Chapter 15: Teaching Students With Different Learning `Needs

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Teaching Students With Different Learning Needs

- Meaning of terms used to describe students with different learning needs
- Methods used to identify these students and their needs
- Approaches and programs designed for these students
- Examine the practice of “streaming” students and consider alternate approaches

Terms Used to Identify Students With Difficulties Learning Math

- Students with learning difficulties
- Students with learning disabilities
- Low-achieving students
- Students at risk of failure
- Students at educational risk
- Students with special needs

Definition:

- Students with learning difficulties are understood to be those students who require extra assistance with mathematics due to their lack of, or failure to use, mathematical knowledge and skills
- It can also be used to describe students who are performing below, or well below, the average level for students of their age

Learning Difficulties vs. Disabilities

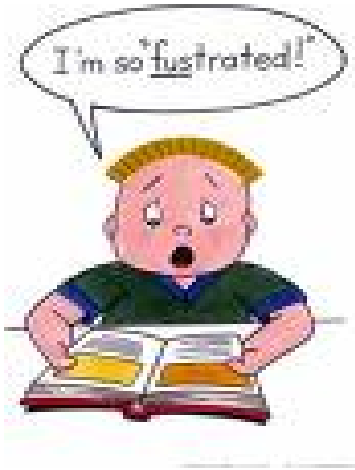
- Westwood (2003)
- Learning Disabilities in Mathematics (about 3 percent of students)
- Dyscalculia – a specific learning disability involving innate difficulty in learning or comprehending mathematics
- Much like Dyslexia and can include confusion about math symbols

Mathematics Learning Difficulty Statistics

- Between 10 - 30 % of primary students
- A Victorian Study: approx. 9 % of Year 8 students and 8 % of Year 9 students were assessed as performing at or below the standard expected for Year 4 students
- 11% of Year 8 students and 10% of Year 9 students were below the standard for Year 6

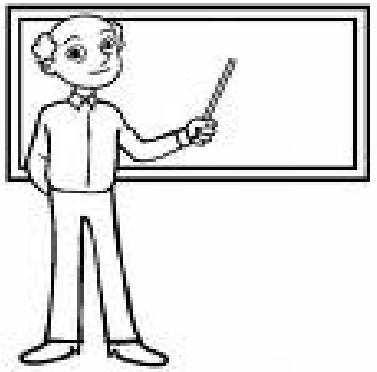
Identifying Students with Learning Difficulties

- Under-developed knowledge
- Gaps or misunderstandings in mathematical concepts and skills
- Poor motivation
- Problems recalling information and facts
- Difficulties in recalling and using problem-solving strategies
- Limited vocabulary
- Low levels of metacognition



Mathematics Work

- Reliance on inefficient counting strategies for computation
- Lack of partitioning (or decomposition) strategies for computation
- Poor understanding of the structure of the number system
- Knowledge of multiplication is limited to a repeated addition concept
- Knowledge of division is limited to sharing by ones and does not include understanding of quotition
- Poor understanding of fractions



Learning Obstacle

- Curriculum proceeds too quickly and students are not ready to assimilate new concepts and procedures
- Teachers language when explaining concepts or asking questions does not match the students level of comprehension
- Abstract concepts are introduced too early without the support of concrete materials, visual aids or real life examples

