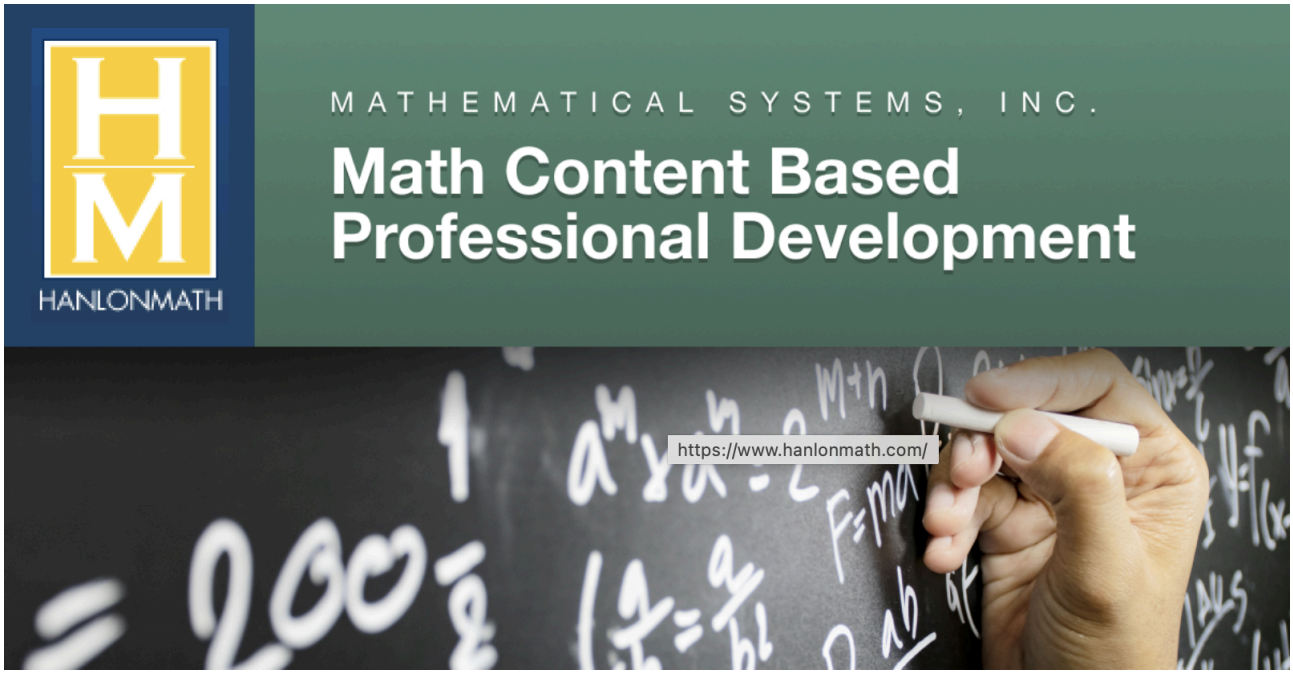

Test Design Affects Student Achievement

Creating unit/chapter tests that set students up for success and at the same time prepares them for high stakes tests such as the PARCC, SBAC, ACT, SAT or semester exams, test design is an important tool in education.

Achieving higher grades, proficiency rates and achievement scores begins with preparation where teachers clearly identify what they expect their student to know, recognize, understand communicate and be able to do. Using that information, teachers create a parallel constructed practice test using the template described below that is sent home to parent and given to students before instruction begins.

The chapter test should consist of three sections. The first section consists of questions that contain no math computation or manipulation. Test items are definitions, identifications, formulas, procedures, theorems, strategies, etc. It's the math students need to know to be successful on thar test. I refer to those as three-star questions and only those questions appear on the first page of the unit/chapter test. They represent 20-30% of the test.

The second section of the test consists of math problems typically done in class, recorded in notes and on homework assignments. These questions often correlate to the three star questions on the first page of the test. I refer to these as questions as two-star questions. For instance, a two-star question might be to find the midpoint of the line segment that connects (3, 5) to (7, 11). That would

correspond to a three-star question on the first page to write the midpoint formula. The second section of the test would be valued between 40-60% of these test.

Designing the test this way eliminates the excuse I can't do math. That's because the three-star questions in the first section, on the first page, don't have math computation or manipulation. That information has to be memorized, preferably with understanding. The simple fact is if the student didn't memorize the formula, the probability of finding a midpoint is very low. However, if they know the formula, the probability is high they will be able to find the midpoint. The 3 star questions take the "I don't have the math gene" off the table because there was no math computation or manipulation.

The third section of the test, between 10-20% of the test, consists of performance & conceptual based problems and problems from the PARCC, SBAC, ACT or SAT tests. Problems taken from those tests should be labeled as such on the test. So if a chapter test consists of 20 questions, using those approximate percentages, between 4 and 6 three-star questions would appear on the first page of the test, 8 to 12 problems would be on the second section of the test, and the one-star questions would consist of 2 to 4 problems.

After creating the parallel constructed practice test, teachers are asked to review the test and identify any questions they think might cause students difficulty. If they can identify any, they should check to see if they have a three-star question on the first page that addresses how to do that problem. If they do not, they should add a question.

On a 20 question test, my preference is to assign each question five points. That takes out the subjectivity and ensures students are getting credit for what they know.

Just as coaches would do before a game, they would have a practice to ensure everyone is ready. And, if not, they would address the deficiency before the game. I would expect the same with testing. Two days before the real test, teachers go over the parallel constructed practice test, one question at a time with the students doing the problem, followed by the teacher doing the same problem. If the teacher saw issues or hesitancies, they would address then and again the next day to make sure the students are ready for the test.

This test design helps prepare students for high stakes tests. The important information students need to know to be successful is on the first page of each test. If 3 to 4 tests are administered each quarter, then students will have 6 to 8

tests with first page reviews and two sets of practice problems to review. Those 1st page reviews are great preparation for high stakes tests.

1. What is the Zero Product Property?
2. Identify the Procedure for Using the Zero Product Property when solving higher degree equations.
3. Write the procedure for solving quadratic equations by completing the square.
4. Write the Quadratic Formula.
5. How was the Quadratic Formula derived?
6. What is the discriminant?
7. What does the discriminant tell us?
8. How do you find the x-coordinate of the vertex in the General Form of a Quadratic Equation?
9. Write the Vertex Form of a Quadratic Equations and identify the vertex.
10. If the coefficient of the quadratic term, a, is negative, are you finding a maximum or minimum?

Please note, none of those questions have any math computation or manipulation, but it's math students need to know to be successful.

Call 702.218.3875 or contact us today to learn more about professional development resources for math educators and administrators.