

THE BEST IS NONE TOO GOOD

By 1972 the American people may be sending about 50 percent of their children to college. How will we make room for them? How will we pay the bill? And what quality shall the education be?

by L. A. DuBRIDGE

THE AMERICAN PEOPLE now send 30 percent of their children to college, and the chances are better than even that in 10 years, more or less, the number will be approaching 50 percent. In some of the more prosperous states 50 percent of the high school graduates *now* enter college.

The number of children who reached age 17 and who thus could potentially be applicants for admission to our institutions of higher education was 2,300,000 in 1956; it will be 3,900,000 in 1972—an increase of 70 percent. If the fraction of these who enroll in college continues to increase as in the past, we will have more than doubled college enrollments by that year.

If our present great educational system of 1800 colleges, junior colleges and universities is just adequate for present enrollments (and I hear little complaint about space going to waste!) then we are going to have to build the equivalent of 1800 more colleges by 1972. Double in 15 or 20 years the plant that has taken 300 years to build! The task is staggering; until 1972 it will cost about a billion dollars a year for physical facilities alone.

We now spend 3 billion dollars a year in operating our universities and colleges—about \$1,000 per student. It is unlikely that the cost will go down; in fact, to bring faculty salaries to where they should be it must go

sharply *up*. Thus we should add a billion dollars a year immediately to the budget, and by 1972 we may need to be spending \$1,400 per student, or 8 billion dollars a year for higher education—in addition to a billion a year needed for plant additions.

As President de Kiewiet of the University of Rochester recently remarked in a brilliant paper on the subject, "All this is absurdly too much." "Or," he adds, "*is it?*" He goes on to point out that American industry is spending at the rate of 25 billion dollars a year for new plant facilities. (Southern California alone is spending a billion dollars a year for new plant.) American Telephone and Telegraph spent a billion dollars last year on new telephone equipment. If we can spend that much on helping people talk to each other, might we not spend an equal amount in helping them have something to talk about? Furthermore, 3 billion dollars a year is only 75 cents out of each \$100 of Gross National Product. In 1972, 8 billion dollars will be only \$1.30 out of each \$100 of the projected GNP for that year.

The bill has got to be met. The American people will not tolerate having half their qualified youngsters refused admission to college. The only question is: When shall we pay, and how? Shall we meet the bill soon enough—or too late? Shall we meet it by tuition fees or private gifts or taxes, or by how much of each?

But the quantitative problem is not the most serious one. Americans can scrape up an additional 3 or 4 billion dollars a year by 1972 if they have to. Much more difficult—and more important—than the question

"The Best Is None Too Good" has been adapted from a talk given at the Conference on Engineering and Scientific Education in Chicago on November 1, 1957.

of how many students are to be educated is the question of what quality shall the education be.

The conclusive test of what the quality of an educational institution *has been* is, of course, the quality of the alumni. If the alumni of 25 years ago appear to have reached, in relatively substantial numbers, positions of high achievement and if they occupy posts of responsibility in government, in industry and in universities, we can then surely conclude that 25 years ago that institution was doing a fine educational job—or, at least, was attracting exceptionally able students.

A long history of alumni success is the earmark of the great institution. And since greatness has tremendous inertia (it is difficult to achieve but, once established, has a tremendous tendency to persist) we are usually safe in taking past performance, if consistently maintained, as a good measure of present quality or the lack of it.

Now, if the measure of past achievement in a given field is the success of the alumni, then we must ask what are the sources of this success? What factors make for continuing high quality? There are, I think, at least four:

1. Quality of students
2. Quality of faculty
3. Quality of leadership
4. Quality of teaching and research facilities

Each of these factors is worth a brief discussion.

Students—The matter of student quality is not usually given adequate nor adequately candid attention. The blunt fact is that, by any sort of test of intellectual ability ever given, the average quality of students at some institutions is very substantially higher than that found at others. In fact, the upper quartile of students at some colleges may hardly come up to the lower quartile at others.

Now, this is not bad; in fact, it is good and should be encouraged. Top-grade students will get a better education if they are in a place where there is stiff competition; and less able students will also do better if they are not hopelessly outclassed by their colleagues.

Difference in performance

It needs to be realized that in technical subjects like mathematics and physics, which require a high degree of quantitative imagination, the difference in performance between a top student and a mediocre student is really very great. It is far greater than the difference suggested by giving the one a grade of 99 percent and the other 60 percent, for example. It is not a ratio of 5 to 3, but a ratio of 5 to 1, or 10 to 1—or, occasionally, 100 to 1—that we are dealing with.

Trying to accommodate in one class a spectrum of student achievement ranging over a ratio of 10 to 1 presents serious difficulties, to say the least. That means a problem assignment which takes 2 hours for the best student takes 20 hours for the least able student. If we

compromise and let the slowest student off with 5 hours of work, the best student may not even bother to solve such easy problems at all. How we attack *this difficult* problem is one of the prime questions of technical education.

There are some people who will say we need not worry about the outstanding student; he will take care of himself. And they will point to the Thomas Edisons and Charles Ketterings who had very little formal education at all.