Learning Obstacles Continued…

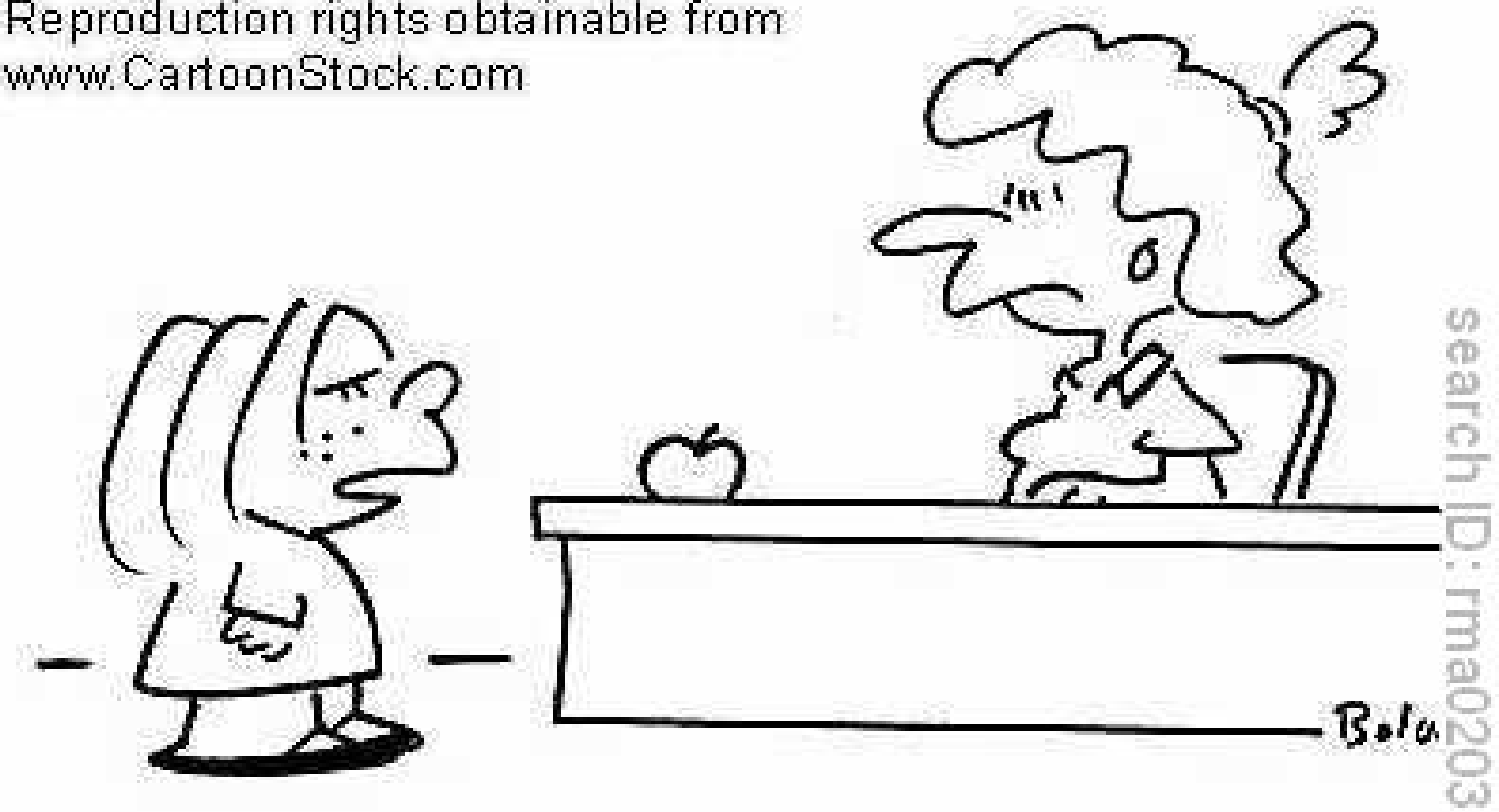
- Concrete or visual aids may have been removed too soon or created confusion rather than clarity
- Mathematical investigations and experiential learning area not followed up with carefully structured activities for consolidating concepts and skills
- Students with reading difficulties are given pure arithmetic or algebra exercises only, and are neither presented with nor taught how to solve worded and non-routine problems

Learning Obstacles Continued…

- There is an emphasis on teaching of procedures and tricks which are rapidly forgotten because they do not enable meaningful learning.
- Mathematics is taught in a linear sequence with inadequate time devoted to each topic, and to revisiting and reviewing of concepts and processes at regular intervals
- There is insufficient guided practice
- There is too little corrective feedback.

Providing Feedback

- Why did the student get this item wrong?
- Can he or she carry out the process if allowed to use concrete aids or computational tool?
- Can he or she explain to me what to do?
- Ask the student to work through the item step by step. At what point does the student misunderstand?



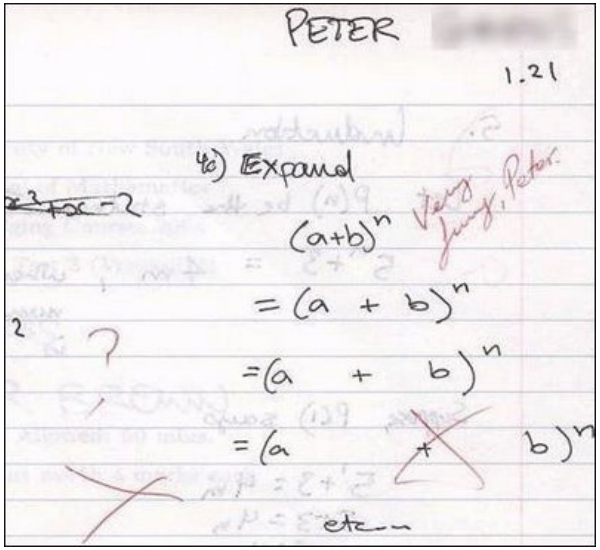
"How do you know I have a learning disability?
— Maybe you have a *teaching* disability!"

