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*Effective Motivation of Engineering Mathematical Education*

For the last 15 years I have been exploring the range of mathematics skills the students entering third-year Civil Engineering possess, and what can best be done with this skills in their final undergraduate mathematics course. What is apparent from the data collected is that their retained knowledge from previous mathematics courses has been gradually decreasing over this time, and their sense of alienation from mathematics has been steadily increasing. These two aspects are naturally related. In fact, when probed, it is clear that the third-year students have tended to lose perspective about what mathematics is useful for, what it can contribute to their career, and even what humans invented these procedures for in the first place.

This course explores how to re-energize students through explicit review sessions, through mobilizing a broad range of motivational arguments, and by trying to set goals of mastery of some key reasoning skills. The results have been largely positive, in that the students have re-engaged mathematics with interest and improving skills. But the lack of positive incoming skills and the demands of an over-crowded schedule set real limits in what can be achieved in a single class. It is believed that the lost sense of mathematics need to penetrate earlier, and more broadly, in the engineering curriculum.

The nature of the course, the results of the pretests over time, and the motivational experiences that have been found to be beneficial will be summarized in this presentation. The basic insight is that mathematics is not primarily helpful as a way of looking inward to engineering students, but can be a satisfying way of looking outward and coming to grips with a responsible engagement with the world. The benefit of this approach is that it allows reasonable limits on when to stop the formal analysis and thus to move on to implementation and monitoring.