Strategies for Differentiating Middle School Math

James and Tammy Parsons
Metro Nashville Public School
July 13, 2010
Differentiation KWL

<table>
<thead>
<tr>
<th>What do I Know</th>
<th>What do I want to know</th>
<th>What did I learn</th>
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Think 7 to Differentiate Instruction

By addressing student:
- Readiness
- Interests/Passion
- Learning Profile

You can differentiate the:
- Content
- Process
- Product
- Learning Environment
By addressing student READINESS

... refers to a student’s knowledge, understanding, and skill related to a particular sequence of learning. It is influenced by a student's cognitive proficiency as well as prior learning, life experiences, and attitudes about school. Readiness can vary widely over time, and according to topic and circumstance. As Tomlinson (2003) points out, if readiness levels in a class vary, so must the complexity of work provided.
Before beginning instruction...

Use diagnostic assessments to determine student readiness. These assessments can be formal or informal.
Assessment Examples

- Pretests
- KWL
- **Exit tickets**
- One minute papers/Quick write
- Anecdotal notes
- Examining work
- Asking students questions about understanding of topic
- Dry erase boards
- Write Abouts
- S-O-S Summary
Write About

Name ___________________________________________ Date ________________

Topic ____________________________________________

Draw a picture or write symbols in this box to summarize the topic

List Key Words about the topic

☐ ____________________________

☐ ____________________________

☐ ____________________________

☐ ____________________________

☐ ____________________________

☐ ____________________________

☐ ____________________________

☐ ____________________________

Paragraph: Summarize your learning by using the terms above in a paragraph about the topic. Check off the terms as you use them. Then circle the terms in your paragraph.
S-O-S Summary

Name ___________________________________________ Date ___________________

Read the following statement: ____________________________________________

What does it mean? ____________________________________________________

What's your opinion? Circle one: I agree I disagree

Support your opinion with evidence (facts, reasons, examples, etc.).

■ ■ ■ ■
## Summaries & Reflections | Verbal-Linguistic & Interpersonal

<table>
<thead>
<tr>
<th>Gr. 3–5</th>
<th>Gr. 6–8</th>
<th>I–P–G–C</th>
<th>Assessments</th>
<th>TechConnect</th>
<th>Page #</th>
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<td>✓</td>
<td>FactStorming</td>
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*Can be used as Exit Cards:
- I–Individual
- P–Partner
- C–Whole Class
- G–Small Group

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## Lists, Charts, and Graphic Organizers | Logical-Mathematical

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## Visual Representations of Information | Spatial

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<td>SmartCards*</td>
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## Collaborative Activities | Kinesthetic & Interpersonal

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<td>✓</td>
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<td>Turn 'n' Talk</td>
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<td>13</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>P-G</td>
<td>Headline News! Summary</td>
<td>✓</td>
<td>16</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>C</td>
<td>Four More!</td>
<td>✓</td>
<td>22</td>
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<tr>
<td>✓</td>
<td>✓</td>
<td>G-C</td>
<td>Find Someone Who... Review</td>
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<tr>
<td>✓</td>
<td>✓</td>
<td>G-C</td>
<td>Carousel Brainstorming</td>
<td>✓</td>
<td>28</td>
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</tbody>
</table>
By addressing student INTEREST

...arises from topics that evoke curiosity and passion in students and in which they want to invest time and energy to learn about. When a student’s interests are tapped, that student is more likely to be engaged and to persist in learning (Csikszentmihalyi, 1990; Maslow, 1962; Sousa, 2001; Wolfe, 2001).
Before beginning instruction . . .

Determine student interest. This can be done by using interest inventories and/or including students in the planning process. Teachers can ask students to tell them what specific interests they have in a particular topic, and then teachers can try to incorporate these interests into their lessons.
By addressing student LEARNING PROFILE

... refers to how a student learns best. Preferences for learning are shaped by (Gardner) intelligence preference, culture, and gender, learning style (i.e., a visual, auditory, tactile, or kinesthetic learner), grouping preferences (i.e., individual, small group, or large group), and environmental preferences (i.e., lots of space or a quiet area to work)
Identify student learning styles and environmental preferences. Learning styles can be measured using learning style inventories. Teachers can also get information about student learning styles by asking students how they learn best and by observing student activities. Identifying environmental preferences includes determining whether students work best in large or small groups and what environmental factors might contribute to or inhibit student learning. For example, a student might need to be free from distraction or have extra lighting while he or she works.
Your learning profile. . .

- **Multiple Intelligences Inventory for Adults**

- **Briggs-Meyers Personality Test**
## Nine Identified Intelligences

<table>
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<tr>
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<th>Think</th>
<th>Love</th>
<th>Need</th>
</tr>
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<tbody>
<tr>
<td><strong>Linguistic</strong></td>
<td>in words</td>
<td>reading, writing, telling stories, playing word games, etc.</td>
<td>books, tapes, writing tools, paper, diaries, dialogue, discussion, debate, stories, etc.</td>
</tr>
<tr>
<td><strong>Logical-Mathematical</strong></td>
<td>by reasoning</td>
<td>experimenting, questioning, figuring out logical puzzles, calculating, etc.</td>
<td>things to explore and think about, science materials, manipulatives, trips to the planetarium and science museums, etc.</td>
</tr>
<tr>
<td><strong>Spatial</strong></td>
<td>in images and pictures</td>
<td>designing, drawing, visualizing, doodling, etc.</td>
<td>art, LEGO’s, video, movies, slides, imagination games, mazes, puzzles, illustrated books, trips to art museums, etc.</td>
</tr>
<tr>
<td><strong>Bodily-Kinesthetic</strong></td>
<td>through somatic sensations</td>
<td>dancing, running, jumping, building, touching, gesturing, etc.</td>
<td>role play, drama, movement, things to build, sports and physical games, tactile experiences, hands-on learning, etc.</td>
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<td>via rhythms and melodies</td>
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<td>sing-along time, trips to concerts, music playing at home and school, musical instruments, etc.</td>
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<td><strong>Interpersonal</strong></td>
<td>by bouncing ideas off other people</td>
<td>leading, organizing, relating, manipulating, mediating, partying, etc.</td>
<td>friends, group games, social gatherings, community events, clubs, mentors/apprenticeships, etc.</td>
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<tr>
<td><strong>Intrapersonal</strong></td>
<td>deeply inside of themselves</td>
<td>setting goals, meditating, dreaming, being quiet, planning</td>
<td>secret places, time alone, self-paced projects, choices, etc.</td>
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<td><strong>Naturalist</strong></td>
<td>in communion with nature</td>
<td>working with nature and natural materials, making distinctions, collecting/categorizing things, caring for plants or animals, being outdoors</td>
<td>time outdoors in nature, interaction with flora &amp; fauna, exploring things, learning about plants and natural events, collection projects, etc.</td>
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<tr>
<td><strong>Existential</strong></td>
<td>To exhibit the proclivity to pose and ponder questions about life, death, and ultimate realities</td>
<td>To pose and ponder question about life, death and ultimate realities</td>
<td>Time alone to ponder, venues to reflect, choices, opportunities to engage in non-judgemental conversations, religious exploration</td>
</tr>
</tbody>
</table>

*Adapted From: Armstrong, Thomas (1994). *Multiple Intelligences in the Classroom*. (p. 27) ASCD: Alexandria, VA*
<table>
<thead>
<tr>
<th></th>
<th>Linguistic</th>
<th>Logical/Mathematical</th>
<th>Spatial/Visual</th>
<th>Bodily/Kinesthetic</th>
<th>Musical</th>
<th>Interpersonal</th>
<th>Intrapersonal</th>
<th>Naturalist</th>
<th>Existential</th>
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Areas for Differentiation

