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Research Into Practice MATHEMATICS

Differentiated Instruction

Reaching All Students

A classroom is very similar to a bus station. Student passengers arrive from a montage of backgrounds with very different needs. They form a mosaic of diversity—academically, culturally, linguistically, economically, socially, and motivationally. The road to their adult destinations will demand different routes.

Additionally, the inclusion of non-English speaking students and those with different learning styles and disabilities cause teachers and administrators to re-evaluate and identify instructional strategies that cater to a wide variety of learning profiles. Unfortunately, the "teaching to the middle" approach used in many classrooms does not provide optimum learning opportunities for such diverse student populations. We know that not all students are alike, yet they are often faced with participating in a "one-size-fits-all" lesson despite their individual knowledge and skills. The result is alarming. Classrooms are filled with disengaged, bored, and unsuccessful students. What can you do to help all of your students reach their full potential? Differentiate your instruction!

What Is Differentiated Instruction?

According to Webster, differentiation is ". . . to make unlike, to develop specialized differences in. . . " (Webster, 1980). Differentiated instruction does not change WHAT is taught; it changes HOW it is taught. It is teaching with student variance in mind. Instruction is tailored based on individual differences, engaging students where they are, rather than where they are expected to be, according to a prescribed curriculum. Teachers modify their instructional strategies to create appropriately different learning experiences for different students. Strategies to differentiate instruction focus on three key areas:

- the pace at which the student learns,
- depth of knowledge and understanding, and
- student interests.

Differentiated instruction is an important tool for engaging students while providing for individual needs. Teachers must have very specific learning objectives and provide multiple learning pathways to those objectives. Clear learning objectives are customized to challenge students as they use their knowledge to organize and make sense of ideas and information. It is important to note that differentiation is not a single instructional strategy but rather a methodology that blends a variety of strategies. Diversity in assignments, products, and pacing allow students to work at their own level of challenge and achieve their own levels of success.

Basia Hall

Basia Hall currently serves as Manager of Instructional Programs for the Houston Independent School District-East Region. With 33 years of teaching experience, Ms. Hall has served as a teacher, department chair, instructional specialist, instructional supervisor, a school improvement facilitator, and a professional development (TEXTEAMS) trainer. Ms. Hall has developed curriculum for Algebra 1, Geometry, and Algebra 2 and contributed to the development of the Texas Essential Knowledge and Skills. A recipient of the Presidential Award for Excellence in Mathematics Teaching, Ms. Hall has co-authored several NSF-funded mathematics education resources, as well as online distance math education courses.

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Identifying Student Needs

Just as a clothing designer must consider a customer's size, style preferences, intended garment use, other styles, fashion trends, and fabrics when creating his garment, a teacher must learn about his students in order to identify the uniqueness and strengths of each learner. Assessing students at the beginning of the year enables one to identify attitudes, interests, and learning styles. Using the students' Lexile information and administering short reading comprehension assessments using text materials provides insight into individuals' reading abilities. Pre-assessing students prior to beginning instructional units of study allows for the determination of the level of background knowledge, skill, and understanding. Using these findings, teachers can begin to build a skills and interest inventory for each student.

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Ways to Differentiate Instruction:

Three elements of the curriculum can be differentiated: the content, the process, and product (Tomlinson, 2001).

1. Differentiating the Content

The content refers to the knowledge and skills that students are to learn. Differentiating the content requires that students are pre-tested so teachers can identify students who do not require direct instruction. Those students who demonstrate understanding of the majority of the concepts are not required to participate in direct instruction and may instead use different textbooks with different reading levels, or proceed to apply the concepts to problem solving and enriched or accelerated study.

2. Differentiating the Process

The process is the performance task that enables students to practice and make sense of the content. Differentiating the process provides students with alternative paths to explore the concepts. Students may, for example, create a graphic organizer to illustrate their comprehension of a particular concept. By modifying the complexity of the graphic organizer for certain students, the teacher can provide multiple levels of cognitive processing for those with varying abilities.

3. Differentiating the Product

The product is the outcome of the lesson—an assessment or project. Differentiating the product varies the complexity of the medium that assesses students' mastery of the concepts. For example, students may be offered a choice of projects and those working above grade level may be required to produce work that requires more complex thinking.

The nature and extent of the differentiation depends on student readiness, interest, and learning profile. Student readiness is an evaluation of the student's prior knowledge, understanding, and current skill level. Interest refers to topics that motivate a student or peaks one's curiosity. The learning profile includes the learning style (visual, auditory, tactile, kinesthetic), grouping preference (individual, small, or large group), and environmental preference (quiet area,

large or small area). Teachers may differentiate instruction based on any one or combination of these factors (Tomlinson, 1999).

Some Strategies for Differentiating Instruction:

Differentiation is not about creating an individualized daily lesson plan for each and every student. Due to class sizes, state and district mandates, and many other factors, few teachers realistically have the time, resources, or energy to differentiate to that degree. Differentiation is about understanding the needs and abilities of your class and providing alternatives within multiple, but manageable constraints. The following strategies provide some options for differentiating instruction. The focus of each strategy is listed in parentheses.

