Essentials of Differentiated Instruction

Differentiated instruction involves:

- using assessment to gather information about students' readiness, interests, and learning preferences
- using the information to differentiate the learning environment, instruction, assessment, and evaluation
- selecting from a varied repertoire of strategies to meet the needs of students

Differentiated instruction is effective instruction that is responsive to students' readiness, interests, and learning preferences. Readiness refers to the student's starting point for learning, relative to the concept being studied. Attention to the students' interests enhances the relevancy of learning by linking new information to students' experiences, and enthusiasm. Learning preferences describe the many different ways in which learners prefer to acquire, process, and work with information. Learning preferences are influenced by gender, culture, classroom environment, learning styles, and multiple intelligences. All three characteristics of the learner—readiness, interests, and preferences—allow educators and students to build new learning through connections to existing knowledge and preferred ways of working. Differentiating instruction for students in a meaningful way depends on the ongoing use of assessment to gather information about where students are in their learning and about their readiness, interests, and learning preferences.

By attending, at various times, to a learner's readiness, interests, and learning preferences, we increase the likelihood that students will be able to build new learning through connection to existing knowledge and preferred ways of working and that they will be engaged in the learning. (Reach Every Student Through Differentiated Instruction, Ontario Ministry of Education, 2009)

The Composition of Our Classrooms

Since the first schoolrooms, a student body has been composed of groups of individuals. Today, our classrooms are more cohesive in terms of age grouping, but certainly not in terms of background or learning style. In a single high school classroom, learners walk through the door with many individual characteristics that contribute to their learning profile, including ethnicity, linguistics, learning style, family environment, and socio-economic background.

Start with Reflection on Individual Potential

One of the best tools every teacher has in their repertoire is reflection. A reflective teacher is capable of adapting, changing, and improving. A reflective teacher collects a purposeful set of data from learners to reflect upon. He or she will use that data to understand the learners and form their next set of instructional and assessment practices; with the goal of student achievement by moving each student to their next level of success. Students learn best when they are challenged to learn new concepts that are developmentally appropriate for them (Flick, 2000). When teachers plan for flexible pacing of new learning and are poised to support and guide students to reach their potential, students can achieve the most. Sometimes, pacing and sufficient learning time are the most important components of instructional differentiation. Provide each student the necessary time in which to reach his or her potential and reflect on the information they are giving you as much as you possibly can.

Both the Student Textbook and Teacher's Resource for *Science Links 9* provide learning and assessment resources ready for your students to use routinely, or for them to choose from when appropriate. These resources, in the form of textbook activities, instructional suggestions, and Blackline masters, include ways to learn and ways to demonstrate learning that are designed for particular learning needs.

Who They Are, What They Know, How They Investigate, How they Communicate

First, reflect on what you know about your students in the context of what will shape their learning experiences. One of the characteristics that determines the ways students learn is learning styles. We can use Howard Gardner's Multiple Intelligences theory to help us understand the many ways in which students like to, and do, process information and experiences. In this table, each of the intelligences is described and some suggested activities that are effective for engaging each type of intelligence are delineated.

Next, to get an idea of the dominant learning styles of the students in your class, consider utilizing one or some of the learner profile assessments available on-line, through educational subscriptions, or through your school's career education programming. In addition, watch and observe students in the first weeks of class to gather information and build a sound, but flexible, picture of who they are and how they learn.

INTELLIGENCE	DEFINITION	STUDENT LIKES…	LEARNING ACTIVITIES
Linguistic	• the ability to develop verbal skills and sensitivity to the sounds, meanings, and rhythms of words	• reading literature, playing word games, making up poetry and stories, discussions, debating, and telling jokes	• have a debate • write a news article • interview a scientist about… • create a report
Spatial	• the ability to think in images and pictures, to visualize accurately and abstractly	• to draw, paint, design, and create • tasks that require visualizing, pretending, imagining, and forming mental images	• chart, map, cluster, or graph • illustrate, paint, sketch, sculpt • create a slideshow or photo album of your trip to… (e.g., space, Earth's core) • create a poster or flyer
Logical-Mathematical	• the ability to think conceptually and sequentially and to discern logical or numerical patterns	• to conduct experiments, solve puzzles and other problems, ask cosmic questions, and analyze circumstances and people's behaviour • working with numbers and mathematical formulas and operations, and the challenge of a complex problem to solve	• design and conduct an experiment • describe the patterns or symmetry in… • create a mathematical formula • develop a code for… • measure • classify
Bodily-Kinesthetic	• the ability to control one's body movements and to handle objects skillfully, to learn through tactile experience	• to perform a task after seeing someone else do it first • to demonstrate to someone else how to do something	• role play • build or construct a… • create movements to explain… • conduct a hands-on experiment
Musical	• the ability to produce and appreciate rhythm, pitch, and timbre	• to study and work with music in the background • to play with sounds, beats, and rhythms	• create a rap or song that explains… • experiment with the effects of vibration on… • indicate the rhythmic patterns in… • use a tune to remember… • give a presentation with musical accompaniment
Intrapersonal	• the ability to be self-aware and in tune with inner feelings, values, beliefs, and thinking processes (reflection, meta-cognition)	• to work alone • time to be self-reflective • to be inwardly motivated rather than seek external rewards • to make connections to his/her own experiences	• describe one of your personal values about… • explain your experience with… • assess your own work/beliefs about… • reflect on…
Interpersonal	• the ability to detect and respond appropriately to the moods, motivations, and desires of others	• to learn through personal interactions • team activities • piggybacking ideas on others' thoughts • discussion	• use lab teams • write team positions on… • conduct a meeting to address… • participate in a service project • teach someone about… • write a sequel to…

