

A PLANNING PROGRAM FOR WORCESTER POLYTECHNIC INSTITUTE

THE FUTURE OF TWO TOWERS

PART II

"to help make our good college an excellent one"

The Planning Committee and the
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SUMMARY

Since the issuance of its initial report, "The Future of Two Towers" (March, 1969), the President's Planning Group has completed the discussion of those objectives which had been presented in summary form only. It has also expanded its analysis of the financial status of WPI, and has attempted to discover those general trends which were present in the various Planning Day discussions. The Group was joined in these tasks by the members of the faculty-elected Planning Committee. Visits to the various undergraduate living groups (fraternities and dormitories) were undertaken by members of the President's Planning Group for the purpose of assessing student opinion on the present status and future aims of the College. A summary of discussions which ensued has been prepared.

Discussions of Objectives 3, 5, 7, 8 and 9 may be found in Part II of this supplemental report. Part III contains a summary of the Planning Day discussions and Part IV contains a summary of the responses to the faculty-administration-trustee-alumni questionnaire, as well as a digest of the replies to the student questionnaire. Part V summarizes the exchanges which took place in the various living groups. The financial analysis is contained in Part VI, and a revised planning schedule is presented in Part VII.

I INTRODUCTION.

This report is a continuation of the first report of the Planning Group, issued in March, 1969. The planning schedule of that first report proposed that the Planning Group present to the chief executive of the College by June 30, 1969 a report covering the following items:

1. Completed preliminary analyses of remaining possible objectives for the College;
2. Additional suggestions for evaluation;
3. Completed analysis of the present status of the Institute with evaluations of strengths and weaknesses and potential resources.

This proposal has been followed in the writing of this second report.

The two reports should be viewed as a whole. Together, they represent an attempt to analyze WPI as it is today and what it might become. We had hoped that the first report would provide a basis for discussion among students, faculty, alumni, and trustees, and we have been gratified at the response. We hope that this report reflects the sense of these discussions. We are very indebted to all concerned for their interest and comment.

Since the issuance of the first report, several related events have transpired:

1. Planning Day was held on April 16, 1969;
2. The Planning Group visited each fraternity and dormitory;
3. The faculty elected a Planning Committee to replace and carry on the work of the President's Planning Group as of June 30, 1969;
4. President Hazzard sent a memorandum to the faculty supporting the planning program.

These events have shaped the progress of the Planning Group and this resulting report.

Approximately 150 students and 130 faculty with alumni and trustee representation attended Planning Day. Eight groups of about 35 members each carried on discussions based on the first report. A summary of these discussions is included herein. Complete records of each group recorder's minutes are available in the reference section of the library. At lunch on Planning Day, Professor Lawrence Neale discussed the results of a faculty questionnaire related to Institute goals. A summary of these results and the results of a similar student questionnaire are included in this report.

The Planning Group, at the request of interested students, visited the campus living groups, two members meeting with each group. Animated and positive discussions resulted in almost all cases. A summary of these discussions is also included in this report.

Several of the objectives only summarized in the March, 1969 report, are herein described in more detail.

Without at this time presenting a detailed financial analysis, this report discusses critical factors that must be considered when discussing quantitatively any future objective of WPI.

As noted in President Hazzard's memorandum to the faculty of May 30, 1969, planning will continue during the summer. The faculty-elected Planning Committee, with the continued help of Professors Roadstrum and Weininger, anticipate meeting President Hazzard's objective. A report on this activity will be published in mid-September. The planning schedule has been revised accordingly.

It is hoped that these two reports will provide the necessary base for faculty, students, alumni, and trustees to work together in setting and implementing the future direction of WPI. Subsequent reports will document the results of these efforts.

II. SOME POSSIBLE OBJECTIVES FOR WPI
(Discussions, continued)

FRONTISPIECEA List of Possible Objectives
for WPI

- Objective 1. To Provide High-Quality Pre-Graduate Education in Engineering and Science.
2. To Educate for Leadership and Decision-Making in a Technological Society.
 3. To Provide a Classical Education in Engineering and Science in the Oxford-Cambridge Manner.
 4. To Become a Research-Oriented Graduate Center in Engineering and Science.
 5. To Become a Middle College.
 6. To Train Students for a Bachelor of Science Degree in Technology.
 7. To Specialize in Educating the Underprivileged.
 8. To Promote Invention and Entrepreneurship.
 9. To Transform Ourselves into a General University.
 10. To Join the State University.
 11. To maintain the Status Quo.
 12. An Appropriate Combination of the Above.

OBJECTIVE 3: To Provide High-Quality Pre-Graduate Education in Engineering and Science.

In spite of the words "Classical Education" in the title of this objective, the word "Oxford-Cambridge" has attracted the greater attention. This discussion is, therefore, somewhat different than the others, because it seems necessary to give some description of the Oxford and Cambridge programs in order to satisfy curiosity. For purposes of comparison a description of the program at the Technical University of Denmark, Copenhagen, is included as well. These descriptions constitute part I. In subsequent parts of the discussion, statements of overall educational objective (II), the need for the program (III), the required nature of the college (IV), and some of the problems in implementation (V) are discussed.

It should be recognized that in spite of the world-wide respect enjoyed by some of the great universities of both Europe and the United States, WPI should not and could not adopt the programs of these schools as such. Much of what these schools do depends on great tradition, renowned faculty, and a different pre-college education. None of these is obtained by edict. Therefore, in parts II to V a general philosophy of education (the classical education) is described which seems consistent with the Oxford-Cambridge approach. The relevance of essential requirements and implementation of this philosophy are then considered.

It should be noted that objective no. 3 is different from most of the others in that it appears to be an educational means rather than an end. In this sense it might be used in connection with several of the other objectives. One might, however, take the point of view that the educational environment has a far greater influence on the student than the content of a particular discipline.

I. Two European Educational Systems.

In order to provide further background it seems pertinent to give descriptions of some other educational systems. Accordingly, descriptions of the academic technical programs at Cambridge University, England, and at

the Technical University of Denmark, Copenhagen, and a description of student living at Oxford University are given below.

1. Undergraduate Education in the Sciences at Cambridge.

i. Background of the entering student.

The classical English system does not try to give equivalent education to all children. Following the primary school education, at the age 10-11 all children in public (as opposed to private) schools take the entrance examinations for secondary school. On the basis of this examination--essentially an achievement test and an interview--one is admitted to a secondary grammar or secondary modern school. (The technical and comprehensive schools are eliminated from this discussion for the sake of simplicity.) In the secondary grammar school one receives a classical academic education aimed toward university or professional training. In the secondary modern school the training is utilitarian.

At the age of sixteen a grammar school student takes the nation-wide examination for the General Certificate of Education at the Ordinary Level. By this time he has completed his general education and has already chosen between science and language as an area of concentration. A typical background at this age would be: English, 5 years; History, 5 years; Geography, 5 years; French, 5 years; Latin, 4 years; General Science, 3 years; Math, 5 years; Chemistry, Biology, and Physics, 1-3 years. The liberal arts major would have taken two years of a second language as an alternate to the last two years of science. All courses throughout the five years are taught by graduate teachers in their major area of specialization.

Approximately one-half of the grammar school class graduates at age sixteen. The remainder prepare for University Entrance Examinations at the age of eighteen, those who have chosen science specializing in three or four of the following subjects: Physics, Chemistry, Mathematics, Advanced Mathematics, Botany and Zoology. Apart from classes in these subjects there is only a nominal attempt to maintain an education in other areas. A large amount of material is covered quite rigorously, so that when a graduate takes the General Certificate of Education at the Advanced Scholarship Level the

academic standard is comparable (?) to that of a sophomore at a typical American college. At the pre-university level education follows a well-defined curriculum and the entrance examinations for which students prepare follow a well-known pattern.

Although in the lower grades periodic tests are given in each subject, the routine hour exam, as practiced in the United States, does not exist. Equal weight was given to performance during the term and the final exam at the end of the term. A lot is expected of the students, and no grading curves are used.

ii. English University System for Scientific Education.

The normal time taken to reach the bachelor's degree in England is three years. It is common practice for the incoming student immediately to specialize in one major area, e.g. Physics, Chemistry, or Math. Such a program will lead to a special degree. Although a general degree program also exists, it is normally taken by people interested in teaching. The student in a general degree program would carry majors in two or more areas, and the academic level is significantly lower than that of the special program, since it aims at general understanding rather than at detailed knowledge of the subject. (It is understood that at some of the newer universities this traditional approach has been modified considerably, programs being offered which are more like the American system.)

iii. The Cambridge System.

The science program at Cambridge differs from that described above in that basic education for the first two years is more general, specialization in the major area taking place only in the final year.

In the first two years one must take six subject-years of courses, each course lasting a full year. Consequently one is exposed to a minimum of three different subject areas, the levels being equivalent to the special program elsewhere. A further requirement is that one must take three different laboratory subjects during the two-year period. Examinations are held at the end of each year; all of the material is covered in the examinations at the end of the second year. Examinations after the third year cover only the

material in the major area of specialization. While at most English universities there is no attempt to train in other areas of endeavor, it is completely unacceptable that one should not have at least surface familiarity with a number of diverse fields in the arts even if one is a scientist. One would never admit to being "only a scientist".

Cambridge University consists of a number of residential colleges, and the whole of life at Cambridge, both academic and social, centers around these. Although one must satisfy minimum university entrance requirements, applications for admittance are sent to the individual colleges rather than to the university. Multiple applications are common, each college selecting to obtain the cross-section of the student body that it requires. Care is taken to maintain a balance between the various disciplines. The university, as such, is an ephemeral organization which arranges courses and examinations, matriculation, and graduation. It is the college that places the individual student within this framework.

In each discipline area (science, engineering, law, etc.) the college appoints a tutor who takes responsibility for the overall direction of the student's program. In view of the student's objectives and past academic record, the tutor advises the best course program to be followed at the start of each year. Typically (in the sciences) several alternative courses are offered in parallel at various levels of difficulty. This is purely for the sake of preparation for the future and for interest rather than for credit, since a common final examination is given, and no formal statement as to the course taken appears on the transcript.

Each course has three hours of lectures per week (plus two hours of laboratory for experimental subjects.) No attendance record is ever taken; anyone is welcome to attend or not as he sees fit. Laboratory work is graded if the student so desires, but these grades do not count in the final assessment of the student's performance.