– Content
– Process/activities
– Product
– Learning Environment
DIFFERENTIATE BY CONTENT

- Compacting
- Flexible Grouping
- Instructional Ladder
- Jigsaw
- Multiple Intelligences
Differentiate by CONTENT

... refers to what students need to learn: the major concepts, principles, and skills that are taught. All learners should be given access to the same content. Teachers should adjust the degree of complexity using diverse instructional processes to teach the content. In this way, all students learn the same concepts but in different ways.
Differentiate by CONTENT

YOUR TASK:

Area Contractor
Differentiate by CONTENT

• Tier I: *The Shape Ups*
• Tier II: *The Greedy Triangle*
• Tier III: *The Dreamers*

Task: Each tier will read their book and prepare a short report in which they describe, draw, classify, and compare the polygons and parts of the polygons.
<table>
<thead>
<tr>
<th>Differentiate by CONTENT</th>
<th>Strategy Ideas:</th>
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</thead>
<tbody>
<tr>
<td>Modify the facts and skills that the students are expected to learn</td>
<td><strong>Compacting</strong></td>
</tr>
<tr>
<td>Content for ALL students should be concept-based, relevant and transferable</td>
<td><strong>Flexible Grouping</strong></td>
</tr>
</tbody>
</table>

**Differentiate Content by...**

**READINESS**
- Do I have resources and/or books available at varying levels of difficulty?
  - Tool: *Lexile Framework*
- Do my students have a wide range of abilities and background knowledge of the topic or skill?
- Do I have assessment data that can help identify the level at which each student should begin working?

**DIFFERENTIATE CONTENT BY...**

**INTEREST**
- Does the topic or concept allow for students to focus on one part of their choosing and still get the big idea?
  - Tool: *Interest Inventory (Word)*

**DIFFERENTIATE CONTENT BY...**

**LEARNING PROFILE**
- Can the material be provided to suit a variety of modalities (visual, auditory, kinesthetic, sequential, etc.)?
  - Tool: Learning Styles Assessment

**Strategy Ideas:**
- *Flexible Grouping*
- *Jigsaw*
- *Orbitals*
- *Flexible Grouping*
- *Jigsaw*
- *Multiple Intelligence options*
- *Tape Recorded materials*
- *Videos*
- *WebQuests*
Strategy: Compacting

- **Focus of Differentiation: Readiness**
- **Definition**
  Compacting is the process of adjusting instruction to account for prior student mastery of learning objectives. Compacting involves a three step process: (1) assess the student to determine his/her level of knowledge on the material to be studied and determine what he/she still needs to master; (2) create plans for what the student needs to know, and excuse the student from studying what he/she already knows; and (3) create plans for freed up time to be spent in enriched or accelerated study
- **Examples**
  A third grade class is learning to identify the parts of fractions. Diagnostics indicate that two students already know the parts of fractions. These students are excused from completing the identifying activities, and are taught to add and subtract fractions.
YOUR TASK: Jessie

- Jessie is in your 6th grade math class. You are planning on teaching the Cartesian coordinate system to your students next week. Jessie takes the pretest and makes a 90%. Your policy has been to compact for students who make an 80% or higher on the pretest. What are three extension activities Jessie could complete while you are working with the other students?

SPI 0606.3.9 Graph ordered pairs of integers in all four quadrants of the Cartesian coordinate system.

CK 0606.3.10 Understand that in an ordered pair (x, y), the x represents horizontal location and y represents vertical location.

CK 0606.3.11 Identify the quadrant of the coordinate system in which a point lies.
5 steps to successful compacting

• Identify the learning objectives or standards all students must learn

• Offer a pretest opportunity to volunteers who think they may have already mastered the content OR plan an alternate path through the content for those students who can learn the required material in less time than their age peers

• Plan and offer curriculum extensions for kids who are successful with the compacting opportunities

• Eliminate all drill, practice, review, or preparation for state or standardized tests for students who have already mastered such things

• Keep accurate records of students’ compacting activities
Student's Name: ____________________________

<table>
<thead>
<tr>
<th>Areas of Strength</th>
<th>Documenting Mastery</th>
<th>Alternate Activities</th>
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Example: Tiered Content according to learning Style

- **Tier I: Visual Learners**
  Groups of students are given a picture from nature, wrapping paper, or other visual item which has a definite pattern. The students use the item to create the same pattern using numbers via the calculator or a new visual using the computer which conveys the same pattern. Students must write a one page justification of how and why the new item represents the same pattern found in the original item.

- **Tier II: Auditory Learners**
  Groups of students are listen to a musical piece or song which has a definite pattern. The students use the item to create the same pattern using numbers via the calculator or a new visual using the computer which conveys the same pattern. Students must write a one page justification of how and why the new item represents the same pattern found in the original item.

- **Tier III: Kinesthetic Learners**
  Students are given the steps for the cha-cha or rumba or some other dance which has a definite pattern. The students use the item to create the same pattern using numbers via the calculator or a new visual using the computer which conveys the same pattern. Students must write a one page justification of how and why the new item represents the same pattern found in the original item.
YOUR TASK:

Tier Content According to Learning Style

You have decided to modify the content this time by using Gardner’s Multiple Intelligences. You want to cover the following standards:

CK 0506.4.3 Build, draw, and work with prisms by means of orthogonal views, projective views, and nets.

SPI 0506.4.3 Identify a three-dimensional object from two-dimensional representations of that object and vice versa.
## STRATEGY: Multiple Intelligences

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<tr>
<td><strong>Existential</strong></td>
<td>To exhibit the proclivity to pose and ponder questions about life, death, and ultimate realities</td>
<td>To pose and ponder question about life, death and ultimate realities</td>
<td>Time alone to ponder, venues to reflect, choices, opportunities to engage in non-judgemental conversations, religious exploration</td>
</tr>
</tbody>
</table>
## CURRICULUM DIFFERENTIATION CHART

Unit:

<table>
<thead>
<tr>
<th>Key Concept</th>
<th>Auditory/Analytic</th>
<th>Visual/Global</th>
<th>Tactile-Kinesthetic/Global</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
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Instructional Ladder

• To Use the Ladders:
  Print off the ladder and write the names of your students in the boxes on the left side of the ladder, based on each student's RIT score and/or based on classroom performance and teacher observation. The RIT score represents a student's Instructional Level; these are **skills the student should be working on right now.** The goal is for each student to move up at least one rung on the ladder.

• Once you know each student's place on the ladder, you may want to differentiate using **flexible grouping, tiered assignments** or other methods so that each student is working at their appropriate level. The ladders may also be effective for guiding students in goal-setting and to help aides and parents see the direction a student is heading with a particular skill, to see what comes next.
Jigsaw

• Works well with small groups needing to cover large amounts of material
• Divide the material to be covered in 3-5 parts. Put the same number of students in each small group. One student is each group is assigned to cover one of the parts of the materials. The student’s job is to become the “expert” on their portion of the material so that they can then share what they’ve learned with the rest of their group.
• Students read their assigned material independently
• Students meet with those from other groups that read the same material to discuss what was most important and what needs to be taught to their groups. (optional)
• Students meet with their small groups and to share what they’ve learned with each other. Follow with whole group discussion of the most important points.
<table>
<thead>
<tr>
<th>Expert Group</th>
<th>Home Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am an expert on the topic of:</td>
<td>What were the other topics covered by my home group?</td>
</tr>
<tr>
<td>Points of discussion I want to talk about in my</td>
<td>How do the topics and information from my home group partners connect with</td>
</tr>
<tr>
<td>expert groups about the topic.</td>
<td>my topic?</td>
</tr>
<tr>
<td>What did I learn in my expert group?</td>
<td>Write a group summary about home group’s subject.</td>
</tr>
</tbody>
</table>
GROUP 1

