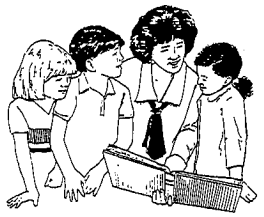
Creating a Differentiated Classroom

by Diane Kinch, Pomona USD, and Cheryl Avalos, Los Angeles



The time has come, the walrus said, to speak of many things, of shoes and ships and sealing wax, of cabbages and kings. —Lewis Carroll

Once upon a time there was an instructional strategy called Individualized Instruction. Theoretically, this was the answer to the classroom dilemma of 35 students at 35 different places in their learning of mathematics. Practically, this was nigh on to impossible for a teacher to accomplish.

Flash forward 30 years and meet a new strategy, Differentiated Instruction, developed by Dr. Carol Ann Tomlinson. Realizing that a teacher cannot adequately plan 35 different lessons for 35 different students every period, Tomlinson (2001), Professor of Educational Leadership, Foundations, and Policy at the University of Virginia, created a model for considering three factors when planning lessons and three aspects of a lesson to plan.

> In a differentiated classroom, the teacher proactively plans and carries out varied approaches to content, process, and product in anticipation of and response to student differences in readiness, interest, and learning needs. (p. 3)

Tomlinson (2000) also states: "Differentiated instruction is a teacher's response to learners' needs guided by general principles of differentiation" (p. 4). Teachers can differentiate the **content** they teach, the **process** they use to teach it, and the **product** made by students in which they prove their understanding of the content. The teacher differentiates these three things by considering students' **readiness** for the material presented, **interests** that may connect to this material, and the **ways** in which students learn.

Content

Differentiating content does not mean teaching different standards or the same standards to different levels of proficiency. Differentiating content means providing different access routes to the content. All students should know, understand, and be able to do all aspects of the standards being addressed.

In a classroom where content is differentiated, students are all actively engaged in learning. There are a variety of print materials available for students. Computers are used to access information on the topic being studied. There are a variety of manipulatives available for students to use, if needed. The teacher is constantly reflecting on how all students, individually as well as the whole group, are accessing the content. The teacher's questions probe for evidence of understanding and the teacher's plans change as a result of this probing.

In the area of content differentiation, teachers can ask themselves these three questions:

- ✔ What are the avenues into my content that students who are English Language Learners can access?
- ✔ Are there highways into my content through different learning modalities?
- ✔ How many connections can I make between my content students' areas of interest?

Process

Process differentiation "means allowing students the time they need to take new ideas, information, or skills through their own filters of meaning" (Tomlinson 2001, p. 79). Creating activities that allow students at different readiness levels to process the content through a lens that matches their learning styles and arouses their interests is at the heart of the differentiating process.

Classrooms in which process is differentiated may have some of the following traits. Activities are tiered to meet the needs of students. Activities address multiple intelligences. Flexible grouping is used. Students have several levels of support—from the teacher, their group members, their activity leaders, etc. The teachers' questioning strategies lead to deeper understanding.

As Einstein said,

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> Most teachers waste their time by asking questions which are intended to discover what a pupil does *not* know, whereas the true art of questioning has for its purpose to discover what the pupil knows or is capable of knowing. (Calaprice, p. 37)

To work on process differentiation, teachers can ask themselves these questions:

- ✔ How can students who learn in diverse ways make sense of what I want them to learn?
- ✔ How do I make sense of this?
- ✔ How do others make sense of this?
- ✔ What opportunities can I give students to make sense of what I want them to learn?
- ✔ What must students know, understand, and be able to do to master this?

Differentiating process means giving students a variety of ways to show us what they know, understand, and are able to do. It is through their product that students take ownership of their learning. Some students show us this via tests, others through a project that may result in a physical model or a lab report. Assessment is formative as well as summative and is inseparable from instruction.

Product

In a product-differentiated classroom, we would expect to see a variety of product choices reflecting multiple intelligences, students working in flexible groups, some students working independently.

