Differentiation in the Elementary Mathematics Classroom

VVCTM Fall Conference
October 7, 2014

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Differentiation in the Elementary Mathematics Classroom
By the end of the session, you should be able to:

* Examine the K-5 mathematics curriculum through a differentiation lens

* Envision and plan for your mathematics classroom as a differentiated learning experience

* Identify ways your mindset and your classroom environment are helping or hindering effective differentiation

* Walk away with instructional strategies and activities that you can immediately implement in your classroom
Differentiation is a way of thinking about teaching and learning that is learner-centered. It is a framework for planning instruction. 

Tomlinson & Sousa, 2011
Differentiation is a teacher’s response to learner needs shaped by a growth mindset.

Tomlinson & Sousa, 2011
Do you think each statement is never true, sometimes true, or always true? Why?

* All students can master important mathematics content.
* Students’ level of mathematics achievement is changeable.
* It is the role of the teacher to enlist the student effort necessary for success.
Differentiation is

a teacher's response to learner needs

shaped by a growth mindset

and guided by five general principles of differentiation:

- respectful tasks
- quality curriculum
- flexible grouping
- ongoing assessment
- building community

Tomlinson & Sousa, 2011
Goals of Mathematics

Mathematical Proficiency

Conceptual Understanding
Productive Disposition
Adaptive Reasoning
Procedural Fluency
Strategic Competence

National Research Council, 2001
Differentiation is a teacher’s response to learner needs shaped by a growth mindset and guided by five general principles of differentiation:

- Respectful tasks
- Quality curriculum
- Flexible grouping
- Ongoing assessment
- Building community

Tomlinson & Sousa, 2011
Reflection Questions

* Does the work that I ask my students to do generally support them in becoming thinkers and problem solvers?

* What structures, routines, and procedures do you use to help students understand, accept, value, and support their commonalities and differences as learners?

* How do you flexibly use space, time, groupings, resources, strategies, and materials in your classroom to address variability in student needs?

Tomlinson & Sousa, 2011
Teachers can differentiate through according to students’ readiness and interest by using a variety of instructional strategies such as Menus, Centers, Stations, Choice Boards, Tiered Problems/Games, Parallel Tasks, Open Questions, Choice, Anchor Problems & Extension Problems.

Tomlinson & Sousa, 2011
What about learning profiles, styles, modes?

* Research shows us that people are not defined by learning profiles, styles, or modes (Hattie, 2012).

* Instead, we should use multiple teaching styles.

* Students’ learning preferences are part of situational interest.
Teachers can differentiate through content, process, and product according to students’ readiness and interest by using a variety of instructional strategies such as Menus, Centers, Stations, Choice Boards, Tiered Problems/Games, Parallel Tasks, Open Questions, Choice, Anchor Problems & Extension Problems.

Tomlinson & Sousa, 2011
Content

* what you teach

* Mathematical Content Standards:

- Number & Operations
- Algebra
- Measurement
- Data Statistics & Probability
- Geometry
Differentiate Content by Interest

Students will be assigned to small groups based on their entrance survey about interests (baseball, playing musical instruments, ancient civilizations, or planets). The small group will solve a measurement problem based on their context of interest.

What is the same about the task for all students?

What is different for different students?
Differentiate Content by Interest

- Choice Menu
- Dinner Menu
- Three-in-a-row Board
- Anchor Problem & Extension Problems

What is the same about the task for all students?
What is different for different students?
Process

* how students engage with the content

* Mathematical Process Standards:
Differentiate Process by Interest

Various manipulatives/tools (cm cubes, inch cubes, foam peanuts, sand, rice, beans, inch tiles, and rulers, yarn, measuring tape) will be provided. Students will choose two different manipulatives/tools to measure lengths and compare.

What is the same about the task for all students?
What is different for different students?
Differentiate Process by Interest

- Students choose to work alone, with a partner, or with a small group.
- Students choose materials and resources.
- Students choose strategies.
- Teacher may select and provide materials, resources, and strategies based on students' interests.
Wise Seating Choices

* https://www.teachingchannel.org/videos/unique-student-seating-strategy

* How is the teacher creating classroom routines that support differentiating the process by interest?
Product

* what students produce
* how students show what they know
* Mathematical Process Standards:
Differentiate Product by Interest

Students will choose to create a picture glossary, an anthology of acrostic poems, or a concept map to show different types of graphs.

