DOCUMENT RESUME

ED 351 956 HE 026 019

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TITLE Charge to the University Committee on the Undergraduate Curriculum.
INSTITUTION Rutgers, The State Univ., New Brunswick, N.J.
PUB DATE 91
NOTE 17p.
PUB TYPE Reports - General (140)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Admission Criteria; Basic Skills; *College Curriculum; Communication Skills; *Educational Planning; *Educational Quality; Engineering Education; General Education; Higher Education; Mathematics Education; Organizational Objectives; Science Education; Skill Development; *Undergraduate Study
IDENTIFIERS *Rutgers The State University NJ

ABSTRACT

This paper presents the long and short versions of the charge to the University Committee on the Undergraduate Curriculum designed to establish Rutgers' university-wide goals of excellence against which each college will be asked to measure its curriculum. The purpose of the Committee's task was to help the colleges meet the challenges of high standards in basic skills, coherence in general education, and integration in major programs. The Committee is charged with the following: (1) to develop a clear and specific articulation of the courses and skill levels that incoming students must have to succeed at Rutgers; (2) to suggest means through which colleges and departments can address the special curricular and teaching issues in science, mathematics, and engineering in order to revive student interest and increase competence, and to recommend high, assessment-based standards for communication skills and means of achieving the new standards; and (3) to recommend university-wide goals that will enable colleges to assess whether their required courses fulfill Rutgers' role as the open door to opportunity and achievement. (GLR)

CHARGE TO THE UNIVERSITY COMMITTEE ON THE UNDERGRADUATE CURRICULUM

Francis L. Lawrence

EXECUTIVE SUMMARY OF THE CHARGE TO THE UNIVERSITY COMMITTEE ON THE UNDERGRADUATE CURRICULUM

The task of the University Committee on the Undergraduate Curriculum is to establish university-wide Rutgers goals of excellence against which each college will be asked to measure its curriculum in order to meet the challenges of high standards in basic skills, coherence in general education, and integration in major programs.

1. Pre-College Requirements.

   The Committee is charged to develop a clear and specific articulation of the courses and skill levels that incoming students must have to succeed at Rutgers.

2. Math, Science, Writing, and Speaking.

   The Committee is charged to suggest means through which colleges and departments can address the special curricular and teaching issues in science, mathematics, and engineering in order to revive student interest and increase competence. It is also charged to recommend high, assessment-based standards for communication skills and means of achieving the new standards.

3. General Requirements.

   The Committee is charged to recommend university-wide goals that will enable colleges to assess whether their required courses fulfill Rutgers' role as the open door to opportunity and achievement through multicultural education that honors diversity and creates community in our interdependent global society; Rutgers' research mission through insight into the university's work of discovery and understanding; and Rutgers' public service mission through structured curricular or co-curricular involvement.

4. The Major.

The Committee is charged to recommend a framework that departments may use to formulate their own high goals and standards and to measure their success in program integration and student learning. The Committee is also charged to recommend plans that departments and colleges may use to develop hands-on involvement of students in research.

President Francis L. Lawrence
Rutgers, The State University of New Jersey
November 12, 1991

CHARGE TO THE UNIVERSITY COMMITTEE ON THE UNDERGRADUATE CURRICULUM

Preface

The Problem in General Terms

There is no doubt that the university is fragmented today, not just Rutgers University with its campuses in three cities, its twenty-six schools and colleges, and its dozens of centers and institutes, but, in large measure, all universities are fragmented. Even middle-sized private institutions struggle to define curricula that are something more than cafeteria offerings of uncoordinated specialized courses. Clark Kerr, former head of the University of California system, gave us the concept of the multiversity inevitably divided against itself, but the comic definition of a university as a collection of departments united by a common parking problem is usually attributed to Robert Maynard Hutchins of the University of Chicago. Derek Bok argued that, in view of the amount and variety of modern knowledge, the 1970s revision of the Harvard curriculum, designed only to guarantee that students were trained in broad areas of skills and methods, was the best one could devise to order the incoherence of an undergraduate curriculum taught by specialists. Stanford's vice president for finance, William Massey, declared confidently that the university, as part of the market system, must provide a varied changing menu of courses that correspond to student tastes and demands.