The university year is composed of two terms with eight weeks of lectures in each, plus a third term with four weeks of lectures, all followed by two weeks of examinations separated from the lectures by a week of study. A six-week summer session is typically required between the second and third years.

In each subject the student is placed under the guidance of a supervisor (not his tutor) with whom he meets, along with two other students, each week for an hour. Typically he submits an assignment prior to the supervision and discusses it and any difficulties arising from lectures or laboratory work during the supervision. No questions are expected during lectures. It is up to the student to absorb the material presented using any technique he finds relevant. The techniques range from attending lectures, reading another person's notes and outside reading, to solving previous exam questions and asking questions of one's supervisor (or demonstrator during the laboratory period.)

It is generally felt among the British undergraduate population that it is unreasonable to try to do all the work allegedly required. Consequently, a personal decision is made as to the most useful disposition of time between formal classwork, homework, and extra-curricular activity--sports, theatre, societies, and talking. A significant portion of the vacation is spent filling in gaps which appear as a result of class-cutting.

Although classes are cut without conscience there is a feeling of tremendous intellectual stimulation. The reason for being at college is to learn; there is ample opportunity to do so; and most people want to. Thus, it is not unusual to find people not attending the classes to which they are assigned and yet attending classes in other areas just for interest's sake. One feels it a privilege to listen to Hoyle or Dirac until one is lost. It is a matter of intellectual pride to try to understand.

The final year is the only one in which there is no significant absenteeism. There are four or five courses offered in the major specialty which are essentially at the level of master's courses at many American colleges. There is no way to get the information together as efficiently as attending lectures. The laboratory work is counted in the final evaluation and attendance is, therefore, pretty regular. Laboratory reports are thorough in both the technical and presentation aspects. There is little time for relaxation as in previous years.

In retrospect, the education received at Cambridge has been found helpful in many ways:

(a) During the year one had the opportunity to pursue knowledge for its own sake without the immediate pressure of hour examinations. "Finals" at the end of the year were nerve-wracking, but question-spotting was developed to a fine art, and a month of intensive study in the second term worked wonders.

(b) Through the broad training in depth during the first two years one had enough knowledge so that the overall patterns of science became apparent. This has also been found to be extremely useful in interdisciplinary research for one can cross from physics to chemistry to mathematics to metallurgy with a basis of understanding in all.

(c) In contrast to much of the American system, emphasis was on understanding how to solve a problem in principle rather than on the solution of many numerical illustrations of the same principle. It was felt that if one could solve a problem in principle, it was a mere detail to do it in practice. It might take a long time to find out how to do this, but it was still a mere detail.

(d) The interaction with students in other areas on an informal basis resulted in a broad education in liberal arts which could never be obtained from formal courses. In such matters integrity and social standards are a far greater stimulus than a 4-point average.

(e) One learned to make decisions as to a course of action and how to remedy any mistakes without making them obvious to everyone. This developed a feeling of self-sufficiency and a capacity for extracting information from the literature without outside help.

2. Technical University of Denmark, Copenhagen.

The following description applies to the program as it existed approximately twenty years ago. While an attempt at up-dating the material is being made, the purpose of including this material is to promote an understanding of educational programs different from our own. It will be noted that this program is in some respects diametrically opposed to the previous one, but also has certain features in common.

i. Background of the entering student.

Starting at age 7, the student had six years of grammar school, four years of intermediate school, and three years of gymnasium.

The gymnasium had three main directions: mathematical line, new language line, and the ancient language line. The Technical University student would come from the mathematical line. The three-year curriculum concentrated on the natural sciences, Newtonian mechanics, astronomy, thermodynamics, electricity, chemistry, and biology. The mathematics included theory of functions of one variable, logarithmic and exponential functions, differential and integral calculus, and analytic geometry. Three foreign languages, history, and geography were also included. Teaching was of the "spoon-feeding" type with classes of about 20 students and much time for extra-curricular activity.

ii. Study at the Technical University.

The first two years were basically theoretical and the curriculum, with minor exceptions, was the same for Civil, Mechanical, and Electrical Engineering students. Lectures were given from 9-12 AM to 300-400 students at a time. Problems were assigned and their solutions thoroughly explained, but attendance at lectures as well as handling the problem solutions was up to the student. The rate of presentation was rather high. The curriculum contained courses in physics (electricity, newtonian mechanics, thermodynamics, optics, atomics), a course in mathematical mechanics (statics, dynamics, motion in various force fields), and geometry (descriptive and vector). At the end of each year was an extensive written examination. The average grades determined pass or fail, and failure meant repeating the whole year with new examinations in all topics. The student, at this point, was unaware of the existence of departments.

In the second part of the studies, $2\frac{1}{2}$ years, the students in the various engineering disciplines separated, and emphasis was on applications. Lectures were still given in the morning hours, but most afternoons were spent in the university drafting rooms where rather comprehensive assignments were worked out, the time allotment being from 2 weeks to 2 months with strongly enforced deadlines. (Examples of assignments were: city planning for a town in Sealand; design of a factory building including static computations, building code

conformation, drawings and specifications; design of a dam including all reinforcement, joint details, etc.; and a foundation for a heavy building.) Two students would often co-operate on these assignments. The drafting rooms accommodated about 20 students, and once each afternoon an assistant to the professor in the field of the assignment would visit from table to table to help or give advice. There were lively discussions between the students who, within the drafting room, became very well acquainted.

The deadline for the assignment had to be met, but whether or not the student did all of the work during the final week was up to him. (One drafting table was often designated by the students for playing bridge, and this would always be in use except for the last few days before a deadline.)

There were also several study tours during this part of the program, and a thesis was required.

There were two examination periods in the second part of the program. Most examinations were written, but an oral examination was also given. Assignment grades and examination grades were both used in making up the final diploma.

It is important to note that broader education in humanities was part of the university entrance requirement and is not found in the university program.

Note: Entrance to the Technical University was after thirteen years of school, but at an age corresponding to the junior year in the American college. The final degree was the master's degree. Also, while the program herein described is that of roughly twenty years ago, from conversations with a Professor currently at the Technical University of Denmark one concludes that their students are allowed more free time than is typical in American colleges.

3. Student Life at Oxford (or Cambridge).

Perhaps it is most important to recognize the role of tradition in college life at the outset. What makes the student at Copenhagen or Cambridge or Oxford study? The answers are usually vague--something to do with pride.

As one Cambridge alumnus put it, "You enter the college and are immediately aware of the great men who have gone before, and you know you must not fail." It is clear that a college attempting to frame a unique program cannot gather tradition unto itself, yet it is clear that tradition and loyalty play a very strong role in maintaining a college, and it is essential that the school be operated so as to build that loyalty. Certainly student life can be a large factor, for a man remembers best those experiences he had at the time when he became a person.

As stated earlier student life at "Oxbridge" centers around the residential colleges. The colleges are not devoted to a single academic discipline, but maintain a cross-section of all. The colleges consist of living and dining quarters and the tutors, the main educational arm of the university. The faculty at all levels are "attached" to the various colleges, and again a cross-section is maintained. Mutual respect for and understanding of the intellectual endeavors of those in other fields is nurtured through interchange in the colleges.

One of the major places where the intellectual interchange occurs is in the dining hall, where the discussion is relaxed, informal, but to an intellectual point of view. Faculty of the college dine in the same hall as the students but at a separate table. The dining is, by WPI standards, formal in the sense that dress and manners are important but not forced. One may have guests from other colleges, and on "guest nights" a special effort may be made with the meal (candlelight, etc.) The educational function of this may seem remote to most Americans, but again the traditions of scholarship are what become important. The undergraduate, dining with a modicum of gracious atmosphere at his own college with a leading scholar in the same hall, is aware that he is an apprentice to greatness.

Every college has members of the faculty--tutors or "Dons". They may or may not "live in", but they are responsible for seeing the undergraduate through his degree in his discipline. Tutors are appointed by the master of the college in consultation with the head of the department. Thus, each college will have tutors in each degree area, and it is the tutor who sees the student through his degree. In addition to the academic role, the tutor plays a social

role as well - he is the one person to be consulted on any matter. Tutors are, on the average, wise people and very much respected.

A typical student day may be as follows:

1. Rise to a cup of tea, brought to the room.
2. Breakfast in college dining hall.
3. Lectures.
4. Lunch.
5. Sports, lectures, library, supervisions, etc.
6. Tea.
7. Study, library relaxation.
8. Dinner.
9. Study, concert, night-life, etc.
10. Bed - college gates close promptly (circa 11:30 p.m. and one must tip the porter 10 Bob to get in after hours!)

The essence of the experience is responsibility and appreciation for the intellect. This is neither forced nor shepherded. The students are allowed "to be". One of the reasons for success in this respect is that the intellectual and social life are the same. Appreciation of beauty (the university gardens are famous) and the repair of a motorcycle are both treated as intellectual explorations, and for a student to express lack of interest in either is not acceptable.

While the American student has facilities still unknown in many European universities (plumbing and heating) he seldom has the felicities. In the mind of many Americans the former are essential and the latter for snobs. Nevertheless, to the European, living rather than dwelling is part of the identification of an educated person.

The essential thing is stimulation--awakening of interest, delight, an awareness of the things of our world, both material and abstract. For the faculty, their role as stimulators is obvious. Chances for meeting with the students are abundant, for faculty are themselves students--more experienced perhaps, but still students in being stimulated and excited, and showing it.

II. Objective.

The objective is to produce a student who is educated. In America the words "educated" and "learned" often have intertwined meanings, different for different people. In technical education, particularly there is considerable confusion. For purposes of this discussion, an "educated" person is defined as having the following characteristics:

- (a) He is able to cope with changes in his environment.
- (b) He is able to learn by himself; able to break an unfamiliar problem into its component parts and find what is known and what is unknown.
- (c) He is able to recognize his own capabilities and limitations and is aware of the rewards and possible disappointments of a maximum effort.
- (d) He is sensitive to interactions with other people and able to communicate with the society around him.

Perhaps the first two characteristics are best encapsulated in W. K. Lewis' statement of objective, "To teach the student to meet the unfamiliar situation with competence." By way of editorial comment, the "educated" person is responsible and believes that uncommitted intellect is useless to society (we want no Ivan Karamazovs in our graduates!) and that man, to be alive, must have a purpose greater than himself.

"Learning", on the other hand, is the process of acquiring and developing information, and, as one wag has said (not entirely facetiously), "Education is what is left after one has forgotten what he has learned."

