Sample 1: Everett Math Assessment and Instructional Guide

Intended Grade Levels: Grade 4–12; Grade 6 reviewed

This 90-page booklet includes the following:

- Rubrics used in Everett district to assess mathematics problem solving.
- The relationship between these rubrics, the rubrics used on the state assessment, and state content standards.
- Results of Everett's 2002 assessment.
- Description of the problem-solving process in student-friendly language.
- The rubric itself in student-friendly language.
- 20 pages of scored student responses to mathematics problems.
- 20 pages of student responses on which to practice scoring, with instructions on how to use them instructionally (pp. 45 and 63).
- Instructional strategies for teaching problem solving.
- Description of legitimate test-preparation strategies.

The goal of the booklet is to "provide meaningful information back to teachers on how our students performed on this assessment, how those results can be used to better inform math instruction, and how to improve student performance on future assessments" (p. 3). Examples follow of the materials included.

"Math Problem Solver in Control" Framework (p. 20)

Math Problem Solver is in Control (Range of 4s and 5s)

The math problem solver controls what is on the page of work. Strengths clearly outweigh the weaknesses, if the latter are present at all. Math skills are evident or extended, and the reader does not have to infer the student's intent or the explanation the student is using to solve the problem. Work communicates and is more than functional via its use of process, words, and graphics.

Problem Solver is Balancing Control and Non-Control (Range from 2.5 to 3.5)

Strengths and needs for improved math problem solving skills are vying for balance. The work needs more explanation, justification, and verification, but at the same time demonstrates more than an emerging understanding of mathematics skills. The solution serves as a communication tool at a functional level, but the reader wants more development of conceptual understanding, reasoning, and the use of appropriate mathematical terminology, calculations, strategies, and checking of work.

Problem Solver is yet to be in Control (Range of 1s and 2s)

"Strategy finding" controls the student. Need for improvement overshadows the student's mathematical efforts. Skills may not be present or they are emerging with hints of what the student intends. Usually the reader needs to infer meaning. Work is not yet functional for communicating the solution or the process used.

Selected Activities for Mathematics Problem Solving for Students (p. 63)

1. Cut the scoring guide's point levels into strips and use them in teaching/learning the traits or to practice evaluating each other.

2. Cut up the scoring guide level descriptions. Place different traits and levels into envelopes. Have the students sort the strips of descriptions back into the correct scoring guide order and trait(s).

3. Have students score a sample paper; then check their scores against the "real" scores rated by professional readers of the same sample.

7. Take one of the annotations for a Level 1 of the scoring guide and have the students rewrite it to make it a Level 3 response.

8. Mount the scoring guides on the wall. Have students improve the scoring guide by placing Post-It™ notes with wording to improve or inform others better of what the guide's description should mean.

11. Put on the wall each teams' approach to solving a math problem. Have all the teams rotate around the room and rate/evaluate the solutions using the scoring guide.

Checklist: Solving Mathematics Problems, Grades 5–12 (p. 72)

My work will be more successful when I . . .

1. Problem solve correctly. That means I . . .

   ___ Made a plan and used it to solve the problem.

   ___ Verified or checked my solution.

2. Use mathematical language correctly. That means I . . .

   ___ Used correct math terms.

   ___ Used mathematical language that is clear and appropriate so that my solution is meaningful.

3. Communicate clearly. That means I . . .

   ___ Used a diagram, chart, table, graph, and/or word picture to help solve the problem.

   ___ Made the representations in my solution clear to read when they are read by others.

4. Make connections. That means I . . .

   ___ Know of other ways to get the answer.

   ___ Extended the solution to the general case.

   ___ Showed how this problem related to other problems, mathematical ideas, or applications.

5. Make a quality presentation. That means I . . .

   ___ Showed the steps to getting the solution.

   ___ Had a solution that was clear for others to follow and understand.

Four-Trait Mathematics Assessment (p. 13)

Conceptual Understanding (CU) "'What' of it"	Process & Strategies "'How' of it"
A. Understanding of problem is 5 THOROUGHLY demonstrated. 4 BASICALLY demonstrated. 3 PARTIALLY demonstrated 2 INCORRECTLY demonstrated. 1 Not demonstrated. **B. Problem information/data are** 5 Used CLEARLY & WELL. 4 Used ENOUGH. 3 MOSTLY used. 2 Used INCORRECTLY. 1 Not used.	**A. Graphs, pictures, or models** 5 VERY CLEARLY support the solution. 4 Support BASIC solution. 3 PARTIALLY support the solution. 2 Are NOT CONNECTED to the solution. 1 Are Missing. **B. Strategy/Skills are** 5 MULTIPLE and appropriate to problem. 4 APPROPRIATE to problem. 3 PARTIALLY appropriate to problem. 2 INAPPROPRIATE to problem. 1 Missing. **C. Plan is/does** 5 EFFECTIVELY IMPLEMENTED to find solution. 4 APPLIES to problem. 3 Applies to PART of problem. 2 Not apply to problem. 1 Missing.