To work on product differentiation, teachers can ask themselves these questions:

- ✔ How can students who learn in diverse ways convince me that they have learned?
- ✔ Am I using multiple assessments for making instructional decisions?
- ✔ Do the products students create accurately assess their learning of the standards?
- ✔ Do the assessment instruments I use match the assessments I give?

If you are a teacher considering differentiating instruction, rule number one is to *start small*. Tomlinson (2001) suggests that teachers

> Have a strong rationale for differentiating instruction based on student readiness, interest, and learning profile. Begin differentiating at a pace that is comfortable for you. Time differentiated activities at a pace that is comfortable for you. Use an "anchor activity" to free you up to focus your attention on your students. (p. 32–35)

Begin slowly, adding a new strategy once or twice a year, as you become more at ease with those strategies you already have in place. The article "How Do I Start Differentiating?" on page 37 gives examples of differentiated activities.

> Only teachers who utilize a variety of instructional models will be successful in maximizing the achievement of all students . . . Teachers need to "play to" students' strengths and to mitigate students' learning weaknesses. This can be done only through the use of instructional variety. (Lasley and Matcsynski 2001)

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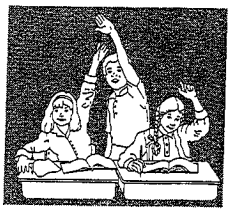
MATHCOUNTS

MATHCOUNTS is a national program for students in 6th, 7th, and 8th grades throughout the United States. Participating schools select students to compete individually or as part of a team in one of the competitions held nationwide during February. Winners progress to the State Competition with results there determining the top four individuals and top coach who earn the honor of representing their state at the National Competition in May.

For additional information or to download copies of previous exams, go to **www.mathcounts.org**.

How Do I Start Differentiating?

by Cheryl Avalos, Los Angeles, and Diane Kinch, Pomona USD



You realize that you are not reaching all of your students and have attended some workshops on differentiating instruction. You would like to try it in your class but do not know where to begin. We would recommend that you begin slowly and at a pace that is comfortable for you. Try differentiating a lesson each quarter or each month during this year. Anchor Activities or Tiered Activities are an easy way to start, so we have provided an explanation and example of each below. Use this as a guide to start differentiating in your class. We know that it is a difficult task to reach all of your students, but hope that this will help you move ahead.

Anchor Activities

Why do you need anchor activities? We need them to meet the needs of the following students: Fast Freddie who always finishes early; Never Done Don who always needs more time; and Explain Again Evelyn who always needs instruction and directions repeated.

What is an anchor activity? It is an activity that students automatically move to when they have completed the assigned task. With an anchor activity, students can move forward in their understanding of mathematics while the teacher works with the students who need additional help. Anchor activities can also be on-going assignments that students can work on independently throughout a unit, grading period, or longer.

What are some examples of anchor activities? Anchor activities can include writing in a journal, practicing concepts, games, puzzles, or reading a mathematics-related book. They should be essential to student learning, never simply time fillers.

Where can I find some activities to get started? Look in the NCTM journals. *Teaching Children Mathematics* has a feature called "Math By the Month," and *Mathematics Teaching in the Middle School* has "A Menu of Problems" that provide interesting problems on a variety of levels. *The Mathematics Teacher* has "Calendar of Problems" each month. The Math Forum and the NCTM web sites are two more places you can find activities. There are also suggested readings at the California Department of Education web site: **www.cde.ca.gov/ci/sc/ll/litscimathacknow.asp**.

Tiered Activities

What is a tiered activity? It is an activity that requires the same outcome for all students, but provides assistance for some students and challenge for others.

What are the steps in developing a tiered activity? The steps in developing the activity include the following (Tomlinson 2001, p. 85):

1. Select the concept, skill, or generalization you want all students to master.
2. Think about your students and their ability levels.
3. Create an activity that is interesting, high level, and requires students to use key skills to understand a key idea.
4. Chart the complexity of the activity. Think of a ladder with low skill or complexity at the bottom and high skill or complexity at the top.
5. Clone the activity along the ladder. Determine ways of supporting students who need more assistance and challenging students who will easily accomplish the activity.
6. Match a version of the task to groups of students.

