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WE HOLD THESE TRUTHS TO BE SELF-EVIDENT

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Being engineering professors, we all know about the need to make assumptions...and we also know that if the assumptions are invalid, the results can be worthless. We learn early in our careers to check our results (*Does the model fit the data? Does the algorithm converge? Does the product meet quality specifications?*) and if they are not satisfactory, to question our assumptions (*Is the solution ideal? Is the reactor isothermal? Is flow laminar?*), and we try to develop the same critical questioning mentality in our students.

When it comes to education, however, our mentality changes. We generally do whatever it is we do without much critical evaluation of how well or poorly it is working, and we accept without question what Armando Rugarcia calls *academic myths*---assumptions that have never been shown to have any basis in reality and often defy common sense. Here are some of them.

Myths about Faculty Recruitment

- *People who (i) don't have Ph.D.'s or (ii) have spent their careers in industry and have no research publications, are not qualified to be engineering professors.*

- *When filling faculty vacancies, an engineering department benefits most by selecting the candidates in the hottest and currently most fundable research areas. How much grant money they attract in the next five years is more important than whether they know enough engineering to teach the core courses and change research areas if their present one goes out of fashion.*

- *The best way to handle required courses that no one wants to teach, like the unit operations laboratory or the capstone design course, is to rotate them among the faculty so that no one gets stuck with them too often. An inferior solution is to fill a vacant faculty position with someone who has the desire to teach these courses and the expertise to teach them well.*

- *When selecting a department head, the faculty benefits most by choosing the candidate with the strongest research record, regardless of administrative experience or ability. How he or she runs the department in the next five-to-ten years is less important than what he or she does in research after that.*

Myths about Research and Teaching

- *Excellence in research and excellence in teaching are highly correlated.*

- *Requiring EVERY faculty member to build up a strong research program as a condition for promotion and tenure is in the students' (professors', department's) best interests.*

- *Excusing new professors from teaching responsibilities so they can write proposals is a good thing to do. Excusing them from research responsibilities so they can develop a couple of good courses makes no sense.*

- *Professors who are excellent at research and mediocre-to-adequate at teaching deserve tenure. Professors who are excellent at teaching and mediocre-to-adequate at research don't.*

Myths about Curriculum Design and Pedagogy

- *Our graduates routinely say they never use 90% of what we taught them. Since we're engineering professors, 90% of what they're doing must not be engineering.*

- *It makes sense educationally to teach students a generalized theory (e.g. transport theory) before teaching them anything about the specific phenomena and devices that the theory was invented to describe (e.g. unit operations).*

- *Tensor calculus, quantum chemistry, and statistical mechanics are things every chemical engineering undergraduate should learn. Statistical process control, project management, and technical writing they can pick up on their own---there's no room for them in our crowded curriculum.*

- *The best thing to do with ethics, safety, environmental science, and all those other important things ABET says we have to teach, is stick them all in the capstone design course.*

- *I accomplish something useful when I spend 50 minutes in class writing detailed derivations on the chalkboard for the students to copy.*

- *We can't teach students to think critically or creatively---either they can do it or they can't.*

- *Students who complain that our lectures have nothing to do with the real world don't know anything about the real world---and we do.*

- *If I have covered the syllabus, I have done my job successfully.*

Myths about Evaluation of Students (Grading)

- *How well our students will do as engineers correlates highly with (a) their undergraduate GPA; (b) their ability to solve problems with unfamiliar twists on 50-minute exams; (c) anything else that we typically use to evaluate them.*

- *An average score of 40 on my final exam proves (a) I set high standards; (b) they didn't understand the material. There is no possibility that it proves (c) the test was lousy.*

- *An average score of 85 on your final exam proves (a) it was a trivial test; (b) you're a soft grader; (c) there was widespread cheating. There is no possibility that the result proves (d) they learned the material.*

- *Performance on the written Ph.D. qualifying examination correlates with anything except performance in courses on the same material.*

Myths about Evaluation of Teaching

- *All methods of evaluating teaching are unreliable, and student evaluations are the most unreliable of all.*

- *If you consistently get outstanding student evaluations, it must be because you are (a) an easy grader; (b) an "entertainer." It is certainly not because you are (c) an outstanding teacher.*

- *If I get consistently rotten student evaluations, it is because (a) the students are ignorant and lazy; (b) I don't water down the material for them; (c) they don't understand what I'm doing for them now but in later years they'll come back and thank me. It is* ***definitely*** *not because (d) I am doing a rotten teaching job.*

I could go on, but you get the idea.

When I classify these points as myths I'm not saying there's nothing to them; it's just that as far as I know they've never been scientifically or even empirically validated. (Mentioning someone who is great at both teaching and research, for instance, doesn't quite do it.) If you can justify one or another of these assumptions, let me know and I'll set the record straight.(1) If, on the other hand, you conclude that the assumptions might be faulty, then how about considering whether some alternative assumptions might lead to better ways of doing things? Couldn't hurt.

References

1. McKeachie, W.J., *Teaching Tips: A guidebook for the beginning college teacher*, 8th Ed., Toronto, D.C. Heath & Co., 1986.
2. Rugarcia, A., "The link between teaching and research: Myth or possibility?" *Engineering Education, 81*, 20 (1991).