The Challenge of Curricular Structure

Despite this general agreement on the fact of fragmentation, and the ingenious arguments often made in its defense, there remain powerful reasons to seek to establish standards in basic skills as well as coherence in general education and integration in major programs in the college curriculum. External and internal voices constantly exhort us to meet the challenge of taking responsibility for our students' education in its broad outlines by setting standards and goals and constructing a curriculum structured to help students to fulfill them.

In some measure, any thoughtful reconsideration of the undergraduate curriculum at Rutgers is complicated by our three-city campus structure and our many undergraduate colleges, each with its own special character. A unique Rutgers advantage, the multiple-college structure has allowed Rutgers to offer undergraduates not only the quality and reputation of a major research university but the collegial atmosphere characteristic of much smaller institutions, even in New Brunswick, where it is supported by the devoted service of faculty fellows. This complex undergraduate structure, which in most ways is a strength, can make it difficult to undertake dialogue on a university-wide basis, especially in regard to the curriculum. But that should not be allowed to paralyze us. University-wide curricular standards would not make it necessary for each undergraduate college to have a rubber-stamp set of general education courses or for each department to construct the major in a rigid sequence. Cook College, for example, has started a critical review of the undergraduate curriculum in light of the teaching mission and goals of the college. Such reviews are always constructive and worth the effort. University-wide Rutgers standards will strengthen, not detract from, college-specific goals. The University Committee on the Undergraduate Curriculum will propose high standards against which each college will be asked to measure its curriculum and achievements. Each college will strive to meet the university-wide goals in its own way.

Although the size and extent of a large state university may pose special problems in devising a framework for curricular coherence, it also offers strong motives for success. In the public eye, Rutgers is sometimes seen as less than the sum of its excellent but complex and sprawling parts. The university acts and speaks with so many voices that we are often heard as a cacophony rather than the great institution that Rutgers actually is. University-wide articulation of Rutgers' standards for undergraduate education would give us a single strong voice in academic matters of crucial importance to our students.

The Charge

I ask that the University Committee on the Undergraduate Curriculum consider the three areas of undergraduate education: the basic skills, the general education requirements, and the major. I believe that the greatest contributions of the Committee can be made through defining areas of special problems and opportunities and in suggesting goals and means that colleges and departments can use to attain those goals. In each area, the study should suggest university-wide guidelines that would address not only what our students ought to learn but how, the most effective ways for them to learn, and the optimal means to measure whether or not they are learning it. Although I cannot make a comprehensive review of each appropriate curricular area here, I do want to comment on some special issues that, in my opinion, deserve the imaginative and conscientious attention of the Committee.

Basic Skills

I ask that the Committee develop a very clear articulation of the necessary pre-college academic courses and skills that incoming students must have to succeed at Rutgers. Obviously, such pre-college specification is most crucial in the mathematical and physical sciences, but it should also pertain to skills essential in the humanities and social sciences. Guidance counselors throughout the state should have no misunderstanding or ambiguities about the courses their students should take, and the teachers in the high school should have no lack of information about the content of those courses. This is an essential part of my plan to dramatically reduce non-credit courses in our curriculum and still to welcome as many or more economically disadvantaged students to our classrooms in the year 2000 as we do in 1991.

Declining Student Interest and Competence in Math and Science

To be blunt, the scientific pipeline in the United States is drying up. Many of those who have been most responsible for the dramatic scientific and technological advances in the United States in the last 30 years have retired or are nearing retirement, and we simply do not have their replacements waiting in the wings. Many experts predict that there will be a serious shortfall in the country's scientific talent pool by the year 2000. According to the National Research Council, interest in majoring in mathematics is at an all-time low. The disinterest is more pronounced among some subgroups: fewer than 10 percent of the students who complete calculus are African-American or Hispanic, and women receive only one in five doctorates in math.

The reasons for this declining interest in science, engineering, and mathematics are many, but to some extent we have ourselves to blame. Professor Uri Treisman of the University of California at Berkeley - and a frequent speaker and consultant at Rutgers last year - put it this way:

> The courses we're teaching were designed at a time of student surplus in the 1960s and 1970s. The courses evolved to control the flow of students into the classroom. We always think it will be 1968 again and that we will have lots of students. But now we have a situation where almost no one wants to be a mathematician or a chemist or a physicist. (Alliance for Undergraduate Education, The Freshman Year in Science and Engineering: Old Problems, New Perspectives for Research Universities, 1990, p.7)