What does an example of a tiered activity look like? Here is an example of a tiered activity.

A SIXTH GRADE TIERED ACTIVITY

Two related components of the sixth grade mathematics curriculum are that students will be able to generate situations and number patterns with tables, graphs, verbal rules, and

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equations (M.R. 2.4) This learning experience is designed to engage students in a problem-solving situation that involves searching for meaning in patterns to enable them to figure out the rules underlying the patterns.

The activity begins with a whole class introduction to the Locker Problem. (This version is from Becker and Pfiefer as presented at the CMP Directors' Meeting, October 2003.)

The Locker Problem
At a new middle school, there are exactly 200 students and 200 lockers. On April Fool's Day, the students played the following prank. The first student to enter the building opened every locker. The second student closed every other locker beginning with locker #2. The third student changed every third locker beginning with locker #3, closing those that were open, and opening those that were closed. The fourth student changed every fourth locker beginning with locker #4, and so on. After all 200 students passed through the locker room, which lockers were open? Why?

All students will be expected to do the following:

- ✔ Solve the locker problem.
- ✔ Produce a t-table.
- ✔ Write a description of the process they followed to discover the pattern.
- ✔ Write a description of the pattern.

Students are then put into three groups with different materials and scaffolding for each.

Group 1:
- ✔ 2-color counters are provided for physically modeling the open/close sequence.
- ✔ A graphic is provided so students can record the open/close position for the first 16 lockers.
- ✔ A t-table with appropriate column headings is provided for recording the information about which lockers remain open.
- ✔ Students are required to write a description of what they did to discover the pattern and to describe the pattern itself.

Group 2:
- ✔ A graphic is provided so students can record the open/close position for the first 16 lockers.
- ✔ Students must produce a t-table; no format is provided.
- ✔ Students are required to write a description of what they did to discover the pattern and to describe the pattern itself.

Group 3:
- ✔ Only the problem is provided (no graphic and no formatted t-table).
- ✔ Students must produce a t-table; no format is provided.
- ✔ Students are required to write a description of what they did to solve the problem and must provide a generalized, algebraic rule.

The activity ends with a whole class discussion of the problem. Students are then asked to write an individual reflection on what they learned from the activity.

AN ANCHOR ACTIVITY
Groups who finish early are given the following problem (also from Becker and Pfiefer):

The eccentric principal of the middle school won the lottery. Now she wants to give away some of the money. She has asked the students to repeat the process but with one big difference. This time, the first student will go to each locker and place $1 in it. The second student will go to every other locker starting with locker #2 and place $2 in it. The third student places $3 in every third locker beginning with locker #3. As in the locker door problem, the process continues. What new questions come to mind? What conjectures or answers do you have?

Ready, Set, Go

Our sample activities are based on student readiness and learning styles. It is also possible to differentiate by student interest. Differentiating allows mathematics teachers to answer the daily question, "When am I ever going to use this?" or "Why do I need to know this?" Students need real answers, not just assurances that they need the mathematics to be ready to do next year's mathematics! Is the shape of a skateboard ramp not parabolic? Is the slope of the bank of a racetrack not considered when turning corners? Does the flight of a paper airplane not depend upon the angles

and symmetry in the folds?

It is now your turn to try differentiating!

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Tomlinson, Carol Ann and Caroline Cunningham Eidson. *Differentiation in Practice: A Resource Guide for Differentiating Curriculum, Grades 5–9.* Alexandria, VA: ASCD, 2003.

