An Institute of

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

Diverse Learners, Multiple Possibilities: Differentiated Instruction in Primary Mathematics

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INSPIRING LEARNING
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Dr Dawn Ng (2 Jun 2022)

What is Differentiated Instruction?

From Tomlinson and Allan (2000):

- Differentiated instruction is defined as ‘simply attending to the learning needs of a particular student or small group of students rather than the more typical pattern of teaching the class as though all individuals in it were basically alike’ (p. 4).

- Differentiated instruction was ‘a way of thinking about teaching and learning’ (p. 13) - not an instructional strategy nor a recipe for teaching nor something that a teacher did to fill a gap in the teaching programme.

Differentiated Instruction as a “Teaching Philosophy”

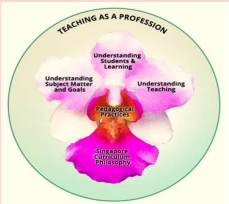
A set of Beliefs - Here are some of them:

- Students of the same age differed in terms of their readiness to learn, their learning styles, their interests, their experiences and backgrounds.
- These differences were substantial enough to warrant the students being taught different things at different speeds and with different support.
- Students learnt best when an adult (a more knowledgeable other) pushed them just beyond the point where they could work without assistance. ***Zone of Proximal Development***
- Students learnt best when a connection was made between the curriculum content and their personal interests and experiences.

[Tomlinson, 2000]

Differentiated Instruction as a Refinement to Existing Good Practices: A Simplified Mind-Map

STP Framework:



Knowledge Bases

- Understanding Subject Matter and Goals
- Understanding Students and Learning
- Understanding Teaching

