and effective learning, she designs a lesson based on differentiated content, process, and product using ICT.

Lesson plan sample for differentiated teaching using ICT

Types of differentiated teaching	Strategies
Content	Advanced learners explore 3D simulations of photosynthesis whereas for struggling learners and intermediate learners, Ms. Dema provides animated videos with subtitles and voiceovers (e.g., Khan Academy, TED-Ed), and she also uses simplified bilingual infographics (English & Dzongkha) to explain photosynthesis in an easy-to-understand format.
Process	**Learning menu strategy** Assigns a self-paced online module (Google Classroom or Moodle) where students can progress at their own speed. Provides an AI tutor (ChatGPT or Perplexity AI) for additional explanations and Q&A. Ms. Dema uses Padlet or Jamboard for group brainstorming on why photosynthesis is essential for ecosystems.
Product	**Students choose how to demonstrate learning:** ***Advanced learners:*** Design an interactive infographic or digital mind map using Piktochart. ***Intermediate learners:*** Conduct a real-life experiment (grow plants under different light conditions) and record your findings in a digital journal (Google Docs). ***Beginners:*** Draw a step-by-step diagram of photosynthesis and take a picture to share online.

Environment	• Assigns an interactive virtual project with real-time collaboration on Google Docs. • Encourages students to participate in an online discussion forum, like google classroom. • Allows students to complete tasks in school ICT labs or libraries during break hours. • Provides downloadable PDFs, recorded videos, and printed worksheets for offline learning at home.

For additional information: https://www.educate-me.co/blog/lms-features Consult Nizet et al., 2023, chapter 7.

Key ideas of the chapter

- *Information and Communication Technology (ICT) supports inclusive education by allowing personalised, flexible, and accessible learning experiences tailored to diverse student needs.*
- *ICT Supports Differentiation Across Four Domains: Content (customised learning materials); process (varied learning paths); products (multiple ways to demonstrate learning), and environment (adaptive and interactive spaces).*
- *ICT removes barriers for students with disabilities, language differences, or limited access to education by offering alternative formats, translation tools, and offline learning options.*
- *Digital platforms facilitate real-time progress tracking, classroom management, and learner autonomy through dashboards, self-paced modules, and automated feedback.*
- *Artificial Intelligence and course management platforms assist teachers in designing multiple learning pathways and adapting instruction to accommodate diverse learners.*

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Annexure

Annexure I: Case Study 1

Differences and Diversity in the Classroom

Overview

This case study highlights how Mr. Tshedup Dorji, an experienced teacher, adapted his teaching approach to accommodate diverse learners in his urban classroom. Initially expecting a relatively uniform group of high-achieving students, he soon realized that his students had varied backgrounds, abilities, and readiness to learn. Through careful observation and assessment, he identified that 70% of his students had low readiness, while 30% demonstrated high readiness in the topic of "Three-Dimensional Motions" (Projectile Motion).

To address this diversity, Mr. Dorji implemented content, process, and product differentiation under the framework of Readiness, Interests, and Learning Preferences. He used relevant tools to assess students' readiness levels, interests, and learning styles. Based on this data, he formed two groups—one for students with low readiness and another for those with high readiness.

He further designed differentiated learning stations equipped with appropriate teaching-learning materials suited to each group's needs. These stations ensured that each group received content, activities, and assessments tailored to their readiness levels. Additionally, he employed different instructional tools and assessment strategies to measure student progress effectively.

This approach not only made learning more accessible but also helped bridge the readiness gap, ensuring that all students could engage with the content at a level appropriate to their learning needs. Through strategic grouping, differentiated instruction, and targeted assessment, Mr. Dorji successfully created an inclusive learning environment that catered to his students' diverse backgrounds and abilities.

Context

Mr. Tshedup Dorji, an experienced teacher who recently transferred from a rural school to an urban school in Thimphu, was assigned to teach Physics for an XI science section with 40 students. Expecting a more uniform group of high-achieving students in the city with similar backgrounds, he initially assumed his class would consist of students with similar readiness to learn. However, he observed a diverse mix of learners with a wide range of backgrounds, abilities, needs and readiness to learn. He came to know this as he taught using traditional methods, relying primarily on textbooks with limited integration of ICT. During the normal observation and assessments, he found that 70% of his students were not ready to learn, while 30% demonstrated a high level of readiness on the topic "Three Dimensional Motions" (Projectile Motion). Recognizing the diverse learning needs and readiness in his classroom, Mr. Dorji adjusted his approach by grouping students based on their readiness levels, creating groups for those with lower readiness and those with higher readiness, allowing him to better address their varied backgrounds and learning needs.

Differences : Readiness, Interests, and Learning Preferences

a. Readiness:

1. ***Challenge:*** The teacher identifies the student's prior knowledge related to three dimensional motions for the teacher to adjust the content based on the complexity of the content.

   Example: Some students may need a foundational review of vector concepts, while others may need advanced applications like relative motion analysis.

2. ***Complexity:*** The teacher determines the difficulty and complexity of the topic to modify the learning process to match the student's existing knowledge, ensuring a smooth transition to new learning.

   Example: *Students with strong mathematical backgrounds may analyse three-dimensional kinematic equations, while those needing reinforcement may first work on two-dimensional motion problems before progressing.*

3. ***Openness:*** The teacher creates various ways for students to engage and demonstrate understanding, encouraging open discussion and interaction about Three-Dimensional Motion.

Example: *Some students may create a simulation using software, while others explain concepts through presentations or written reports, allowing different perspectives on Three-Dimensional Motion formulas to emerge.*

b. Interest:

1. ***Topic:*** A teacher identifies the various interests of students to learn the particular topic.

   Example: *Some students may be interested in learning the concept through audio-visual means, while some may be interested in learning through hands-on experiences.*

2. ***Context:*** The teacher creates a situation by relating to global and local contexts to identify the better context for learners to learn as expected.

   Example: *Some students may learn best with local examples and context, while some may be interested in learning best by going through global narratives.*

c. Learning Preference:

1. ***Autonomy:*** The teacher provides the learner with the freedom to explore in three-dimensional motion using various sources such as the internet, book chapters, magazines, and libraries to identify the kind of autonomy in learning preferences.

   Example: *Some students may prefer to explore the concept from ready-made YouTube videos, but some students may prefer to learn by listening to their peers.*

2. ***Cognitive Engagement:*** The teacher creates different learning stations ranging, from simple to complex, to identify the different levels of cognitive engagement of the learner.