We must do more to attract good students to science, engineering, and mathematics. And we must retain these good students by improving our teaching and by responding to Treisman's challenge to develop courses whose major purpose is not to turn away interested students. Rutgers is already actively engaged in addressing this problem through our participation in the Alliance for Undergraduate Education's Working Group on Science, Engineering, and Mathematics Education, programs such as Dean Amy Cohen's EXCEL project and the Douglass Project for Women in Math,

Science, and Engineering. But, as good as these programs are, they are not enough. We need more good ideas. One idea that seems to me to have considerable merit was suggested recently by Professor Joe Potenza, of the New Brunswick Provost's office and Chemistry Department. This proposal calls for the establishment of an interdisciplinary faculty group that would focus on the special curricular and teaching issues in science, mathematics, and engineering. I would like to see consideration given to this idea, as well as others, as we struggle to deal with this national problem.

Writing and Speaking

Most would agree that one of the most valued qualities of an educated person is the competence to express oneself clearly. Surely, in any listing of the most desired outcomes of a college education, the ability to write and speak with clarity should rank toward the top. Curiously, however, survey after survey indicates that the characteristic of college students that is most distressing to members of the faculty is students' lack of facility with the language. In recent research carried out by the Carnegie Foundation for the Advancement of Teaching, one frustrated college professor lamented: "Most of my freshman students are 'verbal,' but they cannot clearly express an idea. As I read their papers I find some interesting thoughts scattered about, but frankly I have a tough time figuring out what they are trying to say!" (Ernest L. Boyer, College: The Undergraduate Experience in America. The Carnegie Foundation for the Advancement of Teaching. New York: Harper & Row, 1987, p.73)

This faculty member's complaint is reinforced by national surveys, and by my own discussions with faculty members at Rutgers and at other institutions. It is hard to disagree, then, with a major conclusion reached by the Carnegie Foundation:

> We conclude that American undergraduate education cannot be strengthened unless and until the academic deficiencies of entering students are candidly confronted. Top priority must be given to teaching English - essentially reading and writing - to incoming students who lack sufficient mastery of this basic academic tool. Failure to do so will leave them shockingly unprepared to do college-level work. This is unfair to both faculty and students. (Boyer, p.77)

I am heartened by the fact that at Rutgers we have what I think is one of the finest programs in the entire nation for teaching writing. Nevertheless, at Rutgers, as at most other institutions, the responsibility for teaching writing is laid almost exclusively at the door of those who teach English composition. From what I can tell, expecting students to write and assisting students with their writing and oral expression rarely take place in other courses, with the possible exception of honors seminars. Is this what we want? Is there not a better way for us to address the important problem of student communication? Are we content with a situation in which we spend much of our time "...figuring out what they are trying to say"?

General Education

It is in the area of general education that the calls for coherence in the curriculum are most vehemently urged and seem hardest to achieve. Even the most well-intentioned arrangements of distribution requirements are often characterized as mere tinkering driven by departmental turf battles and resulting in cafeteria menus that offer unrelated samples of specialized topics. There is obviously no easy solution to the problem, but we may find some clues to an organizing principle by referring to our basic character and mission as a state land-grant research university.

What the land-grant colleges were intended by the Congress to do, and what they did in fact accomplish, was to change what was taught in higher education, how it was taught, and to whom it was taught. The medieval walls of the city of intellect were breached by linking higher education to the rapid agricultural and industrial development of the country. Nearly all private colleges and many state universities in the mid-19th century still took as their primary mission the education of gentlemen through the formation of moral character and cultural appreciation. The land-grant movement responded instead to the pragmatic and democratic spirit of the nation.

With Abraham Lincoln's signature of the Morrill Act in 1862 and, later, with the passage of the Hatch Act of 1867 and the Smith-Lever Act of 194, the land-grant universities were rejuvenated and expanded. They went beyond the training of lawyers, doctors, teachers and preachers to open the doors of opportunity to all qualified students for an education that would prepare them for work as useful citizens. Specifically, the Morrill Act required every land-grant institution to offer programs in agricultural science, in engineering, and in military science. The Hatch Act added federal funding for the research arm of agricultural education, the agricultural experiment stations, and the Smith-Lever Act funded the cooperative extension services. The result was a tremendous revolution in education and a new social force that changed not only the practice of agriculture but the nature and methods of universities and their links with society. Because their expanded mission was to prepare students for work, the universities began to offer programs in vocational fields: agriculture and engineering, of course, as the Act specified, but also business, education, home economics, journalism, ceramics, and other areas of applied science. Private universities followed suit. Soon Princeton had a school of engineering, Harvard a business school. Universities, especially the land-grant universities, became the crossroads of the state, where politicians, professional people, farmers and business people went for credentialing or for expert advice.