• Happy Birthday, Benjamin Banneker! Benjamin Banneker, a famous black mathematician, was born and died on October 9 (1731–1806). Among his works were a variety of number puzzles. Here is one of them:

Divide 60 into four such parts that the first being increased by 4, the second decreased by 4, the third multiplied by 4, the fourth part divided by 4, that the sum, the difference, the product, and the quotient shall be one and the same number.
YOUR TASK: JIGSAW

Group 2

A contractor is asked to build a new set of townhouses in attached clusters of different sizes. He created plans for one-, two-, and three-house clusters, as shown in the diagram below. The builder used computer software to draw the line segments used to represent the houses. How many line segments are needed to draw 4 houses? 10 houses? 47 houses? $n$ houses? Explain your strategy.
Group 3

Becky wants to make a long-distance call to her friend Sarah from a pay telephone. She has $5.00 in change. The call costs $0.90 for the first three minutes and $0.24 for each additional minute. How long can Becky talk to Sarah?
Group 4

Maria says that 1634 students attend River View Middle School. Mr. Hamm says that the school has 72 more girls than boys. How many girls attend River View Middle School?
Group 5
Someone asked Teri how many children were riding on the merry-go-round with her. Teri plans on being a mathematics teacher so, as do all teachers, she turned the answer into a problem. She said, "If you add 1/3 of the number of children riding ahead of me to 3/4 of those riding behind me, you will know how many were on the merry-go-round."
In order, the parts are 5.6, 13.6, 2.4, and 38.4. The most straightforward approach is to set up equations that represent what we know, calling the first, second, third, and fourth parts $a$, $b$, $c$, and $d$, respectively:

- $a + b + c + d = 60$
- $a + 4 = b - 4 = c \times 4 = d \div 4$

Use the equalities in the second line to express three of the variables in terms of the fourth, say, $b$, and then substitute these expressions into the first equation:

- $a = b - 8$
- $c = (b - 4)/4$
- $d = 4(b - 4)$
- $(b - 8) + b + (b - 4)/4 + 4(b - 4) = 60$

Hence, $b = 13.6$ and $a = 5.6$, $c = 2.4$, and $d = 38.4$. Have your students try to think like Benjamin Banneker to answer this question: Can other numbers be substituted into the puzzle and still be valid?
26; 51; 236; $5n + 1$. One house takes 6 segments. Each additional house only requires 5 additional segments. Therefore, the sequence for the number of segments is 6, 11, 16, 21, 26, 31, 36, . . . . If $n$ is the number of houses, then the $n$th term for this sequence is $5n + 1$, or 5 times the number of houses plus 1. The 5th house would require $5(5) + 1 = 26$ segments; the 10th house would require $5(10) + 1 = 51$ segments; and the 47th house would require $5(47) + 1 = 236$ segments. Another method is to begin with 6 segments for the first house and notice that each additional house adds 5 segments to the total. Therefore, the total number of segments is $6 + 5(n - 1) = 5n + 1$. 
Twenty minutes. After the first three minutes, Becky has $4.10 remaining. At $0.24 per minute, she can talk for seventeen more minutes \((17 \times $0.24 = $4.08)\), leaving Becky with $0.02.
853. The total number is 1634; let $x$ be the number of boys, and let $x + 72$ be the number of girls. Then $x + x + 72 = 1634$; therefore, $x = 781$, and $781 + 72$ is the number of girls.
13 children. A merry-go-round is, of course, round. There must be the same number of children both in front of and behind Teri. Let's call this number $N$. There must be $N + 1$ children (counting Teri) and $\frac{1}{3}N + \frac{3}{4}N = N + 1$. Solving, we find that $N = 12$, so there were 13 children on the merry-go-round (counting Teri).
Jigsaw Grouping Chart

Square Tables indicate Home Base Groups
Round Tables indicate Expert Groups

http://forpd.ucf.edu/strategies/Jigsaw-strategy-Sep09.html
Flexible Grouping

• **Focus of Differentiation:** Readiness, Interest, Learning profile

• **Definition**
  Students work as part of many different groups depending on the task and/or content. Sometimes students are placed in groups based on readiness, other times they are placed based on interest and/or learning profile. Groups can either be assigned by the teacher or chosen by the students. Students can be assigned purposefully to a group or assigned randomly. This strategy allows students to work with a wide variety of peers and keeps them from being labeled as advanced or struggling.

• **Examples**
  – The teacher may assign groups based on readiness for direct instruction on algebraic concepts, and allow students to choose their own groups for projects that investigate famous mathematicians.
DIFFERENTIATE by PROCESS

- Contracts
- Anchor Activities
- Clock Partners
- Tiered Assignments
- Menus
Differentiate by PROCESS

... refers to ways in which the content is taught: the activities that help students understand and eventually own the concepts and skills being taught.

... flexible grouping, in which learners are sometimes grouped by readiness levels, sometimes by interest, and sometimes by learning profiles.
<table>
<thead>
<tr>
<th>Differentiate by PROCESS</th>
<th>Differentiate Process by...</th>
<th>Strategy Ideas:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modify the activities the students are doing to use skills and gain information</td>
<td><strong>READINESS</strong></td>
<td></td>
</tr>
<tr>
<td>Process for ALL students should be purposeful and focused and should promote higher level thinking</td>
<td>- Do I have activities and materials at varying levels of complexity available?</td>
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<tr>
<td></td>
<td><strong>INTEREST</strong></td>
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<td>- Would it make sense to allow students to choose how they work with the ideas or skills? (experiment, read, research, etc.)</td>
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<tr>
<td></td>
<td><strong>LEARNING PROFILE</strong></td>
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<tr>
<td></td>
<td>- Would it be reasonable to provide different activities to accommodate various learning styles?</td>
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<td></td>
<td>- Anchor Activities</td>
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<td>- Appointment Clocks</td>
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<td>- Centers/Stations</td>
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<td>- Cubing</td>
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<td>- Games</td>
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<td>- Homework Options</td>
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<td>- Learning Contracts</td>
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<td>- Menus/Agendas</td>
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<td>- Think-Tac-Toe</td>
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<td>- Tiered Activities</td>
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<td>- Varied Organizers</td>
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<td>- Varied Pacing</td>
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<td>- 4-MAT</td>
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<tr>
<td></td>
<td>- Arrangement Options (working alone, with a partner or in a small group)</td>
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<td></td>
<td>- Multiple Intelligences</td>
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<td></td>
<td>- Reading Buddies</td>
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</tbody>
</table>
Strategy: Anchoring Activities or Sponge Activities

• This may be a list of activities that a student can do to at any time when they have completed present assignments or it can be assigned for a short period at the beginning of each class as students organize themselves and prepare for work. These activities may relate to specific needs or enrichment opportunities, including problems to solve or journals to write. They could also be part of a long-term project that a student is working on. These activities may provide the teacher with time to provide specific help and small group instruction to students requiring additional help to get started. Students can work at different paces but always have productive work they can do. Some time ago these activities may have been called seat-work, and should not be confused with busy-work. These activities must be worthy of a student’s time and appropriate to their learning needs.
Using Anchor Activities to Create Groups

1. Teach the whole class to work independently and quietly on the anchor activity.

2.
   - Half the class works on anchor activity.
   - Other half works on a different activity.
   - Flip-Flop

3. 1/3 works on anchor activity. 1/3 works on a different activity. 1/3 works with teacher—direct instruction.

http://www.wilmette39.org/DI39/iagc05lowprep/anchor.htm
Strategy: Tiered Assignments