It is important to recognize that there is a difference between "education" and the efforts being made in higher education generally. The social pressure for education beyond high school for the entire population has forced the application of the methods of mass education to the colleges and universities. To a large degree this has resulted in structured programs whose major emphasis is on dissemination of information. Professional educators, quite honestly, attempt to construct procedures by which an education can be guaranteed the student; these structures become towers of Babel, as any curriculum study committee can testify. The procedures tend to produce graduates who know "things" and are useful employees, but who,

as often as not, are "uneducated". Thus to an alarming degree, the social pressure has pushed the colleges and universities to the position of awarding degrees for completing courses only. It is clear that while this may be a course for public education, the private sector of higher education is under no such pressure in the overall sense. There are those in society who will be unsuited to the "course-work mill". It is just this consideration which justifies private educational systems, and it follows that if private education uses the same methods as the public sector, justification for private education disappears.*

Because obtaining an "education" is an highly individualistic experience, it appears that the college, as a matter of policy, should not assume any obligation to "educate" the student. It is the responsibility of the college to provide an environment in which the student can, if he chooses, become "educated".

What does the "education" as defined above mean as applied to technical education? In the process of becoming "educated" one acquires, as a matter of course, information and technique; in technical education the information and techniques deal with science and engineering. It must not be assumed that information and technique are unimportant. It is simply that they are the means to an end and not the end. It is essential that the whole attitude of the school be such that the student understands this point.

*One should not be deceived by complexity in the material presented in determining its educational value. A course on boundary layer theory is mathematically complex, but often turns out to be a course in the technique of solving the material, energy, and momentum equations under circumstances for which the boundary layer approximations are valid. As such it becomes dissemination of information. While the information is of unquestioned value, it is questionable whether possession of the information makes one "educated". Certainly, if a second course leads to a degree of Master of B.L.T.; or even if a third course leads to a D.B.L.T. degree, no weight is added to the education. The important consideration is the thinking of Ludwig Prandtl in developing the concept, which consideration can be covered in a few lectures.

III. Need for the Program

It is fairly clear that society in general needs people who are "educated" in the sense used herein. In the technical world, techniques and information become obsolete in an alarmingly short time. Change is a characteristic of the age, and people who can cope with it, understand it, and learn by themselves are essential. Further, technical advance is so rapid and so fruitful in enabling man to control his environment that society is being engulfed by its own passion for convenience and ease. The "educated" person is able to comprehend and cope with such problems.

The question which is most often raised, particularly at WPI, is whether the graduate will have enough knowledge of specifics and technique to be a useful employee. Certainly training will be sacrificed to a considerable degree (see IV below) because we will no longer specify a strict course of study, and this is vastly different from the present program at WPI and most of public education. It is interesting that the Planning Group's survey of companies recruiting at WPI shows that the more progressive companies prefer to do the training, asking that the school concentrate on fundamentals. The less progressive companies prefer the "trained" product. Techniques, however, vary widely from company to company and from year to year. The specifics of technique are better left to the employer. If the graduate knows how to learn, he will be useful to his employer.

The serving of national purpose by a school dedicated to "education" is threefold in scope, although it is clear that there will be large and powerful segments of society who would look on the objective with jaundiced eye. First, attaining such an objective would supply the nation with much needed leadership. Second, the emphasis on "learning how to learn" requires a faculty who themselves are learning, and this will inevitably produce as a by-product factual information, techniques, and points of view which will be of use to the nation as a whole. Finally, the school would provide an opportunity for those individuals who should not be fitted into the standard mold of American educational practice.

In terms of the competitive position of a college emphasizing this objective, the situation is less clear. There are those who will insist that

the present program at WPI has this objective. Certainly the prestige colleges would claim it enthusiastically, and we cite Harvard, Dartmouth, Brown, and Yale as having programs with this objective. It is possible, however, to show a marked difference between the idea and the execution, and it is the manner of execution which prevents superficiality and determines the possible success in meeting the objective.

IV. The Nature of the College,

It must be recognized at the outset that a college which has a single objective may be severely limited in meeting another. Everyone who meets the standards established for mass education will not respond to any particular effort to make him "educated". This means that WPI, as a private institution, should neither attempt to satisfy the needs of all kinds of students, nor should it be swayed from a valid objective by what takes place elsewhere. Accrediting agencies should not govern our educational policy, but should limit themselves to basing their judgment on the result.

What are the characteristics of the college which has the learning environment we seek? Possible guidelines in several areas are:

1. Faculty. Clearly the most important resource of any college is its people, its faculty. The characteristic of the faculty required for the "education" envisioned here is that they be learners and not only learned--people who themselves have found how to learn and can show the process to the students. William Arrowsmith (1) in his article, "The Future of Teaching" translates Nietzsche as follows:

"The entire system of higher education has lost what matters most, that Bildung is itself an end and not the state--this has been forgotten. Educators are needed who themselves have been educated, not the learned louts whom the universities to-day offer our youth. Educators are lacking.... hence the decline of German culture."

It is the learning process that is important, not the information acquired. In this sense, one would argue that a thorough reading of Michael Faraday's notebook would contribute more to an education than memorizing Stratton's "Electromagnetic Theory" (2), while fully recognizing the utility of the

latter in solving problems in electromagnetics. It is this emphasis on faculty as learners that led to research in the universities, but notice that the research in this case was a natural consequence of collecting learners, rather than data. (Here "research" includes scholarly study.)

While it is easy to make a long list of characteristics of faculty we do not want, stating what is wanted is more difficult. Arrowsmith (1) puts it,

"It is men we need, not programs. It is possible for a student to go from kindergarten to graduate school without ever encountering a man...Learning (acquiring knowledge) is important, of course, but it is the means and not the end, and the end must always be either radiantly visible or profoundly implied in the means. It is only in the teacher that the end is apparent..."

and later

"When students say their education is irrelevant, they mean above all the absence of this man. Without him the whole enterprise is ashes, sheer phoniness. This is why students are so quick and so right to suspect a fatal hypocrisy in the teacher who lives without the slightest relation to what he knows, whose texts are wholly divorced from his life, from human life."

While there is clearly no general rule by which one can judge any individual as being suited for the kind of faculty needed, there are a few guides.

- i. First and foremost they will be men (and women) who are always learning, and that learning is primarily in but not restricted to the area of their teaching responsibility. It is a fair question of a faculty member, "What have you learned this year?" (By the same token, however, the school must assure its faculty the time and facilities for learning. Too many faculty are rapidly "burned out" by a myriad of small duties which prevent real learning.) Desirable faculty will never be content to "teach from the book" but will prefer to recreate the material. They will be interested not only in the concept but also in the extension.
- ii. The essence of teaching is in the dialogue. The faculty we seek

must be willing to meet and talk with students as intellectual equals. What is meant here is something different from the conventional classroom recitation--it is informal, it is spontaneous, it is almost never specific or confined.

- iii. In a day when words are twisted into meaningless sounds, to say that the teacher we seek is dedicated sounds trite. Yet dedication to the objectives of the school, to helping to provide the learning atmosphere, to bringing experience to hypothesis and hypothesis to experience are needed. But, one must not mistake insulation for dedication. A teacher can dedicate his working hours to endless student conferences as an insulating device against his own learning. He can dedicate himself to research and study as an insulation from students.

2. Program

The program of study should be aimed first at providing "educational" experience and second at supplying information. The program should encourage the student to seek his own level and make his own mistakes. If a student can learn all of the chemistry for a successful performance on examinations in mechanical engineering without taking a course in chemistry, then he should not be required to take a course in chemistry. As was stated earlier, success in reaching the objective depends strongly on the execution. A few ideas are given in the following paragraphs.

Whenever possible lectures will be given by the best faculty member WPI has in the particular field. The lecture sessions will be large (125 students) compared with WPI's present standards, but the loss of close contact will be replaced by supervisions as at Cambridge. Students will not be associated with departments except for examination purposes. Lectures will, therefore, be given in subject areas rather than on a departmental basis. Students will be required to pass final examinations only in order to qualify in a given area. In this connection it would seem wise to have the examinations made up outside the college, for the student and teacher would then work toward the same end and would share increased confidence in the efficacy of the program.

The problem-oriented approach (3) should also be considered. A student who so desires will be assigned to a research or development project at the college. In this case attendance would be mandatory because much of the work would be financed from outside WPI and must be completed. The student would be brought close to real situations under supervision of the project leader. Armed with first-hand knowledge of the applicability of the lecture material, the student would then develop his experience and attend the lectures he finds relevant.

It seems that WPI, while being particular about admissions, should not concern itself about academic disqualification. Once admitted, a student who can pay the tuition might be allowed to stay as long as he needs. The high tuition and the joint requirements of need and scholarship to obtain financial aid should be sufficient to discourage the professional student. Disqualification would then be considered only for improper or immoral conduct or for interfering with others in pursuit of learning.

The question arises as to the fate of the student who cannot handle the program. First, he has not been "flunked out"; he simply leaves. Second, because of the environment of the school, he is in a good position to know where his real interests lie. In short, an unsuccessful attempt at a program like this could be a profitable experience and leave far fewer question marks as to the next course of action.

Now with the proposed freedom in curriculum choice, and with lack of required attendance at lectures or supervisions, questions are raised: "How can we insure that the graduate will be qualified to hold down a job? Will not the efforts tend to be superficial? Will the product of the American secondary school educational system do the necessary work?" The first of these questions is irrelevant, and the response is "Since he has been taught to learn, he can learn enough to hold a job." The student's efforts will be superficial only if those giving the examinations allow a superficial effort to result in a successful assault on the examinations. By the publishing and selling each year by the college of all the examinations from the previous year, the student would have the means of knowing what kind of material he is expected to handle. (Such publication would also have the beneficial

effect of discouraging a superficial effort by the teachers!) Finally, whether or not the graduate of an American secondary school can be motivated to do the work necessary depends at least partly on the intellectual climate at the college, and partly on whether or not the program itself is designed to provide a transition.

3. The Student.

The most obvious thing about the objective is its limited appeal. The student who simply wants to be a "routine" engineer for the rest of his life should be encouraged, even urged, to matriculate elsewhere. In terms of the current WPI undergraduate, it could be argued that a change will be required. There are two responses to this, the obvious one being complete agreement. If one believes the statistics it is questionable whether higher education does very much for the student except to give him admission to the circle of the elite. If an institution desires to establish a good reputation, it should admit only good students. Further, a change may be indicated anyway because the socio-economic level which has traditionally supplied the largest part of WPI's student body is a shrinking fraction of the country's population.

