

Nevada Public Education



Repetition – Still the Mother of Learning

Bill Hanlon

There is no doubt that poorly prepared lessons make learning math more difficult for students, but good lessons are not good enough either.



I have had many opportunities to observe some great lessons taught by well-prepared teachers. You watch the students, almost all are grasping the concepts or skills being taught during the presentation, then the students are asked to do two or three guided practice problems, and four or five students don't have a clue where to begin.

That's the plight of the students and their teachers. It reminds me of new cashiers, when left on their own for the first time, that's not the line you want to be in.

Great lessons should be used when presenting material, that's just a given. We know it is not a matter of *"if"* students are going to forget information over time, it's a matter of *"when"* they will forget it. By carefully developing concepts and skills or having students identify patterns that lead to procedures, formulas and theorems, students who do "forget" will have a higher probability of redeveloping that information. That's important. We all know that memory diminishes over time.

While that is extremely important, so is memorization of important facts contained in the lesson; whether they are the arithmetic facts in grade school, the Distance Formula in middle school or the Quadratic Formula in high school. Information must be committed to memory. Memorizing helps students absorb and retain information on which understanding and critical thought are based. The more sophisticated mental operations of analysis, synthesis, and evaluation are impossible without rapid and accurate recall of bodies of specific knowledge.

We all seem understand and accept the concept of practice and drill in sports, it's no different in the classroom. Students need practice to be able to a number of things almost automatically in math. Listening to Tony Romo talking about what Tom Brady was seeing in the playoffs and how it affected his play calling makes a

great point. By their experiences, they see patterns that have them pick the best option for calling the play.

In math, students are taught to solve systems of equations by graphing, substitution, linear combination and Cramer's Rule. By looking at the numbers in a given problem, students either pick the best option or struggle. Knowing the best option comes from experience – practice. This happens all through math. To add fractions, students need to find a common denominator. Do they find it by multiplying the denominators, skip counting, finding the LCM or using the Reducing Method? Their experiences should dictate the best path. Students are taught four methods of solving quadratic equations; factoring, $x^2 = n$, completing the square and the Quadratic Formula. How will they know which is the best option if they haven't practiced all four methods and through that practice made determinations by comparing and contrasting that help them recognize the best option?

To help students retain information, we ask teachers to introduce new concepts and skills by linking them to previously learned math and outside experiences. That repetition allows students and teachers an opportunity to review and reinforce material as well as address weaknesses. We ask teachers to provide guided practice in their classrooms to ensure students are learning and applying the math correctly, we teach students to compare and contrast problems so they can see how the problems look alike, but also how they differ. We ask teachers to think aloud, so students can hear their thinking – decision-making. We also ask teachers to do long-term memory reviews to refresh students' memories like preparing for semester exams. Teachers review for tests, just like coaches' review game plans with their players. But what makes some teams better than others, clearly pure talent plays a role, but preparation, practice and being able to recognize how minor changes can affect a play just like numbers in similar problems should affect students' choices.

Math is about decision-making. Without practice – without drills – without repetition, our students can make math more difficult because they don't have the automaticity needed in the decision-making process to think through the best options to attack a problem.

For outstanding performance from our students, they need good lessons, but they also need to have enough practice and repetition to be able to execute the problems with understanding and automaticity.

Bill Hanlon, is a noted speaker, an author, educator, consultant and coach for schools, former Director of the Southern Nevada Regional Professional Development Program, and is a national presenter for organizations such as AASA, ASCD, ALAS, NMSA, NASSP, NSBA, and NCTM. He was the coordinator of Clark County School District's Math/Science Institute and was also responsible for K-12 math audits. He served on the Nevada State Board of Education, Regional Director of the National Association of State Boards of Education (NASBE) and as a member of the National Council for Accreditation of Teacher Education (NCATE) States Partnership Board. He also hosted a television series, "*Algebra, you can do it!*" on PBS Las Vegas.

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