- **Focus of Differentiation**: Readiness
- **Definition**: Tiered assignments are designed to instruct students on essential skills that are provided at different levels of complexity, abstractness, and open-endedness. The curricular content and objective(s) are the same, but the process and/or product are varied according to the student’s level of readiness.
- **Examples**: In a unit on measurement, some students are taught basic measurement skills, including using a ruler to measure the length of objects. Other students can apply measurement skills to problems involving perimeter.

http://my.nctm.org/eresources/view_media.asp?article_id=7173
How to Tier a Lesson

• Identify the grade level and subject
• Identify the standard that you are targeting
• Identify the key concept and generalization (what do I want the students to know at the end of the lesson)
• Be sure the students have the background necessary to be successful
• Determine which part of the lesson you will tier (content, process or product)
  – Content: what you want them to learn
  – Process: the way the students make sense of the content
  – Product: the outcome at the end of the lesson
• Determine the type of tiering (readiness, interest, or learning style)
  – Readiness is based on ability levels (pretest)
  – Interest is based on interest in a topic (survey)
  – Learning style (inventories)
• Determine how many tiers you need
• Develop the assessment component
Tiered lessons

• Addresses a particular standard, key concept, and generalization, but allow several pathways for students to arrive at an understanding of these components, based on READINESS, INTERESTS, or LEARNING STYLES.

• Readiness level implies that the teacher has a good understanding of the students’ ability levels with respect to the lesson and has designed the tiers to meet those needs. The number of tiers depends on the range of ability levels in the specific classroom. They are formed based on our assessment of our students’ abilities to handle the material particular to a lesson.

• When tiered by interest or learning style, we are looking at student characteristics other than ability level. Focus could be on auditory, visual and kinesthetic.
Grade: Seventh
Subject: Mathematics
Standard: Measurement
Key Concept: Students work with measurement of perimeter and area.
Generalization: Students see the relationship between perimeter and area of shapes.
Background: This lesson should be presented fairly early in the year. Students should be familiar with the concepts of perimeter and area. The materials needed are multicolored paper squares and hexagons.

Tier 1: Below Grade Level Learners
Pairs of students are given eight squares that are a variety of colors; you could have the students make their own squares from card stock, or you may already have an appropriate manipulative for the students to use. Students are given a worksheet that contains a series of questions about perimeter and area related to the eight squares. Questions about the greatest and least perimeter, greatest and least area, specific areas, and specific perimeters should be included on the worksheet. In addition, students should be asked to draw specific examples for each question.

Tier 2: Grade Level Learners
Pairs of students are given twelve squares that are a variety of colors; you could have the students make their own squares from card stock, or you may already have an appropriate manipulative for the students to use. Students are given a worksheet that contains a series of questions about perimeter and area related to the twelve squares. Questions about the greatest and least perimeter, greatest and least area, specific areas, and specific perimeters should be included on the worksheet. In addition, students should be asked to draw specific examples for each question.

Tier 3: Above Grade Level Learners
Pairs of students are given twelve hexagons that are a variety of colors; you could have the students make their own hexagons from card stock, or you may already have an appropriate manipulative for the students to use. Students are given a worksheet that contains a series of questions about perimeter and area related to the use of the twelve hexagons. Questions about the greatest and least perimeter, greatest and least area, specific areas, and specific perimeters should be included on the worksheet. In addition, students should be asked to draw specific examples for each question.

Assessment: Each worksheet should be graded for accuracy. An extension for each tier would be to ask questions that involve a greater number of their shape or pertain to another shape.

Fig. 2 A lesson tiered in content according to readiness
Grade: Sixth  
Subject: Mathematics  
Standard: Connections  
Key Concept: Students use technology, such as computers and calculators, as tools to model patterns.  
Generalization: Students create and use mathematical objects to make patterns.  
Background: Students have worked with number patterns and have observed patterns of geometric objects. This lesson would most likely be appropriate toward the end of the academic year. Within each tier, the teacher may choose to have the students work in pairs, triads, or quads.  

Tier 1: Visual Learners  
Groups of students are given a picture from nature, wrapping paper, or other visual item that contains a definite pattern. The students use the item to create the same pattern with numbers using the calculator or a new visual using the computer that conveys the same pattern. Students must write at least one paragraph justifying how and why the new item represents the same pattern found in the original item.  

Tier 2: Auditory Learners  
Groups of students listen to a musical piece or song that has a definite pattern. The students use the music to create the same pattern with numbers using the calculator or a new visual using the computer that conveys the same pattern. Students must write at least one paragraph justifying how and why the new item represents the same pattern found in the music.  

Tier 3: Kinesthetic Learners  
Students are taught the steps for the cha-cha or rumba or some other dance that has a definite pattern. The students use the dance to create the same pattern with numbers using the calculator or a new visual using the computer that conveys the same pattern. Students must write at least one paragraph justifying how and why the new item represents the same pattern found in the dance.  

Assessment: This lesson is meant to be a fun way to consider patterns and provide extra practice working with numbers, geometric objects, calculators, and computers. Although an assessment is not necessary, you may want to grade the project using a rubric based on students’ justifications, ability to work cooperatively, and on originality and creativity.  

Fig. 3 A lesson tiered in process according to learning style
This lesson is tiered in *process according to readiness.*

Tier I: **Basic Learners**  Pairs of students are given the following rules for playing the game *Diabolical Decimals.* *The object of the game is to create the largest number.* Each student rolls a four sided die or six sided die five times and tries to create the largest five digit decimal number. After each roll of the die, each player records a digit from the die on a paper which has five columns labeled tens, ones, tenths, hundredths, and thousandths. A point is scored by the player with the larger number and the game is won by having the most points. The teacher can predetermine the number of rounds or the student pair could set the number of rounds before beginning play. Each pair should play the game several times. Pairs should also play the game with the object of creating the smallest number.

Tier II: **Grade Level Learners**  Pairs of students are given the same rules as the *Basic tier for playing the game Diabolical Decimals* except these pairs would use six sided or eight sided die. Pairs should also play the game with the object of creating the smallest number and/or by trying to make their numbers as far apart as possible, a player scores a point if their difference is the largest.

Tier III: **Advanced Learners**  Triads of students are given the same rules as the *Basic tier for playing the game Diabolical Decimals* except these students would use eight or nine sided die. Triads should also play the game with the object of creating the smallest number and/or of trying to make their numbers as close together as possible, a player scores a point if their difference is the smallest.
Interest Centers or Interest Groups

• **Focus of Differentiation**: Readiness, Interest
• **Definition**
  • Interest centers (usually used with younger students) and interest groups (usually used with older students) are set up so that learning experiences are directed toward a specific learner interest. Allowing students to choose a topic can be motivating to them.
• **Examples**
  • Interest Centers Centers can focus on specific math skills, such as addition, and provide activities that are high interest, such as counting jelly beans or adding the number of eyes on two aliens.
  • Interest Groups Students can work in small groups to research a math topic of interest, such as how geometry applies to architecture or how math is used in art.
Strategy: Learning Contracts

- Focus of Differentiation: Readiness, Learning Profile
- Definition Learning contracts begin with an agreement between the teacher and the student. The teacher specifies the necessary skills expected to be learned by the student and the required components of the assignment, while the student identifies methods for completing the tasks. This strategy (1) allows students to work at an appropriate pace; (2) can target learning styles; and (3) helps students work independently, learn planning skills, and eliminate unnecessary skill practice.
- Examples A student decides to follow a football team over a two month period and make inferences about players’ performances based on their scoring patterns and physical characteristics. The student, with the teacher’s guidance, develops a plan for collecting and analyzing the data and conducting research about football. The student decides to create a PowerPoint presentation to present his or her findings to the class.
Contracts