A second response is reasonable, however. There is a strong indication that the present students do not work at anything like their maximum intellectual level. Students generally admit this. We really do not know what the maximum capability of the present student body may be.

A most important consideration in defining the student body necessary to the intellectual development envisioned is heterogeneity. Intellectual development requires intellectual exchange. People of similar backgrounds and similar achievement do not contrast sufficiently to stimulate intellectual growth. It is important, then, in implementing this objective that WPI broaden the base from which she draws her students. It is also important, however, that the members of the heterogeneous set all experience contact with the other members of the set and learn from them.

4. Environment.

Not the least important characteristic of the college is the intellectual environment it provides. The college should be a cultural center, not only

for the students but also for the community around it, and the students must be made to feel that they are a part of this cultural activity and are expected to participate in it. It will, of course, be argued that the present students do not attend the concerts or lectures which are currently offered. There is a reason for this. With a load of 5 courses per term and compulsory homework, hour quizzes, and even attendance quizzes(!), the student finds himself confronted with 2.5 hour exams per week, the tragedy being that the students firmly believe that studying (cramming) for these examinations is profitable. This leaves 4.5 evenings in which the conscientious students can prepare for the other 12.5 class hours. If the student, being human, wants one evening for social relaxation, the 3.5 remaining evenings become a maximum of 17.5 working hours. This is hardly adequate, and whether the student is using his time wisely or not, the fact remains that the present attitude of the student body and faculty does not permit time for intellectual growth or participation in voluntary cultural events--even by the better students.

The essential requirements of intellectual interchange (student-student, student-faculty, and faculty-faculty) and a feeling of identity require close association in a contemplative atmosphere. WPI should be subdivided into smaller groups (residential colleges), with prominent faculty closely associated with each, in order to promote this type of communion. Ideally, faculty housing should be available close to the campus, or even better, some faculty should "live in". A simple device would be to have faculty associated with each sub-group dine with the students at frequent intervals. For this latter device to be successful, considerable thought and attention will have to be given to the atmosphere in the college dining halls.

IV. Implementation.

The implementation of this objective will require major changes in the nature of WPI. First, faculty qualifications will have to be examined very thoroughly on a wider basis than current departmental needs. (One suspects that there is much talent here which is untapped or misplaced!) Senior faculty will, under this objective, be limited to those who make contributions to their field of specialty and who communicate with the students. Further,

there will be a difference in duties, responsibilities, and prerogatives between senior and junior members. Senior faculty must be contributors to knowledge, and because they must also be leaders in the intellectual life of the college, they must be provided the necessary time.

A second major change, and perhaps the most important, will be in the area of student living and living arrangements. Living group alignments will have to intermix freshmen and upper classmen with faculty assigned to each group. The role of the fraternities in the new system will have to be thought out carefully. It might be possible to include fraternities as subsets of the student body in the same manner as the colleges of the "Oxbridge" system, but this will require a vastly different fraternity selection process, with the college playing a far greater role than the fraternities may be willing to accept. Nonetheless, the problem appears to have several possible solutions.

The third area of major change will be in the administrative structure of the college. Academic policy should not be set by the department heads for the simple reason that a department head, by the very nature of his task is loyal to his department, and to place responsibility for college-wide policy in such hands is to invite conflict of interest. Further, because of the unstructured nature of the curriculum and the fact that student life will be centered in the sub-groups, multiple courses and departmental rivalries for students will be eliminated.

Finally, some method will have to be devised to bring the entering student to the point where he can take intelligent advantage of the freedom of choice and responsibility for his own learning. This could be the most difficult problem. Yet, if we have any faith at all in the capabilities of the student, it must be manifested in the positive assertion that he can make the transition.

References

- (1) Eunich, A.C., (ed), "Campus 1980", p. 116 et seq. Delacorte Press, New York (1968).
- (2) Stratton, J.A., "Electromagnetic Theory", McGraw-Hill, New York (1941).
- (3) Feldman, C.L., The Journal, Worcester Polytechnic Institute, 71, No. 1, 12 (1967).

OBJECTIVE 5: To Become a Middle College.

Introduction

The concept of a middle college is new to this country. In essence, the middle college provides for a combination of both undergraduate and graduate study comprising the junior and senior years of the former and one or two years of the latter. It is based upon the recognition of the increased role of the two-year community college or junior college in American education and upon the greater emphasis on graduate study occurring in the last decade.

Since the adoption of this objective would require a radical departure from our current educational program, it is essential that we review some of the problems that would arise and offer possible solutions to them.

A. Student applicants.

As in all the objectives, the College must look to a wider source of potential students. New England has not yet established a trend toward a fourteen-year public education package. WPI would have to recruit actively in New York, California, the Southwest and those areas where the two-year college concept is well-established both academically and numerically. There would be competition against state university systems and those private institutions who have been willing to absorb some of the better two-year graduates into their own programs.

Only a relatively small number of the graduates of any community college would have either sufficient preparation or ability to meet the academic standards of WPI. At present, the typical two-year college student enrolled in his college because he was unable to meet the admissions standards of a four-year college, or because he was uncertain of his educational objectives and did not wish to incur heavy educational expenses. While the development and improvement of community colleges will increase the supply of adequately educated and intellectually motivated students in the future, we would also have to consider other sources of supply for our student body.

One source of supply would involve participation in 3-2 programs with several liberal arts colleges. Students matriculating here under such a program would have been well-prepared in science and mathematics and would have the added advantage of bringing to the campus varied attitudes and backgrounds not now attainable by our limited curricula and student source. A 2-3 or 2-4 program, whereby liberal arts students would come to WPI at the end of their sophomore year with the intent of remaining until the completion of a bachelor's or master's degree, should also be considered. It is important to emphasize the value of the engineering environment at WPI to those interested in science. Many liberal arts colleges having excellent science and mathematics departments are unable to provide experience in the applications of these subjects.

Those employees in industry with technical skill but without regular college degrees would offer a second potential student source. Many of them are blocked from further advancement. By virtue of their experience, they would bring to the campus an understanding of technical problems that would enrich the educational experience of all students, and they would have a greater appreciation of their own course of study.

B. Curriculum.

There would need to be a major revision of the curricula. Non-credit articulation courses would have to be devised for those students with insufficient preparation. Prerequisites for current upperclass courses would have to be studied to ascertain their relevance in the light of the students' prior education. It is doubtful if matriculating students would be uniformly prepared. Thus, while WPI might require certain courses for admission, it would still be confronted with the problem it now faces with freshmen--a diversity of background and education that makes the students' first courses difficult to teach. The greater maturity of the middle college student body would help considerably, but this is not sufficient. It would be highly desirable that courses taught at the first two years' level be kept small in size, involve individual effort and responsibility, and have close supervision by full-time faculty.

Ideally, most of the students would remain beyond the bachelor's degree for some graduate study. The resulting expansion of WPI's graduate program should permit some of the present master's degree offerings to move from a marginal to a stable basis. Concurrently, advanced undergraduate courses offered irregularly might be scheduled annually, reflecting increased upper-class and graduate enrollment.

C. Faculty.

A significant number of our present teaching staff are primarily involved with instruction of basic courses and could no longer serve in that capacity. Since these courses are difficult to teach well, some of those involved (including some of WPI's finest teachers) have become so specialized in this area that they would find reassignment to higher level courses extremely difficult. A few of these would be well-suited to direct the non-credit articulation courses referred to above. By assigning them to this task, however, great care would have to be exercised to protect their professional integrity. These courses would have to be regarded as an important and integral part of the entire educational program.

Not all those involved in basic course instruction could be utilized in this way. Fortunately, in the science and mathematics departments where most staff members teach at least one basic course, many could be reassigned to more advanced courses. These individuals should welcome the opportunity to teach in their own specialized areas. There would be others, however, who would be unable to change their teaching habits easily or at all, and they would have to be phased out over a period of years.

The humanities and social science departments would also have to adjust their teaching schedules. Advanced courses in these departments have had considerably more appeal to the student body in the past than the required basic courses, and there is no reason to suppose that this appeal would be less to those enrolled in the middle college. In English, for example, an expository writing course at an upperclass level might prove of much greater value to the students than the present freshman course, since at this level, each student ought to have accumulated enough knowledge in his own field to

have something worthwhile about which to write.

As for the remainder of the faculty, the suggested objective might meet with considerable approval. This segment of the faculty would be actively involved with research, their specialties, and with students presumably interested in the courses concerned.

In the discussion of curricular changes above, it was suggested that there be an increase in the number of project and seminar courses at the undergraduate level. Such a program should capitalize on the availability of a larger number of graduate students. The utilization of such students has worthwhile advantages: first, there is the graduate student's satisfaction in helping others learn the knowledge he has recently acquired; second, there is the concomitant advantage of forcing the graduate student to develop mastery in his subject matter if he is to be an effective assistant; third, the undergraduates should respond favorably to the fresh interest and enthusiasm of the graduate student; and fourth, instructional costs could be reduced. While employment of graduate assistants in the instruction of advanced courses was discussed at the April Planning Day sessions outside the context of the middle college, it is worth noting that such employment was regarded favorably by both undergraduate and graduate students.

D. Athletics.

The middle college approach would have serious consequences for the physical education department. Its program, with strong emphasis on continuing life sports, is worth requiring for the first two years of the middle college. In this connection, many of the better liberal arts colleges require physical education for four years, so there might be far less opposition to the program than one might expect.

The matter of our athletic teams is not resolved so easily. The rules of intercollegiate athletic associations have been devised either for the traditional four-year college or for the junior college, so that there would be some question about the ability of the College to field intercollegiate

teams. In all likelihood, they would be replaced by sports clubs (similar to the Cambridge-Oxford scheme) and the more expensive sports, such as football, would undoubtedly disappear, as they have at MIT and Chicago. The poor student and alumni support given WPI's teams in recent years suggests that such an elimination would not create significant opposition.

E. Physical Plant.

If WPI were to become a middle college, minimal changes in the physical plant would be required. There would be a need for additional facilities for graduate research. Science department laboratories now used for basic instruction could be made available for this purpose, and some of the larger rooms in Higgins, currently used for freshmen elective courses, might be converted for use at a more sophisticated level. Since most courses would be taught to relatively small groups, there would be no need for additional lecture hall space.

