Math Lesson – Why Volunteer?

Outcomes or Learning Goals

The story *Why Volunteer?* provides an opportunity for students to consider the benefits of engaging in volunteer work. The story also supports issues of time management as well as project planning and collaboration. The related math problems address proportional reasoning and supports students in using a ratio table as a computational tool.

Grade Level

MAT1LZ – Locally Developed Math grade 9
MAT2LZ – Locally Developed Math grade 10

Context & Rationale

In the book *Why Volunteer?* we meet Fatuma, who acquires new knowledge and skills from each volunteer experience in which she participates. This helps students understand how the investment of time in volunteer work prepares and supports them in finding employment. It has the added benefits of providing opportunities to meet new people as well as the satisfaction of contributing to the community. Solving problems in real-life contexts, such as those provided in this lesson, helps newcomer English Language Learners, especially those with limited work experience, acquire life skills (e.g., time management) and financial concepts that are important in their daily lives.

Related Topics/Units

• solve problems drawn from everyday situations involving ratio/rate (Gr. 9)
• solve problems involving the calculation of rates drawn from a variety of everyday contexts and from familiar social issues (Gr. 10)
• calculate rates in activities drawn from their experiences (Gr. 9, 10)
• read, interpret and explain orally and in writing data displayed in simple tables and graphs (Gr. 9, 10)
• determine the relationships among decimals by constructing diagrams and building models (Gr. 10)
• communicate information about proportional reasoning (Gr. 9)
• verbalize their observations and reflections and reflections regarding proportional reasoning and ask questions to clarify their understanding (Gr. 9, 10)
• communicate, orally and in writing, the solutions to proportional reasoning problems and the results of investigations, using appropriate terminology, symbols and form (Gr. 9)
• explain their reasoning used in problem solving and in judging reasonableness (Gr. 9, 10)
• develop, select, and apply problem-solving strategies while posing and solving problems (Gr. 9)

Number Sense and Numeration Skills from the Ontario Mathematics Curriculum, Grades 1-8 (2005), that link well to this lesson and would support the needs of limited prior formal learning students are:

• demonstrate an understanding of simple multiplicative relationships involving whole-number rates, through investigation using concrete materials and drawings (Gr. 5)
• represent relationships using unit rates (Gr. 6)

Additional References:

Big Ideas and Questioning K-12: Proportional Reasoning
http://www.edugains.ca/resources/LearningMaterials/ContinuumConnection/BigIdeasQuestioning_ProportionalReasoning.pdf

This Ministry resource identifies the key concepts in proportional reasoning across each division. Questions connected to each big idea are provided in the resource as a means for differentiating instruction while provoking and clarifying thinking.

Lesson Sequence

Part 1 Minds On/Prior Learning (15 minutes estimated for this section)	What to prepare
Activity 1. Remind students of the book they have read, *Why Volunteer?*. 2. Watch video: The World Walks for Water http://www.youtube.com/watch?v=kbVPnqJ73xQ&feature=related Invite students to share challenges they have had with respect to water: either challenges with accessing water or challenges accessing clean water. 3. According to Wikipedia's page on walking, the average adult walking speed is 80 m/minute. How long would it take an adult to walk one km? Create a T-chart, labeling the columns "# of minutes" and "distance in m". See chart below for example. Use the following script to solve the answer using the ratio table: "From Wikipedia, we know that in 1 minute, an adult can walk 80 metres." (Record on T-chart) "How many metres can an adult walk in 2 minutes? How do you know?" (Try to draw out the term "double". Record on T-chart) "How many metres can an adult walk in 10 minutes? How do you know? (Try to draw out that ten times facts are "friendly facts". Record on T-chart) "How many metres can an adult walk in 12 minutes? How do you know?" (Try to draw out that we can use the information in the chart to find this answer. Record on T-chart)	Copies of the book *Why Volunteer?* Reference: http://wiki.answers.com/Q/

