

## **Strategies For Teaching Technical Subjects To Non Technical Engineering Technology Students**

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### **ABSTRACT**

Almost any technical curriculum is challenged by students that are not technically oriented. Terminology, basic science, machine concepts, technical terminology and common sense are key ingredients required when entering an engineering technology program. Experience in my courses indicate students that do not have basic technical mechanical knowledge are at a disadvantage and do not compete on a level playing field with other technical oriented students. The paper outlines the problem and suggests applied approaches and teaching strategies. The advantages to tailoring instruction to the non technical student will result in improved retention and a more informed and more interested student.

### **PROBLEM STATEMENT**

While all of us may be created equal twenty years down the path of life many people develop differences in level of achievement, communication skills, technical ability and practical experience. Instructors and professors all except that fact in a technical course, that is experience and ability will vary within a random group of students. However what do we do about it? Usually nothing or the minimum which is certainly not enough to create a level playing field when competing in technical courses. Competing? Yes most professors still require a curve to establish letter grades based on the average and standard deviation. Such a policy places students in a very difficult position in an environment that should foster not only learning but teamwork.

Let's clarify the issues. I believe the students entering engineering technology programs today come from a much more varied background than entering students twenty years ago. Thus we have a more diverse group but not necessarily a more experienced group. Many of these students have had little opportunity to experience machines used for manufacturing and most have never owned an automobile so have no basis for cost or maintenance requirements of a machine. The reasons for this result from many different factions and could be an entirely separate argument in itself. One of the stronger being that today's working parents have little time available for working on machines in the home or for hobby. Also today's high school student is usually inundated in school activities.

All these considerations lead me to believe that in engineering courses there is a need to address the less experienced students as non technical at least as an incoming student. The negative side of not coming to grip with the facts is losing the students interest and desire for knowledge at the initial point of their college career. Possibly losing the student to another curriculum or being academically expelled. Today I think it more important than ever to consider retention, opportunity and fairness in our teaching styles and technical



course structure. Professors should not be wrapped-up in research and gray matter to the point where they forget who the customer and client really is and what their needs are.

## **SOME STRATEGIES TO CONSIDER IN YOUR DESIGN OF INSTRUCTION AND CLASSROOM TECHNIQUE**

### **Association**

Professors and instructors must remember in a technical class to include basis in the course. The student is not far removed from high school and still cannot see the light at the end of tunnel. How and where will the student potentially apply the knowledge from the course? Associate some application or varied experiences that students can identify with in the very first class session. The automobile has to be the most overworked application and article of identity used in technical courses. Try other ideas such as processes used to manufacture household products or even services. Association is a very powerful tool and can be used to gain the attention of the learner in every single lecture or laboratory session.

### **Do not omit the obvious**

The obvious for one person may not be obvious for another. When discussing technical subjects do not be afraid to repeat yourself or start at the beginning. Back-up and re-work the front end of the problem regardless of how fundamental it may seem. I find professors that have taught a course several years or know the subject matter by heart tend to ignore what they believe to be the “obvious”. Remember to start at the beginning and explain the obvious.

### **Details. Details. Details . . . . .**

Details are boring . . . . at least to the young. There are details in the homework, details in the reading, details in problem format, details in writing and details in the course logistics. What do professors usually tell all students when they do poorly on a assignment because they ignored the details? . . . . . To bad . . . . . get used to it!

It's impossible to get rid of details so your probably right in saying “get used to it”. However take a look at your lecture notes and check them for format and organization. When presenting technical information details are important and if left out send the learner on a tangent. Be careful however not include to many needless details as they can be equally distracting to the learner.

### **Classroom audiovisuals**

I limit classroom materials to the real article when possible and overhead transparencies. I use the old fashioned chalk board for analytical problem solving where I can refer back to previous calculations and there is no rush for the student to copy the work. When developing objectives for the lecture make sure and include objectives for the audiovisuals. Transparencies are very effective for flow charts, showing machine function and circuit schematics. Transparencies also offer opportunity for student participation and are quick to reference during question and answer sessions. VCR tapes and movies are real sleepers if the content is to technical and is not useful if to entertaining. Studies indicate audience concentration peak at about fifteen minutes and drop rapidly on into the film. Films however can be effective to gain the attention of non-technical types and if used up front in your lecture can give clarification for the following lecture material



particularly to the visual learner. When working problems on the chalk board always work the problem cold and do not copy directly from your notes. You may tend to leave “details” out that in later study could confuse the learner.

### **Project work**

I believe project work needs to be “hands on” in engineering technology courses. This is particularly useful when teaching a service course. Can you imagine teaching a engineering technology beginning welding course with out the actual experience of making a weldment?. It can also include computer simulation software in many applications. A project is the final phase of the course where all the fundamentals of knowledge and problem solving merge into one large mess !

### **Problem solving**

Some researchers claim problem solving cannot be taught and is a technique that must be discovered by experimentation. While this maybe more than theory the door is still open for development of thought process and procedure. Getting started is still my toughest part of a project even after almost twenty-five years in the business. Simplify and limit the problem. Define a goal and be willing to modify it, after all the B-52 started with a twelve page proposal and is still flying today. Project work should be limited to workable assignments that are attainable within the given time frame. Class projects can give the learner confidence and the final icing on the cake to an excellent learning process.

### **SUMMARY**

My personal experience teaching technical courses has definitely changed me over the years. When I was a student in college there was a war going on and administrators and professors shared an attitude of indifference. If you get the material fine and if you do not, well that’s fine too! There was always a line at the admissions office and very little thought was given as to the needs of the customer. My initial attitude and style when I entered the teaching profession was similar to my professors but more recently I see my role as trying to deliver the instruction for all incoming levels of technical background. The benefits are thereto reap if professors listen to their customers (employers) and design and deliver instruction to benefit the learner. Benefits of adjusting your teaching style for entering non technical learners are increased retention, increased interest in technical disciplines, lifelong learning awareness and an enhanced product for your customer.

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## ACKNOWLEDGMENTS

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