Tiered Assignments (Readiness)
Tiered assignments are designed to instruct all students on the same objectives but at different levels of complexity and open-endedness. There may be two or more tiers per assignment. The tasks at each tier allow students to process the information and gain understanding at their own ability level.

Example:
Pattern Block Math
Tier 1: Identify all the ways you can group your pattern blocks.
Tier 2: Identify all the different patterns you can make with your blocks.
Tier 3: Create a bar graph to show all the different kinds of pattern blocks.

Compacting (Readiness)
Compacting is the process of modifying instruction by determining those basic skills students have already mastered. The practice or repetition of those skills is replaced by more challenging options. Alternatives may include enrichment or accelerated study.

Example:
A class is learning to identify the place values during its study of decimals. Pre-tests show that six students already know them. These students will work on math enrichment when known concepts are presented in class. The six students will work with the class on days when the instructional topic is a concept they have not yet mastered.

Centers or Groups (Readiness/Interest)
Interest groups are usually used with secondary students, while interest centers are generally used with elementary students. Both centers and groups are designed so that learning experiences relate to a specific interest. Students may select a topic generating increased motivation.

Example:
Centers are small-group stations that let students work together on high interest tasks such as puzzles, problems using manipulatives, and brain teasers. A center may focus on the practice of operations with whole numbers.

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Groups give students opportunities to research, problem solve, and work cooperatively. An interest group in an Algebra I class is researching and creating a presentation using technology on the transformations of functions.

Learning Contracts (Readiness/Learning Profile)
A learning contract is a written agreement between the teacher and student. The teacher specifies the concepts and skills to be learned and the required components of the assignment. The student identifies the methods for completing the tasks. The contract allows the student to work independently while setting daily and weekly work goals and developing management skills. It also eliminates unnecessary skill practice.

Example:
Students are learning to identify, describe, and compare the relationships between parts of circles. Students have the choice of using textbooks, Internet sources, or teacher-provided materials. All students must complete the first activity.

1. Read at least two of the given resources, define and compare circle vocabulary using words, numbers, and illustrations.
2. Verify the accuracy of pi using at least six different–sized circular objects, and document the results.

The second activity requires the student to select a task from a list—such as creating a center with activities, planning a presentation with technology, conducting an interview with an engineer/architect, reading and writing a report, creating and writing a product (song, story, poem, etc.) related to the concept of circles.

Flexible Grouping (Readiness/Interest/Learning Profile)
Grouping is called "flexible" when students are not assigned to the same group for each task or area of study. Students may be placed in a group based on readiness, interest, and/or learning profile. Teachers or students may designate groups. This flexibility allows students to interact with a variety of their peers without being identified with any specific group or ability level.

Example:
Algebra 2 students often begin the year with widely varied skills. The teacher may use whole group instruction to review key concepts and skills and then assign groups, based on readiness, to work cooperatively to apply the concepts and skills in problem–solving situations of varying difficulty.

Cubing (Readiness/Interest/Learning Profile)
Cubing is a strategy that helps students perceive an idea or concept from six different points of view. Each of the six faces of a cube represents a different perspective for an idea. A student rolls the cube and completes the activity that is displayed on the top face of the cube. The tasks on each face vary in difficulty, and not all students/groups receive the same cube. The tasks may be differentiated by readiness, interest, and/or learning profile. The sides of the cube may contain the following prompts:

Side one—Describe it, recall, name, locate, list
Side two—Compare it, contrast, explain, write
Side three—Associate it, connect, make design
Side four—Analyze it, review, discuss, diagram

Side five—Apply it, propose, suggest, prescribe
Side six—Argue for/against it, debate, formulate, support.

Example:
A class is studying fractions. A cube has each of the following displayed on a different face.

1. Locate It—In two minutes, list all of the places we find fractions in everyday life.
2. Define It—What is a fraction? How would explain a fraction to a friend who was absent from class today?
3. Solve It—Complete the problems 1–5 on page 106. Be sure to show all of your work and illustrate each with a diagram.
4. Review It—What are the names of the parts of a fraction? How do they relate to one another?
5. Analyze It—Why do you have to invert the divisor and then multiply when dividing fractions? Draw a diagram to support your answer.
6. Connect It—Create an illustrated story, rap, or poem about fractions.

Independent Study Projects (Readiness/Interest/Learning Profile)
Independent study projects are research projects where students develop the skills for independent learning. The ultimate objective of this strategy is to encourage and prepare the learner to initiate, direct, and complete his own project in areas which are of personal interest and value. The degree of structure and assistance from the teacher will vary depending on the student's ability to manage time and productivity.

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Summary

Differentiated instruction offers a variety of approaches to what students learn, how they learn, and the method they use to demonstrate mastery of their learning. It engages students and allows them to take greater responsibility and ownership for their learning, while providing opportunities for peer teaching and cooperative learning. In order for students to reach their full potential, we must teach content effectively, and we must teach students effectively. Differentiated instruction provides a vehicle for meeting students' needs.

"The fact that students differ may be inconvenient, but it is inescapable. Adapting to that diversity is the inevitable price of productivity, high standards and fairness to kids." – Theodore Sizer (1985).