3. ***Type of Learning:*** The teacher provides a variety of learning environments, such as hands-on experiences and computer simulation, to address the different styles of the learners.

d. Pressure:

The teacher designs a variety of activities to identify the different levels of stress or pressure, which can impact their learning and performance.

Diversity:

Diversity: Ability diversity, age diversity, gender diversity, ethnic diversity, religious diversity, socioeconomic diversity, experiential diversity, sexual orientation diversity, geographic diversity, and linguistic diversity

Context

Mr. Dorji's classroom in Thimphu reflects diverse socioeconomic, linguistic, and cultural backgrounds, impacting students' learning experiences. While some students have access to private tutoring, technology, and extracurricular activities, others face financial constraints and additional household responsibilities. Linguistic diversity, with students speaking Dzongkha, Sharchop, Lhotshampa, and English at varying proficiency levels, affects comprehension and expression. Learning styles and cognitive abilities also vary, requiring different teaching approaches to engage all students. Socio-emotional development differs based on social exposure, with some students confident in public settings while others struggle with anxiety or family challenges. Technology access is another disparity, with some students having personal devices for digital learning while others rely solely on school resources. Additionally, students come from diverse cultural and religious backgrounds, shaping their perspectives and engagement in school activities. These differences highlight the need for inclusive and adaptable teaching strategies.

Example 1: Diagnostic Assessment Tool and Profiles

Diagnostic/Pre-Assessment Tool: Readiness and Preferences for Learning Three-Dimensional Motion (Projectile Motion)

Teacher:	Mr. Tshedup Dorji
Subject:	Physics
Grade:	XI Science
Class Size:	40 students

Purpose

To assess students' readiness, interest, and learning preferences for the topic of three-dimensional motion (projectile motion). This assessment will identify prior

knowledge, openness to new ideas, and individual learning preferences to help the teacher group students and scaffold instruction accordingly.

Section 1: Readiness Check

Objective: *Determine prior knowledge, skills, and openness to learning about Three-Dimensional Motion.*

1. Prior Knowledge Test:

Multiple Choice: What factors influence a projectile's trajectory?

- ☐ Only the mass of the object
- ☐ Launch angle, initial velocity, and gravity
- ☐ The direction of gravity only
- ☐ None of the above.

Short Answer: Briefly describe what you know about the concept of trajectory in projectile motion.

Answer: _____

Problem Solving: Imagine a ball is launched at a 45° angle. Predict how its distance would change if the launch angle were increased.

Answer: _____

Section 2: Interest Inventory

Objective: *Identify students' specific interests within the broader topic of Three-Dimensional Motion to tailor activities accordingly.*

1. Topic Preference:

Which area are you most interested in exploring further?

- ☐ Sports Applications (e.g., soccer, basketball)
- ☐ Engineering (e.g., arch design, projectile paths)
- ☐ Nature (e.g., water fountains, trajectories in nature).

2. Learning Activity Preference

Choose the learning activity you feel most interested in:

- ☐ Hands-on experiments
- ☐ Computer simulations
- ☐ Problem-solving exercises
- ☐ Group discussions.

Section 3: Openness and Cognitive Engagement

Objective: *Gauge students' openness to new learning formats and readiness for exploratory and autonomous learning.*

1. Openness to New Ideas

Are you comfortable participating in open discussions and sharing ideas about new physics concepts?

- ☐ Very comfortable
- ☐ Somewhat comfortable
- ☐ Not comfortable.

2. Self-Assessment of Engagement

How would you rate your interest in using digital tools (e.g., simulations) for understanding physics concepts?

- ☐ Very interested
- ☐ Somewhat interested
- ☐ Not interested.

3. Autonomy Level

Rate your interest in independently exploring resources like the internet, books, and simulations to learn more about projectile motion:

- ☐ Very interested
- ☐ Somewhat interested
- ☐ Not interested.

Section 4: Preferred Learning Context

Identify preferred learning environments to align with students' learning preferences and ease of learning.

1. Learning Environment Preference

Choose your preferred learning setting:

- ☐ Laboratory
- ☐ Computer lab (for simulations)
- ☐ Outdoor learning activities.

2. Scenarios for Model Development

Would you enjoy creating a physical or digital model to represent projectile motion?

- ☐ Yes, very interested
- ☐ Somewhat interested
- ☐ Not interested.

3. Adaptation to Task Complexity

Which type of task do you find more engaging?

- ☐ Basic concepts review (low complexity)
- ☐ Applying concepts to problem-solving tasks (medium complexity)
- ☐ Advanced projects requiring critical thinking (high complexity).

Section 5: Self-Reported Comfort with Pressure

Objective: *Assess students' comfort with various levels of challenge and pressure to guide the rotational teaching method and activity planning.*

1. Comfort with Challenge

How comfortable are you when working on complex science problems under time constraints?

- ☐ Very comfortable
- ☐ Somewhat comfortable
- ☐ Not comfortable.

2. Preferred Level of Guidance

When learning new topics in science, do you prefer:

- ☐ Step-by-step guidance from the teacher
- ☐ Initial guidance with some independence
- ☐ Complete independence.

Evaluation and Grouping

1. Readiness Levels grouping:

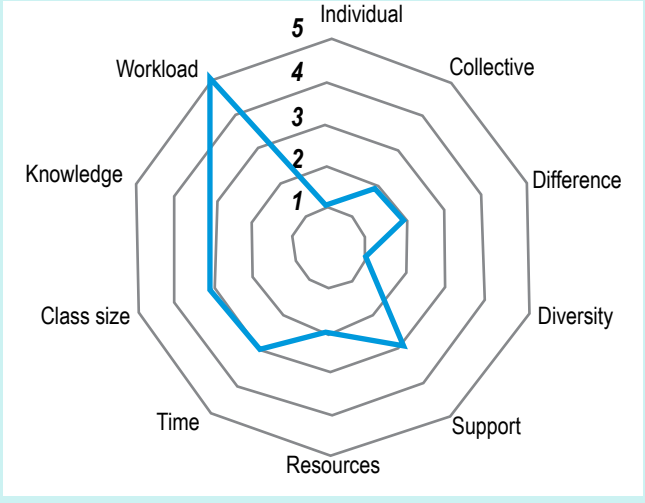
- *High Readiness:* Demonstrates prior knowledge, comfort with pressure, and high engagement with advanced tasks and independent learning.

