

Dimension 2: Meeting Individual Needs

This dimension is about how the teacher ensures that all students have the best opportunity to make sense of mathematics by using a variety of lesson styles and by differentiating instruction. Every student should feel that mathematics is something he or she can learn.

LESSON STYLES

One way for teachers to meet a range of student needs is to use different styles of lessons.

Some lessons could be taught using a direct instruction approach where students are helped to understand a mathematical skill, concept, or procedure in a fairly uniform way under the direction of a teacher. This makes the most sense when students are introduced to rules or approaches that have been externally selected to be standard (conventions). In certain circumstances, sometimes struggling students benefit from this very direct modelling.

In other situations, a more guided lesson format is appropriate. A guided approach is where students move toward a common goal or set of understandings, but they have a significant participatory role in the development of those understandings, under the guidance of a teacher. As with direct instruction, some content suits this approach better than others. For example, if students are problem solving, they might be guided up to a point to ensure they understand the problem but be allowed to make a plan and carry it out on their own, using their own strategy, which might be different from other students.

In still other situations, students should explore mathematics through open exploration and/or investigation. In these situations, students are not all necessarily going to end up with the same information, and may not even be working on the same topic. This lesson style allows students to participate to the greatest extent they find possible. For example, students might be presented with an addition situation and allowed to invent their own strategy for coming to terms with adding unfamiliar numbers. Follow-up discussion is particularly important with this lesson style, to enhance/highlight various mathematical processes such as reasoning, communication, and problem solving.

DIFFERENTIATED INSTRUCTION

Differentiated instruction is a means for tailoring instruction to meet the needs of different groups of student. Some students

- need assistance because English is not their first language
- have reading difficulties or lack prerequisite skills and concepts
- have learning disabilities
- have a special interest or talent in mathematics and may need enrichment programs and/or an additional challenge
- are at different phases of development

It is important to involve low-achieving students in the full range of tasks that are found in a mathematics program, from the practice of basic skills and the application of procedures to more complex rich problem solving.

DIFFERENT LESSON STYLES

Teachers can vary instructional approach using these three lesson styles:

- direct instruction
- guided activity
- exploration and/or investigation

All students benefit from a variety of lesson styles simply because different students have different personal learning preferences.

Differentiation is a way of thinking about teaching and learning that recognizes that students are individuals and that they learn in different ways and at different rates.

Scaffolding

Teachers can differentiate instruction by providing more support during various parts of the lesson in the form of scaffolding. Scaffolding provides the additional links some students need to connect concepts and relationships. The teacher can provide scaffolding by

- using graphic organizers, such as tables and webs to get them started
- providing more supporting visuals
- using smaller sentences and fewer words
- using the same math concept but using smaller numbers
- providing blanks and boxes for students to record solutions and answers
- using questions/problems that have been broken down into more steps
- providing activities that have sequenced questions that build on previous ideas
- providing hint boxes and vocabulary reminders
- highlighting key words or numbers

Scaffolding is a temporary support that enables students to achieve at a higher level of performance than they would be able to reach on their own. This support is gradually removed to encourage independence.

Varying Tasks, Tools, and Time

Teachers can also differentiate instruction by

- using mathematics problems that range in the degree of difficulty
- using contexts that students are familiar with and interested in (see sample context in the margin)
- creating centres that allow students to explore mathematical concepts beyond regular class activities
- developing individual math agendas for students to give them specific activities and investigations when they have free time
- making manipulatives and calculators available to all students at all times
- allowing more time to complete tasks
- providing tools; for example, students who are having difficulty learning multiplication facts can use a multiplication table when solving problems, if the focus is on problem solving and not on recall of multiplication facts

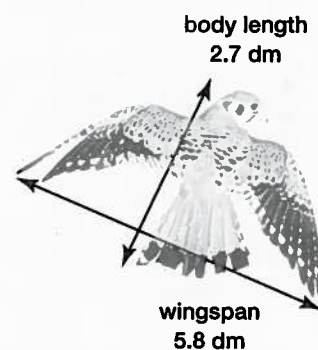
Teachers can also allow students to respond using different forms of communication for the tasks assigned in class. If some students have difficulty with written communication, then they can explain orally and physically using manipulatives to demonstrate.

Varying Physical and Grouping Arrangements

Teachers control the learning environment through their classroom expectations and norms. Teachers can arrange for students to work in small same-ability groups to re-teach an idea or skill or to extend and enrich. Or, students can work in mixed-ability groups, where stronger students can assist in differentiating instruction for weaker students by reading problems aloud and/or scribing for students. Students should be encouraged and expected to work together.

Some students need a quiet space to work while other students need to move about the classroom. Both learning preferences need to be supported by the teacher.

Teachers can provide scaffolding for low-achieving students so that they can learn the same content as other students.



An interesting context in which to engage certain students to work with decimals could be finding the difference between the wingspan and body length of birds.

RESOURCES FOR DIFFERENTIATED INSTRUCTION

Resources that are based on how children learn developmentally are particularly helpful to teachers. Teachers can better understand the sequence in which children learn mathematical concepts and skills and use that information to tailor instruction to individual or small groups of students operating at different cognitive phases. PRIME provides such information for teachers through developmental maps that show how children learn math in each of the strands: Number and Operations, Patterns and Algebra, Data Management and Probability, Measurement, and Geometry. PRIME also provides specific instructional strategies for making adaptations for individual students.

Many mathematics textbook programs now assist teachers with differentiated instruction by providing alternative questions and problems, activities for low- and high-achieving students, and blackline masters with scaffolded questions and problems.

HOW THE ADMINISTRATOR CAN SUPPORT THE TEACHER

The administrator can help the teacher in this dimension by

- acknowledging teachers who vary their lesson style according to student needs and the math content
- setting up teaching schedules to allow students to move between classrooms, if required, to better differentiate instruction
- setting up spaces where teachers can direct students who need access to the library, technology, or manipulatives not available in the classroom
- encouraging teachers not to teach to the “lowest common denominator,” but to find ways to manageably differentiate instruction
- assisting teachers to work with parents to ensure that expectations for personalized instruction are reasonable
- assisting teachers to work with parents to ensure that they understand that “back to the basics” is not the solution for struggling students
- provide access to professional development activities that focus on how children develop mathematically (such as PRIME)

LINKING THE NCTM PRINCIPLES AND STANDARDS

This dimension links most strongly to the following NCTM principles and standards (see pages 4–7 in Section 1):

- *Equity* by making all mathematics accessible to all students
- *Assessment* by allowing students to demonstrate their understanding in a personal, rather than standard, way
- *Communication* by the acceptance of different forms of communication, whether physical, oral, and/or written

PRIMECONNECT

- PRIME Developmental Maps
- *Guide to Using the Developmental Maps*
- *Diagnostic Tools*
- *Background and Strategies*

Each strand of PRIME has these components that are designed to assist teachers in differentiating instruction according to the developmental phase in which a student is performing.

(See page vii.)