Diagnostic Tools

- Pen-and-Paper Diagnostic Tests
- Clinical Interviews
- Rich Assessment Tasks (worksheets, problem-solving)
- Past Experiences/Prior Teachers
- Records

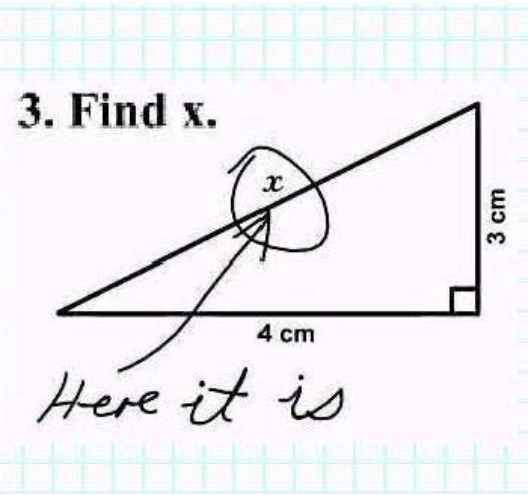
Pen-and-Paper Tests - Pros

- Assesses Content
- Assesses Procedural Knowledge
- Assists Teachers to Construct a Student Profile
- Assesses Overall Strengths and Weaknesses of Students



Pen-and-Paper Tests - Cons

- Too easy
- Too difficult
- May not equally represent the curriculum of instruction
- Cheating can easily occur during this method of assessment. Hence, does not fairly represent the capabilities of the student.



Clinical Interviews - Pros

- Allows the teacher to probe students thinking by inviting them to express their ideas verbally in an one-on-one conference.
- Provides insight into weaknesses and strengths of the student
- Provides insight into how students think about and solve a problem

Clinical Interview - Cons

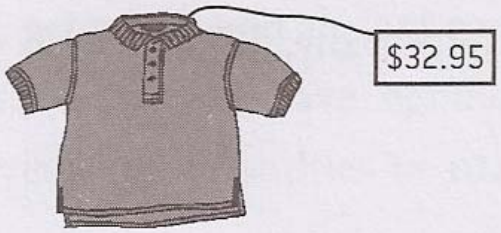
- Length of time to provide individual student interviews

Clinical Interview

Worded problem: Subtraction $50 − $32.95 =

Instruction

'Read the problem and work out the answer.'



How much change would you get from $50 if you bought a shirt for $32.95?

'Explain how you worked out your answer.'

If the student is not able to work it out mentally, tell them that they can use pen and paper.

Recording sheet

- ☐ uses written decomposition algorithm
- ☐ uses written equal addition algorithm
- ☐ mentally subtracts hundreds then tens then ones
- ☐ adds on to find the difference [+ 5c + $5]
- ☐ other (specify):

Application and Problem Solving - Pros

- Discovers student's problem-solving strategies
- Discovers student's actual understanding of mathematical concepts
- Can utilize real-life contexts in order to make it more relatable to student
- Can be performed in a group environment

Application and Problem Solving - Pros Cont…

Allows teachers to discover if errors are:

- based on random or repetitive circumstances they occur in
- based on general or conceptual errors
- based on weak recording skills or misuse of equipment
- based on inappropriate generalization
- based on unhelpful images of the concept
- based on faulty memory

Application and Problem Solving - Cons

- Students with reading difficulties
- Utilizing group activity may not be a true representation of each student's math intellect

Worksheets - Pros

- Tests a wide range of problems from differing levels of difficulty
- Allows the teacher to discover the intelligence levels of students
- Helps the teacher to determine the strengths and weaknesses of all students

Worksheets – Cons

- Time consuming
- If they are not worth any grade, less likely students are going to work efficiently at them
- Typically of a take-home nature, thus students have access to additional materials to help solve problems (i.e, peers, texts, notes, etc.)