F. Placement.

Industrial recruiters have become increasingly interested in students with some graduate study. Thus, the middle college program would have some appeal to those seeking our graduates. The greater emphasis nationally on graduate study would result in more of the students desiring a continuation of their formal study, either here or in doctoral programs elsewhere.

G. Financial.

The financial problems resulting from the adoption of this objective must not be taken lightly. The College's basic courses have been of material assistance in maintaining the cost of instruction for all programs within reasonable bounds. Their virtual elimination would be offset in part by increased enrollment in upperclass and graduate courses, many of which are presently far from self-sustaining. Mention has already been made of the utilization of graduate assistants in the instructional program, and it might well be that there could be some reduction in the number of full-time professional staff. Some support should be secured from those industrial concerns

whose employees become our students--the Bell Laboratories, IBM, General Electric, and other well-known companies have supported other institutions on a similar basis for many years. Finally, the WPI Associates program should be expanded, not only for direct financial support but also for providing potential research projects for master's degree candidates.

Conclusion.

To our knowledge, there is now no college whose chief function is to be a middle college. Whether this is a desirable goal for WPI is open to serious deliberation. The concept should not be dismissed in a preemptory fashion, however, for the entire pattern of higher education is undergoing significant changes. To ignore the needs of the graduates of the two-year colleges is to ignore an increasingly important segment of the college population; to fail to provide a degree program for those desiring it in industry is to fail to recognize the trend toward continuing education throughout the country; and finally, to avoid the development of mutual programs with liberal arts colleges is to avoid the value of a highly successful concept, employed by many of our competitors, that has served as a useful method of maintaining a dialogue between the scientific and non-scientific communities.

OBJECTIVE 7: To Specialize in Educating the Underprivileged.

One of the most acute and momentous problems facing the American nation is that of absorbing its underprivileged citizens, most visibly the blacks, into the economic and social mainstream. Inasmuch as a university or college degree is becoming ever more necessary as a passport to affluence, we are witnessing the beginning of an intense campaign aimed at providing higher education for the underprivileged. It has been customary for a sizeable proportion of those underprivileged students who did manage to gain admission to these institutions to major in the arts and, in particular, the social sciences. The reasons for this choice were complex and certainly subject to a good deal of individual variation, but a few motivating forces seemed to be at work on a large scale: (1) a desire for personal discovery and a sense of identity; (2) the hope of exercising one's skills back in the ghetto or barrio for the benefit of one's own community; (3) the conviction, often sound, that one's academic background precluded a career in the sciences or engineering, save for the most gifted and determined.

There are signs that this bias in favor of social sciences among university students drawn from the underprivileged classes may be in the process of weakening. The reasons for this are multiple: (1) the realization that the powers of a sociologist, psychologist or social worker in most "real" situations are very limited because of the scope and complexity of the problems; (2) the growth of severe doubts concerning many of the basic premises, particularly in sociology, as they have been applied to the underprivileged themselves; (3) the discovery that many of the problems facing the ghetto have technological and political bases which the graduates' training has not yet equipped them to handle.

The increasing demands for Black Studies programs may be viewed in part as a reaction to the unsatisfactory state of affairs outlined above. One might project, therefore, that a curriculum heavily oriented toward science and technology, particularly one in which there was an unusual stress on social relevance, might well exercise a strong appeal for many disadvantaged students

as well as for a number of those with "ordinary" social and educational backgrounds. It would undoubtedly be necessary, however, actively to recruit students for a program in science and technology since, in spite of its desirability from their point of view, there are a number of personal and historical barriers which stand between them and entrance into a course of study generally reknowned for its difficulty.

Implementation.

The possibilities here are legion, but some order and direction can be introduced into this topic by taking account of two important determinants. First, the method of implementation will be heavily dependent on the proportion of students who come here with serious academic disadvantages. Second, there are some programs which might be generally desirable for all students and into which disadvantaged students might fit with reasonable comfort, as opposed to those programs specifically designed for disadvantaged students.

Before discussion of various programs appropriate to a number of possible conditions is attempted, some general comments are in order. If WPI is to make a serious effort at educating disadvantaged students, even on a modest scale, then the presence of certain personnel on campus will be well-nigh indispensable. There will have to be at least one, and hopefully several, staff members who have come from the same backgrounds as these students--in practice, this means that we will acquire several black staff members. The most critical need would probably be in the office of the Dean of Student Affairs, followed closely by the Admissions Office, and then the academic staff at large. These people would not be here solely to serve the disadvantaged students but rather to provide understanding, advice and a source of identification for those having a hard time adjusting to campus life.

The present advisory system is supposed to make available quite a bit of personal counseling for each student, but it is well known that the results are highly variable. Staff members who are interested and willing to make the effort are often quite effective; since they are precisely the same people who are also involved in a number of other campus activities, however, this effort

is made not without considerable sacrifice. Faculty members who become involved in student counseling above and beyond the normal requirements should have this fact taken into account when their work loads are computed. In a venture of this type in which student counseling may be of the utmost importance, it will behoove the College to provide something more than a make-shift arrangement.

Unless WPI concentrates exclusively on educating the underprivileged, we could expect to have a student body of quite varied social and educational background. While many college students seem receptive to the latter, their parents are often considerably less open-minded. This tendency seems to be more pronounced as one descends the socio-economic scale. The college may have some nimble public relations exercises ahead of it.

It would be convenient at this point to define three "population ratios" which might obtain at Worcester Tech, each of which would require a different educational approach or approaches. They are:

- A. Disadvantaged students constitute only a small portion of the student body (less than 10%);
- B. Disadvantaged students comprise almost the whole of the student body;
- C. Disadvantaged students form a sizeable, but not overwhelming, portion of the student body (roughly 15% to 45%).

A summary analysis of the options available in each case is set out below.

- A. If disadvantaged students make up only a small fraction of the student body, then it is likely that WPI will be able to accommodate them with little alteration of its basic structure; the particular form of the curriculum will not be critical. The general approach will be to repair academic deficiencies in a concentrated effort during the first year or so, and then absorb these students into the academic mainstream. This may require attendance at summer sessions before the freshman year begins and during the freshman-sophomore break, at the least. In the cases of marked penury, it may also be necessary to pay students for attending summer sessions.

The influx of several dozen disadvantaged students will probably create some demand (undoubtedly concurred in by a sizeable fraction of non-disadvantaged students) for an increased number of social science and humanities courses which are directly descriptive of their background and situation. It is much less likely that cries will be heard for a Black Studies program or similar project, because the students who enroll here will be aware that this is not a general university and will presumably have come to avail themselves of our technological expertise. One might also anticipate a desire on the part of many students for an increased emphasis on the social usefulness and consequences of engineering practice. This would hardly constitute a radical request in light of shifting attitudes of engineering students on all campuses.

Aside from the cost of tuition scholarships and living stipends for a sizeable number of impecunious undergraduates, the Institute would be obliged to provide a sizeable number of graduate teaching assistants whose sole function would be to act as tutors. It is envisaged that only experienced graduate students would be used in this capacity; it might well be appropriate to pay them more in order to attract the best students and encourage conscientiousness. The employment of gifted and interested seniors in a subordinate tutorial capacity also merits consideration.

- B. There is only one circumstance under which we could assemble a freshman class consisting mainly of disadvantaged students--we would have to let it be known in the high schools of the large urban ghettos that we were prepared to take in virtually any graduate, regardless of record, who displayed an interest in and aptitude for science or engineering. We would, in effect, become a sophisticated Job Corps Training Center.

Under this plan there would not be much point in having separate remedial courses in order to get people through in four years. It would appear to be much more reasonable to have a five-year program, the first year of which would be largely devoted to recapitulating basic high school material, concentrating on language and communication, and weeding out the most hopeless cases. The remainder of the curriculum would be fairly "normal", but somewhat restricted in scope. Much less emphasis would be placed on preparing students for graduate

study and much more on giving terminal bachelor's degrees. A very high degree of relevancy would be required in the curriculum--aeronautical engineering would be superfluous, while a course on the renovation of dilapidated structures would be right in line with the aims of the program. The need for individual attention, counseling and tutorial help would be great in this program, and a good deal of faculty time would be consumed by faculty-student contacts, particularly in the early years.

- C. If the College were to take in a student body containing a substantial number of disadvantaged students, then two markedly different educational systems would present themselves as possible approaches for coping with a very heterogeneous student body. One is the "two-track" system, and the other is the "unstructured curriculum".

The two-track system would require a fairly standard, reasonably structured four-year curriculum into which freshmen with traditional academic credentials would matriculate directly. Students with weak backgrounds would enter a separate program which would be designed to lead into the main curriculum at some definite point, such as the beginning of the junior year. The curriculum designed for the disadvantaged students would have to be very flexible as to course sequence and length of time required for completion. The courses would also have to blend skillfully remedial material with new subject matter; some courses might be entirely different from their counterparts in the standard curriculum, particularly in the humanities and social sciences.

While a program such as that outlined above might overcome a number of academic problems, it is open to the serious objection that it would create two classes of students. This is a tricky point--it is highly debatable as to whether the program would actually encourage the division of the student body, or whether it would rather be recognizing a pre-existing division and seeking to be as efficient as possible under the circumstances. In any case, the unstructured curriculum approach which follows is not subject to criticism on the grounds noted above.

The absence of college-wide required courses, a very flexible system of

departmental requirements, and above all the abolition of the strict four-year program are the hallmarks of the unstructured curriculum. Each student would be encouraged to set his own pace and map out his own course of study. Under such a scheme remedial courses and multiple tracks become unnecessary, Since there would be no stigma attached to taking a small academic load at any one time, or in taking more than four years to finish, there would be little danger of creating two classes of students. An unregimented curriculum of this type would have considerable appeal for many bright students with very respectable academic credentials, as well as allowing disadvantaged students to find their way in a comparatively pressure-free environment. The lack of curriculum rigidity would also allow the introduction of courses with a very contemporary orientation which might again be anticipated to appeal to many bright, able students with good backgrounds as well as to students from the ghetto. Superior students might well complete their education in less than four years, thus partially compensating for the considerable number of those who will require more than four years.

The mode of operation of an unstructured curriculum requires a good deal of fore-thought and analysis before such a course can be embarked upon; such a comprehensive analysis is not warranted here. But it should be recognized that it has merit for the education of privileged students, disadvantaged students and those who fall in between. Many relevant arguments may be found in the discussion of Objective 3 (Classical Education....).