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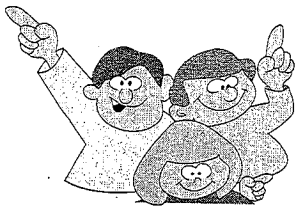
One Definition of Differentiation

by Megan Taylor, Summit Prep HS, Redwood City



While recently participating in a workshop on differentiation, I had an epiphany: mathematics teachers don't believe in differentiation. I sat among pairs of mathematics, social studies, English, science, and Spanish teachers who were discussing the definition of differentiation and its implication in their classrooms. I thought about the excuses mathematics teachers give for not only *not* differentiating, but for supporting tracking in their schools. "Students come to our school at too many different levels . . . You can't possibly challenge the 'high' kids in a classroom of 'low' ones . . . *my* school is very diverse . . . we already have our textbooks . . . it won't work with our schedule . . . I don't have the time or energy to rewrite my entire curriculum . . . we are held accountable to state standards and we'll never get all our students up to snuff if we don't track them . . . the standards are cut and dried, they're not like those *other* subject standards."

As a teacher in a completely untracked high school, where every freshman is enrolled in the same mathematics class, I can say I *must* use differentiation in my classroom. This is the only way to truly engage and challenge every student. All ten teachers at my school believe wholeheartedly in truly heterogeneous classrooms. We serve a population that draws both from poor Latino communities as well as rich, affluent ones. Our students come from more than 40 middle schools, and only some of them passed their middle school mathematics classes before being sent to high school. We are a charter school subjected to the same CAT6 and STAR tests as our nearby schools, but receive about a fourth of the money per student. Because we haven't found a perfect curriculum, we write our own, drawing from many existing ones. We are a true public high school with one big difference: we do not track.

Okay, so what do I mean when I say "differentiation" anyway? We all know what tracking is, as most of our students were put into "ability lanes" from sometime in early elementary school. Tracks are usually rigid paths that prevent mobility. It is not uncommon for a guidance counselor to tell students that the mathematics class they take in seventh grade will automatically set their mathematics class placement for the next five years. At my school we recently spent professional development time talking about differentiation, defining it, identifying real examples of it in our classrooms, and writing units of teaching with this as a philosophical basis. Our definition can be summed up in the chart at the top of page 40.

When we began to share ways we were differentiating our curriculum, we found that, although we agreed with our definition of differentiation, we were doing it in very different ways. Furthermore, we discovered that in many cases what we were doing was not differentiation at all. For example, we've all heard of a teacher who has an "extension" activity ready for those students who finish class assignments early. He/she justifies this

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Differentiation is	*Differentiation is NOT*
• Giving all students access to the same content and skills by using multiple teaching strategies to meet the different learning needs of individual students. • Designing curriculum that both supports and challenges every student by using ongoing assessment of students prior knowledge of content, interests, learning strengths/weaknesses, social and cultural backgrounds and gender. • Engaging every student in learning that connects to their daily lives. • Every student meeting the same standards at different levels of depth. • Instruction that is student-centered, involving whole-class, group, and individual instruction. • Curriculum that is concept-focused and principle-driven. • An approach that values students progress toward—as well as mastery of—learning standards.	• Tracking within the classroom. • Teaching to the lowest common denominator or teaching to the middle. • An IEP for each student. • Based upon wholly subjective or one-time criteria. • Prioritizing fun and engagement over important educational standards. • Just more work for some students. • A prescriptive instructional tool. • An add-on to current practices. • Necessarily a philosophy on grading.

Summit Prep High School—Working Definition of Differentiation 2005

as differentiation because it provides a challenge for a student who obviously got the initial material and needed something more to do. However, by looking at the definition above, this tactic is not differentiation for many reasons. First, this student is given more work, not work that necessarily challenges her to meet the standards for the lesson at a greater depth. Second, how was the original assignment assessed? Does it meet the standard? Does it show evidence of the type of understanding the teacher expects from the student? Third, did this teacher put the same time and effort into the "extension" activity as he or she put into the initial activity, taking into account standards and learning goals?