Newfoundland and Labrador Diagnostic Tools

Math Placement Test (MPT)

- Examines a number of basic skills in mathematics in specific core areas of addition, subtraction, multiplication and division of numbers, fractions, and algebraic expressions
- Used by students to assess preparedness for university mathematics courses and it is required of students to qualify for entry into specific courses
- MPT Link http://www.mun.ca/math/mpt/mptsynopsis.pdf

Newfoundland and Labrador Diagnostic Tools

Criterion Referenced Test (CRT)

- Administered in grades 3, 6, and 9
- Administered to show whether a student has mastered the information that is taught to them in a particular topic or grade
- The test is created from predetermined criteria set forth by the school or government
- Given by teachers to establish how well their students have learned the data and skills that were taught in the class

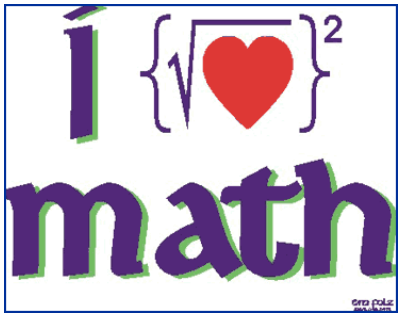
Newfoundland and Labrador Diagnostic Tools

Criterion Referenced Test (CRT)

- Teachers can judge the students' strong areas and those that need work.
- It may also give them insight into how they can teach more effectively
- The CRT is based solely on an individual's performance and not in reference to the performance of others.

General Remarks

- Is it poor instruction or poor capabilities?
- Do not rely only on one source of assessment (past experiences, prior teachers, and student's records)
- Provide intervention strategies



Mathematically Talented

- Needs
- Teaching
- Enrichment Programs
  - Math League
- Accelerated Programs
- Resources

"After Accelerated Math I think I deserve a little rest."

Mathematically Talented

- Definition:
  - Creative
  - Risk-Taking
  - Curious
  - Imaginative

Mathematically Talented

- Needs attention
- High intelligence does NOT imply good behaviour
  - Poorly behaved students can be math inclined
- Gifted students may choose hide talents
- Can suffer from: underachievement, boredom, frustration, psychological distress

Mathematically Talented Teaching

- Develop autonomy, self reliance, social skills
- Tests with bonus higher order questions
  - Don’t assume they want to do extra work
  - BRIBES!
- Group with other students for challenging Q’s
  - Foster communication skills
  - Helps other students pick up habits from gifted

Mathematically Talented Enrichment Programs

- Activity or withdrawal program
  - Competition, after school, holiday
- Tasks involve problem solving and application
- Open to all students to avoid prejudice
- Good outlet for gifted students but shouldn’t be only one

Mathematically Talented Math League

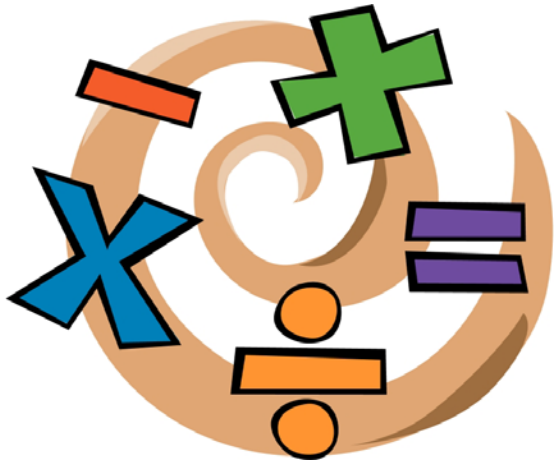
- Schools compete against each other in groups
- Encourages communication within group
- Students present solutions

Mathematically Talented Accelerated Programs

- Curriculum in shorter amount of time
- Should be more challenging than placing them a year ahead
  - Should have higher order tasks
  - Include complexity, creativity, critical thinking
  - Use mathematical reasoning, conjecture, proof
- CDLI

Mathematically Talented Resources

- CDLI
- ‘A Taste of Mathematics'
- ‘Crux Mathematicorum’
  - Mathematical Mayhem

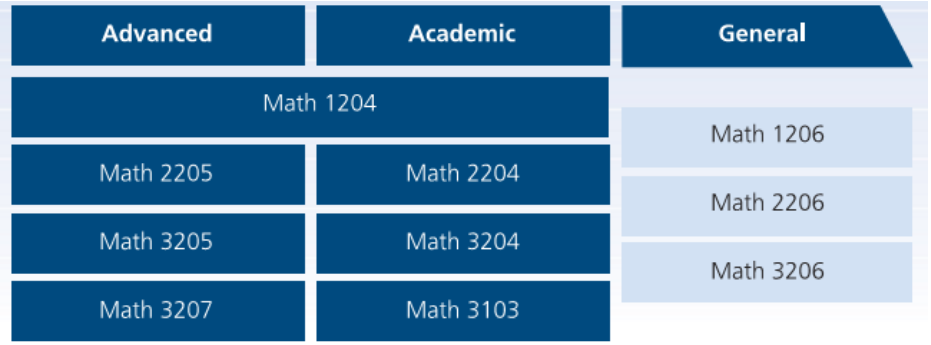


Diverse Student Needs

How does the school and teacher provide for diverse needs of students?

