

SOME ECONOMICS

A Presidential Perspective

A research-rich, discovery-based, lean and lively curriculum developed in a community of learners “works” at the undergraduate level. The next obvious questions—both at the institutional and national levels—are: What’s the cost? Is it cost effective? Here it is critical to distinguish between several units of analysis: cost per student enrolled; cost per course or lab taught; and cost per baccalaureate degree produced. And, it is important to include all costs that can be accurately attributed, including appropriate shares of libraries, computer centers, and physical plant—items normally not allocated to departments, much less to courses, in typical college accounting or budgeting systems.

Studies of the economics of education have shown the payoff from undergraduate education comes with the achievement of a degree, not partial completion of a program (although some data suggest this is not as strong a finding for women). What’s important for an institution, a program, or the country is not the intake, or the enrollment level, but the output. Yet, comparative “cost” studies generally examine the educational costs per student enrolled at an institution. Given the systematic differences in costs between lower-level and upper-level undergraduate instruction, and the different attrition rates at different types of institutions, costs per

enrolled student will not accurately reflect real differences in the costs to produce baccalaureate degrees. Such studies will systematically bias the results against colleges with high graduation rates.

For example, independent colleges sometimes show higher costs per enrolled student, though some recent studies (e.g., for New York State) indicate no substantial differences in costs per student enrolled between public and independent colleges of arts and science. Since they have higher completion rates, independent colleges (and public institutions with apparently richer resource levels) are probably more efficient, and less costly, when the measure is the cost of producing baccalaureates.

A well-designed study on real comparative costs of producing baccalaureates would be useful; but the above arguments suggest that when one looks at effectiveness and the real efficiency of resource use, the science-active colleges are not as expensive as some would erroneously conclude.

Traditional undergraduate SMET (Science/Mathematics/Engineering/Technology) approaches treat freshman courses as weeding out courses, not recruitment courses—they act “as a filter, not a pump.” This often (not always) means low class sizes at upper levels and consequent high cost from low student/faculty ratios. If the productivity of faculty, space, and instrumentation is to be raised, one way to do it is to reduce

the attrition rate from lower-level to upper-level courses—one of the objectives of the curriculum and approach at the science-active colleges. The longtime chair of our exceptionally effective geology program is fond of saying, “Geology majors are made, not born.” The department treats its introductory course as a proselytizing course for majors and as a result has well-filled upper-level courses. Per graduate, the costs are modest, because the “conversion rate” from elementary to intermediate, to advanced courses is so high.

While we need some further research to confirm, contradict, or modify this mixture of established results and educated guesses, the arithmetic of increased retention and low marginal costs of added students at the advanced levels strongly suggests that changed approaches, even with consequent added costs at the introductory levels, are likely to be worth it.

Creative use of resources to change the way students learn science, and to change in a way that is cost effective, must be a joint effort of faculty, administrative staff, and governing boards. For starters, most traditional budgeting systems in the liberal arts colleges provide neither

the accounting information nor the flexibility of decision making, to permit academic departments to know, much less to reallocate, the various costs associated with a department's activities (or those of a course or laboratory). We need to generate the information so that faculty can consider options of trading off alternative uses of resources—space (including improvements), instrumentation, support staff, technical staff, faculty time, consumables, library resources, computer time, access charges, and even travel funds—as they consider how best to help students learn to do science.

This will not be an easy process. The information is not readily available on a cost-accounting basis; lines of budgetary authority generally dictate that the total resources actually employed in instruction are controlled by several different administrative units. Buildings and raw space cannot costlessly be transformed into personnel, animals, or network access fees. Yet, the lessons and insights of the Total Quality Management, or continuous improvement, movement suggest we need to focus on the entire process, not on the individual pieces. This means breaking down the administrative barriers that constrain budgets, involving many different people in the discussion of how best to deal with individual courses, course sequences, or major programs.

If we expect faculty to be creative, we collectively have to allow them the flexibility to do so. Similarly, if faculty expect resources to be made available, they must consider the full range of constraints within which institutions operate. Just as politicians and economists have to understand each other and jointly participate in the making of good public policy, so, too, faculty and administrators have to understand each other and participate jointly in thinking through the best, most efficient, most effective ways of helping our students learn to do science. This collaboration is even more essential than it was in the past because of the rapid and continuous obsolescence of techniques and instrumentation, the continued explosion of knowledge, and the demonstrable concern of all of our publics with the costs of the higher education enterprise.