

## *Winning Teaching Strategies*

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“Investigation is the forerunner of knowledge.”

Wise words depict the foundation of effective teaching. One of the best examples of this approach is the Active Learning Technology environment in which “sage on a stage” lecturing is replaced with active learning in which the instructor is immersed in the student’s paths of discovery. Translating the successes of this environment to standard classrooms has presented some challenges. These are exacerbated by large classroom settings and the recent pivot to online education.

Portions of the ALT success can permeate into the classroom. Investigation can start with posing questions which stump the student. An example I use in physics courses is to ask the students to predict the behavior of an action which they invariably misjudge. For example, “If the mass at the end of a pendulum is doubled, does the oscillation period also double?” This is a tricky question since the mass does not affect the oscillation period. The question is posed to the students, and they tend to firmly agree on an incorrect answer. Then the proof of the correct answer is shown supplanting a bit of joy in their discovery.

In image processing classes, an effective series of questions has been: “What are the 3 primary colors? How does one create green from the primary colors?” The first two questions are easily answered, but they are merely a setup for the final question: “Your computer monitor is RGB (red, green, blue), how do you create yellow?” Much like this document, I never reveal the answer for at least a week, encouraging curious students to seek the answer.

The reverse process can also be a part of the education process. Students with unusual backgrounds can provide insight to problems not presented in the textbook, and the instructor, much like Hans Ørsted, can alter the lecture to pair with the students’ insights. One standout example occurred when teaching physics to active-duty military personnel. The concept of predicting the landing spot for a boat crossing a flowing stream caused difficulty until one sergeant asked, “Is this similar to when we parachute out of an airplane in a crosswind?” This example was not in the text and most definitely not within my background, nor will it ever be. However, the kinematic similarities were strong, and the pertinent example served much better than the textbook’s. The lecture was enhanced by the satisfaction the students received by supplanting lecture material.

Finally, the interactions within active learning provide many opportunities for adding humor to the instruction. This is important as humor keeps the students alert and makes the learning enjoyable. In an active setting, humor can arise from interactions with students. In a large setting, the instructors can embed humor in the lectures. I’ve posted funny images and have a slew of one-liners at the ready, such as “This is the same thing only different.” After the pivot to online, I created a series of one-minute videos to add to the lecture videos which had nothing to do with class, except to offer tension release. These were simple shots such as divulging the secret to getting an A+, but recording it at the Manassas train depot just as a noisy train came into the station, masking every word I spoke.



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Getting involved with the students is an important component of their education. Ask yourself, “Who was my favorite professor?” And then ask, “Why?” Commonly, the answer to the second question does not include classroom lecturing, but other forms of interactions. Active learning has been the tool that I have found to be effective, and I have attempted to use it in other settings. I look forward to the day when I can once again interact with the students in an inviting classroom setting.



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