Is Your Studying Really Resulting in Learning?

In my discussions with students I begin with how much are you studying and when. For example are you studying 25-35 hours a week….at least 25? This is important because it takes time to learn…if you don’t put in the time, the next two sets of questions are not relevant.

The next question is when are you studying? Are you keeping up with your classes and assignments. Are you giving yourself plenty of time to prepare for exams? Or…….Do you procrastinate? Are you doing things at the last minute and cramming for exams?

Finally, are you learning? Can you work problems with confidence? Do you understand concepts and can you apply what you have learned to new situations? Can you teach what you have learned to someone else confidently, competently, accurately and fluently?

The following simple concept from high school and college chemistry illustrates what one must do to really learn.

Ideal Gas Equation

The ideal gas equation is \( PV = nRT \). If you have memorized this, perhaps as “pivnert”, this isn't the same as understanding why the law is this and how it is derived. Following is a scenario for understanding. Work through it so you re-discover and construct the ideal gas law for yourself.

\( P \) (pressure) is directly proportional to \( n \) (amount of gas) and \( T \) (temperature; the hotter, the greater the pressure) and indirectly to \( V \) (volume; as one squeezes a balloon, the pressure increases). You can express this proportionality as \( P \sim nT/V \). Do you understand why these relationships are direct or indirect and that pressure is result of gas molecules striking the interior surface of the container?

Multiplying \( P \sim nT/V \) by the proportionality constant \( R \) makes this an equality \( P = nRT/V \) which is rearranged to \( PV = nRT \). Do you know why multiplying a proportionality by a constant gives an equality? (Think of a simpler example such as increasing the number of employees in a company that sells bags of marbles from 5 to 10. You know production will increase but the real output is the number of employees times the number of bags of marbles per employee….the proportionality constant.)

Do you know how the value for \( R \) is determined and why it is 0.082 l-atm/mole-K? (A mole of gas at standard temperature, 273K, and pressure, 1atm, occupies 22.4 liters as determined by experiment; see if you can determine \( R \) from this). Now do you understand why \( R \) specifically works as a proportionality constant? Could you teach the ideal gas equation to someone else with confidence, competence, accuracy and fluency?

Will You Commit to Studying to Really Learn?

This example is a simple illustration of how you should address concepts in your classes. It takes time to really learn so first you have to make the time. It takes only a minute to memorize \( PV = nRT \) but maybe 30-60 minutes to truly understand and derive it. This isn’t easy. But satisfaction comes with hard work. Many students work out at the Rec Center…they take it seriously and it is hard work. Exercising the mind is hard work as well. Either done seriously and responsibly bring rewards and great satisfaction and can mean a lot to your future. I hope you will commit to developing a strong academic work ethic and pursue meaningful studying and learning.