In the late 19th and early 20th centuries, although many applied scientists still exercised their creative genius outside academe, the land-grant universities' enthusiastic pursuit of their new mission of scientific research for practical purposes soon brought the successors of Thomas Edison into the universities. Land-grant research conquered tuberculosis, gave the ceramic industry a sound technological footing, and led the Green Revolution, among other accomplishments.

At the same time, the emphasis of land-grant universities on applied science brought the scientific method to higher education. Students in the private colleges of pre-Civil War America studied the classics, Latin, and Greek, mathematics, rhetoric, philosophy and theology through lectures and texts, mastered by reading and memorization. The new scientific mission of the land-grant colleges required students to use their powers of observation and analysis to compare, measure, and experiment in laboratories and field trips.

The U.S. Congress and the states also intended the land-grant colleges and state universities to become a real force for democracy. Higher education traditionally trained a small elite composed of the children of the educated, propertied classes to succeed their parents as the leaders of society. The new land-grant institutions admitted the children of farmers, workers and storekeepers, people of all religions, and - outside the South - people of all races as well. One of the major forces in the emergence of a relatively classless society in which boundaries of power and influence are permeable and can be crossed was the creation of the land-grant colleges and the concept that inspired them: universal access to higher education as the open door to opportunity.

The founding of the land-grant institutions was of seminal importance not only in uniting education with applied research and in opening access to higher education to the entire population, but also in forging close links between the universities and the people, the business and industry, and the government of their region. Charles Van Hise of Wisconsin., one of the first great land-grant presidents, used to say that the borders of the campus were the boundaries of the state. His concept of the university's interest and influence is too narrow for today's world, but it does capture vividly the fact that the state university has always viewed itself less as an academic cloister than as a missionary society with an obligation to disseminate its knowledge as widely as possible.

Today, not only the New Jersey economy but the world economy is in transition. We are undergoing tremendous change from the Industrial Age to the Age of Information or, if you prefer, from a manufacturing economy to a service economy. Just as advances in agriculture have resulted in less costly, more abundant food production and made farm prices a smaller part of the U.S. Gross National Product, so the automation of factories has made goods cheaper and available in greater volume and has reduced their proportion of total payroll employment in the United States. Now, for both agricultural products and manufactured goods, it is increasingly the service aspects that employ people and represent a greater and greater proportion of their value, whether it is in the research, engineering and design that go into the planning or into the distribution and marketing that bring them to the consumer. American higher education, and particularly the land-grant university, has played a tremendously important role in the rapid transformation of work and the economy and has an even more important role to play in the future as our needs for higher and higher levels of education for workers and for continuing education and the dissemination of research become greater and more widespread.

The land-grant research university is pragmatic, democratic, and missionary in its character. Land-grant universities were founded to serve the needs of American society by means of hands-on education for all the citizens of a democratic nation. They have been outstandingly successful, and Rutgers, in its relatively short span as a full-fledged state land-grant research institution, has been more successful than most. We are linked by the advanced technology centers and by hundreds of other public service activities to the economic, social, and cultural advancement of our state, our country, and our global society.

Our problem in forging a coherent general education curriculum is in finding ways to communicate our basic principles to our students and to engage them in implementing those principles in action. The composition of our student body is increasingly multiracial and multicultural, as it should be in our society. How can we teach them to honor their heritage, which is complex and multiple, and, at the same time, to work together and to respect one another? Should multicultural

and gender studies be offered as specialized, separate courses in the general education curriculum, or should they be presented as part of new, broader courses? Moreover, we need to reflect in our curriculum the obvious fact that we live in an increasingly interdependent global society. How can we give our students a realistic view of the world-wide dynamics in trade, finance, manufacturing, education, environmental protection, security, and communication upon which America's well-being depends? Rutgers is a research university with the obligation to stay at the cutting edge of knowledge and to disseminate that knowledge throughout society. How can we engage our students in Rutgers' work of discovery and give them insight into the vital links between undergraduate education and research as well as the essential importance of research to the university's mission? How can we involve students in Rutgers' mission of public service? Should their involvement be curricular or co-curricular?