- **Learning Contracts: (High Prep)**
- Works well with individual students
- Detailed list of directions and assignments for the student to complete within a set period of time. Teacher and student work together to establish contract requirements and due dates. Can be effectively used to develop goal-setting.
# LEARNING CONTRACT

For: ________________________________

Student's Name: ________________________________

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<thead>
<tr>
<th>✓</th>
<th>Page/Concept</th>
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Extension Options: ________________________________

**SPECIAL INSTRUCTIONS**

Your Idea:

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<th>✓</th>
<th>Working Conditions</th>
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Teacher's Signature: ________________________________

Student's Signature: ________________________________

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From *Teaching Gifted Kids in the Regular Classroom* by Susan W. Wiltz. Copyright © 2003, Free Spirit Publishing, Inc., Minneapolis, MN: 866/703-7322; www.freespirit.com. This page may be photocopied for individual or classroom use only.
Strategy: Choice Boards

• **Focus of Differentiation:** Readiness, Interest, Learning Profile

• **Definition**
  Choice boards are organizers that contain a variety of activities. Students can choose one or several activities to complete as they learn a skill or develop a product. Choice boards can be organized so that students are required to choose options that focus on several different skills.

• **Examples**
  Students are given a choice board that contains a list of possible activities they can complete to learn about volume. For example, students can choose to complete an inquiry lesson where they measure volume using various containers, use a textbook to read about measuring volume, or watch a video in which the steps are explained. The activities are based on the following learning styles: visual, auditory, kinesthetic, and tactile. Students must complete two activities from the board and must choose these activities from two different learning styles.
**MAKE A QUILT**
Use the cm graph paper (provided) to design a quilt. Use 4 colors. When your quilt is complete and every square is shaded determine the fraction, decimal and percent for each color. See sample.

**COLOR CODING**
Review the numbers on the color-coding work sheet. Color equivalent fractions, decimals and percents all in one color. Once a matching set of 3 is found pick a new color and search for another matching set. Continue until all numbers are shaded.

**RUMMY CARD GAME**
Use the deck of number cards provided to play rummy with a classmate. Your objective is to find 2 sets of equivalent fractions, decimals, and percents. See the rummy instruction page for further directions.

**I HAVE, WHO HAS**
Create an I have, Who has activity for a class of 24 students. Include equivalent fractions, decimals and percents. See the template sheets with more directions. (May change this to play I have, who has with 3 friends)

**COMPUTER**
Go to the website given below to play The Ameba (Equivalent Fraction Game) http://mathforum.org/te/exchange/hosted/ameba/

**POSTER**
Design a poster that illustrates how to convert decimals to fractions and fractions to decimals.

**SURVEY**
Design a survey and then poll at least 20 friends. Display your data as fractions, decimals and percents.

**MUSIC**
On your own or with a partner create a song that teaches the steps for converting a fraction to a decimal and a decimal to a fraction.

**YOU ARE THE TEACHER**
Design a study guide that reviews what a student needs to know about determining equivalent forms of fractions, decimals and percents. Include some practice problems and answer guide.
Subject: Algebra I - Probability

Main Dish (complete all)
Create a list of 10 pairs of events. 5 pairs should contain events that are dependent and 5 should be independent. Explain each classification.
Examine a list of functions and determine which functions represent probability distributions.

Side Dish (choose two)
Work with a partner to analyze the game of “Primarily Odd.” See your teacher for game cubes and further instructions.
Design a “game spinner” that has this probability distribution: \( P(\text{red}) = 0.1; P(\text{green}) = 0.2; P(\text{blue}) = 0.3; P(\text{yellow}) = 0.4. \)
Suppose a dart lands on a dartboard made up of four concentric circles. For the center of the board (the “bull’s eye”), \( r = 1.5 \); the remaining rings have widths of 1.5. Use your understanding of area and probability to determine the probability of 1) hitting the “bull’s eye” and 2) landing in the outermost ring.

Dessert (optional and can only be completed after the other 2 courses)
Figure the probability of “Murphy’s Law” and make a case for whether or not it should indeed be a “law.”
Use a frequency table to chart the colors that your classmates wear for a week. Then, use the probability to predict how many students will wear a certain color on a given day.
2-5-8 Menu

- Two choice worth 2 points (remember and understand levels)
- 4 choices worth five points (apply and analyze levels)
- Two choices worth 8 points (evaluate and create levels)
- GOAL: Reach 10 points
YOUR TASK: Create a 2-5-8 Menu

<table>
<thead>
<tr>
<th>8 points</th>
<th>8 points</th>
<th>5 points</th>
<th>5 points</th>
<th>2 points</th>
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<tr>
<td><strong>Evaluation:</strong></td>
<td><strong>Synthesis:</strong></td>
<td><strong>Analysis:</strong></td>
<td><strong>Application</strong></td>
<td><strong>Recall</strong></td>
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<tr>
<td>- Editorialize</td>
<td>- Hypothesize</td>
<td>- Summarize</td>
<td>- Show</td>
<td>- List</td>
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<td>- Decide</td>
<td>- Imaging</td>
<td>- Abstract</td>
<td>- Make</td>
<td>- Identify</td>
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<td>- Evaluate</td>
<td>- Compose</td>
<td>- Classify</td>
<td>- Translate</td>
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<td>- Dispute</td>
<td>- Combine</td>
<td>- Dissect</td>
<td>- Illustrate</td>
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<td>- Rate</td>
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<td>- Graph</td>
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<td>- Discuss</td>
<td>- Create</td>
<td>- Compare</td>
<td>- Teach</td>
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<td>- Verify</td>
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<td>- Construct</td>
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<td>- Judge</td>
<td>- Estimate</td>
<td>- Deduce</td>
<td>- Demonstrate</td>
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<td>- Grade</td>
<td>- Forecast</td>
<td>- Order</td>
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<tr>
<td>- Choose</td>
<td>- Design</td>
<td>- Investigate</td>
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<td>- Assess</td>
<td>- Predict</td>
<td>- Differentiate</td>
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<td>- Categorize</td>
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<td>- Separate</td>
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<tr>
<td>BLOOM’S TAXONOMY</td>
<td>WEBB’S DEPTH OF KNOWLEDGE</td>
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<tr>
<td>---------------------------------------------</td>
<td>------------------------------------------------</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>KNOWLEDGE</strong></td>
<td>Recall – Recall of a fact, information, or procedure (e.g., What are 3 critical skill cues for the overhand throw?)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>“The recall of specifics and universals, involving little more than bringing to mind the appropriate material”</td>
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</tr>
<tr>
<td><strong>COMPREHENSION</strong></td>
<td>Basic Application of Skill/Concept – Use of information, conceptual knowledge, procedures, two or more steps, etc. (e.g., Explain why each skill cue is important to the overhand throw. “By stepping forward you are able to throw the ball further.”)</td>
<td></td>
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<tr>
<td>“Ability to process knowledge on a low level such that the knowledge can be reproduced or communicated without a verbatim repetition.”</td>
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</tr>
<tr>
<td><strong>APPLICATION</strong></td>
<td>Strategic Thinking – Requires reasoning, developing a plan or sequence of steps; has some complexity; more than one possible answer; generally takes less than 10 minutes to do (e.g., Design 2 different plays in basketball and explain what different skills are needed and when the plays should be carried out.)</td>
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</tr>
<tr>
<td>“The use of abstractions in concrete situations.”</td>
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<td></td>
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</tr>
<tr>
<td><strong>ANALYSIS</strong></td>
<td>Extended Thinking – Requires an investigation; time to think and process multiple conditions of the problem or task; and more than 10 minutes to do non-routine manipulations (e.g., Analyze 3 different tennis, racquetball, and badminton strokes for similarities, differences, and purposes. Then, discuss the relationship between the mechanics of the stroke and the strategy for using the stroke during game play.)</td>
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<tr>
<td>“The breakdown of a situation into its component parts.”</td>
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</tr>
<tr>
<td><strong>SYNTHESIS AND EVALUATION</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>“Putting together elements &amp; parts to form a whole, then making value judgments about the method.”</td>
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<tr>
<td></td>
<td>2 points</td>
<td>5 points</td>
<td>5 points</td>
<td>8 points</td>
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<tr>
<td><strong>BLOOM’S</strong></td>
<td>Knowledge/Comprehension</td>
<td>Application</td>
<td>Analysis</td>
<td>Synthesis</td>
</tr>
<tr>
<td><strong>WEBB’s</strong></td>
<td>Recall and Reproduction</td>
<td>Skills and Concepts</td>
<td>Strategic Thinking</td>
<td>Extended Thinking</td>
</tr>
<tr>
<td>Identify</td>
<td>Show</td>
<td>Summarize</td>
<td>Hypothesize</td>
<td>Editorialize</td>
</tr>
<tr>
<td>Locate</td>
<td>Make</td>
<td>Abstract</td>
<td>Imaging</td>
<td>Decide</td>
</tr>
<tr>
<td>Memorize</td>
<td>Illustrate</td>
<td>Classify</td>
<td>Compose</td>
<td>Evaluate</td>
</tr>
<tr>
<td>Review</td>
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<td>Dissect</td>
<td>Combine</td>
<td>Dispute</td>
</tr>
<tr>
<td>Match</td>
<td>Teach</td>
<td>Graph</td>
<td>Invent</td>
<td>Rate</td>
</tr>
<tr>
<td>Reproduce</td>
<td>Construct</td>
<td>Compare</td>
<td>Create</td>
<td>Discuss</td>
</tr>
<tr>
<td>List</td>
<td>Demonstrate</td>
<td>Contrast</td>
<td>Infer</td>
<td>Verify</td>
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<td>Deduce</td>
<td>Estimate</td>
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<td>Order</td>
<td>Forecast</td>
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<td>Investigate</td>
<td>Design</td>
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<td>Differentiate</td>
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<td>Separate</td>
<td>assess</td>
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<td></td>
<td></td>
<td></td>
<td>Categorize</td>
<td></td>
</tr>
</tbody>
</table>
Clock Partners

