Differentiated Instruction Teaching/Learning Examples

GRADE 7 MATHEMATICS: DATA MANAGEMENT
Two 60–minute periods

1. I See, I Think and So Graphic Organizer (Non-linguistic Representations)*
2. Problem-based Learning (Generating and Testing Hypotheses)*, RAFT (Role, Audience, Format, Topic)**
3. Journal Entry (Setting Objectives and Providing Feedback)*

*Marzano's Categories of Instructional Strategies (See Resources, below)
**Differentiated Instruction Structure

DIFFERENTIATED INSTRUCTION DETAILS

Knowledge of Students
Differentiation based on student:
☐ Readiness   ☐ Interests   ☑ Preferences:
   ☐ Styles   ☑ Intelligences   ☐ Other (e.g., environment, gender, culture)

Need to Know
• Students' preferred ways of learning (i.e., words, numbers or pictures) in order to support their choice in the RAFT (Role, Audience, Format, Topic) assignment

How to Find Out
• Student self-assessment based on three Multiple Intelligences (i.e., verbal-linguistic intelligence, logical-mathematical intelligence and visual-spatial intelligence)

Differentiated Instruction Response
☐ Learning materials (content)   ☑ Ways of learning (process)   ☑ Ways of demonstrating learning (product)   ☐ Learning environment

Tri This! Triangle (Appendix B) differentiates the process and product based on students' verbal-linguistic, logical-mathematical and visual-spatial intelligence preferences.

CURRICULUM CONNECTIONS

Overall Expectation: Data Management and Probability
• Make and evaluate convincing arguments, based on the analysis of data

Specific Expectations:
• Identify and describe trends, based on the distribution of the data presented in tables and graphs, using informal language
• Make inferences and convincing arguments that are based on the analysis of charts, tables and graphs

Learning Goal:
• Analyze data to form hypotheses and create convincing arguments

ASSESSMENT AND EVALUATION

Assessment/Success Criteria

Thinking
• Reasoning and Proving≠: Extracts and interprets tables and graphs

Communication
• Communicating≠: Describes in words the meaning of the data and graphs

Application
• Connecting≠: Makes connections to real world situations that use data for evidence

Assessment Tools:

• Anecdotal Comments
• Rubric

≠ Mathematical Process

PRIOR LEARNING

Prior to this lesson, students will have:
• Experience displaying data using charts and graphs

MATERIALS AND RESOURCES

Materials:
Computer access
Chart paper and pens
Variety of images from books, magazines or newspapers—one set per group; see Minds On: Carousel segment of the lesson inside this folder

Appendix A: I See, I Think and So Organizer—one per centre
Appendix B: Tri This! Triangle—one per pair
Appendix C: Data Management RAFT Chart—one per student
       Appendix C1: Outlier Data—as needed
       Appendix C2: Grade 7 Student Data—as needed
       Appendix C3: Driving Teacher Data—as needed
       Appendix C4: Crab Data—as needed
Appendix D: RAFT Rubric—one per student
Appendix E: Tri This! Triangle: Expanded—supplementary resource

Internet Resources:
Ministry of Education (2004). *Think Literacy, Subject-Specific Documents, Language/English Grades 7–9* (I See, I Think and So graphic organizer, p. 2).
    See *Think Literacy* Library at www.edu.gov.on.ca/eng/studentsuccess/thinkliteracy/library.html
North Vancouver School District. Data in the Real World: www.nvsd44.bc.ca/mind
TIPS4RM (Targeted Implementation and Planning Supports for Revised Mathematics)—Grade 7:
    www.edu.gov.on.ca/eng/studentsuccess/lms/tips4rm.html#grade7

Resources:
Ministry of Education (2005). *The Ontario Curriculum, Grades 1–8: Mathematics*.
Van Allsburg, Chris (1984). *The Mysteries of Harris Burdick*. Boston, MA: Houghton-Mifflin.

Teaching/Learning Sequence: Grade 7 Mathematics—Data Management

MINDS ON
- Establishing a positive learning environment
- Connecting to prior learning and/or experiences
- Setting the context for learning

CONNECTIONS
L: Literacy
ML: Mathematical Literacy
AfL, AoL: Assessment for/of Learning

Groups ➝ Carousel: I See, I Think and So
When reading, an inference is a connection made between what is in the text and what is in the mind that helps the reader to form an educated guess. This is the same concept as making inferences with data.