- *Moderate Readiness:* Shows basic understanding, openness to guidance, and interest in engaging with medium-complexity tasks.
- *Low Readiness:* Requires foundational support, prefers a structured learning environment, and benefits from lower-complexity tasks.

2. Learning Preference grouping:

- *Hands-on or Interactive Learners*: Group in laboratory or hands-on settings.
- *Simulation or Technology-Engaged Learners:* Group in computer labs with simulation-based tasks.
- *Independent or Autonomous Learners:* Assign autonomous research and exploratory tasks.

Teacher Differentiation Compass



1= Poor
2= Low
3= Middle
4= Middle High
5= Very High

In this situation, Tshedrup can consider

- *Individual intervention is average importance (Score: 3/5)*
- *Group interventions are of huge importance (Score: 4/5)*
- *Some factors of difference are present, but not all (Score: 4/5)*
- *Only four factors of diversity is present (or recognized by him) (Score: 3/5)*
- *He cannot count on any support from outside or inside the classroom (Score: 1/5)*
- *He has adequate resource at his disposal (Score: 4/5)*
- *He has limited time to carry out a differentiated sequence (Score: 2/5)*
- *He has many students in his class to look after (Score: 4/5)*
- *He knows an average concept about DTL (Score: 2/5)*
- *His workload does not allow him to plan an intervention (Score: 2/5)*

e. Planning Templates

Use this template to plan the lesson based on findings from the pre-test.

Teacher: Tshedup Dorji	Grade: Male	Quarter: Date: 14.11.2024

Differentiated lesson plan

Expected learning standard

Analyse the projectile motion, including the resolution of vertical and horizontal components of acceleration, using interactive simulation to relate its applications in games, the military, and physical processes in motion.

Learning objectives

Knowledge Objectives

1. *Explain key concepts like trajectory, range, initial velocity, angle of launch, and acceleration due to gravity for projectile motion.*
2. *Identify factors affecting projectile motion, such as how angle and speed influence the motion's height, distance, and time in the air.*
3. *Relate projectile motion to real-world Applications such as sports (e.g., basketball, soccer), engineering (e.g., designing parabolic arches), and nature (e.g., the path of water from a fountain).*

Skills Objectives

1. *Demonstrate the ability to use mobile apps or interactive simulations to adjust angles and speeds and observe the resulting changes in projectile motion.*
2. *Analyse simulation data to interpret how each variable affects motion.*
3. *Use the understanding of projectile motion to solve hypothetical or real-life problems, such as calculating the best launch angle for a specific distance.*

Values Objectives

1. *Develop curiosity and engagement to explore physics concepts using technology, enhancing an appreciation for how digital tools can deepen understanding.*
2. *Recognize the importance of precise measurement and careful adjustment of variables when conducting simulations.*
3. *Foster the relevance of physics in daily life and the practical applications of learning physics concepts in contexts like sports and engineering.*

<table>
<tr><td colspan="4">Grouping decisions and strategies

Students are grouped according to their specific readiness levels for learning projectile motion, taking into account varying degrees of personal and situational interest, as well as different learning preferences.

Each group is carefully formed to reflect the diverse backgrounds of the learners.</td></tr>
<tr><td colspan="2">Group 1: For the lower level of readiness student group. (70%)</td><td colspan="2">Group 2: For higher readiness (30%)</td></tr>
<tr><td>Activity 1

This activity is to ignite interest and motivate students to learn the topic “projectile motion.”</td><td>Begin with a short video clip demonstrating a basketball being shot into a hoop, explore the factors that affect the motion of the basketball, and introduce the concept of projectile motion. (Since the learners are not ready to learn when taught in a normal classroom using textbook and lecture methods, this activity is to ignite curiosity and motivation toward learning the topic based on interest and learning preferences).</td><td>Station 1</td><td>Printed definitions and diagrams for key terms (trajectory, range, initial velocity, angle of launch, gravity)

Video clips or images showing real-world examples (e.g., basketball shot, water fountain, and parabolic bridge arch).

Reflection sheets.

(This activity is designed for high-level readiness students, and therefore a station has been designed for them to recollect and reiterate on the concept of projectile motion).</td></tr>
</table>

Activity 2 This activity provides the learner with the opportunity to explore more on complex concepts such as launch angle, speed, projectile motion, and trajectory, etc., by ensuring their interest and learning preferences.	Using a simulation app allows students to visualize these effects in real time. It was observed that there was a poor performance while assessing these concepts when offered in the normal classroom settings, Therefore, to cater their different learning styles and preferences, simulation has been chosen to address this low-level readiness of students. By experimenting with variables like angle and speed, students can observe how each change influences the projectile's trajectory. For instance, they might see how increasing the speed makes the path longer or how a lower angle results in a flatter trajectory. This hands-on experience with the app helps students grasp how physics concepts work together to shape projectile motion.	**Station 2**	In this workstation, the students are expected to express their learning by interpreting the data derived from the simulation and they are expected to work independently or in pair. Computer devices with a projectile motion simulation app/web (such as PhET, Algodoo, or a similar tool) Angle protractors, data recording sheets, and graph paper Calculators. Problem scenarios for real-life applications (e.g., determining the best launch angle to reach a specific distance)
Teacher Involvement/ Activity	Face-to-face involvement with low achievers is necessary since they need more attention.	Limited involvement of teachers will only guide students about an activity.	

Differentiated Lesson Plan

Plan the lesson based on the information provided in the lesson plan template

Lesson Plan:	**Three-Dimensional Motion (Projectile Motion)**
Grade:	XI Science
Duration:	80 Minutes

Learning Standards/Competency

Analyze projectile motion by resolving vertical and horizontal components of acceleration in understanding its applications in real-life contexts (games, military, sports, etc.).