- Used to quickly put students in pairs or small groups
- Make a copy of the clock for each student. The name of another student goes at each hour mark around the clock so that asking students to find their “1 o’clock” partner puts the students in pairs (or groups of 3-4).
- Purposefully fill in some of the student names so that you know, for example, that 2 o’clock partners are mixed ability, 4 o’clock partners have similar interests, or that 7 o’clock partners were chosen by the students.
Differentiate by PROCESS according to INTEREST

- A collection of 10 to 20 objects for which students should be able to estimate the various characteristics. Some items you might consider including are a pencil, a box, a picture of a garden, a bucket, and a book. The collection should include some items which are very familiar to the students and perhaps some that are not. All the characteristics need not be measurable for every item. Students select a characteristic they are interested in estimating and measuring for a subset of the collection. These subsets could be selected by each interest group which adds the dimension of the students selecting items appropriate for measuring their characteristics. Another option would be subsets selected by the teacher prior to the lesson where you may choose to include items for which the characteristic is not appropriate.

  Tier I: **Length**  
  Tier II: **Area**  
  Tier III: **Weight**  
  Tier IV: **Capacity**

Each tier will complete the following activities with respect to their subset.  
- Students create a table for recording their estimates and measurements.  
- Students first estimate the characteristic for each item. Students should make estimates in both the American and metric systems and record the estimates on their table. Next students measure, in both systems, the characteristic for each item using an appropriate device and record the measurement. Have each tier share their results with the class.
DifferenCIate by Product

Performance Assessments

Alternative Assessment

Tiered Rubrics

Varied Products

Question Choices
Differentiate by PRODUCT

... allow students to demonstrate whether they have learned the key concepts and skills of a unit and to apply the learning to solve problems and take action. Different students can create different products based on their own readiness levels, interests, and learning preferences (Tomlinson, 2001). Students should be given a choice of four or five products from which they may select to demonstrate mastery of learning. Students also may elect to work alone or in small groups on their products. Products should be related to real problems, concerns, and audiences, and they should synthesize rather than summarize information.
### Differentiate by PRODUCT

**Modify the method by which the students demonstrate what they learn**

Products for ALL students should be focused on - and require the use of - the skills and concepts being taught.

<table>
<thead>
<tr>
<th>Differentiate Products by...</th>
<th>Strategy Ideas:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>READINESS</strong></td>
<td><strong>Alternative Assessments</strong></td>
</tr>
<tr>
<td>• Can the final product or assessment be provided at varying levels of difficulty or complexity?</td>
<td></td>
</tr>
<tr>
<td>◦ Tool: Rubrics</td>
<td><strong>Question Choices</strong></td>
</tr>
<tr>
<td><strong>INTEREST</strong></td>
<td><strong>Performance Assessments</strong></td>
</tr>
<tr>
<td>• Can the students choose a manner of demonstrating what they’ve learned and still focus on the key ideas and skills?</td>
<td></td>
</tr>
<tr>
<td>◦ Tool: Ways to Show what You Know</td>
<td></td>
</tr>
<tr>
<td><strong>LEARNING PROFILE</strong></td>
<td><strong>Tiered Rubrics</strong></td>
</tr>
<tr>
<td>• Would it be reasonable to provide different assessments to accommodate various learning styles?</td>
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<tr>
<td></td>
<td><strong>Varied Products</strong></td>
</tr>
</tbody>
</table>
Tiered by PRODUCT according to READINESS

- **Tier I: Basic Learners**
  Pairs of students are given a set of “real-number” cards and a blank Venn diagram which has three overlapping circles labeled as follows: numbers greater than 1½, numbers less than 3.5, and numbers between 0 and 15. Students write each number in the appropriate circle.

- **Tier II: Grade Level Learners**
  Pairs of students are given a set of “real-number” cards and a blank Venn diagram which has three overlapping circles which are not labeled. Students must sort their cards and decide on labels for each of the circles. Then students write each number in the appropriate circle.

- **Tier III: Advanced Learners**
  Pairs of students are given a set of “real-number” cards and a blank number line. Students must sort their cards and decide where to place each on the number line. Students complete the lesson by writing each number on the number line.
Tiered in PRODUCT according to INTEREST

Tier I: *Geometry Shapes*

Students create designs on grid paper which illustrate a variety of percents. The designs should incorporate several shapes and depending on the abilities of these students you may limit the number of percents they have to illustrate. For example, you may require students to illustrate 10%, 25%, 50%, 60% and then have the students pick four different percents. Have students write an explanation for each design. Materials needed are grid paper, markers or crayons, and lined paper for the explanations.

Tier II: *Mental Money*

Students mentally solve a variety of problems which involve percents and money. The problems should have at least 8 different values of percents, e.g. 1%, 5%, 10%, 20%, 25%, 50%, 75%, 80%, which are applied to a variety of monetary values, e.g. $10, $100, and $200. Since this lesson intended to be a mental activity, the problems and the students’ responses should be recorded.