Assessing Student Learning in the Major

Two years ago the University Academic Forum Committee on Assessing Student Learning recommended that each department, as part of its cyclical external review, be required to submit evidence about undergraduate learning in the discipline (Second Report of the University Academic Forum Committee on Assessing Student Learning). This evidence regarding student learning was expected to be shared with the university's internal Committee on Standards and Priorities in Academic Development, as well as the external visitation team. I agree with the Forum's recommendation and continue to support it. One way that we can periodically monitor our curriculum is to look carefully at what our students are learning and what they are not. This is not a new priority, but an indication that I expect departments to continue to look for evidence that their majors are progressing in accordance with some coherent expectations. I shall also be asking the new Vice President for Undergraduate Education to assume the responsibility for monitoring this process, and to continue to shape the policy and sharpen the procedures by which we measure our departments' success in enhancing our students' academic growth and development.

In examining the major, reviews should give special attention to the questions that were raised in the recent report of the Association of American Colleges. Are there or should there be common curricular touchstones for our undergraduate students? Have our departments specified their expectations for students' learning? Can our departments explain how particular requirements serve common goals for learning? Do faculty members review student work over time in relation to departmental goals? Are the results of such discussions used to review and revise program goals? Do program requirements and practices support students in bringing together different parts of their learning, within the major and related fields? What can departments do to encourage fuller relationships between one's major and other parts of the curriculum?

Obviously, these are not new questions. In fact, several of our undergraduate programs addressed many of these very questions recently when they participated in a multi-institutional experiment to examine the feasibility of using a comprehensive examination for undergraduates. But the questions, I hope you will agree, are vital. They are questions that we must examine again and again. And they are questions to which we must provide satisfactory answers if our undergraduate experience is to be coherent.

Involving Students in Research

Henry Rosovsky of Harvard wrote that the best research universities believe "...that research and teaching are complementary activities; that university-level teaching is difficult without the new ideas and inspiration provided by research; and that an ideal intellectual balance for the professor includes undergraduate and graduate instruction." (Henry Rosovksy, The University: An Owner's Manual, New York: Norton, 1990, p. 84)

I could not agree with Rosovsky more about the complementarity of teaching and research. But Rosovsky was describing it only from the standpoint of how involvement in scholarship makes faculty members better teachers. Another way that I would like to see close integration between scholarship and undergraduate education at Rutgers is to bring more undergraduate students into first-hand contact with and involvement in the research activities of our faculty members.

The scholarly activities of the Rutgers University faculty are incredibly vast and diverse. And the research and scholarly activities are not, as some would like to believe, so esoteric and so specialized as to be impenetrable to all but a few. Frequently I pick up the Sunday New York Times and find book reviews by Rutgers faculty members. Radio, television, and newspaper coverage of breaking world and local news often includes the comments and views of faculty members at Rutgers. Our faculty members are involved in the understanding and the shaping of the world as it develops around us. What an incredibly rich resource for our undergraduate students.

The very quality that makes an undergraduate education at Rutgers special is the opportunity for our students to become exposed to the fascinating and important ideas being pursued by their teachers. Some opportunities already exist for our students. From all reports that I have received, they appear to be very popular with the students and the faculty members who are involved. Particularly noteworthy are the internships for undergraduates in the various research centers, bureaus and institutes. The participating students can receive academic credit and outstanding experience; the participating programs receive matching funds.

However, I do not think that these arrangements, while valuable and extremely successful, go far enough. I think we are missing an opportunity to capitalize on a major strength of the university if we do not try to draw more of our students into such direct research experiences. Perhaps a program along the lines of one now available at Vanderbilt University in which selected students are offered summer research assistantships providing both academic credit and a stipend

would be something for us to consider. There are many possibilities. In New Brunswick, the Committee on Undergraduate Education in the Context of a Research University called for the development of such programs at the departmental level. Recently, New Brunswick Faculty of Arts and Sciences Dean Richard McCormick has indicated progress on the implementation of such a plan. These are important steps; I want to move as aggressively as possible on this front. If we succeed in doing this - and I am confident that we can - we will have gone a long way in demonstrating that faculty engagement in research, until now regarded by many as being the enemy of undergraduate education, is in fact a strong ally, and our undergraduate students will have become the clear beneficiaries.

President Francis L. Lawrence
Rutgers, The State University of New Jersey
November 12, 1991