But I think this attitude is wrong—very wrong. The future creative leaders of our science and technology should have *the most challenging* opportunities to develop their capacities—intensively and early. You can point to certain great scientists and engineers who are self-taught—but I can point to many, many more who developed under the challenging and understanding encouragement of a great teacher—such as Ernest Rutherford, Niels Bohr, or Robert Millikan, to name but three in the field of physics.

There are so many examples of a great scientist building up a school from which other great scientists have come, that we are forced to the conclusion that—though a few may come through handsomely, even though neglected—we can substantially increase the yield of good technical people if we provide the stimulation, the encouragement and the practical help that a high quality educational center can give. Maybe the most important function of a great center or a great teacher is just to attract the best students and let them stimulate each other. If so, that is a most significant contribution.

Quality and quantity

What shall we do, then, about student quality as enrollments rise? Shall we tighten up the admissions policies of our colleges, cutting off, say, by 1972, the lower half or two-thirds of those who would *now* be admitted—educating only those of ever-higher intellectual capacity?

There are some who advocate this course—and advance in its favor perfectly sound arguments about the importance of quality versus quantity. Others advocate this course to save money.

Nevertheless, this extreme measure will not be accepted by the American people, who are determined to have greater, not less, educational opportunities. Nor is this solution, I believe, either practical or desirable—for four reasons:

1. Our selecting and predicting techniques are not nearly good enough to refuse a higher education to half of those who desire it. We would be cutting off many who, because of poor schooling, poor home environment, or other reasons, have made a slow start but may still do very well.

2. In the engineering fields we need men with a variety of skills. And not all the talents we need are necessarily reflected in high academic standing. The old

adage that "the *A* students make the professors and the *C* students make the money" is no longer good statistics, but it still is more than occasionally true.

3. The quantitative shortage of scientists and engineers is sufficiently severe and sufficiently long-term that we should seek to recruit a larger rather than a smaller percentage of students into our engineering schools.

4. Finally, there is no conclusive evidence that under proper conditions rising enrollments in a particular institution necessarily result in declining quality or in lesser opportunities for the gifted student.

What then do we do to keep broad educational opportunity and also to insure the quality of training we need? I would propose:

1. Expand facilities for higher education throughout the country, especially in public institutions, to provide space for the same or slightly larger fraction of the total college-age population as now, and at the same time improve our selection techniques to eliminate the loafers and incompetents.

2. Make more extensive use of the junior college as a means for providing the first two years at low cost for many students—thus delegating to those institutions some of the task of eliminating the unfit and preparing the better ones for upper-division work elsewhere.

3. Provide for all students of outstanding ability, whenever and wherever they appear, special attention, special encouragement and special incentives to go on beyond the routine work of the classroom; and encourage them, when it is appropriate, to transfer to other institutions where more adequate facilities or competition will be found.

4. While many institutions expand their facilities, a few schools around the country should be encouraged in their efforts to select only the most able students and provide them with a supremely challenging program.

We have such schools now—and many of them are facing a difficult dilemma. Shall they expand enrollment and make their excellent facilities available to more students—even at some loss in quality—or shall they put all available resources into higher and higher quality opportunities for a carefully selected few? Or can some, in fact, expand and raise quality also?

The select few

I would not presume to judge what the proper course is for any particular college—except my own. But I do suggest that those who do elect to give high-quality instruction to a select few be given encouragement and support—in spite of the fact that some segments of public opinion will brand such institutions as "undemocratic," a horrible distortion of the meaning of that word.

Faculty—Good scholars are very scarce. You would think, in fact, they would command the highest salaries of anyone in the community. But, instead, their salaries have always been low and, in purchasing power, they

have been getting relatively lower as the years go by.

Our colleges and universities are being subsidized by their faculty members who, in the nation as a whole, forego a billion dollars a year in salary because they love to live in a university atmosphere. Now that is very generous and loyal of them—but the universities are courting disaster if they allow this contribution to continue.

Opportunities more remunerating, and in some ways equally rewarding, are available outside the universities for scientists and engineers—especially young ones not yet bitten with the university bug. The quality of our faculties will surely erode away if we do not find ways of keeping a very much larger fraction of these bright young men in the teaching profession.

The seed corn of the future is such a valuable resource that we must promptly begin to adopt more realistic methods of conserving it. The second report of the President's Commission on Education Beyond the High School flatly recommends that average faculty salaries be doubled in the next five to ten years. It is about the most sensible suggestion I have heard.

First-class faculty

To have first-class colleges we *must* have first-rate faculty and there is just no room for further argument on that point. We'll either get first-class talent and pay for it—or we will have second-rate universities. Again the decision rests with the American people.

But this is no easy task. To double the top salary levels of professors in the leading universities means bringing them from the present \$10,000-\$15,000 salary levels to \$20,000-\$30,000. Now \$20,000 is the annual income on some \$500,000 endowment, and \$30,000 is the income on \$750,000. A group of 100 top professors, then, will require an endowment of \$50,000,000 to \$75,000,000. Not more than 15 private institutions in the nation have that much endowment to cover *all* expense.