Learning objectives

Knowledge Objectives

1. *Explain concepts like trajectory, range, initial velocity, launch angle, and gravitational acceleration.*
2. *Identify factors affecting projectile motion, such as angle and speed.*
3. *Relate projectile motion concepts to real-world applications (e.g., sports, engineering).*

Skills Objectives

1. *Use simulation tools to experiment with variables in projectile motion.*
2. *Analyse data from simulations to interpret the findings.*
3. *Solve real-world problems related to projectile motion.*

Values Objectives

1. *Develop curiosity to learn new concepts by using technology.*
2. *Recognize the importance of accurate measurement in simulations.*
3. *Connect physics to real-life applications, like sports and engineering.*

Learning Experiences

Introduction (10 minutes)

1. *The teacher begins the lesson with a brief video on basketball shots, introducing the idea of projectile motion and the factors involved (trajectory, angle, speed).*
2. *Engages students by discussing what they observed, sparking curiosity about how angles, velocity, and gravity affect the basketball's motion.*

Activities by Readiness Level

Group 1: Low Level of Readiness (70%)

Activity 1 (10 minutes): *Ignite interest in projectile motion through relatable visuals and scenarios.*

Teacher Instruction: *The teacher shows additional short clips of various projectiles in sports (e.g., soccer, archery), and prompts the discussion.*

Student Activity: *Students identify how each scenario's path might change based on speed and angle, encouraging engagement through observation.*

Activity 2 (20 minutes): *Explore the basic concepts of angle, speed, and trajectory using simulations.*

Teacher Instruction: *The teacher introduces a simple projectile motion simulation app (e.g., PhET) and guides students in adjusting angle and speed values while observing changes in the projectile's motion.*

Student Activity: *Students record their observations on how changes in angle and speed influence trajectory and range.*

Assessment: *Teachers use a checklist to evaluate understanding of each variable's impact.*

Group 2: Higher Level of Readiness (30%)

Station 1 (15 minutes): *Recollect and deepen understanding of key concepts in projectile motion.*

Teacher Activity: *The teacher provides printed definitions, diagrams of key terms (e.g., trajectory, range), and real-world application examples.*

Student Activity: *Students complete reflection sheets, answering questions related to the trajectory of different projectiles and hypothesizing about factors that affect each scenario.*

Assessment: *Reflection sheets will be reviewed to gauge comprehension by using annexure 1.*

Station 2 (20 minutes): *Conduct independent investigations and apply concepts to problem-solving tasks.*

Resources: *Simulation app, angle protractors, graph paper, calculators.*

Student Activity: *Students work independently or in pairs, using the simulation to analyze different projectile motion scenarios (e.g., finding the best angle for maximum range).*

Assessment: *Collect data recording sheets and problem-solving results for feedback by using tool 2.*

Closure (15 minutes)

Discussion: *Facilitate a class discussion in which each group shares key insights from their activities.*

Wrap-Up Activity: *Pose real-world challenges for which students suggest solutions using their understanding of projectile motion, emphasizing practical relevance in daily life.*

Exit Slip: *Ask students to write down one new thing they learned and one question they still have to inform the next lesson.*

Tool 1: Projectile Motion Reflection Sheet

Name	
Class	XI Science
Date	

Purpose:

Reflect on and deepen understanding of key concepts in projectile motion.

Instructions

Review the provided definitions, diagrams, and real-world examples.

Answer each question thoughtfully and clearly. Be prepared to discuss your answers with the class.

Reflection Questions

1. Understanding Key Terms

i) Define each of the following terms in your own words:
Trajectory: _____
Range: _____
Initial Velocity: _____
Angle of Launch: _____
Acceleration due to Gravity(g): _____

2. Observing and Analysing Trajectory

i) After reviewing the diagrams and real-world examples, describe the typical path (trajectory) of a projectile in motion (e.g., a basketball shot, a water fountain arc):

Answer: _____

ii) What do you observe about how the trajectory changes when the launch angle is increased or decreased?

Answer: _____

3. Exploring Influencing Factors

i) Explain how angle of launch affects the height and distance (range) of the projectile.

Answer: _____

ii) Explain how the initial speed affects the range and height of the projectile.

Answer: _____

4. Hypothesis and Prediction

i) Predict what would happen to the trajectory if the projectile is launched at a very low angle. Explain your reasoning.

Prediction: _____

ii) If you wanted to maximize the distance a projectile travel, what angle would you choose and why?

Answer: _____

5. Real-World Applications

i) Choose one real-world example of projectile motion (e.g., a soccer kick, fountain spray, archery). Describe how understanding projectile motion could help optimize the motion in this scenario.

Answer: _____

ii) Reflect on how knowledge of projectile motion might be useful in a field like engineering or sports. Provide an example to illustrate your answer.

Answer: _____

Teacher Feedback Section

Comprehension of Key Concepts: _____

Application of Knowledge: _____

Further Comments: _____

Tool 2: Projectile Motion Data Sheet

Name	
Class	XI Science
Date	

Purpose:

Conduct investigations on projectile motion and apply concepts to solve problems.

Instructions

Use the simulation app to explore how varying angles and speeds affect the

range and height of projectiles.

Record data for each trial and answer the analysis questions at the end.

Data Collection

Sl No	Launch Angle (°)	Initial Speed (m/s)	Maximum Height (m)	Range (Distance, m)	Time of Flight (s)
1					
2					
3					
4					
5					

Note: Repeat the experiment by adjusting the launch angle and initial speed to observe how these changes impact the projectile's trajectory.

Data Analysis Questions

1. Pattern Observation

Describe any patterns you observed between the launch angle and the range of the projectile.

Answer: _____

2. Optimal Angle for Range

Based on your trials, which launch angle produced the maximum range? Explain why you think this angle was the most effective.

Answer: _____

3. Impact of Initial Speed

Describe how increasing the initial speed influenced the projectile's height and range.

Answer: _____

4. Predictions and Adjustments

If you were asked to hit a target at a specific distance, what adjustments would you make to the angle or speed?

Answer: _____

5. Real-Life Application

Imagine you are designing a water fountain that needs to reach a specific height and distance. How would your findings from this activity guide your design choices?

Answer: _____

_____

_____

Problem-Solving Task

Scenario: A ball needs to be launched to reach a target 50 meters away. Based on your findings:

i) What angle and speed would you recommend for the launch?
Angle: _____
Speed: _____

ii) Explain how you arrived at these values using your data from the trials.

Answer: _____

_____

Teacher Feedback Section

Data Collection and Recording: _____

_____

Application of Concepts: _____

Further Comments: _____

This data sheet is collected and reviewed as part of the assessment for understanding and application of projectile motion concepts.

Tool 3: Projectile Motion Simulation Checklist

Name	
Class	XI Science
Date	

Purpose:

Evaluate the understanding of how angle and speed impact the trajectory and range in projectile motion.

Checklist Criteria

For each criterion below, mark the student's performance with a check (☐) in the corresponding box.