What is the same about the task for all students? What is different for different students?
Differentiate
Product by Interest

- Multiple Genres
- Multiple Representations
- Connections to Self, World, Math, Other Content Areas

What is the same about the task for all students?
What is different for different students?
Teachers can differentiate through 

- content
- process
- product

according to students’

- readiness
- interest

by using a variety of instructional strategies such as

- Menus, Centers, Stations, Choice Boards, Tiered Problems/Games,
- Parallel Tasks, Open Questions, Choice,
- Anchor Problems & Extension Problems

Tomlinson & Sousa, 2011
Reflection Questions

* Do you listen to and engage students in conversations about their interests?

* Do you provide interest-based work options to students? Do you invite students to propose interest-based work options?

* Have you developed classroom routines and procedures that support students in working with varied materials, strategies, and in varied group configurations?

Tomlinson & Sousa, 2011
Teachers can differentiate through according to students' content process product by using a variety of instructional strategies such as 

Menus, Centers, Stations, Choice Boards, Tiered Problems/Games, Parallel Tasks, Open Questions, Choice, Anchor Problems & Extension Problems

Tomlinson & Sousa, 2011
Readiness

* “an individual’s current proximity to, or proficiency with, a specific set of UKDs”

* zone of proximal development (ZPD)

* where a student lies on the continuum of mastery along a learning progression or learning trajectory

Tomlinson & Sousa, 2011
What is a learning progression?

* A developmental learning progression is a sequence of levels of understanding, knowledge, and skills within mathematical content and process standards.

* big idea + progression of strategies + mathematical models (representations/tools)

* Students’ movement through learning progressions depends on each individual’s experiences engaging in mathematical tasks. (not age/grade level)

* Teachers are responsible for evaluating where individual students are along each learning progression and creating appropriately challenging tasks to support their development along the progression.
Content Learning Progressions

- Counting
- Concept of Ten
- Addition and Subtraction Problem Types
- van Hiele Levels of Geometric Thinking
- Measurement

Look for the three parts of a learning progression in each.
Differentiate Content by Readiness

Students will complete one of the three tiered problems: comparing lengths within one metric unit (low), comparing lengths within metric system (mid), comparing lengths between U.S. and metric system (high). Students will be assigned one problem based on a preassessment.

What is the same about the task for all students? What is different for different students?
Differentiate Content by Readiness

Students will find quotients based on three levels of numbers: small numbers related to basic facts (low), two- and three-digit numbers without remainders (mid), two- and three-digit numbers with remainders (high). Students will be assigned one problem based on preassessment.

What is the same about the task for all students?
What is different for different students?
Differentiate Content by Readiness

- Open Questions
- Parallel Tasks, Tiered Problems and Tiered Games
- Adjusting Numbers

What is the same about the task for all students?
What is different for different students?
Look for the three parts of a learning progression in each.
Students will find equivalent area measurements using unlimited inch tiles (direct modeling), 10 inch tiles (skip counting/repeated addition), or only calculators (derived facts).

What is the same about the task for all students?
What is different for different students?
**Differentiate Process by Readiness**

Students will be partnered for the game based on low/mid and mid/high readiness levels according to yesterday’s exit slip assessing knowledge of 3D shape vocabulary. Students will be partnered for the game based on low/mid and mid/high readiness levels according to yesterday’s exit slip assessing knowledge of 3D shape vocabulary.

What is the same about the task for all students?
What is different for different students?
The Worm Problem
What will the worm look like on Day 10? Day 100? Day D?
Worm Problem

* What different representations are students using to problem solve?
* How has the teacher created a classroom environment that supports differentiating the process by readiness?
Differentiate Process by Readiness

- Assign partners: low/mid & mid/high
- Make specific materials/resources available
- Make specific strategies

Wednesday, October 8, 14
Differentiate Product by Readiness

Students will sort 3D shapes and create a bar graph to represent their sort. Group 1 (low) will be provided with a bar graph on graph paper with a title, blank lines for axes labels, and a single increment scale. Group 2 (mid) will be provided with a bar graph on graph paper with blank lines for title and axes labels and a scale by 2s. Group 3 (high) will be provided with blank graph paper.

What is the same about the task for all students?

What is different for different students?
Differentiate Product by Readiness

* Give a story context, write an equation and solve.
* Given an equation, write a story and solve.
* Given an answer, write a story and an equation.
* Provide varying levels of support for organization and labels.
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Tomlinson & Sousa, 2011
Reflection Questions

* Will you administer a preassessment far enough in advance of the unit to have time to plan based on what you learn about student readiness?

* Have you identified key points in the unit where students are likely to fall behind, develop misunderstandings, or move ahead rapidly?

* Are you using student work time to meet with or teach small groups and to monitor student work and progress?

Tomlinson & Sousa, 2011
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- product

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