- Streaming
- Pathways
- Inclusion
- Differentiated instruction

Streaming



- NL: General/Basic, Academic, and Advanced Math
- Grade 9 teacher makes a recommendation but the student and his/her parents have the final decision.
- Certain courses are considered prerequisites (e.g. Math 1204 for 2205/2204) which can prevent students changing streams.

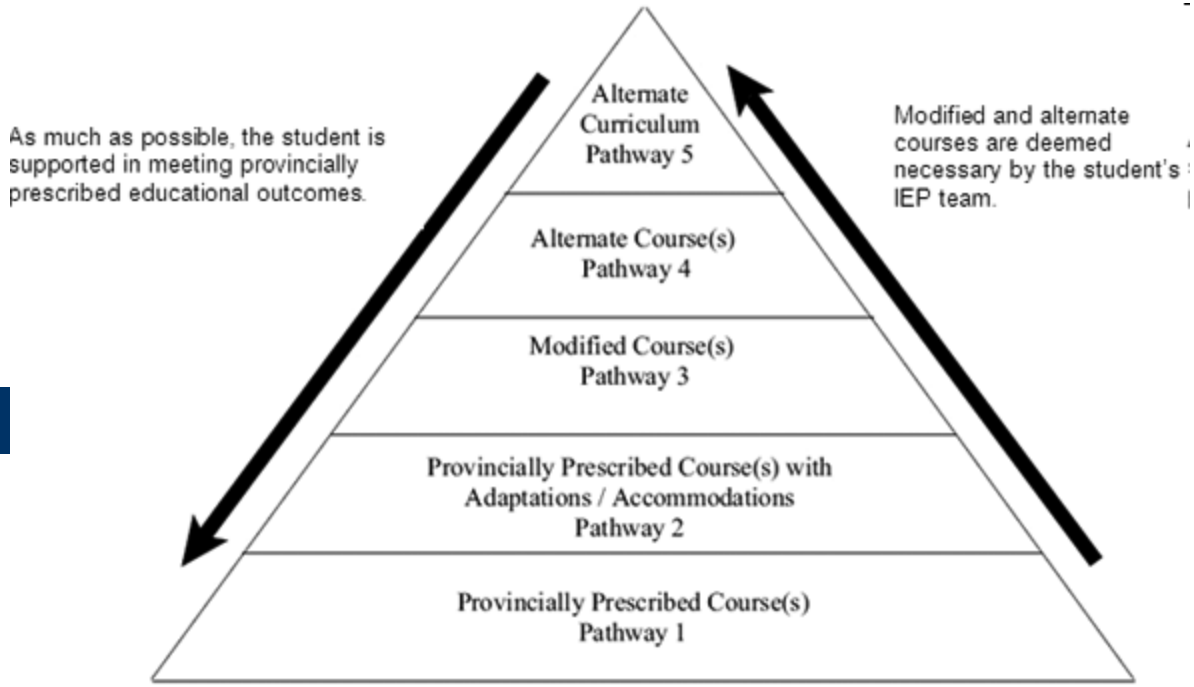
Aim of streaming

- Advanced - Those entering post-secondary programs that require calculus (e.g., Mathematics, Sciences, Engineering, Commerce, etc)
- Academic - Those entering post-secondary programs that do not require calculus (e.g.,Humanities, Fine Arts, some Trades and Technical programs, etc.)
- General - Those entering the workforce, trades or technical programs that do not require advanced mathematics.

Pathways

- Pathways is a way to describe how educators deliver educational programs to meet the individual strengths and needs of all students. A student must have an exceptionality to access Pathway 2, 3, 4, or 5.
- Programming decisions are made by the student's program planning team.
- Students can get support in an area of need, and if that need changes, they may need programming in a different Pathway.
- Students may have different pathways in different subjects

Pathways



- Pathway 1 - Provincially Prescribed Course(s)
- Pathway 2 - Provincially Prescribed Course(s) with Adaptations/Accommodations
- Pathway 3 - Modified Course(s)
- Pathway 4 - Alternate Course(s)
- Pathway 5 - Alternate Curriculum

http://www.ed.gov.nl.ca/edu/k12/studentsupportservices/pathwaysdesc.html#whatis

Pathways and students with exceptionalities

- Majority of our province's children Pathway 1, the proscribed curriculum, with decreasing numbers of children accessing more intensive supports.
- The exceptional student requires a modified curriculum
- Some children may have, multiple, complex and/or severe needs which require immediate intensive supports provided through Pathways 2, 3, 4 and 5.
- An exceptionally able student who has demonstrated mastery of the provincially prescribed curriculum may access Pathway 3 and Pathway 4 to meet his/her individual learning needs.

