Hanlon's Razor

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What works is work!

~Language Acquisition~
It's not just non English speakers having difficulties

Many of the difficulties students experience in mathematics are not the result of not understanding the math concept, but are a direct result of not having acquired the vocabulary and notation to understand those concepts.

For instance, finding the degree of the monomial such as $5x^2y^3z^4$ requires students to add the exponents. Students missing a question such as this are not having difficulty with the math concept – addition. Chances are greater they didn't understand the question.

The *teacher expectancies* require classroom teachers to embed language acquisition activities as part of everyday instruction for *all* students – not just English language learners.

The components of the Sheltered Instruction Observation Protocol (Preparation, Building Background, Comprehensible Input, Strategies, Interaction, Practice Application, Effectiveness of Lesson Delivery, and Lesson Review/Assessment) can easily be aligned with the *teacher expectancies* and should be used for all students.

Hanlon has consistently recommended balance in the delivery of instruction and assessment. Balance, as he has defined it, is vocabulary and notation, conceptual development and linkage, memorization of important facts and procedures, problem solving, and the appropriate use of technology. The *teacher expectancies* specifically identified the acquisition of vocabulary and notation as an important component (Balance) in the delivery and assessment of mathematics.

The *teacher expectancies* specifically require teachers to have students write about what they have learned at the end of a day's lesson. They require teachers to use linkage, to take notes in class, which in turn, requires students to draw pictures (model) their understanding, to write explanations, to verbalize their knowledge.

Teachers and administrators have continuously been asked to use oral recitation when introducing a new concept, procedure, or formula. That language acquisition strategy not only embeds the information in short-term memory, it also teaches the students how to read it, say it, and write it. Too often, students will read ${}_nC_r$ as "n C r." If teachers used oral recitation as a language acquisition strategy, students would have seen it on the

board, been taught to read it and say it, then know ${}_nC_r$ is a "combination of *n* things being taken *r* at a time." Unit tests should include questions on vocabulary and notation!

Additionally, questions on teacher-made tests should be asked with the same formality they will see on high stakes tests so there is not a disconnect between what students have learned in the classroom and what they are tested. Language is important for communication, for learning, it should be an objective that is in every math classroom.