Criteria	Observations and Notes	Meets Expectations	Needs Improvement
1. Adjusts Angle in Simulation	The student accurately adjusts the angle in the simulation as instructed and observes changes in the trajectory.	☐	☐
2. Records Angle Observations	The student records clear observations about how changes in angle affect the trajectory shape and maximum height.	☐	☐
3. Adjusts Speed in Simulation	The student adjusts the speed in the simulation as instructed and observes the changes in range.	☐	☐
4. Records Speed Observations	The student records clear observations on how changes in speed impact the projectile's range and overall path.	☐	☐
5. Describes the Impact of Angle on Range	The student explains how different angles (e.g., 30°, 45°, and 60°) affect the projectile's distance.	☐	☐
6. Describes the Impact of Speed on Range	The student explains how varying speeds influence the range and describes the relationship between speed and distance.	☐	☐
7. Relates Angle and Speed to Trajectory Shape	The student connects how the combination of angle and speed determines the trajectory's arc shape (e.g., a flatter or higher curve).	☐	☐

8. Demonstrates Engagement with the Simulation	The student actively engages with the simulation, testing different values beyond the minimum requirements.	☐	☐

_____

Overall Feedback

Areas of Strength: _____

Areas for Improvement: _____

_____

Post Assessment

Multiple Choice (All Students)

Choose the best answer for each question.

1. A projectile is launched with an initial velocity v at an angle θ above the horizontal. Which of the following statements is true about the vertical component of the initial velocity?
   - ☐ a) It is equal to vcosθ.
   - ☐ b) It is equal to vsinθ.
   - ☐ c) It is zero.
   - ☐ d) It is equal to v.
2. Neglecting air resistance, what is the only force acting on a projectile after it is launched?
   - ☐ a) The force of the launch.
   - ☐ b) Friction.
   - ☐ c) Gravity.
   - ☐ d) Air pressure.
3. A ball is thrown straight up in the air. At its highest point, what is its vertical velocity?
   - ☐ a) Equal to its initial velocity.
   - ☐ b) Zero.
   - ☐ c) Equal to g (acceleration due to gravity).
   - ☐ d) Constant and non-zero.

Short Answer (All Students)

1. Explain in your own words what is meant by the "trajectory" of a projectile.
2. A projectile is launched horizontally from a cliff. Describe how the horizontal and

vertical components of its velocity change (or remain constant) during its flight, neglecting air resistance.

Application Problems

Part 1

Low Readiness:

1. A student throws a ball straight up in the air with an initial velocity of 10 m/s.

   a) How long does it take for the ball to reach its highest point? (Use g = 10 m/s²)

   b) What is the maximum height the ball reaches?

2. Imagine you are kicking a soccer ball. You want it to travel as far as possible. What angle should you aim for (approximately)? Explain why.

High Readiness:

1. A projectile is launched with an initial velocity of 20 m/s at an angle of 30° above the horizontal. Calculate: a) The horizontal and vertical components of the initial velocity. b) The time it takes for the projectile to reach its maximum height. c) The maximum height reached by the projectile. d) The total horizontal distance (range) covered by the projectile. (Use g = 10 m/s²)
2. A cannon fires a projectile with an initial velocity v at an angle θ. Derive an expression for the range (horizontal distance) of the projectile in terms of v, θ, and g (acceleration due to gravity), neglecting air resistance. Explain each step in your derivation.

Part 2:

1. The trajectory is the path followed by a projectile through the air. It is typically a curved path due to the influence of gravity.
2. The horizontal component of the velocity remains constant (neglecting air resistance). The vertical component of the velocity decreases as the projectile goes up, becomes zero at the highest point, and then increases in the downward direction as it falls.

Part 3:

Low Readiness:

1. a) 1 second, b) 5 meters
2. Approximately 45 degrees. This angle provides the best balance between

horizontal and vertical velocity, maximizing the horizontal distance travelled.

High Readiness:

1. a) Horizontal: 17.3 m/s, Vertical: 10 m/s, b) 1 second, c) 5 meters, d) 34.6 meters
2. Range = $(v^2 \sin 2\theta)/g$ (Derivation involves resolving initial velocity into components, using kinematic equations for vertical motion to find the time to reach max height, doubling that time for total flight time, and then using horizontal velocity and total time to find range.)

Annexure

Annexure II: Case Study 2

Differentiated Learning: Renaming Fractions for Mathematics Key Stage-II grade 4

Overview

This case study examines Mrs. Dechen's differentiated instruction for renaming and comparing fractions in her diverse 4th-grade class. It details her assessment of student readiness, interests, and learning styles, and how she differentiates content, process, product, and learning environment. A sample lesson plan illustrates these differentiated strategies in action, including tiered activities, collaborative learning, and choice-based product options. The study concludes with sample diagnostic tools and assessment questions, emphasizing the importance of diverse assessment methods. .

Context: Classroom Situation

Mrs. Dechen, a Grade 4 mathematics teacher, has a diverse class with varying learning needs and styles. Her objective for the lesson is to teach the students how to rename fractions, compare fractions, and understand their real-life applications, such as sharing food or dividing a group of people into equal parts.

The class is composed of students with different abilities: some students understand fractions quickly and can make connections easily, while others struggle to visualize fractions or see their applications. Additionally, some students learn better through hands-on activities, while others prefer verbal explanations or visual aids. Mrs. Dechen's goal is to ensure that all students achieve the lesson's competencies and objectives by differentiating the content, process, product, and learning environment.

Assessing Learners' Readiness, Interests, and Learning Preferences

To ensure differentiated instruction is effective, it is important to assess learners' readiness, interests, and learning preferences prior to beginning the lesson. Teacher notes students' pattern in terms of readiness and categorize them into different assessment level (i.e., Beginning, Approaching, Meeting, Advancing, and Exceeding). Here's how this can be achieved.

a. Readiness:

- ***Pre-Assessment***: Start with a short quiz to assess students' prior knowledge of fractions. Questions might include identifying fractions, matching equivalent fractions, and performing simple fraction operations (refer to Sample Diagnostic Assessment Tool and Profiles).
- ***Observation:*** Observe students as they interact with visual fraction materials (such as fraction circles or bars). Check for any misunderstandings, such as confusing numerators and denominators or difficulty in visualizing fractions as part of a whole.
- Encouraging students to do a show of hands activity to diagnose the level of understanding on the topic could be used as well.

b. Interest:

- ***Interest Surveys:*** Use a simple survey to find out students' preferences. Ask them about their favourite subjects (math, science, sports, etc.) and use this data to relate fraction concepts to real-world interests. For example, "If you were dividing a pizza (interest in food), how would you name the parts?"
- ***Group Discussions:*** Engage students in conversations about how fractions appear in their daily lives (e.g., cooking, sports scores, etc.), giving them a chance to share personal connections.

c. Learning Preference:

- ***Learning Styles Inventory:*** Implement a short quiz to understand whether students are visual, auditory, or kinesthetics learners. This will guide you in choosing activities that fit their learning preferences (refer to Sample Diagnostic Assessment Tool and Profiles).
- ***Classroom Setup:*** Provide a range of concrete materials like fraction bars, circle manipulatives, and visual charts to support different learning preferences.