WPI could embark on one or two programs which would be independent of, but complementary to, several of the options outlined above. One-year student exchanges between WPI and all-black colleges, on a sizeable scale, would be quite appropriate in the context of options A and C. Our students would study humanities and social sciences at the black colleges, while the visiting students would take a concentrated program of science and engineering. The attitudes of many WPI students and their parents represent a potential bar to the effective functioning of this program.

The College could also take a greater interest in programs for high school students, particularly in those schools in poor neighborhoods. Such a

project would be of great relevance to Option B. For many of our faculty, however, this would involve an unacceptable shifting of attention from higher studies to very elementary ones.

This section will close with one more observation of a very general nature. If we at WPI want seriously to undertake to provide a college education for substantial numbers of disadvantaged students, then we will have to divest ourselves of the entrenched feeling that there is something sacred about present admission standards and about the four-year curriculum.

Financial Analysis.

The biggest costs of the proposed objective would arise from the need for a large number of tuition scholarships and stipends; the outlay for tutorial services might also be substantial if the number of disadvantaged students on campus was sizeable. A full scholarship at this time amounts to \$4000 per student per year. The demand for full scholarship support might be eased somewhat if Federally-financed long term loans were to become available for disadvantaged students.

It seems inescapable that the major cost of a program aimed at educating the underprivileged must be absorbed by the Federal government. In terms of the outlay for tuition scholarships option A would be the least expensive and option B the most expensive. The interest of various Federal agencies in financing one of these programs, however, is likely to be directly proportional to the number of disadvantaged students being accommodated. WPI might, therefore, have a better chance of a fully supported program by taking in large numbers of disadvantaged students than by trying to restrict their number. Finally, the unstructured curriculum of option C seems most likely to draw support from agencies, other than Federal; it might have considerable appeal for those foundations interested in experimentation in higher education.

OBJECTIVE 8: To Promote Invention and Entrepreneurship.

At the freshman picnic early in September of last year an intelligent student eager to begin his studies at WPI explained to a faculty member why he had come to the Institute. "I had the choice of going to several other Eastern colleges, and I think I could have done well even at the most prestigious of these; but I think only at WPI will I have the freedom to continue working on some independent projects which I want to get patents for as soon as possible. Is there anyone on the faculty who could evaluate what I have been designing? I really would like to find some shop space to start putting together my individual-propulsion-machine."

Nine months later this competent and highly motivated freshman has left the college because of academic failure. The college had failed to recognize in this applicant the innovative-entrepreneurship aptitude and to encourage it. He was the son of a self-employed, innovative and successful entrepreneur. He had been most creative in developing various gadgets and processes when he was in high school; he had selected WPI because he thought inventive engineering and technology would be emphasized here and be supplemented by well-taught theory. He admitted before leaving Worcester that his year had not been wasted, but he thought it might have been a success if he had been encouraged to start in the shop-laboratory and to proceed as necessary to the theoretical studies of the lecture hall, rather than to have been deluged with theoretical courses during his freshman year.

Another member of last year's freshman class was more fortunate in his academic courses, but he remarked before leaving for his summer vacation that the only inspiration of the year for him had been the Honors Lab program in Chemistry; he had hoped that the other freshmen science courses would have been equally free. Still another capable student became so engrossed, this year in the technical problems of the new campus FM station that his academic program collapsed, but he gained a sense of adventure about engineering that many of his so-called successful classmates have not discovered.

In talking with students, members of the Planning Group have heard time and time again how they wish that the problem-solving they found rewarding in their freshman Introduction to Engineering Problems had been continued in their actual degree programs. They reported in many cases that WPI had turned them away from engineering rather than toward it.

There are then obvious reasons that make a program in Invention and Entrepreneurship relevant to the needs of our students. Such a program would admit undergraduates who have a demonstrated potential for technical inventiveness and, under the direction of inventive and productive staff members, give them space, time, inspiration and equipment to develop new products. Research and development projects might be established at various levels of sophistication. Perhaps the freshmen might be given considerable freedom to select projects.

The undergraduate student should, however, see about the campus all degrees of inventive research and development being conducted by his supervisors, the upperclassmen, the graduate students and the senior staff. The newer student would be encouraged to join projects which interest him. When his supervisor discovers what new knowledge the student needs in order to proceed, he should assign him to a faculty member in what could probably be called the "Basic Studies" division of the Institute. "Basic Studies" such as mathematics, physics, chemistry might be taught on a lecture-course basis or on a tutorial basis. At no time should the basic instruction be the sole occupation of the undergraduate; the shop-lab project work should be the central part of his "curriculum."

Because of the possible flexibility of this goal it might be more relevant than our present emphasis on purely theoretical studies to both the so-called disadvantaged students and to many foreign students, if WPI accepts its obligations in these areas.

According to some engineers and scientists at UCLA who have established programs in innovative engineering and entrepreneurship, many foreign students who graduate from American technical colleges remain in the United States not for lack of concern for the developing country of their origin nor for the

material advantages of American life but because they have not been able to discover opportunities in their home countries for using their advanced technical knowledge. Dr. M. Asimow and others at UCLA have designed programs which encourage these students to apply business "know-how" for the promotion of small technological industry in their own countries. Among the new machines developed in the program have been adding machines, small electric motors, appropriate bench tools, as well as a vegetable canning process for the vegetarian Indian market. All of these inventions have apparently stimulated new industry in the home market.¹

Many professionals in America choose not to contribute their talents to the solution of urban problems, perhaps because in their theoretical technical education they have not been helped to see that technical innovativeness and entrepreneurship is a useful and contagious combination for improving our communities.

If WPI were to adopt the promotion of Invention and Entrepreneurship as its primary educational goal, not only would we be serving individual students, but we would also be serving society at large in a significant manner. If WPI were successful in developing this goal, the school might consider establishing an experimental branch in a less developed area of this country or abroad. We would here be providing a place for young inventive engineers to study and experiment, giving them assistance in applying their innovative techniques and inventions to industrial and social problems. We would be providing an environment in which innovative research at all levels of sophistication might proceed without the immediate demands imposed on the innovative engineer in most industrial situations or without the demands imposed on him by the traditional academic programs in engineering. Hopefully we would also be providing society with new useful inventions and innovations in engineering and applied science and an innovative spirit transmitted by our graduates. There would be many opportunities to develop interesting and profitable relationships with industries and governments. New England and the

1. "UCLA Reverses 'Brain Drain,'" ASEE International Engineering Education Newsletter VII, 1, (Mar. 1969), p. 1

rest of American society could look upon us as the center of innovative experiment in technological matters, where invention was encouraged in the young men and women who came as undergraduates and where older engineers might teach the arts of invention.

WPI's truly outstanding graduates during its first century have been inventors; they have been ingenious developers of new hardware and processes which could be patented. One thinks of James E. Smith, founder of the National Radio Institute, Robert Goddard, Elwood Haynes, inventor of an electric oar, Atwater Kent, radio pioneer, and more recently of Ed Funk, and Howard Freeman. Many of the present applicants to the College still say they "like to work with their hands and make things." They wish to come to Tech because of our tradition of practical engineering--a tradition going back to the days of the Washburn Shops² and to the more recent period when we were not so encumbered with theoretical courses and students could spend more time in the shops and labs experimenting with all kinds of devices and gadgets and procedures applicable to the industrial and social world outside the college. One assumes that innovativeness will still be rewarded by American society in the century ahead.

Is a primary educational goal of promoting Invention and Entrepreneurship compatible with WPI resources, present and possible? It is most certainly compatible with a very significant part of our tradition. While much of the space on the main campus is now devoted to classrooms and lecture halls, there is considerable lab and shop space still not used to its fullest capacity in modern experiment. The inventor works from what space and equipment is available, and probably in undertaking this option it would be far more important at the start to develop the innovative spirit in staff, students and supervisory personnel than to worry first of all about having an ideal plant. The Alden Research Labs are already solving real engineering problems in an inventive way, which could be an important asset in implementing this goal.

Much of our present faculty are not primarily oriented to the shop and lab. Much of the present lab and shop work on campus, we have gathered from

2. Tymeson, Two Towers, p. 16, etc.

both students, staff and alumni, is undertaken in a cold, prescribed, un-inventive manner; this is one cause of our losing potential engineers and scientists from our present program. We do have some faculty members who have remained close to practical industrial problems and exemplify the inventive spirit that the late Carl Johnson conveyed to all who ever talked with him. We have on the present faculty others who are fully engaged in basic theoretical research which could, under this option, be the base for further applications. The emphasis would be on applied invention, but this would not mean that fundamental research and theoretical studies would not continue. There would hopefully develop less distinction between the theoretical and the practical. Theory would be sought when needed, but the attention of the undergraduates would be constantly directed to invention and application and solving of practical problems.

The present academic atmosphere of the campus would not be compatible with this goal. Any emphasis on degree requirements or orientation toward the traditional graduate study programs with carefully outlined degree requirements would be a hindrance.

In the rush to develop elaborate disciplined degree programs and to promote, for industry and the government, specialized research and development, the traditional engineering colleges have neglected the average, un-academic but inventive engineer. If WPI were to promote a program of Invention and Entrepreneurship with very careful recruitment of talented students and staff and carefully designed public relations with press and industry, we would not find much competition from other four-year engineering colleges. There may be some competition from the technical institutes, but many of these are now favoring technical "know-how" rather than inventiveness. We could, undoubtedly define a program quite different from what these schools provide and appeal to a different, if limited, audience. Careful surveys would need to be made to determine how many potential students there are in this area. Then it would be possible to start estimating what size the college should ideally be.

Our chief competition would undoubtedly come from the research institutes of the larger universities and from dynamic young companies that have been

spin-offs of these and of the larger corporations. We would need to recruit faculty and supervisory staff from these sources. The success of so many spin-off companies in recent years should be an inspiration to this program and not a hindrance. One thinks of some of the spin-offs in the Boston-Cambridge area, in the San Francisco-Palo Alto area, and in the Los Angeles area: Control Data, Hewlett-Packard, Digital Equipment, E G & G, High Voltage Engineering, Itek. Closer to home we have witnessed the Jamesbury development, Wang Laboratories, and a number of other local and innovative industries develop from the larger industries.³ WPI's emphasis would need to be different from both the small innovative technological industry and from that of the large research institutes like Stanford, or Cal Tech's Aeronautics Laboratory, or MIT's Instrumentation Laboratory. With our traditional emphasis on undergraduate education, we could most likely distinguish ourselves by attending to less elaborate engineering gadgetry than what these larger institutes have been developing, while at the same time we might wish to increase our sophisticated research in such areas as hydraulics, fluidics, materials, and those several other areas where we have already been quite successful on the main campus and at the Alden Labs. Some on campus think we should make robots.