\+ Mathematics Pedagogical Content Knowledge

Teaching Mathematics

Differentiated Instruction

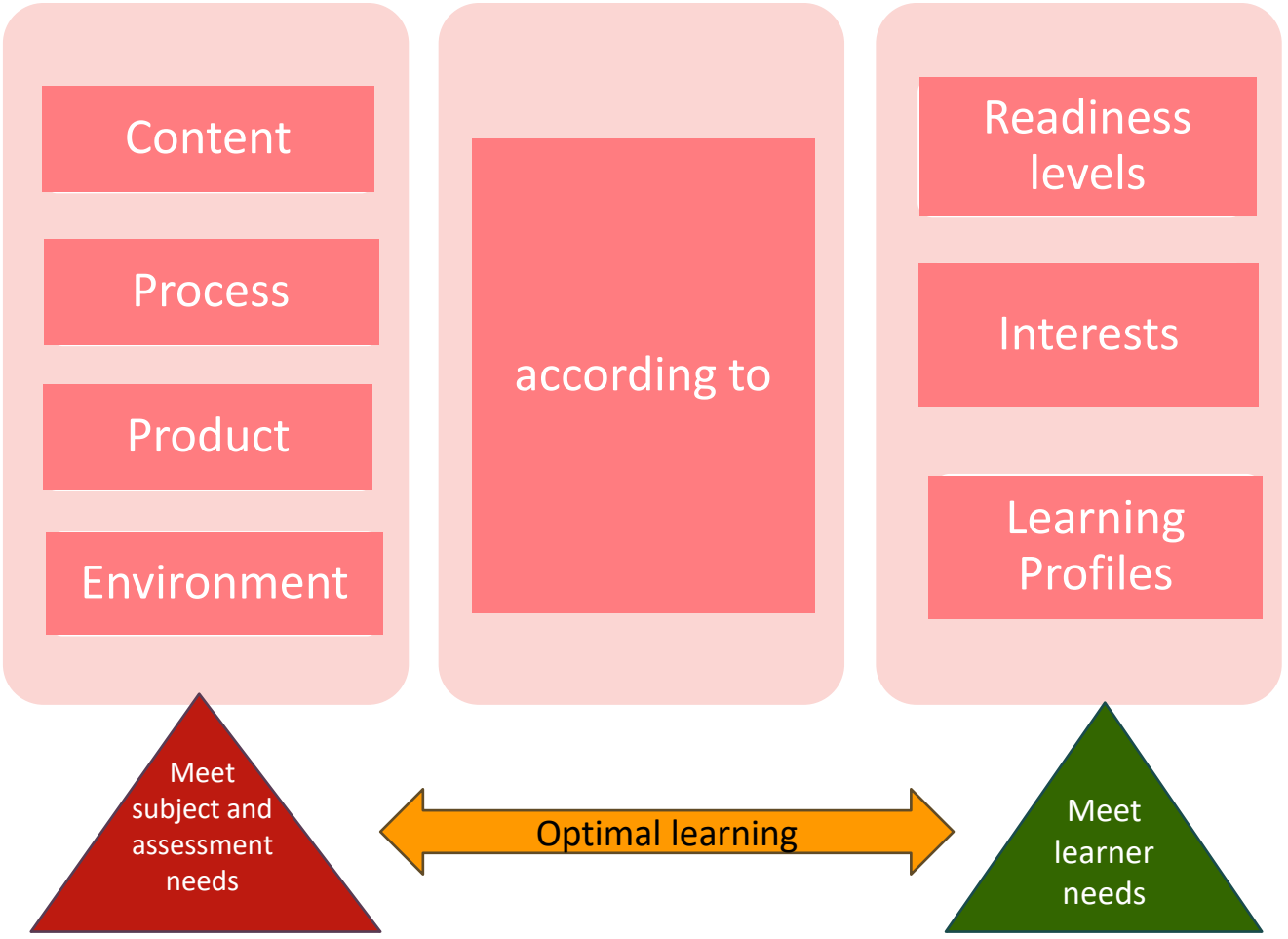
Whole Class Teaching Approaches

Some Strategies

- Small Group Learning (e.g. Jig-Saw, Learning Stations, Whiteboarding, WebQuest)
- Teaching Up (see Tomlinson & Javius, 2012)
- Providing different scaffolding for different readiness levels
- Task design/choice (Bloom's Taxonomy, Tomlinson's Equalizer Buttons)

A Framework & Principles of Differentiation (Tomlinson, 1999)

A Framework for DI: Teachers can differentiate by…



Interwoven and Connected:

Content - what pupils learn (*ideas, concepts, descriptive information and facts presented to students*)

Process - how to make sense of content, ideas & skills (*activities, teaching methods, thinking skills*)

Product - how pupils demonstrate what they have learnt (*outcomes from the activities, tasks*)

Learning environment - the conditions for optimal learning *(physical setting, psychological and virtual environment)*

Differentiation by Content

E.g. P3 SIO – List equivalent fractions of a given fraction with denominator not greater than 12.

Teacher has already introduced equivalent fractions to the whole class using paper folding, shading diagrams (C-P-A used).

But some students are more ready than others in understanding the following:

- Equivalent fractions have the same value – without having to rely on visuals.
- Many equivalent fractions can be generated from the same fraction.

Teacher use DI after whole class teaching.
This lesson is to set the stage for the next SIO: “fractions in simplest form”.

Differentiation by Content

E.g. P3 SIO – List equivalent fractions of a given fraction with denominator not greater than 12.

Group 1:
(Consolidate idea – many equivalent fractions can be generated from the same fraction)

- show using fraction discs/strips
- shading

*important to link these to ___=___=___=___ written representation.

Differentiation by Content

E.g. P3 SIO – List equivalent fractions of a given fraction with denominator not greater than 12.

Group 2:
(Consolidate idea – generate equivalent fractions without hands-on, explain why they are equivalent)

- video lists a few examples - students continue to generate equivalent fractions of a given fraction.
- students draw to help explain why the fractions are equivalent – can use a game (pair work)

Differentiation by Content

E.g. P3 SIO – List equivalent fractions of a given fraction with denominator not greater than 12.

Group 3:
(Challenge – shorter way to generate equivalent fractions – prelude to multiplication method)

- use patterns, inductive reasoning
- teacher questioning to help students see pattern

Differentiation by Product

E.g. P3 SIO – List equivalent fractions of a given fraction with denominator not greater than 12.