Communication of Reasoning (CR) = "Explain it"	Accuracy & Reasonableness (AR) "Defending/Connecting it"
A. Math terms are 5 ALL used correctly. 4 MOSTLY used correctly. 3 PARTIALLY used correctly. 2 Used INCORRECTLY. 1 Not used.	**A. Calculations/diagrams are** 5 COMPLETELY accurate. 4 BASICALLY accurate. 3 PARTIALLY accurate. 2 ATTEMPTED, but incorrect. 1 Missing.
B. Thinking is 5 THOROUGHLY explained. 4 BASICALLY explained. 3 PARTIALLY explained. 2 ATTEMPTED to be explained. 1 Not explained.	**B. Solution is** 5 Justified, verified, AND extended. 4 Justified, verified, OR extended. 3 PARTIALLY justified, verified, or extended. 2 UNSUCCESSFULLY justified or verified. 1 Missing or there is only an answer.
C. Solution explanation is 5 COMPLETELY understandable. 4 BASICALLY understandable. 3 PARTIALLY understandable. 2 CONFUSING. 1 Not given.	**C. Connections are** 5 Made between solution and general situations. 4 BASICALLY made. 3 PARTIALLY made. 2 ARE ATTEMPTED. 1 Not made.
D. Work is/has 5 Clearly presented and VERY logical. 4 CLEARLY presented with some logic. 3 SOME logic. 2 WITHOUT logic. 1 Not (or little) given.	**D. Work is** 5 Checked a DIFFERENT way. 4 Checked same way as originally. 3 Checked SOMEWHAT. 2 Checked with INAPPROPRIATE method(s). 1 Not checked.

Source: Everett, WA Public Schools. Used with permission.

Sample 2: Fish Tank

Intended Grade Level: Grade 5

Description

The following lesson/assessment is about how to set up an aquarium. The lesson has two parts. In part one the students read an information sheet and then observe the instructor actually setting up a new tank. In part 2, students work in small groups to actually set up a tank using the directions provided by the instructor. We have attached the information sheet, a set of test specifications to guide the development of a test, and the test the instructor developed to assess learning.

Setting up a Tropical Fish Tank-Information Sheet

Have you ever thought of setting up a fish tank as a hobby? It's fun and easy to do. To get started, you need seven things: a tank, some gravel, a pump, an underwater filter, a light, a heater, and water. Of course, you also need a place to put the tank and a place to plug in the heater, pump, and light. That's it. You don't need fish. They come later. Don't be in a hurry to put fish into a new tank. If you rush things, you'll kill them.

Don't buy any tank smaller than 20 gallons. Bigger is better. A 10-gallon tank will only hold a very few small fish. Figure out where you want the tank before you set it up; it's tough to move later. You don't have to buy a special stand, but make sure that whatever you set the tank on will hold plenty of weight. A 20-gallon tank filled with water weighs well over 150 pounds. Put the tank somewhere away from light. Even small amounts of natural light encourage the growth of algae which, though actually beneficial to some fish, will also cloud the water and turn it an unattractive murky green.

When you have your tank where you want it, install the filter. This needs to go in before anything else. Do not plug anything in yet, however. Next add the gravel. You need 10 pounds for every 10 gallons of water in the tank. You don't need to rinse or clean gravel from a pet store; it's ready to go.

Once the gravel is in place, add the water. Use clear water from your tap. It's a good idea to add dechlorinator to neutralize any chemicals in the water before adding fish. Dechlorinator is available from any pet shop. Fill the tank close to the top, remembering that you will need to add the heater.

Next, hook up the heater and set it to 80 degrees. Make sure it's well submerged in the tank. Most heaters are fully submersible, cord and all. Be careful not to set the temperature too high; not all fish can stand water temperatures of 90 degrees or more.

Now, turn on the light, admire how nice everything looks, and plug in the pump to start your filter system. Keep in mind that the pump forces air through the system. As you turn it up you add more air to the water. You also move the water around more. Some species of fish do well with all that commotion but others do not, so keep this in mind later when you choose your fish.

Finally, let the tank "cure" for five to ten days-or even more, if you can stand the wait. This allows for establishment of healthful bacteria to deal with pollution in the tank. When you're finally ready to add the fish, add just a few-perhaps one (or two at most) for every five gallons until you are sure the bacteria are sufficiently well established to keep your fish alive.