"So far we have a distance of 960 m. How many more metres to get to 1 km? How do you know?" (40 m) "How can we use the information in the chart to find out how long it would take to walk 40m?" (Draw out that it would be half the time to walk 80 m, so half a minute.) "So, how long would it take for an adult to walk one kilometer?" **# of minutes** / **Distance in m** 1 — 80) double 2 — 160 10 — 800 - "friendly fact" 12 — 960 1/2 — 40 12 1/2 — 1000 State: "This T-chart or table is called a ratio table (also may be referred to as a rate table). This might be a tool you use when solving today's problem." If you have a class anchor chart of strategies/tools, add ratio table to your list.	
Assessment For the class in general, assess fluency of multiplication facts, and ability to use strategies such as doubling, halving, 10 x facts, and partial products. You may be able to assess the computational fluency of a number of individual students are they share the answers to facts and explain their thinking.	
Part 2 – Work On It (30 minutes estimated for this section)	
Work in small groups - 2 per group. We just learned that it takes 12.5 minutes for the average adult to walk 1 km. If the average distance to a water source is 6 km, how long would it take for the average adult to walk there and back: - each day? - every day for a week? - every day for a month? Calculate the total time in hours and minutes.	Blank paper for students to record thinking and solution.

Activities During Work Period • Students work with partners and record question, work/thinking, and answer on chart paper. • Teacher visits partners to clarify the question they are answering and to see if they have a strategy to start/continue working on the problem. • Teacher thinks about which solutions to share in the third part of the lesson, and the order in which they will be shared. Solutions selected should show a variety of strategies (and hopefully will include the ratio table).	
Assessment For each student, observe and document: - use of multiplicative reasoning - computational strategies and fluency - clear representation of the problem and communication of thinking	
Part 3 – Conclude & Share Solutions (20 minutes estimated for this section)	
Activity The solutions selected (2-4) are shared, starting with the simplest strategy and moving to the most complex. Also, consider clarity of communication when selecting solutions and order in which to share. As students share their work, encourage them to discuss *how* they solved the problem. You may wish to question the students to focus attention on a particular aspect of their solution, rather than inviting the student to share their entire process/solution. Invite other students to ask questions of the presenters. An interesting way to share solutions is to post a piece of student work, and then have students turn and talk to a partner about what strategy they think the students used to solve the problem. Students then share their hypothesis/thinking with the whole group, and the creators of the solution can explain their thinking at the end. At the end of the sharing, highlight key learning by recording it on the whiteboard or on chart paper.	
Follow up 1. See problem recording sheet (attached). If it takes 34.6 minutes for the average adult to walk 1 km carrying a jug of water, how long would it take for the average adult to walk 6 km to a	

water source and back: - each day? - every day for a week? - every day for a month? Calculate the total time in hours and minutes. 2. Thinking about Fatuma … If Fatuma volunteers 1.25 hours a day during the school week, how much time does she volunteer: - in one week? - in one month? How much time is this in minutes? This second problem could lead to a conversation about time management. How do students manage school, homework, and a part-time job (whether a volunteer or paid position)?	
Assessment For each student, continue to observe and document: - use of multiplicative reasoning - ability to apply use of a (new) model/tool - clear representation of the problem and communication of thinking Based on your assessment for learning data, do students need additional opportunities to: - acquire basic multiplication facts - develop mental computational skills - use a variety of strategies and tools to solve problems involving rate - communicate thinking and reasoning Select problems for future exploration based on student learning needs. Consider teaching ten-minute mini-lessons involving number strings as frequently as possible. The mini-lessons support students in learning basic facts and mental math computational skills through conceptual understanding and thinking. For additional mini-lessons involving number strings refer to: *Minilessons for Early Multiplication and Division*, by Catherine Twomey Fosnot. *Minilessons for Extending Multiplication and Division*, by Catherine Twomey Fosnot.	

"The sun beats down, hot on your back," Megan recalls. "Your footsteps fall on uneven terrain. Soon dust covers your feet, as you climb down a hill that gets steadily steeper with each step you take. You become more exhausted by the minute. A 40-pound water can is on your head, secured by ropes. The can presses down on your neck and it's much heavier than you expected, weighing you down as you try to keep it in place. If the can tips, you'll lose the precious water stored inside. More than just water, the contents of this can represent life for the family you're carrying it for."
(http://www.metowe.com/2013/02/22/life-changing-experience-2-water-walk-in-kenya)

It would take longer for an adult to walk one kilometer when carrying an 18 kg (40 pound) jug of water.

If it takes 34.6 minutes for the average adult to walk 1 km carrying a jug of water, how long would it take for the average adult to walk 6 km to a water source and back:

- each day?
- every day for a week?
- every day for a month?

Calculate the total time in hours and minutes.