Differentiating Content, Process, Product, and Learning Environment

a. Differentiating Content:

- For Beginners: Provide simple fraction circles and bars to help students visualize basic fractions like $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$. Focus on hands-on activities where students physically manipulate objects to form and compare fractions.
- For Advanced Learners: Introduce mixed numbers and more complex fractions. Provide worksheets with higher-level problems that ask students to rename fractions using different denominators (e.g., $\frac{1}{2} = \frac{2}{4}$, $\frac{3}{6} = \frac{1}{2}$).

b. Differentiating Process:

- For Visual Learners: Use color-coded fraction bars or circles to help students compare and rename fractions. Ask them to colour different sections to represent equivalent fractions. You may use the EduTen platform to help students compare and rename fractions using gamification.
- For Auditory Learners: Explain the concept of equivalent fractions using songs or rhymes. For instance, “One-half is the same as two-fourths; they’re equal all the way.”
- For Kinesthetic Learners: Incorporate movement-based activities. Have students use fraction strips to build and compare fractions, moving between different stations that represent various fraction values.
- Reading and Writing: Provide sentence starters for written explanations. For example:
  - "To rename the improper fraction ___, I divided the numerator by the denominator. The whole number is ___, and the fraction is ___."
  - Use fill-in-the-blank worksheets to guide their writing.

  For learners who prefer to read, provide simplified texts and visual aids:
  - Provide students with simplified explanations and use visual aids, such as fraction bars, number lines, or pie charts, to represent fractions visually.
  - Provide step-by-step written instructions for identifying and comparing fractions.

c. Differentiating Product:

- For Lower-Level Learners: Have them complete worksheets with basic fraction comparison and renaming tasks. Use visuals to support their understanding.
- For Higher-Level Learners: Ask them to create a fraction chart where they must represent several fractions with different denominators, show equivalence between fractions using concrete materials, and then present their findings to the class.

d. Differentiating Learning Environment:

- Flexible Seating and Tools: Mrs. Dechen sets up different workstations: one with manipulatives, another with visual aids like charts and diagrams, and a third with digital tools (e.g., interactive whiteboards or apps). Students can choose where they feel most comfortable working based on their learning preferences.
- Collaborative Spaces: Provide group activities where students can work together using manipulatives and discussion, helping each other understand equivalent fractions.

Sample Lesson Plan

Plan the lesson based on the information provided in the lesson plan template

Topic:	Renaming Fractions
Grade:	IV
Duration:	50 Minutes
Subject:	Mathematics
Date:	

Competency

Demonstrate the ability to compare, rename, and order fractions and use them for day-to-day life activities.

Lesson Objectives:

By the end of the lesson, students will be able to:

1. *Identify and rename fractions in different forms.*
2. *Compare fractions with denominators.*
3. *Apply their understanding of fractions to solve real-life problems.*

Materials:

- *Fraction bars*
- *Number lines*
- *Pizza slices (plastic or printed)*
- *Fraction circles or bars*
- *Interactive whiteboard or digital tool*
- *Handouts with fraction problems*
- *Markers, pencils, and paper*

Lesson Introduction (10 minutes)

Content differentiation

1. *Teacher Activity:*
   - *Introduce the concept of fractions using visual aids such as fraction bars, number lines, and pizza slices.*
   - *Explain the concept of equivalent fractions (e.g., $\frac{1}{2} = \frac{2}{4}$) using concrete materials like fraction circles.*
   - *Briefly review how fractions represent parts of a whole.*
2. *Student Activity:*
   - *Students observe the visual materials and listen to the explanation.*
   - *They ask questions if they have difficulty understanding.*
   - *They take notes and refer to materials as needed.*

Lesson Development

Process Differentiation

Differentiated Activity: Tiered Tasks (15 minutes)

1. *Teacher Activity:*

   Group students into three categories based on readiness and considering the students 'ability diversity:

   - ***Group 1 (Beginning):*** *Focus on identifying and naming simple fractions ($\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$).*
   - ***Group 2 (Approaching/Meeting):*** *Practice renaming fractions with denominators (e.g., $\frac{1}{2} = \frac{2}{4}$).*
   - ***Group 3 (Advancing/Exceeding):*** *Solve more complex fraction problems involving mixed numbers and different denominators (e.g., $\frac{1}{3} + \frac{1}{2} = ?$).*
   - *Monitor throughout the classroom, providing support and guiding students as needed.*

2. *Student Activity:*
   - ***Group 1:*** *Use fraction bars and pizza slices to match fractions and identify their equivalents.*
   - ***Group 2:*** *Use number lines and concrete materials to rename fractions (e.g., $\frac{1}{2}$ to $\frac{2}{4}$).*
   - ***Group 3:*** *Work on more challenging fraction problems, discussing strategies with peers.*

Collaborative Learning (10 minutes)

1. *Teacher Activity:*
   - *Organize students into pairs or small groups.*
   - *Encourage higher-achieving students to support their peers by explaining the process of renaming fractions or comparing them.*
2. *Student Activity:*
   - *In pairs or small groups, students explain and solve fraction problems collaboratively.*
   - *High-achieving students assist others with renaming fractions or comparing different fractions.*

Differentiated Learning Environment:

- ***Flexible Seating:*** *Students can choose where to work: at manipulatives stations, with visual aids, or using digital tools on interactive whiteboards.*
- ***Stations:*** *Each station will be equipped with resources (fraction strips, number lines, digital tools, etc.) that students can access depending on their learning preferences.*

Product Differentiation (10 minutes)