Test Specifications Chart (Blueprint)

Content	Knowledge	Analysis	Inference	Evaluation
Setting up a new fish tank	4	2	6	1

Unit Test

Multiple Choice

1. About how much gravel is needed in a new tank?
   a. About 10 pounds.
   b. *About 10 pounds for every 10 gallons of water.
   c. It depends on the size of the tank.
   d. About 1,000 pounds.

2. Of the seven basic items you need to start up a new fish tank, which of the following is not one of them?
   a. *Fish.
   b. Gravel.
   c. A filter.
   d. All of the above.

3. The first step in setting up a new fish tank is to
   a. Buy a fish.
   b. Buy the tank.
   c. *Put the tank where you want it.
   d. Put in the water.

4. The main purpose of dechlorinator is to
   a. To kill algae in the water.
   b. Encourages the growth of beneficial bacteria.
   c. It cleans the gravel.
   d. *Make the water safe for the fish.

5. If you add fish to a new tank too soon, which of the following undesirable results will occur?
   a. The fish will get sick.
   b. *The fish will die.
   c. The fish will grow rapidly.
   d. Healthful bacteria will begin to grow.

6. The main purpose of the air pump is to
   a. *Pump air into the water.
   b. Empty water from the tank.
   c. Keep the fish moving at a fast pace.
   d. Stir up the water so it will look cloudy.

7. It would probably be a good idea to set up a new fish tank
   a. Near a window.
   b. On a small bookcase
   c. *Slowly, taking your time.
   d. Close to an electrical outlet.

*Correct answer

True/False

8. It is a good idea to not put a new fish tank too far away from natural light.

   True False

9. Natural light can stimulate the growth of algae, thus killing some fish.

   True False

Fill in

10. You should set the temperature in your tank at _____ _____

11. After your fish tank has cured for _____ weeks, add _____ fish for every _____ gallons of _____

Matching

12. Match items on the left with those on the right. Use each item on the right once or more than once.

a. Pump	_____ 1. Cleans the water
b. Filter	_____ 2. Reduces pollution
c. Algae	_____ 3. Adds air to water
d. Heater	_____ 4. Dangerous to fish
e. Bacteria	_____ 5. Turns water murky
f. Filter	_____ 6. Harmful to fish
g. Dechlorinator	_____ 8. 90 degrees
h. Pollution	_____ 9. 80 degrees
i. Light	_____ 10. Don't add too soon
j. Gravel	_____ 11. Helpful to fish
	_____ 12. Kills fish
	_____ 13. Add last
	_____ 14. Add first
	_____ 15. Causes algae
	_____ 16. Ready to go
	_____ 17. Helps show off fish attractively

Essay

13. Choose one of the following and write a one-paragraph answer (30 minutes, 50 points).

    a. Explain why it is important not to add new fish to your tank too soon.

    b. Do you agree or disagree that setting up a new fish tank is a simple process? Explain your reasons.

Source: Adapted from *Practice with Student-Involved Classroom Assessment* (pp. 369-371), by J. A. Arter & K.U. Busick, 2001, Portland, OR: Assessment Training Institute. Copyright © 2006, 2001 by Educational Testing Service. Adapted by permission.

Sample 3: Culminating Project

Intended Grade Levels: Grades 8–9

Description

The following assessment is given at the end of middle school social studies courses to document competence in the skills listed. Students write a paper and give an oral presentation. A group of teachers rate the research paper. Presented here are the exit outcomes, a description of the research project, and a rubric that the raters use for the research paper. No information is provided on scoring the oral presentations.

Exit Outcomes

Skills and Habits of Mind

- Research
- Writing in a variety of modes
- Analytical reading
- Working cooperatively in a group setting
- Working independently
- Effective listening
- Ability to speak publicly
- Effective time management
- Organization of materials, readings, etc.
- Good study habits
- Effective questioning
- Group discussion

Attitudes/Dispositions

- Good citizen
- Respectful
- Open minded
- Curious
- Reflective
- Persevering
- Lifelong learner
- Positive academic self-concept

Content

- The L.E.A.R.N.S. analytical model (Law/government, Economics, Arts, Research, News/current events, Science/technology)
- Analytical thinking
- Cause and effect thinking
- Inferential thinking
- Deductive thinking
- Evaluative thinking
- The origins of western civilization

Essential Questions

- How does change occur?
- What does "human rights" mean?
- Where do governments come from?
- Where do economic systems come from?

Description of the Research Project

Students will pick a topic, write a research paper at least 10 pages long (and with 10 references), and give an oral presentation at least three minutes long.

Rubric for Research Report

Criteria:

Neatness, spelling, punctuation, grammar, capitalization, understanding.

Rubric:

Distinguished—Writing shows creativity in theme and development. It is correct in all mechanics.

Proficient—Writing correctly uses information and supportive details. Few errors in mechanics are apparent.