Tier III: *Newspaper Adds*

Students work from advertisements in newspapers or magazines to create percent stories. Supply the students with a complete newspaper or magazine which contains a variety of percents, e.g. percents presented in an article, graph, or table, discount coupons, or discounts of any kind. Students create at least three stories about percents using the information from three different places. Each story must end in a question and require the use of percents to solve. Student supply the answers as well. Materials needed include newspapers and/or magazines and paper for writing the stories and solutions.
## Possible products

<table>
<thead>
<tr>
<th>Maps</th>
<th>Mobiles</th>
<th>Web Pages</th>
<th>PowerPoints</th>
<th>Puzzles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Book Covers</td>
<td>Dioramas</td>
<td>Cartoons</td>
<td>Murals</td>
<td>Architecture</td>
</tr>
<tr>
<td>Posters</td>
<td>Puppets</td>
<td>Car Designs</td>
<td>Musical Performances</td>
<td>Poetry Readings</td>
</tr>
<tr>
<td>Photography</td>
<td>Advertisements</td>
<td>Graphic Organizers</td>
<td>Diagrams</td>
<td>Models</td>
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<tr>
<td>Simulations</td>
<td>Demonstrations</td>
<td>Blueprints</td>
<td>Collages</td>
<td>Graphs</td>
</tr>
<tr>
<td>Book Covers</td>
<td>Experiments</td>
<td>Set Designs</td>
<td>Multi-media Presentations</td>
<td>Calendars</td>
</tr>
<tr>
<td>Relief Maps</td>
<td>Debates</td>
<td>Fund Raising</td>
<td>Service Projects</td>
<td>Videos</td>
</tr>
<tr>
<td>Mock Trials</td>
<td>Editorials</td>
<td>Diaries</td>
<td>Biographies</td>
<td>Journals</td>
</tr>
<tr>
<td>Speeches</td>
<td>Role Playing</td>
<td>Masks</td>
<td>Quilts</td>
<td>Buildings</td>
</tr>
<tr>
<td>Growing Plants</td>
<td>Writing Books</td>
<td>Bulletin Boards</td>
<td>Machines</td>
<td>Terrariums</td>
</tr>
<tr>
<td>Elections</td>
<td>Gardens</td>
<td>Terrariums</td>
<td>Computer Programs</td>
<td>Creating Games</td>
</tr>
</tbody>
</table>

Students may also develop interest or learning centers as a personal project for their class or for another grade level.
Tiered Rubrics

Benefits of Using Rubrics:

1. **Focus on What's Most Important**
   Decide: What skills, concepts or facts do you want student to understand at the end of the assignment?
   Weight the parts of the rubric so that what is most important for the students to learn is the largest part of the grade.
   For example, if the content (facts and information) of a project is the focus (what you want the students to spend most of their time on), then most of the rubric points should be on content skills, with fewer points, if any, used for other skills such as neatness and spelling.

2. **Provide Clear Expectations**
   Let the students know exactly what they are expected to learn and/or do.
   Give them a target to aim toward.

3. **Grade Objectively**
   Clear expectations make it easier to grade consistently and with less subjection.
   Once the rubric is established, grading often becomes faster and easier.

4. **Effective Student Self-Evaluation**
   Students can use the rubric to assess their own work, resulting in a better understanding of what they have accomplished and what they can work on for next time.

5. **Track Progress**
   Be able to identify specific improvements within a concept or skill.

• 2-3 rubrics are developed for one project, and given to students based on readiness. This provides all students with appropriate skills to focus on and a chance to be successful.
**Question Choices**

- **Evaluation:**
  - Editorialize
  - Decide
  - Evaluate
  - Dispute
  - Rate
  - Discuss
  - Verify
  - Judge
  - Grade
  - Choose
  - Assess

- **Synthesis:**
  - Hypothesize
  - Imaging
  - Compose
  - Combine
  - Invent
  - Create
  - Infer

- **Analysis:**
  - Estimate
  - Forecast
  - Design
  - Predict
  - Summarize
  - Abstract
  - Classify
  - Dissect
  - Graph
  - Compare
  - Contrast
  - Deduce
  - Order
  - Investigate
  - Differentiate
  - Categorize
  - Separate

- **Application:**
  - Show
  - Make
  - Translate
  - Illustrate
  - Record
  - Teach
  - Construct
  - Demonstrate

- **Recall:**
  - List
  - Identify
  - Locate
  - Memorize
  - Review
  - Match
  - Reprod

- **During whole group discussions, include questions that everyone in the class is able to answer, as well as more complex questions that only a few students may be able to answer. Adjust the difficulty of the questions depending on which student will be called on to respond.**
Strategy: The Name Card Method

• Discussion Buddy Pairs
  
  After the question is asked the buddies get think time independently then they get to have pair time

• Don’t match cards to kids

• Never put cards on bottom or place used ones in another can
Alternative Assessments

• Wide variety of possibilities, including use of different rubrics or assessments/tests for different students.

• **Low Prep Version:** Include as part of the assessment several questions of varying complexity or focused on different aspects of the concept, allowing students to make some choices about which ones they answer. (Example: Students are required to answer question 1 but can choose from questions 2-4 for their second response.)
<table>
<thead>
<tr>
<th>Techniques</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Tasks such as open-ended constructed-response tasks with rubrics</td>
<td>May better illuminate students' capacity to apply mathematics in complex or new situations</td>
</tr>
<tr>
<td>Observations Conversations Interviews</td>
<td>Can provide insights into students' thinking</td>
</tr>
<tr>
<td>Evaluative conferences (with goal setting)</td>
<td>Can monitor changes in students' thinking and reasoning over time</td>
</tr>
<tr>
<td>Anecdotal Notes Journals: Reflective, Interactive, Writing Prompts, etc. Written Group Reports</td>
<td>Can monitor changes in students' thinking and reasoning over time Can clarify the process standards and students' own thinking</td>
</tr>
<tr>
<td>Portfolios with artifacts, performances, and/or work samples</td>
<td>Can be the &quot;show piece&quot; of ongoing work and learning</td>
</tr>
<tr>
<td>Self-Assessments Questionnaires Interviews</td>
<td>Can assist with goal setting Can help students assume responsibility for their own learning Can help students become independent learners</td>
</tr>
<tr>
<td>Quizzes/Tests</td>
<td>May indicate whether students can apply procedures</td>
</tr>
<tr>
<td>Standardized Tests</td>
<td>Formal tests like CSAP and Terra Nova allow teachers and parents to evaluate learning progress over a period of time, as well as to evaluate instructional programs</td>
</tr>
</tbody>
</table>
Varied Products

- Possibly the easiest way to differentiate
- Allow students to make choices about how they demonstrate what they’ve learned, whether they write an essay, make a poster, or act out a scene.
- Be clear about your expectations, possibly using a rubric; then allow them to meet the requirements in their own way.
- This also works well when you have limited resources because not all students need to same materials and equipment at the same time.
DIFERENTIATE by LEARNING ENVIRONMENT

- Performance Assessments
- Alternative Assessment
- Question Choices
- Tiered Rubrics
- Varied Products
Differentiate by LEARNING ENVIRONMENT

...reviewing classroom routines, space, and pace, in order to provide students the best conditions for learning
Differentiate by LEARNING ENVIRONMENT

• Provide choice in materials, assignments, pacing, and grouping.
• Consider what materials will be available for student use.
• Plan procedures for accessing materials.
• Explain the procedures when working in small groups, whole group or individually.
• Assist students with ways to keep track of assignments.
• Role-play what students should do when they need help when the teacher is working with a small group.
Differentiate by LEARNING ENVIRONMENT

• Explain the choices students can make about where and how they work.
• Consider how to manage flexible pacing.
• Teach students to keep track of their goals and accomplishments.
• Provide meaningful and engaging “anchor activities”; work that students can do if they finish before other students.
Differentiated Instruction for Math

is a process through which teachers enhance learning by matching student characteristics to instruction and assessment. Differentiated instruction allows all students to access the same classroom curriculum by providing entry points, learning tasks, and outcomes that are tailored to students’ needs (Hall, Strangman, & Meyer, 2003). Differentiated instruction is not a single strategy, but rather an approach to instruction that incorporates a variety of strategies.
Additional Strategies

