NCTM – Boston #197

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Success = S^4 → Student-Centered Support for Struggling Students

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Ingrid Peterson
ipete@ku.edu
University of Kansas

Susan Gay
sgay@ku.edu
University of Kansas

Elizabeth McClain
lizkim@ku.edu
University of Kansas

The number of students leaving high school unprepared for college mathematics continues to be a major concern for postsecondary instruction. Significant numbers of these students struggle with course content, habits of learning and self-confidence.

In our work with beginning level students in the college classroom we have incorporated supplemental strategies to help increase these students' participation and success. Writing assignments, online surveys, group activities, and various forms of summative feedback are used to encourage self-monitoring and promote independent learning by struggling students as they transition from high school to college level mathematics classes.

Students who participated in these supplemental strategies were generally more engaged in the coursework and out-performed student groups that did not utilize the same approaches.

Sample strategies:

Self-monitoring Record Form

The student recorded her/his name, whether the assignment was completed when due, and the number of times s/he logged in to complete the assignment. The student answered questions about the environment(s) in which the assignment was completed including the location where most of the online work occurred (e.g. dormitory, library, apartment, other), any distractions in the work environment while working online, and online resources that were used. The student also recorded any help-seeking actions s/he considered and evaluated the quality of their own submitted work.

Unit Overview Guide

The table below includes a list of the BIG ideas from Unit 2. For each BIG Idea, complete the following task:

- A concrete example as well as a general/abstract definition.
- A Cornell-style notes-in-the-margins good-idea reminder for yourself for each example.

Lesson 2.1 BIG Ideas	Lesson 2.2 BIG Ideas
» Standard form → x-, y-intercepts » Parallel and perpendicular lines » Direct variation » Linear regression	» Characteristics → Domain, range → Inc, Dec, Constant → Symmetry ▸ Test for symmetry » Basic Functions
Lesson 2.3 BIG Ideas	**Lesson 2.4 BIG Ideas**
» Transformations → CBAD: cf(bx + a) + d → What affects x-, y-values? » Piecewise-defined functions	» Operations → Domain → Tables/Graphs » Difference Quotient » Compositions → Domain → Tables/Graphs

Test Reflection Assignment

(adapted from Brown [1])

DIRECTIONS: Spend some time looking over your exam, and assess your performance by completing the following items. This assignment is due at the beginning of our next class meeting. Please take time to seriously reflect on your work, and do your best to offer ***neatly organized responses***.

1. On a piece of notebook paper, write about your performance on the test, pointing out one or two specific strengths and one or two specific weaknesses in your mathematics. Be sure to focus on the ***mathematics concepts*** rather that your test-taking skills, and identify those concepts using accurate mathematics terminology.
2. You are possibly experiencing some "feelings" concerning the test you got back. If you are like me, you may now realize that you "totally blew" a problem you should have been able to do OR you should have studied for and you wish you could do it over. Here's your chance. Please identify the problem you missed and show that you ***can*** do that problem correctly. Use your book and notes as needed, but try to do the work without the assistance of another person. Be sure to show or explain all work (or thinking) necessary in arriving at the correct solution.
3. Describe (in detail):
   a) how you studied for the exam and
   b) what you will do differently, if anything, to prepare for the next exam.

What's my function?

Directions:

- Have students stand in 2 lines.
- Hand out cards and a piece of tape to students and instruct them to not show the person in front of him/her the card.
- Students tape the card on the back of the person in front of them. First person in line will tape theirs to the last person in line.
- Every student will need a sheet of paper to record his or her information.
- Instruct students to have a classmate provide one piece of information about the function on their sheet of paper from looking at the graph on his/her back. The student will sign his/her name for the information s/he has filled in.
- When all items are filled in, a final person needs to check all information and sign off.
- Students will then sketch their graph with as much detail as possible and write a possible equation in factored form.

What do you notice? What do you wonder about?

Patterns and relationships can be identified through close observation of the events and images that we come in contact with every day and are frequently described effectively in mathematical terms. Your assignment is to write a 3-4 paragraph description of the attached image, identifying at least 3-5 distinct mathematical relationships or patterns that you observe. What do you notice? What do you wonder about? What quantitative questions come to mind? How does the (size, number, weight, length, shape…) of _____ affect ____ ? Use complete sentences and correct vocabulary and grammar.

Vocabulary, Concept, and Sense-making Questions [2]

Other short activities and writing exercises that help both instructors and students diagnose errors and misconceptions:

1. Does the following make sense? Explain your answer. "Every line in the rectangular coordinate system has an equation that can be expressed in slope-intercept form."
2. What does it mean for a linear system to be *consistent*?
3. Compare and contrast the concepts of *even/odd functions* and *even/odd multiplicities of zeros.* Is it possible for an even function to have zeros with odd multiplicities?

References:

[1] Brown, Scott A. (2005). "You Made it Through the Tests; What About the Aftermath?" *Mathematics Teaching in the Middle School 11(2)*, 68-73.

[2] Gay, A. Susan & Peterson, Ingrid (2014). "Writing to Promote and Assess Conceptual Understanding in College Algebra" *PRIMUS: Problems, Resources, and Issues in Mathematics Undergraduate Studies*, 24(7), 637-646.