WPI should be attentive to its potential leadership in the Route 495 development. The Boston area today within the 128 sphere and the northern 495 area performs about \$1 billion in R&D annually in nearly 900 laboratories many of which were "spin-offs" of the university complex.⁴ In its distinctive way, why should not WPI nourish the development of new products and industries for the last quarter of the twentieth century? This would be a daring primary goal. Perhaps the school's motto could be: "Better an Interesting Failure than a Mediocre Success".

3. A stimulating article by Victor J. Danilov on "spin-offs" appears in the May, 1969 issue of Industrial Research, pp. 54-58. The profile of the typical "inventor-entrepreneur" is shown later.

4. Danilov, p. 56.

OBJECTIVE 9: To Transform Ourselves into a General University.

Introduction

In the first report of the Planning Group, eleven different possible objectives for WPI were listed. In order to clarify some of these objectives, qualitative discussions were presented. In writing this first report, it was felt that the concept of a general university was quite well understood by the intended reader, and, therefore, only a simple summary was presented. During planning day a sizeable amount of interest in this direction was noted in most groups, particularly among the students present. It is still felt that a detailed explanation of the general university is not required by the reader. Further, a quantitative discussion at this point would not be in keeping with the tenor of the other discussions, nor is it possible without a great deal of further study by the committee. It is felt, however, that a discussion of several of the critical criteria involved in considering this objective is meaningful in view of the interest displayed by the planning day discussion groups.

A Discussion of WPI Student Interest in the General University

During and after planning day, the members of the Planning Group have talked at some length with a large number of WPI students, including visits to each living unit. As a consequence of these visits a discussion is possible of student interest in the general university concept.

Most WPI students while in high school were quite successful in science and mathematics. While neither they or their guidance counsellors had a very clear picture of engineering, it seemed natural to consider a career in engineering or science. After some experience at WPI, some number of these students still have incomplete understanding of the professional and social life-styles of the engineer or scientist. Further, despite the proximity of Holy Cross College and Clark University in Worcester, it has been found by the Planning Group that there is almost no interaction between our students and students of these other colleges. WPI students,

therefore, have little understanding of the educational experience of their peers in these liberal arts colleges. They have some feeling, in many cases not justified, that the non-technical courses at WPI are not "real" non-technical courses but diluted courses for engineering students.

As the sensitive WPI undergraduate matures in his college experience and questions his selection of a professional direction, he feels, quite rightly, a sense of inferiority and to some extent isolation from the lack of interaction with non-engineering students that would permit him to make proper evaluations. If he feels dissatisfaction with engineering or science, he has little comprehension of other disciplines for comparative purposes. He feels very little possibility of lateral movement without some significant degree of difficulty.

As a result, some WPI students feel that re-orientation of WPI as a general university or part of a general university would permit a much more meaningful college experience. They feel that contact with other disciplines would allow them, if unsure of their direction, to either transfer to another discipline or to remain in engineering or science with a great deal more confidence in their decisions.

WPI as a General University or as Part of a General University

This objective requires a very careful, and by no means simple, study of the need for another general university in New England. There are many general universities, both public and private, within this area.

Without any quantitative evidence it would appear that if WPI were to adopt this goal, some close alliance with Clark University would be mandatory. (Of course we must for the moment assume without justification that Clark would also consider this possibility.) Alliance with the Worcester church affiliated colleges seems remote. The possibility of WPI expanding by itself seems even more remote.

If WPI were to combine with Clark, a major difficulty is at once apparent. The schools are geographically separated. Case Institute of Technology and Western Reserve University in their merger were greatly aided by the fact that the campuses are adjacent. A first prerequisite, therefore, would be a flexible transportation system that would permit students to take courses on

each campus location randomly during the day with little effort. Otherwise vital intermingling would not occur.

The combination of instructional departments, endowments, and trustees that now separately exist is a second complex primary consideration that requires very careful and detailed study. For example, Case and Western Reserve upon merging suffered political upheavals in at least one set of departments that severely weakened the resulting departmental merger.

WPI and its Atmosphere

As the Planning Committee continues its study, it becomes more and more aware that to a great measure the impact of an educational institution is the complex result of a great many intermingling parts, the whole being greater than the sum of these parts. Faculty and student attitudes, geographic location, physical size, traditions, alumni, benefactors, campus architecture and grounds, and many other variables result in an ambience or milieu that is here identified as its atmosphere. This objective as much as any other presented thus far would change the atmosphere of WPI. As a university WPI would be large contrasted to small; it would satisfy community needs rather than defining its own goals; it would have many administrative and educational units rather than few; it would have a significant graduate population rather than a primarily undergraduate population; it would have different attrition and admission policies; it would have a much more heterogeneous faculty and student body.

It is not intended here either to support or to condemn this change in atmosphere. It is felt, however, that realization of the significance of the total atmosphere of WPI is most important in considering this objective, for it does imply a major shift in emphasis in almost all areas.

III. SUMMARY OF PLANNING DAY DISCUSSIONS

III. SUMMARY OF PLANNING DAY DISCUSSIONS

It is apparent, even from the recorder's condensations, that each discussion group had its own mood, its own concerns, and its own focus. It would, therefore, be quite misleading to suggest that any consensus, except of the broadest kind, emerged from the several discussion groups. Nonetheless, there were certain themes and counter-subjects which appeared with reasonable frequency in many of the group minutes, and it is advantageous to present them here.

As far as the operation of the Planning Group itself is concerned, one recurrent criticism was that it had failed to distinguish sufficiently between the goals and the methods by which they are to be obtained. The hope was expressed that more care would be devoted to this important distinction in future reports.

It is relatively easy to tick-off those objectives which aroused little enthusiasm. Few would care to join the state university; fewer still wish to see WPI transformed into a middle college; a B.S. in Technology is a less-than-exciting prospect for the large majority; and there is near universal agreement that the status quo is a condition of which we should divest ourselves with all deliberate speed. Although there were some comments that WPI did have a responsibility to the underprivileged, none seemed willing to advocate this as our prime function. Interest in the general university was expressed in many quarters, although considerable skepticism was voiced regarding the feasibility of its attainment. In many cases the interests seemed to be for the diversity of offerings available at a general university rather than for the type of institution itself.

The bias in favor of our remaining a college of limited size, primarily oriented toward undergraduate education, was overwhelming; and the idea of our becoming a research-oriented graduate center was decisively rejected. At the same time, both faculty and students seemed to feel that a modest graduate program was essential for attracting a superior faculty and for enabling its members to maintain their intellectual vigor. The view was

expressed that the graduate students should provide intellectual stimulation not only for the faculty, but also for the undergraduate students. Some felt that the educational experience of the undergraduate student could be greatly enriched through increased contacts between graduate and undergraduate students. Several participants thought that graduate students could be more effective in assisting in the instruction of advanced courses rather than in teaching basic courses.

Many agreed that preparing a student for graduate study was an increasingly important task for a leading undergraduate school, and that WPI should move accordingly. At the same time, concern was indicated for those students who were disinclined to undertake post-graduate studies; it was felt that they should not be coerced into such a program. In several groups the suggestion was made that a five-year program might provide the answer. One line of study would terminate in a Master's degree; a parallel line of study would be a five-year cooperative program.

Of those objectives which specifically stress undergraduate education, no "choice" could be expressed between objectives 1 and 2. In fact, there was a good deal of debate over whether or not one objective led automatically to the other, and whether leadership could be taught in any formal way. These two objectives seem clearly marked for further study.

The responses to objective 3 ran the gamut from total indifference to wild enthusiasm. It is moot whether the majority of participants truly understood the implications of this proposal. Where they did, some skepticism was expressed concerning the ability of our students to handle the responsibility. A number felt that many aspects of this approach could profitably be incorporated into any program which WPI decided to implement.

Objective 8 was not widely discussed. There was limited debate over whether or not the stated objective could constitute a realistic goal for a college. Some did feel that the innovative spirit envisaged by this proposal should be nurtured by the college.

SUMMARY

Along with, and intertwined within, the discussion of goals and criteria was an obsessive reference to atmosphere and ambience. There were repeated

pleas, and even demands, for more openness, less structure and rigidity, an escape from provincialism, more debate and interaction between faculty and students, a humanizing atmosphere -- in short, excitement and possibility. Very few of the participants were strongly attached to a given goal or combination of goals. Rather, what the participants desired was an objective that would bring about the change in atmosphere they so obviously felt has been lacking here. It would appear that WPI has underestimated the latent hunger for experimentation and intellectual excitement that lies within this college community.

IV. SUMMARY OF QUESTIONNAIRE RESPONSES

IV. SUMMARY OF QUESTIONNAIRE RESPONSES

In March and April of 1969, the Planning Group distributed two questionnaires, one to the faculty, administration and alumni of WPI, and the other to both the undergraduate and graduate students of the College. These questionnaires were based primarily on a questionnaire devised by Edward Gross and Paul V. Grambach of the University of Minnesota which was published in University Goals & Academic Power (American Council on Education, Washington, D.C., 1968).

The purpose of the questionnaires was to obtain some indication of the attitudes of our academic community toward the proper aims of WPI. Each respondent was asked to indicate his reaction to each suggested aim in two ways; first, he was asked to designate what he felt was the relative importance of the aim at the College now; and second, he was asked to express his opinion on how important that aim should be at WPI.

As in all questionnaires designed to be answered by simply checking the appropriate category of response, it is difficult to assess the real reaction of the respondents to some of the aims--many answers would need some amplification to be truly meaningful. Nevertheless, the results do shed some light on the attitudes of the various groups associated with the College and, in some instances, tell us more about ourselves than perhaps we would ordinarily care to admit.