- Frayer Model
- Most Difficult First
Frayer Model

• The Frayer model is a word categorization activity that helps learner to develop their understanding of concepts. Two versions of the Frayer model can be used. In the first, students provide a definition, list characteristics, and provide examples and non-examples of the concept. In the second, students analyze a word's essential and nonessential characteristics and refine their understanding by choosing examples and non-examples of the concept.
<table>
<thead>
<tr>
<th>Definition (in own words)</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>A whole number with exactly two divisors (factors)</td>
<td>* 2 is the only even prime number</td>
</tr>
<tr>
<td></td>
<td>* 0 and 1 are not prime</td>
</tr>
<tr>
<td></td>
<td>* Every whole number can be written as a product of primes</td>
</tr>
</tbody>
</table>

(PRIME)

<table>
<thead>
<tr>
<th>Examples</th>
<th>Non-Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>2, 3, 5, 7, 11, 13...</td>
<td>* 5 is not a factor of 12</td>
</tr>
<tr>
<td></td>
<td>* 0 is not a factor of any whole number</td>
</tr>
</tbody>
</table>

(WORD)

<table>
<thead>
<tr>
<th>Essential Characteristics</th>
<th>Non-essential Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Examples</th>
<th>Non-Examples</th>
</tr>
</thead>
<tbody>
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<td></td>
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</tbody>
</table>
**Definition (in own words)**

A mathematical shape that is a closed plane figure bounded by 3 or more line segments

**Characteristics**

- Closed
- Plane figure
- More than 2 straight sides
- 2-dimensional
- Made of line segments

**Examples (from own life)**

- Pentagon
- Hexagon
- Square
- Trapezoid
- Rhombus

**Non-Examples**

- Circle
- Cone
- Arrow
- Cylinder
Strategy: Most Difficult First

• The teacher gives the following assignment: Pages 59-60 #3-5, 8-9, 11-15, 21-23

The most difficult problems are:
• *#5, *#9, *#14, *#15, *#22

• 80% mastery might indicate the student is ready to move on and knows the content.
Challenging Advanced Learners

- Design activities that are more complex, abstract, independent, and/or multistep.
- Pose a challenge question or task that requires them to think beyond the concrete and obvious response (from the newly learned material) to more abstract ideas and new use of the information.
- Require more complex expression of ideas: different types of sentences, synonyms, more than one adjective or action (verb) to describe what’s happening.
- Require that metaphors and similes, idiomatic expressions, or specific literary elements be included in their writing.
- Ask students to make text-to-text and text-to-world connections (more abstract than text-to-self connections).
- Require students to note relationships and point out connections among ideas: compare and contrast; cause and effect; problem and solution; sequence, steps, or change over time; advantages and disadvantages; benefits; etc.
- Ask students to tell the story from a different point of view.
- Ask students to place themselves into the story or time period and write from the first-person point of view.
- Ask students to consider “What if?” scenarios.
- Provide multistep math problems.
- Include distracters.
- Do not provide a visual prompt.
- Ask students to suggest tips or hints that would help others who struggle to make sense of the information.
- Provide a problem or model that does not work; have students problem-solve.
- Have students create their own pattern, graph, experiment, word problem, scenario, story, poem, etc.
- Have students use the information in a completely new way (Design an awareness campaign about …; Create a flier to inform …; Write/give a speech to convince …; Write an article to educate …; Write an ad to warn others about …; Design a program to solve the problem of …).
Scaffolding Struggling Learners

• Offer teacher direction (reteaching with a different method).
• Allow the student to work with a reading partner, study buddy, or learning partner. (Buddy-up an English language learner (ELL) with another student.) This will provide peer support for collaborative learning.
• Allow students to use class notes, textbooks, and/or other classroom resources to complete the task.
• Provide a model or exemplar (of a similar problem solved or a sample of the type of writing expected).
• Furnish step-by-step directions; break down the task.
• Provide hints or tips.
• Color-code different elements; highlight for focusing; provide “masks and markers” for focused attention on specific text.
• Provide sentence strips, sticky labels with terms, or manipulatives (plastic coins, Judy clocks, Unifix cubes, fraction tiles, number lines, algebraic tiles, calculators, etc.).
• Provide a partially completed graphic organizer or outline.
• Provide out-of-sequence steps for students to reorganize.
• Provide a cloze (fill-in-the-blank) paragraph (with or without a word box) for students whose language is extremely limited or for those who struggle with grapho-motor skills.
• Give a framed paragraph or essay (with sentence starters to help organize the writing).
• Provide guided questions.
• Supply a word bank and definitions.
• Support with visuals, diagrams, or pictures.
• Provide words on labels for students to simply pull off and place appropriately.
• Allow additional time.
Teachers can differentiate

Content

Process

Product

according to students'

Readiness

Interests

Learning styles

through a range of instructional and management strategies such as

adjusting questions, anchor activities, interest centers, learning centers, compacting, cubing, graphic organizers, independent projects, learning contracts, menus, rubrics, scaffolding, student choice, think-pair-share, tic-tac-toe, tiered instruction, and more.

Tomlinson, 1999, pg. 15
Resources

- [iris.peabody.vanderbilt.edu/resource_infoBrief](http://iris.peabody.vanderbilt.edu/resource_infoBrief)
  [k8accesscenter_org_training_resources_documents_Math_Differentiation_Brief_pdf.html](http://iris.peabody.vanderbilt.edu/resource_infoBrief)
- [www.oswego.edu/plsi/taketest.htm](http://www.oswego.edu/plsi/taketest.htm)
- [edprodevelopment.com/resources/presentations/differentiatedinstruction.htm](http://edprodevelopment.com/resources/presentations/differentiatedinstruction.htm)
- [www.doe.in.gov/exceptional/gt/tiered_curriculum/welcome.html](http://www.doe.in.gov/exceptional/gt/tiered_curriculum/welcome.html)
- [fdlrssouth.dadeschools.net/hrd/CMagnus/C.%20Magnus%20MINI%20PD's/MINI%20PD%20Overview%20of%20Differentiating%20Instruction.ppt](http://fdlrssouth.dadeschools.net/hrd/CMagnus/C.%20Magnus%20MINI%20PD's/MINI%20PD%20Overview%20of%20Differentiating%20Instruction.ppt)
- [www.oise.utoronto.ca/adaptiveTech/Differentiation/How_to_Differentiate_Instruction.html](http://www.oise.utoronto.ca/adaptiveTech/Differentiation/How_to_Differentiate_Instruction.html)
- [iriscenter.com/resources.html](http://iriscenter.com/resources.html)
- [www.eht.k12.nj.us/~Jonesj/Differentiated%20Instruction/Compacting.htm](http://www.eht.k12.nj.us/~Jonesj/Differentiated%20Instruction/Compacting.htm)
- [www.engr.ncsu.edu/learningstyles/ilsweb.html](http://www.engr.ncsu.edu/learningstyles/ilsweb.html)
- [www.foridahoteachers.org/differentiation_framework.htm](http://www.foridahoteachers.org/differentiation_framework.htm)
- [www.foridahoteachers.org/curriculum_ladders_math.htm](http://www.foridahoteachers.org/curriculum_ladders_math.htm)
- [www.foridahoteachers.org/Strategies%20files/Ways%20to%20Show%20What%20You%20Know.pdf](http://www.foridahoteachers.org/Strategies%20files/Ways%20to%20Show%20What%20You%20Know.pdf)