

“HANDS-ON” OR “HIGH-TECH” IN ENGINEERING EDUCATION?

By Ken Bondy

INTRODUCTION

What provides the best education for a civil engineering student who wants to be a structural engineer? One which maximizes the exposure to high-tech analytical methods (computer matrix techniques, finite element, three-dimensional frame analysis, dynamic analysis), or one which emphasizes the practical aspects of the structural engineering office (preparation of drawings and calculations, codes, materials of construction, office practice) with a minimum of high-powered analytical techniques?

Educators have pondered this question for decades, since it appears that the limited time available for an undergraduate curriculum does not practically permit the inclusion of a good dose of both. Thus most undergraduate engineering schools have evolved into providing one or the other. Some schools go exclusively with a high-tech analytical curriculum; others offer mainly practical, how-to courses that are geared toward the actual day-to-day structural engineering office practice. Students graduating from the high-tech school with an undergraduate degree must pick up the practical aspects of structural engineering on his/her own, on-the-job. Similarly those with degrees from the practical school must learn any advanced analytical techniques necessary for their job on their own time through self-study, seminars, additional courses, tutelage of an experienced associate or supervisor, etc.

In this talk I hope to explore the advantages and disadvantages of each philosophy and offer some recommendations based upon my own personal experience.

PERSONAL BACKGROUND/QUALIFICATIONS

Graduated from UCLA, a high-tech school learned practice on my own.

Taught at UCLA – kids don't know what a drafting board is nor CAD don't know what the product of the structural engineer is nor generally what structural engineers do

Worked with engineers from Cal Poly SLO, a “practical” school offering ARCHE (Structural Engineering)

Served on advisory board to College of Architecture, including ArchE

Tracked the careers of many of my students for almost twenty years (advantage of access to many SE firms as a specialized consultant)

ADVANTAGES AND DISADVANTAGES

The graduate of the high-tech school is better trained as a problem solver, able to evaluate situations and come to the right conclusions, gathering information on the way. Potentially better manager. May not stay in engineering, prefers management (construction, industry, etc. in a related field).

Practical graduate is immediately useful and much in demand and knows it. Tends to not advance as quickly.

PERSONAL OPINIONS

High tech is better if you have to pick one.

Best currently available education for an SE is practical undergraduate, high-tech MS PhD not necessary for most who want a career in SE, actually detrimental (time not worth it, practical experience more valuable)

5-6 yr integrated curriculum with both, leading to MS but within same school.

RECOMMENDATIONS

High tech schools should tell students that they are in a high-tech school and what to expect.

All schools should do a better job of describing the practice of SE, choices they must make at graduation (government, industry, design) and how the first choice can influence their entire career.