The Ford Foundation recently made munificent gifts totaling \$250,000,000 to the accredited private colleges of the country—over 600 in number. This was about equal to one year's salary budget for these institutions. As an endowment, therefore, it provided about a 4 percent salary increase. To *double* the salaries in these same institutions would have taken an endowment gift of 6½ billion dollars! Impossible? Well, at least we must admit it won't be easy and we ought to get to work.

Leadership—The third qualitative criterion in university education is that of leadership: the leadership of the faculty, of the deans and other administrative officers, of the president and the trustees. Someone must set up the ideals which an institution seeks to achieve—and then keep the helm firmly fixed in that direction.

In 1908 a great scientist and scientific leader named George Ellery Hale became a trustee of a private manual training school in Pasadena. He persuaded the other trustees that southern California needed a technical university "second to none" in the nation. Fortunately, he

wasn't laughed at, and within two years Throop Polytechnic School had transferred to other schools its 600 elementary and high school students, had retained its best 30 college students, moved them to a new campus and established a policy and a program which led straight to the California Institute of Technology of today. Leadership with vision and with determination brought to reality what in 1908 must have seemed to many to be a hollow boast.

A similar story has been repeated at many institutions. Inspired leadership will attract inspired faculty members; they will attract first-class students; and all together they will attract the necessary funds to make first-class institutions.

I cannot tell you how to manufacture inspired leadership among the trustees, faculty and administration of our colleges. I can only say that without it new goals of high quality cannot be attained.

Dr. Raymond B. Fosdick has said of Dr. Wickliffe Rose, onetime head of the General Education Board—a Rockefeller creation—that his (Rose's) insistent policy in supporting education was expressed in a single phrase: "Make the peaks higher." Where inspired leadership was found—in administration or faculty—he advocated supporting it to the limit; where superb quality was being achieved, he wanted to make it still better.

Make the peaks higher

I believe higher education in America could well adopt Dr. Rose's motto, "Make the peaks higher." This does not prevent making the base broader too—in fact, it requires it. But it brings out the fact that a major function of a broader base is not to take up more space, but to support the higher peaks.

Such a policy is quite contrary to the views held by many educators. There are many who, in fact, advocate the contrary thesis; namely, "leave the peaks alone and fill up the valleys." Their thesis would be to help the weak or so-called "needy" institutions rather than the best ones. This, it is claimed, is "the democratic way."

Now no one could deny for a moment that it is to the national interest to have many good universities, and that it is desirable for every college and university to get a little better. But it is equally important that there be a few institutions—we dare not hope for more than a few—of really superb quality. We must, for the sake of future generations, have a few outstanding leaders, a few institutions that are blazing the trails of the future.

Facilities—A good institution needs adequate facilities. A good faculty needs adequate material support. "Mark Hopkins on one end of a log and a student on the other" is a fine ideal. But as a New York court, passing on the taxability of student and faculty residences, once remarked: "Institutions early learned that a student must live somewhere else than the end of a log. Nor is the other end a suitable residence for the teacher—particularly in northern New York."

Bricks and mortar, steel and concrete are essential elements in a fine technical institution. We must have laboratories for teaching and research libraries where the knowledge of the past is readily accessible to the present; living, dining and recreation facilities conducive to a life of scholarship—these things are essential to students and faculty alike.

Hardheaded businessmen are inclined to criticize universities for making "inefficient use" of space. A classroom, they say, is used only 6 hours a day, 5 days a week, only 9 months a year. Why not 70 hours a week instead of 30? Why not 12 months a year?

Well, why do we use the bedrooms in our houses only 8 hours a day? Why not take turns sleeping and make one bedroom do the work of three? Also, why do automobile assembly lines operate only 40 hours a week—with 6 weeks off every fall to change models?

Machines for men

The answer is, of course, that machines are made for men—not men for machines. Buildings and laboratories are designed to make learning easier, not harder. The time of people—of students, of faculty, of other employees—is far more valuable than the building space they need. It is poor economy to impede the work of a \$20,000 professor (in 1965, that is!) for many years for lack of a few thousand dollars' worth of space.

The entire capital cost of a university plant is often no more than 3 to 5 times the operating expenses for a year. And even if classrooms can stand being used 12 months a year, neither the teacher nor the student can.

What I have been saying may be briefly summarized:

1. One brilliant creative scientist or engineer may turn up with more new ideas than 100 ordinary ones. He may, in fact, need the help of the 100 in putting his ideas to use. Hence, while we are educating the 100 we should not fail to find and encourage and give special attention to the *one*.

2. Since we cannot always pick out "the one" at an early age, we must provide opportunities for *many*—and we will need the many, too.

3. Since we can, on the other hand, select some—even if not all—superior students at an early age, there should be a few places where those students can go for especially challenging opportunities.

4. Lest we end up with first-rate students studying under second-rate professors, we must find ways of keeping more first-class professors in the universities.

5. A colossal task faces America in doubling our educational plant and staff during coming years and at the same time improving its quality. We may by 1972 have to spend twice as much for higher education as we do for cigarettes! If we can only make clear to the American people what the task is, I feel sure they will tighten their belts and make the sacrifice.

6. In higher education in America, even the best is none too good.