

## A Good Beginning

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In August I was considering the opening remarks and discussions that would enhance the learning experience of students in my sections of General Chemistry. To test my ideas I used my daughter and her fiancé as student substitutes while I asked them questions that required proportional reasoning and mental arithmetic. Questions similar to:

Using a hose to deliver water, it takes 5 minutes to fill a 10-gallon aquarium. Using the same hose with the same water flow, how long will it take to fill a 200-gallon tank?

My wife (Ph.D. in education) immediately asked me to explain what the purpose of the exercise is. I related that many students fail chemistry because of underdeveloped reasoning skills and their inability to hold several facts in memory simultaneously and interrelate them. She replied that my discussion exercises would not help them, but would only point out their weaknesses, thereby embarrassing them and making them feel stupid. Wow!

For decades my colleagues and I at Slippery Rock have tried to meet the national performance standards recognized by the ACS for General Chemistry and to lower the high failure rate in this traditional two-semester general chemistry course. We have, to date, not been able to achieve national performance standards and continue to have high failure rates—40–50%. Changing texts did not bring about the desired change. Using the Toledo test to sort students at the beginning produced no change. Using a math skills test for placement: no change. Instituting a preparatory chem course to precede General Chemistry: no change.

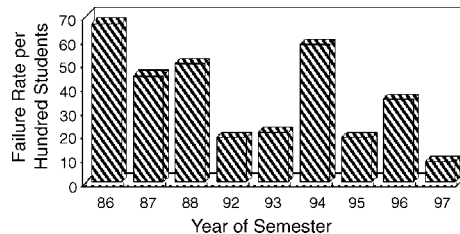
Testing and prep chemistry courses make many of the freshmen feel inadequate and frighten the ones who are clearly adequate for the task on the basis of their high school records and SAT scores.

Because of my life partner's comments I changed the activity in the opening class. I asked the students to imagine that they owned a small business and were hiring new employees whom they hoped would work for them for many years. What characteristics would you be looking for in these people? The students freely participated in this nonthreatening brainstorming activity and within 15 minutes two panels of the blackboard were covered with words such as trustworthy, dependable, hard-working, meets deadlines, etc. Ah, these words do indeed describe a good employee, but they are also descriptors for good students.

Trustworthy, the student does not cheat. Dependable, work is completed as expected. I pointed to class participants and asked individuals to use *their* words to construct sentences describing good student behaviors. I concluded by stating that if they adhered to these behaviors I would greatly enjoy them as students. They set the behavioral standards.

Results: high attendance rate (not required, voluntary) 98.7%, high homework completion rate 92.6%, and high academic performance.

In the figure is a display of the failure rate for the first exam, in my sections, for the last nine years. The highest failure rate is for a section that was added after the regular advisement period for late admission students to the university. The next highest failure rate is for a section that met from 3:30 to 4:45 p.m. when class participants were tired. Failure rates of 20 per 100 are associated with the "good" morning class hours. The record low failure rate of only 9 per 100 is, in my opinion, a direct result of the positive encouraging activity during the first class meeting that has been continued through subsequent classes.



Very little lecturing occurred in the '97 section throughout the semester. The students and I discussed their learning and mutually eliminated points of confusion, and I continued to focus on their attitude and behavior rather than criticizing their intellect either overtly or covertly. By encouraging them and developing a "can do-will do" attitude the questions that they asked after reading and working exercises were either caused by small misinterpretations or their realization that there is more than what the authors have stated. Having students request additional information is a pleasure. A good beginning indeed. Focus on the students, encourage them, and they will learn chemistry with a positive attitude.