Another characteristic that determines how students learn is what they have learned previously. Using Get Ready, the diagnostic tool that is presented at the beginning of each unit in the student text, you can assess much more than previous knowledge. Get Ready provides an opportunity to check understanding of concepts, as well as what inquiry skills students are capable of applying and students' level of literacy and numeracy skill. The inquiry, literacy, and numeracy skills checked at the beginning of each unit address those skills that are used often in the upcoming unit. The Concept Checks allow teachers to peer into the window of what students can remember and demonstrate from the last time a similar science topic was presented. Get Ready provides pre-assessment opportunities for you to find out:

- What the student already knows about the big ideas of the unit.
- What standards, concepts, and skills the student understands and is able to apply.
- What further instruction and opportunities for mastery are needed.
- What requires reteaching or enhancement.

With your tool-belt filled with individual learning profiles and diagnostic assessment results, you are ready to plan for differentiation to increase student achievement.

Build Towards a Framework of Differentiation

Each student has a different cultural and academic background; each student has their own set of learning skills and interests. The process of differentiating instruction means to be "responsive to the diverse learning needs and preferences of individual learners. It is a comprehensive framework or organizing structure for how we understand and enact the teaching and learning in our classrooms —all the teaching and learning, not just the instruction we differentiate" (Karen Hume, page 1: Start Where They Are). Whenever a teacher reflects on which instruction/assessment/experience is best and most appropriate for a particular student, and enacts that decision, the teacher is engaged in differentiating to serve the individual learner. However, we can define these opportunities more clearly, as follows.

There are three kinds of differentiation:

1. *Differentiating Content*: When the situation requires it, we may need to differentiate the knowledge, skills or attitudes that we expect of the individual learners. This may be the case in responding to an Individual Education Plan (IEP), which may specify modification and adaptation of curriculum to meet the needs of the student.
2. *Differentiating Process*: Varying learning activities or instructional strategies provides appropriate methods for students to explore concepts. For example, students may be offered a choice (or be required) to use graphic organizers, a listening/video watching centre, maps or graphical data to support or replace narrative reading and writing. They may have different skills and interest in working alone, in pairs or in small groups cooperatively. They may be instructed according to their intelligences profile, or to expand it, as teachers present material variously through song, rhyme, art, skit, and technology. Students require opportunities "to learn in a variety of ways—individually, cooperatively, independently, with teacher direction, through hands-on experiences, and through examples followed by practice" (The Ontario Curriculum, Grades 9 and 10, 2008).
3. *Differentiating Product/Assessment*: Differentiating the product means varying the complexity or type of product/assessment/response that students create to demonstrate mastery of the concepts. Allowing students to "show what they know" using a variety of modalities and media offers them the opportunity to reach their potential by communicating in ways they are able. Assessment tools like rubrics provide a handy method of assessing student achievement when students choose different products to demonstrate the same curricula learning.

Combining Instructional Acumen with Assessment Skill

At the high school level, student choice is, in a nutshell, a good thing. Open-ended inquiry, tasks, assessments and investigations allow students to design their own pathway of learning, inherently providing an assessment context for individual learning, growth self-awareness and reflection. The teacher's role is to provide the varied opportunities for student demonstration of learning with the professional understanding of what guidance and support may be required by each student. This is our Assessment for Learning. Then, assessment drives instruction. We begin with the idea that students may choose or need to demonstrate their learning in the variety of formats, then we design those formats, and then plan the instructional strategies that prepare students for the assessment opportunities and the curriculum to be addressed. Flexibility with respect to instructional strategies is key as students unveil new information about what they have learned and how they learn.

Benefitting from this Teacher's Resource

Teaching strategies in this program have been designed to engage a wide variety of learners. In addition, throughout this Teacher's Resource, you will provided with tips, strategies and tools for further differentiating your instruction. As these opportunities arise, they are denoted by the icon DI, and can be found in the following support structures:

- Unit openers
- Chapter openers
- Activities
- Investigations
- Case studies
- Instructional strategies
- Using the text
- Using the images

Know the Benefits and Limitations of your Instructional Approach

Whatever your preferred pedagogical styles, it is critical to know their benefits and their limitations. As a general rule for any of these approaches, the benefits and limitations are often two sides of the same coin. For example, students may gain comfort and confidence from an approach that includes a lot of structure and repetition. On the other hand, they may be challenged to grow by a more open-ended approach. Similarly, students may be able to make meaningful connections by drawing diagrams. On the other hand, they have a chance to build their vocabulary and provide support for their ideas when asked to respond in words. Be prepared to see growth from all students, in varying degrees, and move to other pedagogical techniques based on the needs that you perceive in the students.

A Final Word on Confidence

If 100 people wrote definitions of the role of the teacher, it would be difficult to find two similar definitions. Consensus eludes us as we search for clarity on what students should learn, to what depth they should learn, how quickly they should learn, and how they should learn. Yet, it is generally agreed that varying the learning experiences of students to meet their learning needs and styles makes sense, and research shows is a successful guiding pedagogical principle (Gregory and Chapman, 2002). Students become more engaged with science when they feel that their teacher works to understand them and considers their unique learning profile. So, get to know your students. Trust your data. Plan different learning experiences and products based on that data. Be prepared to reflect, revisit and revise as new information about the learners' profiles becomes available. Celebrate your students' achievement as they strive to reach their potential.

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