1. *Teacher Activity:*
   - *Provide students with three options for demonstrating their learning in three different stations:*
     - ***Station 1:*** *Hands-on activity using manipulatives (fraction bars or pizza slices).*
     - ***Station 2:*** *Complete a written worksheet with fraction problems.*
     - ***Station 3:*** *Use a digital tool or interactive whiteboard to demonstrate equivalent fractions and create their own examples.*
2. *Student Activity:*
   - *Choose one of the product options based on their learning preferences.*
   - *Begin demonstrating their understanding by completing the activity of their choice.*

Lesson Closure

Conclusion and Reflection (5 minutes)

1. *Teacher Activity:*
   - *Ask students to share their chosen methods of demonstration.*
   - *Summarize the key points of the lesson: comparing, renaming, and ordering fractions.*
2. *Student Activity:*
   - *Reflect on their learning by sharing their thoughts and experiences with the class.*
   - *Answer any remaining questions or clarify any doubts.*

Reflection:

At the end of the lesson, Mrs. Dechen will reflect on:

- *The effectiveness of using differentiated materials and activities for different learning levels.*
- *How well the students engaged with the content and each other.*
- *Which methods worked best in helping students demonstrate their understanding of fractions.*
- *Adjustments to be made for the next lesson based on the students' performance.*

Assessment Rubrics and Checklist:

Criteria	Beginning	Approaching	Meeting	Advancing	Exceeding
Accuracy of Fraction Identification	Struggles to identify fractions	Identifies some fractions, but with mistakes	Identifies most fractions correctly	Identifies all fractions correctly with few errors	Demonstrates exceptional accuracy in identifying and renaming fractions
Use of visual Models	Does not use visual models or uses them incorrectly	Uses visual models, but with some confusion	Uses visual models correctly for most examples	Uses visual models to confidently demonstrate understanding	Uses visual models and explains reasoning clearly and accurately
Application of Equivalent Fractions	Struggles to find equivalent fractions	Finds some equivalent fractions with guidance	Finds equivalent fractions with few errors	Finds equivalent fractions correctly and explains the process clearly	Demonstrates an in-depth understanding of equivalent fractions and can explain multiple methods
Participation in Activities	Rarely participates or contributes	Participates with help or guidance	Actively participates and contributes to discussions	Leads discussions and helps others understand	Takes initiative in teaching peers and explaining concepts clearly

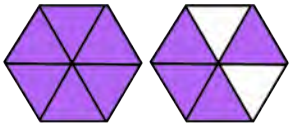
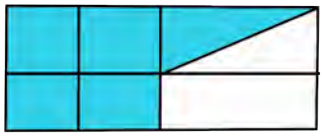
Sample question to assess Fraction Understanding (Class IV)

I. Identifying Fractions

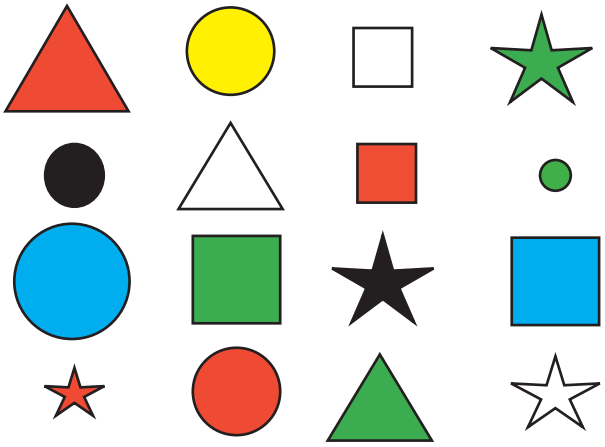
Can the student recognize and name the fraction represented by a visual model?

Sample Questions:

1. What fraction of the shape is shaded?

a)	
b)	
c)	

2. Draw a picture that shows $\frac{2}{5}$.
3. What fraction of the group of objects is circles?



- *Can the student identify the numerator and denominator of a fraction and explain their meaning?*

Sample Questions:

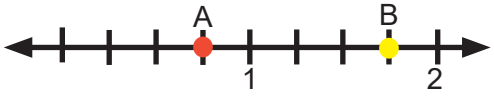
1. In the fraction $\frac{3}{8}$, what does the 3 tell us? What does the 8 tell us?
2. If a pizza is cut into 6 slices and you take 2, what fraction of the pizza did you take? Which number is the numerator and which is the denominator?

- *Can the student represent fractions on a number line?*

Sample Questions:

1. Mark $\frac{1}{4}$ and $\frac{3}{5}$ on this number line.

2. What fractions are these points on the number line?



II. Renaming Fractions

- *Can the student identify equivalent fractions?*

Sample Questions:

1. Which of these fractions are equivalent to $\frac{1}{2}$? (you can choose more than one answer).
   a) $\frac{2}{4}$
   b) $\frac{3}{5}$
   c) $\frac{4}{8}$
   d) $\frac{5}{10}$
   e) $\frac{6}{14}$
2. Write two fractions that are equal to $\frac{3}{5}$?

3. Show that $\frac{2}{4}$ is the same as $\frac{1}{2}$ using a drawing.

Can the student convert between improper fractions and mixed numbers?

Sample Questions:

1. Represent $\frac{7}{3}$ using any model and write it as mixed fractions.
2. Represent $\frac{22}{3}$ using any model and write it as an improper fraction.

III. Comparing Fractions

- *Can the student compare fractions with the same denominator?*

Sample Questions:

1. Which is bigger, $\frac{3}{5}$ or $\frac{1}{5}$ 1?
2. Arrange these fractions in order from least to greatest: $\frac{2}{6}$, $\frac{5}{6}$, $\frac{1}{6}$.

- *Can the student compare fractions with different denominators by creating equivalent fractions?*

Sample Questions:

1. Which is greater, $\frac{2}{3}$ or $\frac{3}{4}$? (Encourage them to find a common denominator).
2. Compare $\frac{1}{2}$ and $\frac{2}{5}$. Explain your answer.

Important Considerations:

- ***Use a variety of assessment methods:*** Do not rely solely on written tests. Include activities like drawing models, explaining their reasoning, and working with manipulatives.
- ***Observe student work:*** Pay attention to how students approach problems. This can give you valuable insights into their understanding.
- ***Provide feedback:*** Let students know what they are doing well and where they need to improve.
- ***Differentiate:*** Adjust the difficulty of questions based on individual student needs.
- ***Connect to real life:*** Use examples and word problems that relate to students' everyday experiences to make fractions more meaningful.