Apprentice—Writing does not have a theme and/or few supportive details. Errors in mechanics are common.

Novice—Research report is begun but not concluded. Writing shows lack of understanding. Contains several errors in mechanics.

Source: Adapted from *Practice with Student-Involved Classroom Assessment* (pp. 372–373), by J. A. Arter & K.U. Busick, 2001, Portland, OR: Assessment Training Institute. Copyright © 2006, 2001 by Educational Testing Service. Adapted by permission.

Intended Grade Levels: Grades 10–12

Description

This test is intended to assess mastery of content knowledge (knowledge of Emerson) and reasoning skills. The test consists of predicting Emerson's stand on various issues and citing evidence from various sources to support the prediction. This was practiced during class using statements different from those on the test. The author teaches and assesses Emerson in this fashion because he has found that students have trouble understanding Emerson and relating what he says to their own lives.

Students get one point for the right answer to each of the statements in the test and one point for their rationale. However, the author notes that even if a student doesn't provide the "right" answer as denoted in the scoring key, he will still give credit if the rationale for the answer is compelling. Results are used as 10 percent of the final grade in a literature class.

The Test

"Read each of the statements below and put a check if Emerson would most likely complete the activity or put an X if he would disagree or not do the listed activity. For each answer, find a statement from Emerson's work to support your check or X. Be sure to quote the statement directly and give the page number in parentheses. Use the introduction to Emerson, *Nature*, and 'Self Reliance.' Emerson would:

1. _____ reject organized religion.
2. _____ look to the past for guidance.
3. _____ claim that religious truth comes from intuition.
4. _____ rely on others for his success and happiness.
5. _____ join a popular civic organization.
6. _____ take solitary walks in the woods.
7. _____ dress in the most popular style of the day.
8. _____ speak boldly his opinions and thoughts.
9. _____ attend a seminar, 'How to Get Ahead and Reach Financial Success.'
10. _____ ask advisors what to do with his career."

Source: Brother Martin High School, New Orleans, LA. Adapted from *Practice with Student-Involved Classroom Assessment* (p. 374), by J. A. Arter & K.U. Busick, 2001, Portland, OR: Assessment Training Institute.

Sample 5: Reading Rate Assessment

Intended Grade Levels: Grade 2–3

Description

The teacher assesses the reading rate of students once per quarter. The teacher chooses a book each quarter that she judges is at an appropriate reading level. All students read the same book each quarter, but the books might differ as the year progresses. The students read for one minute while the teacher marks miscues. *Reading rate* is defined as the total number of words read in one minute minus the number of words that were skipped or misread.

For example, at the beginning of second grade, the teacher chose the book, *Look Out Ronald Morgan*, as being of reading level 2.2. Lucy read the first 30 words in one minute with one error. Her reading rate was 29 words per minute. John read 105 words in one minute with 3 errors. His rate was 102.

The teacher uses the information to report progress to parents. Copies of the letters she sends in October and April follow.

Letters to Parents

October 1997

Dear Parent,

As part of the first quarter assessment of your child, I checked your child to see how many words per minute he/she could read using a book at the second grade level. The book was *Look Out Ronald Morgan*.

Research shows that when an individual can read at a rate of 150–200 wpm, they are reading proficiently and will comprehend at a high rate. Students should be able to reach that goal by the end of 5th grade. The goal for 2nd graders is 80 wpm, and the goal for 3rd grade students will be to read 110 wpm at the 3rd grade level. It only makes sense that the more at ease we are in reading, the more we will understand what we have read.

Next quarter your child will again be tested, but at the 3rd grade level instead of the 2nd grade.

Please read your child's results and see where they are and how they compare with his/her peers. Oral reading at home will greatly improve your child's reading rate.

_____ is currently reading 2nd grade material at a rate of _____ wpm.

April 1998

Dear Parents,

Your child was tested last week on the story "The Recital," a story that every child has read twice. It is a story that comes from our third-grade reading book.

Please remember that our goal is to read 110 works per minute by the end of the year. As you can see we have quite a range from 37 words per minute, all the way to 208 words per minute.

Who has it easier in school? Yep, you got it . . . those who can read at a good rate have a much easier time, it only makes sense. Those of you who faithfully listen to your child or read with your child, pat yourself on the back. I applaud you.

Keep reading with your child this quarter. Let's see what percentage of our class can make that 110 word goal.

_____ is currently reading 3rd grade materials at a rate of _____ words per minute.

3rd Quarter Reading Rates

Source: Colleen Eaton, 1998, Eatonville Elementary School, PO Box 669, Eatonville, WA 98328. Adapted from *Practice with Student-Involved Classroom Assessment* (p359-361), by J. A. Arter & K.U. Busick, 2001, Portland, OR: Assessment Training Institute.