Inclusion

- Special education where students are taught apart from able peers is increasingly seen as segregation. Arguments for inclusive education include equality and human rights.
- The department's view on inclusive education promotes the basic right of all students to receive appropriate and quality educational programming and services in the company of their peers.
- An inclusive culture starts from the premise that everyone in the school should feel that they belong, realize their potential and contribute to the life of the school.

What do teachers think about inclusion?

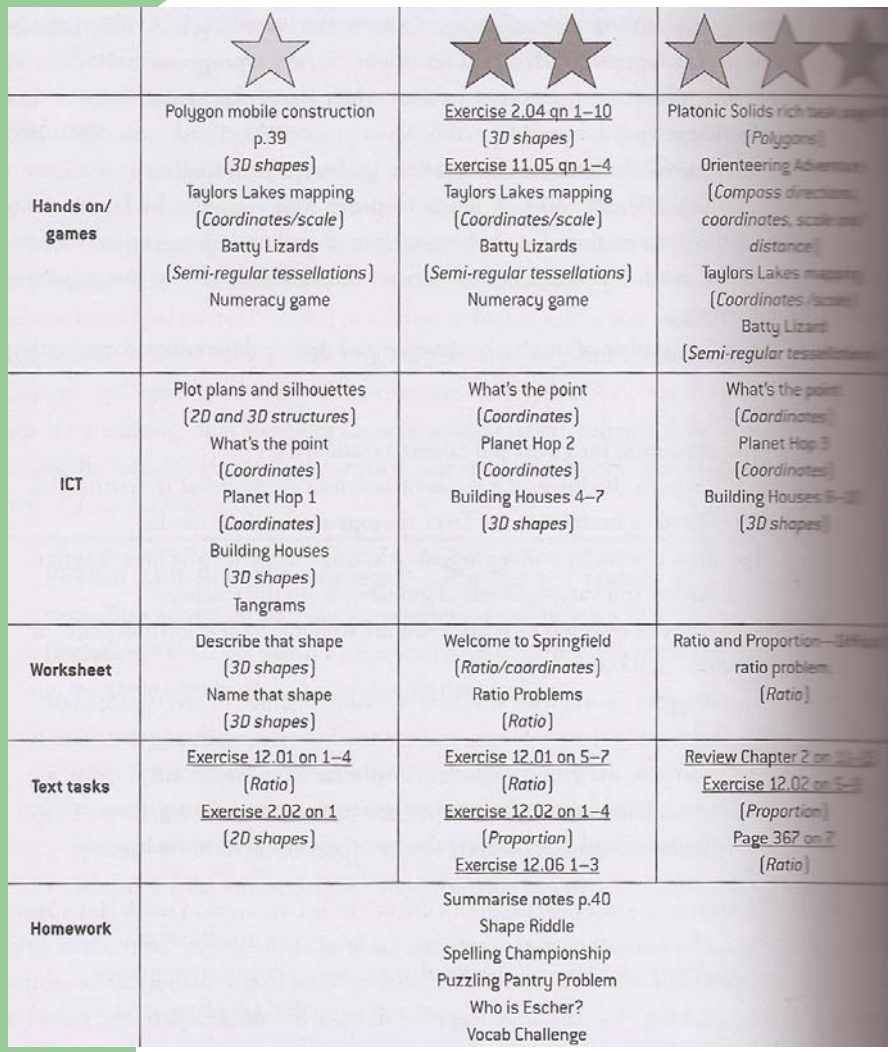
- Research indicates that teachers don’t disagree with inclusion but they feel inadequately prepared and under resourced to deal with children who have severe disabilities and behaviour problems.
- When asked one teacher pointed out that learning disabilities don't imply behaviour problems. You can have students who learn fine but are misbehaving.
- Consider what you believe about inclusion, as your beliefs will influence your decisions.

Heterogeneous classroom

- So now more than ever teachers can expect a heterogeneous (mixed-ability) classroom
- A differentiated approach to learning focuses on the needs and abilities of the student as opposed to the curriculum
- Differentiated curriculum may include various choices of activities, different tasks or levels of depth, various tools for aiding learning and various media for recording and reporting learning.