Set up various centres each with a different picture from the book *The Mysteries of Harris Burdick* by Chris Van Allsburg. (Alternatively, newspaper or magazine pictures, without accompanying text, can be used.)
Place a copy of I See, I Think and So Organizer (Appendix A) at each centre.

Assign students to random groupings and ask each group to choose a recorder.
For the first two minutes, each group brainstorms responses to the "I See" question, "What do you see in the picture?"
The recorder fills in the "I See" column on the organizer.

Provide a signal for groups to move to the next centre. For the next two minutes, each group reads the responses to "I See" and responds to questions in the "I Think" section:
- What do you think is happening in the picture?
- What does the evidence tell you?
The recorder fills in the "I Think" column on the organizer.

Provide a signal for groups to move to the last round at a new table. For the next two minutes, every group reads the first two sections and responds to the section "and So…" by completing the prompts "I conclude" or "I think."

Whole Class ➝ Discussion
Invite students to share some of their responses to "and So…".
Discuss the meaning of "inference" and how it may apply to interpreting data in mathematics.

L: I See, I Think and So Graphic Organizer— Inference

ACTION
- Introducing new learning or extending/reinforcing prior learning
- Providing opportunities for practice and application of learning (guided ➝ independent)

Pairs ➝ Problem-based Learning/Data Management RAFT
The Tri This! Triangle (Appendix B) is designed to provide learners with alternative ways to explore and express ideas using key skills. The Tri This! Triangle has three sides with a scale ranging from low to high. Students choose where they are on the scale based on their intelligence preferences for words (verbal-linguistic intelligence), numbers (logical-mathematical intelligence) or pictures (visual-spatial intelligence). Students should identify their two preferences for learning and select the number that is outlined by those two modes.

For example:
- If numbers and words are their preferred learning modes, then the resulting number would be 3
- If their preferred modes are words and pictures, the resulting number is 4
- If they are comfortable with all three modes, then 2 is their resulting number
The resulting numbered cell is matched to the numbered assignment in the Data Management RAFT Chart (Appendix C).

The RAFT assignments (Appendices C1–C4) are differentiated based on student intelligence preferences.
Note: The Tri This! Triangle can be expanded to contain up to nine options, one for each of the Multiple Intelligences, although two to four choices are sufficient in most differentiated classrooms. See the Tri This! Triangle: Expanded (Appendix E).

Students:
- Select the Data Management RAFT assignment that is the same number as their intelligence preference
- Work with a partner who has selected the same RAFT assignment
- Review the criteria for success as outlined on the RAFT Rubric (Appendix D)
- Pair up to complete the task for a particular role, audience, format, and topic

For each assignment, students are:
- Forming a hypothesis about the question
- Using the data provided to prove or disprove their hypothesis, and
- Forming a conclusion
Note: Some of the RAFT assignments require the use of a computer and the Internet.

Circulate and talk to students. Help students consider what evidence they need to prove their hypotheses.

AfL: Mathematical Process— Reasoning and Proving/RAFT/ Anecdotal Comments

CONSOLIDATION AND CONNECTION
- Helping students demonstrate what they have learned
- Providing opportunities for consolidation and reflection

Groups of Four ➝ Sharing RAFT Assignments
Pair students heterogeneously according to the following RAFT grouping numbers to share their products: 1 and 4, 2 and 3.
Give students enough time to examine and discuss each other's work.
Note: All products should be displayed around the room after sharing.

AfL: Mathematical Process— Connecting/RAFT Sharing/Rubric

Whole Class/Fours ➝ Discussion
Facilitate a discussion that connects math and everyday life. If possible, show a video such as Data in the Real World, www.nvsd44.bc.ca/mind; see the Internet Resources section on the reverse of this folder. Encourage students to make specific connections between data and analysis and occupations.

Individuals ➝ Journal Entry
Students complete a Journal Entry answering the following questions:
- What is data and how can it be used?
- What types of careers would require the use of data and the ability to make inferences from the data?

Journal Entries should indicate understanding of the skills students used when inferring conclusions from data.

AfL: Mathematical Process— Connecting/Journal/Anecdotal Comments