Group 1:
Consolidate idea – many equivalent fractions can be generated from the same fraction – show and tell, simple worksheet with shading.

Group 2:
Consolidate idea – generate equivalent fractions without hands-on, explain why they are equivalent – pair work, game, drawing.

Group 3:
Challenge – shorter way to generate equivalent fractions – prelude to multiplication method – patterns/inductive reasoning.

Group 4:
Error analysis – identify errors in equivalent fractions, explain error.

Differentiation by Process

E.g. P3 SIO – List equivalent fractions of a given fraction with denominator not greater than 12.

Group 1:
Consolidate idea – many equivalent fractions can be generated from the same fraction – show and tell, simple worksheet with shading. Use of teaching aids, teacher modelling, individual work.

Group 2:
Consolidate idea – generate equivalent fractions without hands-on, explain why they are equivalent – pair work, game, drawing. Video, pair work.

Group 3:
Challenge – shorter way to generate equivalent fractions – prelude to multiplication method – patterns/inductive reasoning. Group discussion using worksheet, teacher questioning at the end.

Group 4:
Error analysis – identify errors in equivalent fractions, explain error. SLS platform, teacher gives (written) individual feedback after.

Differentiation by Learning Environment

E.g. P3 SIO – List equivalent fractions of a given fraction with denominator not greater than 12.

Group 1:
Consolidate idea – many equivalent fractions can be generated from the same fraction – show and tell, simple worksheet with shading. Use of teaching aids, teacher modelling, individual work.

Group 2:
Consolidate idea – generate equivalent fractions without hands-on, explain why they are equivalent – pair work, game, drawing. Video, pair work.

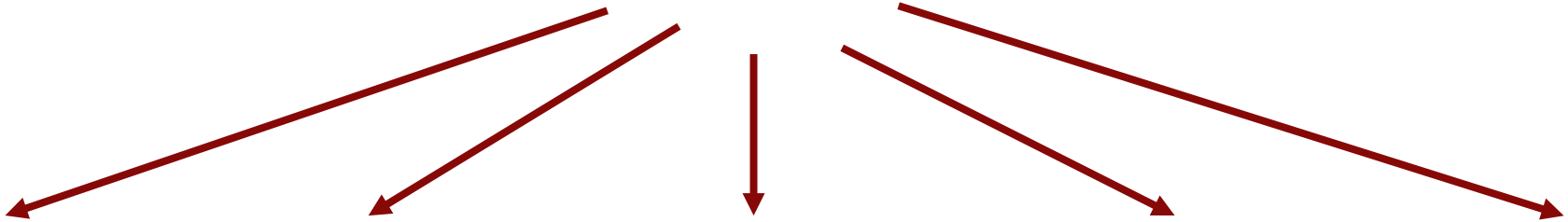
Group 3:
Challenge – shorter way to generate equivalent fractions – prelude to multiplication method – patterns/inductive reasoning. Group discussion using worksheet, teacher questioning at the end.

Group 4:
Error analysis – identify errors in equivalent fractions, explain error. SLS platform, teacher gives individual feedback after.

Principles of Differentiation

Teacher's response to learners' needs and profile

guided by



- Pre- & on-going assessment & adjustment of tasks
- Respectful & challenging tasks which are aligned to learning goals
- Focus on key knowledge, understandings, and skills
- Emphasis on making meaning & higher-level thinking
- Flexible grouping and choices

Planning for DI: Some Considerations

Interwoven

- Identify SIO and pre-requisites
- Decide whether you would use a combination of whole class teaching and small group learning to help students attain the SIO.
- Lesson Plan – 4 interconnected sections

  Lesson Introduction → Getting the students ready for the SIO

  Lesson Development → Addressing the SIO

  Consolidation → Let students show you whether they have attained the SIO with assistance or independently

  Closure → Summarising key learning (take-home messages)

Where does Differentiated Instruction come in and how?

Interwoven

- Teaching Up
- Flexible Grouping
- Respectful Tasks

- How and when would you use pre- and on-going assessments (as formative assessment) to inform teaching and learning?