Sociologist L.S. Vygotsky (1962) coined the term "zone of proximal development" to describe the maximum amount of learning one student can achieve in a set amount of time in a classroom. If two students begin a year together in one mathematics class, it is almost impossible to ensure they will leave in June with the same depths and breadths of understanding. If these two students happen to come into the class with different skill levels, they will leave with even greater differences. Furthermore, it is likely that the academic strengths of one student are another student's weaknesses, and vice versa. Vygotsky makes the point that it is okay that these students come away with different amounts of learning and understanding. Teachers should plan for it. What is essential, however, is that teachers must push all students to achieve personal maximum learning. I am convinced that differentiating curriculum is the best way to do this.

Differentiation as a philosophy may take many forms, but should be inseparable from good teaching practices. I have used my school's definition to come up with a few specific examples.

In the mathematics classroom, differentiation could include:

- ✔ giving students a choice of assignments, projects, or tests;
- ✔ using different grading rubrics or guidelines for different students;
- ✔ planning for complex instruction and structured group work involving specific roles and goals;
- ✔ student-teacher goal setting based on specific, well-designed pre-assessments;
- ✔ flexible seating;
- ✔ individual and group open-ended problems with many correct answers and/or paths to the answer(s);
- ✔ graduated or tiered tasks (assignments with increasingly more complex tasks);
- ✔ multiple intelligence options;
- ✔ a variety of graphic organizers (fill-in-the-blank proof, a started two-column chart, or a blank sheet of paper).

My most recent steps for my classroom have been to "backwards-plan" units for our new precalculus class next year. Using the Wiggins and McTighe (1998) model, we began taking the intimidating standards and breaking them down into three categories of statements: things that represent enduring understanding, things that are important for students to know and be able to do, and things students should be familiar with. Next we prioritized our standards, with enduring understandings first. For each standard, we decided what a basic, proficient, and advanced understanding looked like in our classroom. It was very important to us that the basic level of understanding still meant a student met the standard as it is written. An example of one of our standard's breakdown is given below:

Advanced Algebra Standard 2.0: Students solve systems of linear equations and inequalities (in two or three variables) by substitution, with graphs, or with matrices.

ADVANCED understanding means a student can solve a system of *multiple* equations or inequalities using graphs, elimination, substitution, and matrices and, before solving, can assess which method is most appropriate to use.

PROFICIENT understanding means a student can solve a system of two equations or inequalities using graphs, elimination, and substitution, and can solve systems of three or more equations or inequalities with matrices or some other method.

BASIC understanding means a student can solve systems of two or three equations or inequalities using graphs, elimination, or substitution.

We are only now beginning the process of taking these descriptions and building a curriculum. We have a long way to go. My motivation for doing this time-consuming work with my mathematics colleagues comes from my confidence that, when all my lessons will be based on these standard breakdowns, different students will be challenged in appropriate ways. Furthermore, *all* my students will be working toward the state standards at paces that challenge them with minimal frustration.

One way I differentiate my lessons after writing these breakdowns is by making "choice" a big part of every week. I ask students to choose a level for the standard of each assignment, project, or test. I can be sure that students who choose the "basic" requirement will still meet the mathematics standards. It is amazing to witness how students select appropriately. It is encouraging to observe students who at first choose a basic requirement, but later choose proficient because of the nature or content of an assignment. This allows students the flexibility to accept the depth of challenge appropriate for them on each standard.

Teachers at my school who differentiate using choice disagree on how grades should be given for these different assignments. Some teachers assign "A" grades for work meeting all the requirements in any of the three categories while others believe a "C" grade is the highest grade possible for completing a basic standard. Creating and giving differentiated assessments is different from grading them. Deciding on the grading system that works best for you, your class, and your students should be the last step in the differentiation process.

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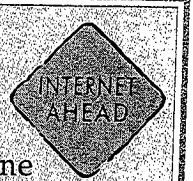
Internet Resources
Convergence



Convergence is an online magazine published by the Mathematical Association of America (MAA), with cooperation of the National Council of Teachers of Mathematics (NCTM). It can be found at **convergence.mathdl.org**.

It is a resource for grades 9–14 mathematics teachers who want to use mathematics history to engage and motivate their students.