Mathematics Teaching-Research Journal On-Line
A peer-reviewed scholarly journal
Editors: Bronislaw Czarnocha (Hostos Community College)
Vrunda Prabhu (Bronx Community College)
Anne Rothstein (Lehman College)
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Using Errors to Diagnose Math Misunderstandings

Anne Rothstein

This article takes as a given that students use an information processing model that can be discovered to solve mathematical problems. This model includes the following components:

Input -- the raw material of the problem or example as presented
Sensation
Reception
Perception
Processing -- the internal actions that lead to solving the problem
Temporary Storage
Short Term Memory
Encoding
Retrieval
Solution
Output -- the observable work and answers provided by the student
Response Organization
Emit response
Feedback

The trick of using student errors to diagnose misunderstandings is to require that students show all their work and/or talk through or write the steps they use to solve mathematical problems. It may be helpful to provide students with a math solutions template with which to organize their work. A sample template that students might use to organize their work is provided at the end. By going through the template with the questions you can identify where the student may have misunderstandings or problems and then target those areas.

Math misunderstandings may be present at any stage of information processing.

The following questions are meant to help the teacher review the student's work and determine if the various elements needed to reach a correct answer are present in the shown work submitted by the student. It is not sufficient to look

only at the answer but to go through the work and see that each step of the process is accurate. Correct answers, as you know, can be gotten using incorrect steps and intermediate answers.

☐Does the student read the problem correctly?

☐Can the student copy numbers and formulas accurately?

☐Can the student substitute numbers in the formula properly?

☐Does the student have spatial or visual difficulties?

☐Does the student demonstrate signs of dyslexia?

☐Is the student's work in proper sequence?

☐Does the student write legibly and clearly?

☐Can the student line up the number columns?

☐Does the student apply steps in proper order?

☐Does the student understand mathematical language?

☐Does the student's native language lead to incorrectly expressing order of operations?

☐Does the student know basic math facts, procedures and rules?

☐Does the student understand the order of operations?

☐Does the student recognize the type of problem?

☐Does the student choose the correct formula?

☐Does the student work precisely in working through the problem?

☐Can the student follow the steps or elements of the problem?

☐Can the student identify which aspects of a problem (as in a word problem) are important?

☐Can the student estimate the answer?

☐Does the student use the correct value label during intermediate steps?

☐Does the student use the correct value label in the answer?

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☐Can the student evaluate the produced answer with the reasonable answer?

☐Can the student ignore irrelevant information?
☐Can the student focus on the form of the final answer?
☐Does the student understand the directions given for problem solution?
☐Can the student express, orally or in writing, the directions?
☐Can the student read and follow written directions?
☐Can the student solve problems that require multiple steps?

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Student Work Template

Rewrite the problem you are going to solve:

Write the formula you will use to solve the problem:

Substitute the numbers into the formula:

Describe how you will solve the problem:

What is the approximate answer you expect to get once you work the problem?

Solve the problem showing the exact steps you to get the answer:

How confident are you that the answer you got is correct? Why?