Differentiated curriculum

- Compacted curriculum for gifted students
- Tiered instruction: hierarchical activities
- Independent study
- Group study (flexible groups)
- Individual contracts (teacher)
- Negotiated curriculum (student)



	★	★★	★★★
Hands on/ games	Polygon mobile construction p.39 (*3D shapes*) Taylors Lakes mapping (*Coordinates/scale*) Batty Lizards (*Semi-regular tessellations*) Numeracy game	Exercise 2.04 qn 1–10 (*3D shapes*) Exercise 11.05 qn 1–4 Taylors Lakes mapping (*Coordinates/scale*) Batty Lizards (*Semi-regular tessellations*) Numeracy game	Platonic Solids rich task (*Polygons*) Orienteering Adventure (*Compass directions, coordinates, scale and distance*) Taylors Lakes mapping (*Coordinates/scale*) Batty Lizard (*Semi-regular tessellations*)
ICT	Plot plans and silhouettes (*2D and 3D structures*) What's the point (*Coordinates*) Planet Hop 1 (*Coordinates*) Building Houses (*3D shapes*) Tangrams	What's the point (*Coordinates*) Planet Hop 2 (*Coordinates*) Building Houses 4–7 (*3D shapes*)	What's the point (*Coordinates*) Planet Hop 3 (*Coordinates*) Building Houses 8–10 (*3D shapes*)
Worksheet	Describe that shape (*3D shapes*) Name that shape (*3D shapes*)	Welcome to Springfield (*Ratio/coordinates*) Ratio Problems (*Ratio*)	Ratio and Proportion—Ultimate ratio problem (*Ratio*)
Text tasks	Exercise 12.01 on 1–4 (*Ratio*) Exercise 2.02 on 1 (*2D shapes*)	Exercise 12.01 on 5–7 (*Ratio*) Exercise 12.02 on 1–4 (*Proportion*) Exercise 12.06 1–3	Review Chapter 2 on 12–15 Exercise 12.02 on 5–8 (*Proportion*) Page 367 on ? (*Ratio*)
Homework		Summarise notes p.40 Shape Riddle Spelling Championship Puzzling Pantry Problem Who is Escher? Vocab Challenge	

(p382 textbook Figure 15.4)

Tiered Instruction Model

- Number of stars represents level of challenge. Underlined tasks compulsory and teacher helps students choose from remaining tasks.
- Teacher needs to prepare students and explain that curriculum and expectations are designed to meet student needs.
- Different not additional work for gifted/talented students.

Differentiation - Content

- The most basic content of a lesson should cover the standards of learning set by the district or province.
- The teacher may differentiate the content by designing activities that cover different areas of Bloom's Taxonomy
- When a teacher differentiates content they may adapt what they want the students to learn or how the students will gain access to the knowledge, understanding and skills but…
- All students are working towards the same objectives

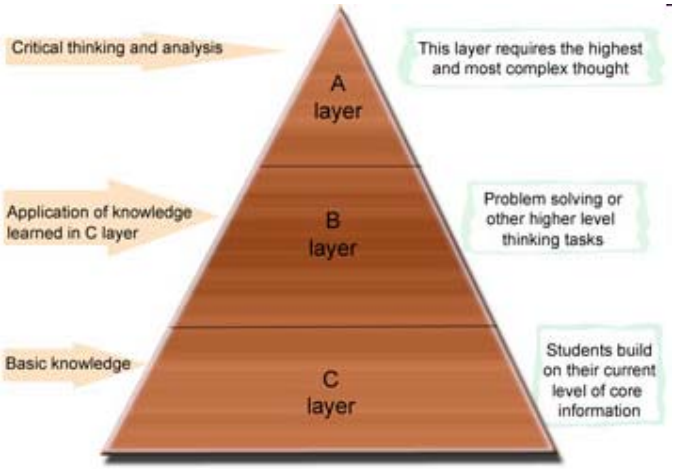
Differentiation - Process

- The process of how the material in a lesson is learned may be differentiated for students based on their learning styles
- This stage of differentiation allows students to learn based either on what method is easiest for them to acquire knowledge, or what may challenge them most (they need practice in it).
- How a teacher plans to deliver instruction is based on assessment that show the needs, learning styles, interests, and prior knowledge of students.

Differentiation - Product

- The product is what the student produces at the end of the lesson to demonstrate the mastery of the content: tests, evaluations, projects, reports, or other activities.
- Based on students' skill levels and educational standards, teachers may assign students to complete activities that demonstrate mastery of an educational concept (writing a report), or in a method the student prefers (composing an original song about the content, or building a 3-dimensional object that explains mastery of concepts in the lesson or unit).