Samples of Pre-Assessment Tools and Profiles

Sample 1: Pre-Assessment Tool: Students Learning Preferences

Purpose:

This assessment will identify students' learning style: Visual, Auditory, Reading or Writing, and Kinesthetics to help the teacher group students and scaffold instruction accordingly.

How to categorise:

The category with the highest score represents your primary learning style. If the learners have a close balance across multiple categories, they may have a **blended learning style** and benefit from a mix of approaches.

A: Visual Learner

B: Auditory Learner

C: Reading or Writing Learner

D: Kinesthetics Learner.

Learning Style Inventory

Instructions: For each question, choose the option that best describes how you prefer to learn or process information. There are no right or wrong answers.

1. When learning something new, I prefer to:
   A. see diagrams, charts, or pictures.
   B. listen to explanations or discussions.
   C. write down notes or instructions.
   D. try it out hands-on or physically practice.
2. In class, I learn best when:
   A. the teacher uses visual aids like videos, slides, or drawings.
   B. the teacher explains the topic out loud.
   C. I can take notes and read through written materials.
   D. I can participate in activities or experiments.
3. When I need to follow directions, I prefer:
   A. a map or visual representation.
   B. someone explaining it to me verbally.
   C. written instructions.
   D. just trying it and figuring it out as I go.

4. I remember information better when:
   A. I see it in pictures or graphs.
   B. I hear it explained.
   C. I write it down or read it multiple times.
   D. I do it myself.

5. My favourite way to study for a test is:
   A. reviewing charts, diagrams, or flashcards with images.
   B. discussing topics with a friend or listening to recordings.
   C. reading and summarizing notes or writing practice essays.
   D. using hands-on activities or practical applications to practice.

6. When I solve a problem, I usually:
   A. draw a picture or create a diagram.
   B. talk it out with someone or say it out loud.
   C. write a step-by-step solution.
   D. experiment with different approaches until I find the solution.

7. I enjoy lessons or activities that involve:
   A. watching videos, looking at pictures, or observing demonstrations.
   B. listening to stories, lectures, or podcasts.
   C. reading textbooks, articles, or writing summaries.
   D. building, moving, or interacting with materials.

8. When giving a presentation, I prefer to:
   A. use visuals like slides, charts, or pictures.
   B. speak confidently without many visuals.
   C. provide a handout or write out the main points.
   D. include hands-on activities or props.

9. When I get frustrated with a task, I prefer to:
   A. look at diagrams, pictures, or videos for help.
   B. talk to someone and ask for guidance.
   C. read instructions or notes to figure it out.
   D. tinker with it until I figure it out myself.

10. When I watch a movie, I often pay attention to:
    A. the scenery, colours, and visual details.
    B. the dialogue and how the characters sound.
    C. the plot and storyline in the subtitles or script.
    D. the actions and physical movements of the characters.

11. In group projects, I like to:

A. make charts, graphs, or slides for the presentation.
B. discuss ideas and brainstorm out loud with my group.
C. write summaries or prepare written reports.
D. work on building or creating something hands-on.

12. When I remember past events, I:
A. picture them in my head like a movie or photograph.
B. recall the conversations or sounds.
C. remember the details I wrote about or read about later.
D. recall how I felt or what I physically did.

Option	A	B	C	D
Score				

Example 2: Pre-Assessment tool: Student's readiness

Purpose:

This assessment will identify students' readiness to help the teacher group students and scaffold instruction accordingly.

Scoring Rubric and Categorization

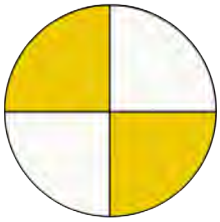
After students complete the test, score their answers to determine their readiness level (provide one point for each question correctly answered):

- Beginning (0–4 points): Struggles with basic fraction concepts and needs support with visuals and concrete materials.
- Approaching (5–8 points): Understands basic fractions but struggles with renaming or comparing.
- Meeting (9–12 points): Can rename, simplify, and compare fractions at grade level.
- Advancing (13–16 points): Solves problems with fractions and can explain reasoning clearly.
- Exceeding (17–20 points): Demonstrates mastery by solving advanced problems and finding creative solutions.

Instructions: Answer the questions below. Show your work where necessary.

Section 1: Basic Fraction Understanding

1. What fraction represents the shaded part?



   A. $\frac{1}{4}$
   B. $\frac{2}{4}$
   C. $\frac{3}{4}$
   D. $\frac{4}{4}$

2. Which fraction is greater?
   A. $\frac{1}{2}$ or $\frac{1}{4}$
   B. $\frac{3}{4}$ or $\frac{2}{4}$
   C. $\frac{2}{3}$ or $\frac{3}{3}$

3. Write the fraction for this situation:

   A pizza is divided into 6 equal slices. If 4 slices are eaten, what fraction represents the slices eaten?

Section 2: Renaming Fractions

1. Write two fractions that are equal to $\frac{1}{2}$.
2. Rename $\frac{3}{6}$ as a fraction with:
   a). A denominator of 12
   b). A denominator of 18
3. Simplify the following fractions:
   a). $\frac{4}{8}$
   b). $\frac{6}{12}$

c). $\frac{9}{15}$

Section 3: Comparing Fractions

1. Compare the fractions using <, >, or =:
   a). $\frac{1}{2}$ ___ $\frac{2}{4}$
   b). $\frac{2}{3}$ ___ $\frac{2}{3}$
   c). $\frac{7}{8}$ ___ $\frac{4}{6}$
2. Arrange these fractions from smallest to largest:
   $\frac{3}{4}$, $\frac{1}{2}$, $\frac{2}{3}$

Section 4: Problem-Solving with Fractions

1. Find a fraction between $\frac{2}{5}$ and $\frac{3}{5}$. Explain your reasoning.
2. A recipe calls for $\frac{2}{3}$ cup of milk. If the recipe is doubled, how much milk is needed? Write your answer as an equivalent fraction.
3. Create two fractions that are equivalent to $\frac{4}{6}$. Explain how you found them.

Section 5: Visual Comparison

1. Which fraction is greater? How do you know?

2. Look at the two fractions below. Without calculating, explain which one is closer to 1:
   a). $\frac{5}{6}$
   b). $\frac{3}{4}$