Learning Differently

1 Students are often told that they must memorize information. They are told that certain information is essential to their education. As a consequence, many students believe that memorizing information is the only way to learn it.

2 But studies have shown that memorization is not always an effective way to learn. Having to memorize something simply for the sake of memorizing it is ineffective because it lacks context. Ask a typical middle schooler how to find the missing side of a right triangle, and he or she will hopefully recite the Pythagorean Theorem. But go one step further and ask the reason why it works, and most students will fumble for an explanation. Many students will simply say that they don't know – that they were told to memorize the formula and substitute values into an equation in a problem.

3 One can have a similar conversation with students across grade levels, from kindergarten all the way up through college. This is a fact that should worry students, parents, and teachers alike. The problem of rote memorization – that is, memorizing and recalling specific pieces of information – happens most in math and science. This might make sense, at first, because of the nature of these subjects. But this seemingly logical idea hides the more dangerous pitfalls of rote memorization itself.

4 Rote memorization encourages students to learn only tidbits of information. The recall of this information can be easily assessed by standardized tests. As a society, we record the results of these tests and look at them as an indicator of intelligence. But do standardized tests really measure intelligence? Some standardized tests certainly do. They are designed to measure a student's ability to reason critically and apply past learnings to new problems. But many more do not, requiring students to memorize facts and formulas that show only a surface understanding of the subject. This becomes an issue when students leave the school system and must face problems that are far more ambiguous and complex. In fact, research has shown that high test scores do not necessarily translate to overall success in life. In one study, the U.S. Department of Education analyzed achievement in nations throughout the world. The study looked at a number of indicators of a nation's success, such as national wealth, degree of democracy, economic growth and even happiness. There was no clear connection between high test scores – and the ability to memorize specific information to pass the tests – and the success of advanced countries.

5 We should not overemphasize rote memorization; it consumes a great deal of student study time while resulting in little real learning. Instead, we should be developing our students' conceptual understanding. This means focusing on critical thinking skills that, though more difficult to quantify, are arguably more important than the ability to remember out-of-context information. After all, the human brain is not designed like a computer. Where computers more effectively store and retrieve information, the human mind demonstrates a greater ability to reason and process complex information.

6 The development of critical thinking in students results in vital skills necessary to success in life. Critical thinkers use logic to help them to make decisions and choose belief systems that will guide later actions and behaviors. Critical thinking means being able to see connections between ideas, and spot flaws in arguments. It leads to effective problem solving because the thinker is able to foresee consequences of actions. These skills are much more necessary in the complexity of adult life than the ability to recite facts or formulas.

7 Teachers of every grade level across the curriculum can – and should – help their students become critical thinkers. This can seem like a difficult task to achieve, but there are many practical ways to accomplish this in the classroom. Regardless of the subject being taught, all teachers should provide opportunities for students to ask questions. This should take the place of much of the drill-like tasks and

mimicry that happens in the classroom. Students should be encouraged to thoughtfully examine ideas and give their opinions. Teachers should challenge students to explain their perspectives and come up with alternate ways to solve problems, rather than focusing on the single correct answer. This requires students to both know the formulas (for example, that the Pythagorean Theorem can be written as $a^2 + b^2 = c^2$) and understand how to apply them.

8 Journaling is an effective tool in fostering critical thinking. Teachers can ask students to write about their reactions to a reading or a class discussion. Students can explain the way they arrived at a certain conclusion or solved a problem or make predictions about the outcome of a short story or a lab experiment. This is a focus on "thinking about thinking," or metacognition. Practicing metacognition makes students more self-aware of the ways in which they learn and how they can develop their own understanding. This will bring a host of benefits later in life.

9 Brainstorming and peer group work can also help students become critical thinkers. Brainstorming is a relaxed and fun way to come up with new solutions to problems. It encourages students to "think outside the box." It can reveal seemingly crazy but often creative and novel ways to tackle problems. Peer groups can brainstorm, or they can simply verbalize ideas they generated in their journaling. The sharing of ideas with peers helps students become open to new perspectives. It also fosters empathy and tolerance of different opinions. Discussing with peers also teaches students how to learn and work in a social setting, which most work places require.

10 Critical thinkers have never been more vital to the success of the individual and society. So, let's leave the memorizing to computers and instead teach our students to become better problem solvers. Let's teach our students to be better able to draw on their knowledge and experiences in order to tackle new problems of all kinds.