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Please enjoy this complimentary excerpt from *Teaching Mathematics in the Visible Learning Classroom, Grades K-2* by John Almarode, Douglas Fisher, Kateri Thunder, John Hattie, and Nancy Frey.

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Ensuring Tests Evaluate Mastery

Tasks are great, but there will always be mathematics tests. Tests are not only common in the mathematics classroom, but they can be an effective means for determining the mastery of learners. The intention and design of any test determines the usefulness of the evidence generated about learner mastery. Whether multiple-choice or open-ended, tests must provide the necessary evidence about student learning so that both the teacher and the learners can make a clear evaluation of their understanding with the specific mathematics content. In designing mathematics tests, we must take into account several aspects of that test if we are to achieve high-quality evaluation of student learning.

Whether in our own classroom or in the classrooms of the teachers featured in this book, a test designed to evaluate learner mastery must contain questions or items that are consistent with the teaching and learning in that classroom. If the focus in Ms. McLellan's first grade classroom is on the meaning of the equal sign, representing and describing equal values, and determining the unknown whole number, then an end-of-unit or standard test cannot contain items that solely focus on conceptual understanding or application to provide a clear evaluation of student mastery (e.g., explaining the meaning of the equals sign). Likewise, if the focus in Ms. McLellan's class is on the conceptual understanding of the equal sign and comparing values on each side of the equal sign, a test for mastery cannot contain items that only focus on determining the unknown whole number. Therefore, the first aspect of a well-designed test is that the test items align with the expectations of the standard and associated learning intentions and success criteria.

Test items should provide learners with the opportunity to demonstrate different levels of mastery. In addition to having test items that align with the expectations of the standard, a well-designed test will have questions that fall in the progression toward the standard.

In addition, the test might ask learners to explain how each approach allows them to support their solution. Including the components that build up to the standard will allow Ms. Busching, for example, to determine how much learners have mastered if they have not fully mastered the standard.

As we reflect on our days as elementary mathematics students, we can likely recall instances in which we missed questions on a test because we were not clear on what the questions were asking us to do. When we received feedback on the test, we may have responded to that feedback with, "Oh, that's what you wanted on number 15?" Using consistent language on a test is vital in evaluating the learning of mathematics compared to semantics. As students engage in mathematics learning, we must ensure that the language we expect them to master is the language we use in the learning experiences. For example, if Ms. Busching plans to include questions on her test that use the terms *combining*, *separating*, and *comparing*, then these concepts should be introduced during the learning experiences. Likewise, if she is going to use *associative property* and/or *the commutative property* or other terms for a adding and subtracting larger numbers, learners need experiences with that vocabulary or terminology. Using consistent language applies to the cognitive aspects of the questions as well. We must ensure learners know what we mean by *analyze*, *explain*, or *support your answer*.

The checklists below provides additional guidelines for developing well-designed tests. These checklists help to ensure that our tests provide clear evidence about our learners' mastery in mathematics.

The first aspect of a well-designed test is that the test items align with the expectations of the standard and associated learning intentions and success criteria.

Teaching Takeaway

There should be items on the test that build up to the standard or mastery level.

Teaching Takeaway

Students should be familiar with the language of the test.

CHECKLISTS FOR CREATING TESTS THAT ASSESS MASTERY

Short-Answer Items

- Can the items be answered with a number, symbol, word, or brief phrase?
- Has textbook language been avoided?
- Have the items been stated so that only one response is correct?
- Are the answer blanks equal in length (for fill-in responses)?
- Are the answer blanks (preferably one per item) at the end of the items, preferably after a question?
- Are the items free of clues (such as *a* or *an*)?
- Has the degree of precision been indicated for numerical answers?
- Have the units been indicated when numerical answers are expressed in units?

Binary (True–False) and Multiple-Binary Items

- Can each statement be clearly judged true or false with only one concept per statement?
- Have specific determiners (e.g., *usually*, *always*) been avoided?
- Have trivial statements been avoided?
- Have negative statements (especially double negatives) been avoided?
- Does a superficial analysis suggest a wrong answer?
- Are opinion statements attributed to some source?
- Are the true and false items approximately equal in length?
- Is there approximately an equal number of true and false items?
- Has a detectable pattern of answers (e.g., *T, F, T, F*) been avoided?

Matching Items

- Is the material for the two lists homogeneous?
- Is the list of responses longer or shorter than the list of premises?
- Are the responses brief and on the right-hand side?
- Have the responses been placed in alphabetical or numerical order?
- Do the directions indicate the basis for matching?
- Do the directions indicate how many times each response may be used?
- Are all of the matching items on the same page?

Multiple-Choice Items

- Does each item stem present a meaningful problem?
- Is there too much information in the stem?
- Are the item stems free of irrelevant material?

- ❑ Are the item stems stated in positive terms (if possible)?
- ❑ If used, has negative wording been given special emphasis (e.g., capitalized)?
- ❑ Are the distractors brief and free of unnecessary words?
- ❑ Are the distractors similar in length and form to the answer?
- ❑ Is there only one correct or clearly best answer?
- ❑ Are the distractors based on specific misconceptions?
- ❑ Are the items free of clues that point to the answer?
- ❑ Are the distractors and answer presented in sensible (e.g., alphabetical, numerical) order?
- ❑ Have *all of the above* been avoided and *none of the above* used judiciously?
- ❑ If a stimulus is used, is it necessary for answering the item?
- ❑ If a stimulus is used, does it require use of skills sought to be assessed?

Source: Adapted from Linn, R. L., & Gronlund, N. E. (2000). *Measurement and assessment in teaching* (8th ed.). Upper Saddle River, NJ: Merrill Prentice Hall. Used with permission.

Figure 5.7



These checklists are available for download at resources.corwin.com/vlmathematics-k-2.

If our ultimate goal is for students to see themselves as their own mathematics teacher, we have to devote time to helping them prepare for assessments. Simply telling our learners to “pay attention” or “practice” is not enough to support them in their journey to becoming assessment-capable visible learners in mathematics.