Layered Curriculum



- Three Levels of instruction, A,B,C. C level covers basic requirements curriculum (max C grade). B and A are higher level (Bloom's taxonomy). These levels require more work but show a deeper understanding.
- Each level has choices of assignments each worth a certain amount of points. Total points determine grade.
- Grades are not based on the traditional percentage of correct information remembered, but rather on the depth in which a student pursues the study of a topic.
- http://help4teachers.com/how.htm

Algebra 1 - Chapter 3 **Learning Goals: Solving 1 & 2 step equations, Equations-Var. Both Sides, Algebraic Formulas** **NAME** _____

Daily Work (Home/Class)

* Listen to lecture / take notes (5 pts EACH day) (25 possible) _____

8 DAYS

1. Page 135-136 #10 - 51 (10 pts.) _____
2. Page 142 #15 - 53 (odds) Page 144 #66 - 82 (10 pts.) _____
3. Page 148-149 #16 - 43 and #50 - 55 (10 pts.) _____
4. Review Wkst #3.3 (10 pts.) _____ *QUIZ 3.3 (20 pts.)*
5. Page 157 #13 - 41 (odds) Page 169 #15 - 35 (odds) (10 pts.) _____
6. *QUIZ 3.6 (20 pts.)* Page 177 #11 - 29 (odds) Page 183 #5 - 20 (10 pts.) _____
7. REVIEW: Page 190-192 #1 - 34 - (20 pts.) _____
8. Chapter 3 TEST (100 pts.)

Notes	_____
Homework	_____
Activities	_____
Technology	_____
Projects	_____
Bonus	_____
TOTAL POINTS	_____ = Grade: _____

Grading Scale: (200 possible)

A	180-200
B	160-179
C	140 -159
D	120 -139

Activities - 45 POINTS

1. Chapter 3 Warm-Ups and Daily Quizzes (30 pts.) _____
2. Real Life Application: Biology Page 46. (25 pts.) _____
3. Cooperative Learning: Page 61 (Work with ONE partner) (10 pts.) _____
4. Real Life Application: Recycling - Page 62 (10 pts.) _____
5. Real Life Application: Tunnels Page 76 (10 pts.) _____
6. Application: Swimming Page 91 (10 pts) _____
7. Cooperative Learning: Golden Ratio - Page 117 (Work with ONE partner) (10 pts.) _____
8. Real Life Application: Skyscrapers - Page 118 (10 pts) _____

Technology - 25 POINTS

1. Chapter 3 PowerPoint Lesson * Work out problems presented and summarize. (15 pts.) _____
2. Website Internet Quiz * Chapter 3 (10 pts.) _____
3. Graphing Calculator: Solver Page 38 - 39 (10 pts.) _____
4. Graphing Calculator: Solve Equations by graphing Page 68-69 (15 pts.) _____
5. Spreadsheet (Excel) Page 82 with textbook page 173 Print out work. (15 points) _____
6. Astro Algebra - Complete 2 topics related to solving equations. (Write a summary) - Ask for CD (10 pts) _____
7. Internet Activities of your choice pertaining to 1 learning goal listed above. Must include: URL, printout of screens and a summary of what was learned. (15 pts) _____
8. IBM Exploration Toolkit and Equation Worksheet. Complete and summarize what activity did. (Ask for disk/computer) (15 pts) _____

Layered curriculum

Projects - 25 POINTS

1. Instant Replay Video Game - BINGO - Chapter 3 (15 pts.) _____
2. Review Game - Page 120 (Ch 3 Resource Book) (15 pts) _____
3. Math Detective: Page 158-163 (Pick ANY 15) (15 pts.) _____
4. Cooperative Learning: Page 46-47 (Work with 1 partner) (10 pts.) _____
5. Math Starters: Page 203 - 207 Pick any 10 (10 pts.) _____
6. Make an ORIGINAL 20 question TEST for Chapter 3. Give to a class-member and grade. Turn in blank copy, key copy, and student copy. (15 pts.) _____

○ * *Circled items can be completed at home, in the library, or in class.*

BONUS POINTS: _____ POINTS

DATE: _____

TEACHER SIGNATURE: _____

* Class Website: schools.rps205.com/guilford/godtland

Any Questions?

“Not every child has an equal talent or an equal ability or equal motivation, but children have the equal right to develop their talents their abilities and their motivation.”

John Fitzgerald Kennedy