For purposes of discussion, this summary will be divided into four parts: (1) aims bearing directly on the educational goals of the College; (2) objectives involving the role of the student in the decision-making process at WPI; (3) objectives involving the role of the faculty in the decision-making process at WPI; and (4) attitudes about the college in general and opinions regarding criteria for faculty evaluation. In all of the following, it should be kept in mind that we received responses from only part of each group involved, although everyone was urged to participate. Furthermore, not all respondents answered each question. The number of replies were as follows:

Faculty:	72
Administration and department heads:	19
Trustees and alumni:	25
Undergraduate and graduate students:	170

In the tables below, the letter headings represent the category of the respondent: F, Faculty; A, Administration and Department Heads; T/A, Trustees and Alumni; and S, Students. The letters T, Top Importance; G, Great Importance; M, Medium Importance; L, Little Importance, and N, No Importance appear on the side following the statement of each aim or question. The first of each pair of numbers represents the "IS" reaction and the second, the "SHOULD BE" reaction.

I. AIMS BEARING DIRECTLY ON THE EDUCATIONAL GOALS OF THE COLLEGE

		F	A	T/A	S
1. TO PRODUCE A STUDENT WHO, WHATEVER ELSE MAY BE DONE TO HIM, HAS HAD HIS INTELLECT CULTIVATED TO THE MAXIMUM.	T	1-33	0-7	1-11	4-56
	G	8-20	2-10	6-11	21-75
	M	36-13	9-2	13-4	58-34
	L	21-2	7-0	3-0	80-4
	N	2-0	1-0	0-0	10-4
2. TO PROVIDE THE STUDENT WITH SKILLS, ATTITUDES, CONTACTS, AND EXPERIENCES FOR LEADERSHIP IN SOCIETY.	T	0-16	0-6	1-10	1-39
	G	8-35	3-11	2-10	23-94
	M	37-16	7-1	13-4	79-31
	L	22-5	8-1	5-1	57-4
	N	4-0	0-0	1-0	8-1
3. TO DEVELOP THE INNER CHARACTER OF STUDENTS SO THAT THEY CAN MAKE SOUND, CORRECT MORAL CHOICES.	T	1-23	0-5	4-11	0-32
	G	6-17	4-11	1-8	6-66
	M	27-16	10-3	10-5	46-44
	L	32-10	4-0	9-2	96-24
	N	4-4	1-0	0-0	23-7
4. TO TRAIN STUDENTS IN METHODS OF SCHOLARSHIP AND/OR SCIENTIFIC RESEARCH, AND/OR CREATIVE ENDEAVOR.	T	3-35	0-8	2-10	9-57
	G	13-31	3-9	6-15	35-85
	M	39-6	9-2	13-1	73-23
	L	16-0	7-0	1-0	44-4
	N	1-0	0-0	0-0	4-1
5. TO PRODUCE A WELL-ROUNDED STUDENT, THAT IS ONE WHOSE PHYSICAL, SOCIAL, MORAL, INTELLECTUAL AND ESTHETIC POTENTIALITIES HAVE ALL BEEN CULTIVATED.	T	1-22	0-5	1-11	3-77
	G	8-28	4-8	4-8	7-57
	M	37-14	4-6	14-6	48-30
	L	24-7	10-0	3-0	89-5
	N	1-0	1-0	0-0	23-2
6. TO ASSIST STUDENTS TO DEVELOP OBJECTIVITY ABOUT THEMSELVES AND THEIR BELIEFS AND HENCE TO EXAMINE THOSE BELIEFS CRITICALLY.	T	1-17	1-6	2-9	1-36
	G	4-36	1-9	1-11	7-80
	M	30-10	8-4	11-5	38-37
	L	31-7	7-0	8-0	89-13
	N	4-1	2-0	0-0	33-5
7. TO MAKE SURE THE STUDENT IS PERMANENTLY AFFECTED (IN MIND AND SPIRIT) BY THE GREAT IDEAS OF THE GREAT MINDS OF HISTORY.	T	1-16	0-3	1-5	2-14
	G	4-20	0-7	0-7	9-51
	M	25-24	4-9	9-9	43-60
	L	32-7	11-0	7-3	95-34
	N	4-1	4-0	3-0	17-10

If we analyze the seven aims listed above, it is clear that as far as the respondents are concerned, we have not been providing the type of education that the members of our academic community desire. It is significant that, with the exception of the seventh aim and to some extent the third, more than two-thirds of each group felt that these aims were of either top or great importance in terms of what we should be doing. While the very nature of these aims might suggest to any respondent that he ought to be in favor of them, it should be observed that there is a consistency of response by all groups and that the third and seventh, worthy though they may be, did not elicit the same support as the others (a fact which might have been predicted in view of the College's educational emphasis). It is interesting that the trustees and alumni, the group least close to the daily activities of the College, were the most optimistic regarding the current operation of the educational program and that the members of the administration, who might be expected to express similar optimism, were of essentially the same mind as the faculty and student body.

		F	A	T/A	S
8. TO ENCOURAGE STUDENTS TO GO INTO GRADUATE WORK.	T	0-11	0-2	0-1	5-16
	G	10-32	1-11	3-1	26-60
	M	44-28	12-5	13-16	90-72
	L	18-0	5-0	4-5	42-14
	N	0-1	0-0	2-3	5-5
9. TO EMPHASIZE UNDERGRADUATE INSTRUCTION AT THE EXPENSE OF THE GRADUATE PROGRAM.	T	10-13	1-1	3-5	7-28
	G	28-17	13-7	9-10	67-69
	M	25-28	3-10	9-5	70-46
	L	6-8	1-0	1-4	13-14
	N	0-3	1-1	1-1	8-9
10. TO EDUCATE TO HIS UTMOST CAPACITIES EVERY HIGH SCHOOL GRADUATE WHO MEETS BASIC REQUIREMENTS FOR ADMISSION.	T	2-26	1-6	4-13	10-42
	G	16-19	5-9	6-5	33-55
	M	38-12	7-2	6-2	76-51
	L	11-11	6-1	5-4	38-9
	N	4-3	0-0	2-2	5-8
11. TO ACCOMMODATE ONLY STUDENTS OF HIGH POTENTIAL IN TERMS OF THE SPECIFIC STRENGTHS AND EMPHASES OF THIS COLLEGE	T	0-7	1-1	2-3	12-8
	G	7-21	4-9	8-8	58-41
	M	42-29	9-8	6-7	77-79
	L	20-11	3-0	6-6	17-31
	N	2-3	1-0	0-1	2-9

In the four aims listed immediately above, we begin to see a divergence of opinion and some inconsistency. While the respondents appear to believe that students should be encouraged to go into graduate work, a surprising number are not particularly in favor of accommodating the type of student, namely one of

high potential, who might be expected to continue with advanced training. In this connection, it is interesting to note that the students believe that we have been more selective than we ought to be, while both the faculty and administration believe we ought to be more selective.

Within this category are also some aims of a more general nature:

		F	A	T/A	S
12. TO SERVE AS A CENTER FOR THE DISSEMINATION OF NEW IDEAS THAT WILL CHANGE THE SOCIETY, WHETHER THOSE IDEAS ARE IN ENGINEERING, SCIENCE, LITERATURE, THE ARTS, OR POLITICS.	T	1-23	0-4	1-3	1-55
	G	1-20	0-10	0-7	9-78
	M	25-15	4-4	9-8	37-30
	L	33-11	12-1	10-7	92-9
	N	10-2	3-0	2-1	32-2
13. TO KEEP UP TO DATE AND RESPONSIVE.	T	2-40	2-12	1-13	4-73
	G	12-26	0-6	9-11	23-82
	M	40-3	11-1	13-2	62-12
	L	14-3	5-0	0-0	66-2
	N	4-0	1-0	0-0	14-0
14. TO MAINTAIN TOP QUALITY IN ALL PROGRAMS IN WHICH WE ENGAGE.	T	2-39	1-9	3-14	13-83
	G	21-25	5-7	10-6	52-76
	M	36-7	9-1	8-4	82-9
	L	12-1	3-1	1-0	19-0
	N	0-0	1-0	1-2	2-0
15. TO MAINTAIN TOP QUALITY IN THOSE PROGRAMS WE FEEL TO BE ESPECIALLY IMPORTANT (OTHER PROGRAMS, BEING, OF COURSE, UP TO ACCEPTABLE STANDARDS.	T	2-22	0-9	2-13	18-46
	G	20-29	8-9	13-10	65-77
	M	41-15	8-0	6-3	74-36
	L	5-2	2-0	1-0	8-6
	N	2-0	0-0	0-0	1-1
16. TO CARRY ON PURE RESEARCH.	T	0-6	0-0	0-0	1-8
	G	2-18	2-7	1-3	19-41
	M	24-33	5-9	7-10	75-83
	L	41-8	10-3	15-12	64-26
	N	3-6	2-0	0-1	7-9
17. TO CARRY ON APPLIED RESEARCH.	T	0-4	1-1	1-2	
	G	14-32	4-10	3-5	
	M	41-32	8-8	13-15	
	L	16-3	6-0	5-3	
	N	1-1	0-0	0-0	
18. TO KEEP THIS PLACE FROM BECOMING SOMETHING DIFFERENT FROM WHAT IT IS NOW; THAT IS, TO PRESERVE ITS PARTICULAR EMPHASES AND POINT OF VIEW, ITS "CHARACTER".	T	8-2	2-1	1-1	47-8
	G	23-9	9-4	7-6	78-23
	M	25-19	3-3	9-8	24-40
	L	12-24	4-10	4-5	12-52
	N	1-16	0-1	1-6	3-45

Perusal of aims 12-18 and their corresponding responses indicate that, in general, most of those answering the questionnaire were of the opinion that WPI has not been current in its attitudes. The administration and student body were particularly critical of the College's interest in keeping up to date and were most inclined to regard it as endeavoring to maintain its present attitudes. Fortunately, with the exception of a fair portion of the alumni who might understandably wish to preserve the college they knew in a form they would recognize, the college community appears to be clearly in favor of a more responsive attitude. It is also worthy of note that the faculty and student body are less in favor of maintaining top quality in selected programs (rather than in all areas) than the administration and alumni. Here, one might expect that fear of being part of a less important program influenced the vote of the first two groups; while department heads saw in the notion of top quality selected programs the opportunity to obtain additional support for their own programs; and the trustees saw in that same notion the opportunity to reduce budget figures by supporting fewer programs on a maximal basis.

As far as research is concerned, it is clear that applied research is regarded with greater favor than pure research, an answer not unexpected. The student body, being less acquainted with research, was inclined to rate the importance of research lower--here, it would be interesting to ascertain if their responses reflected in any way a fear that, with greater emphasis on research, the quality of instruction might deteriorate.

II. OBJECTIVES INVOLVING THE ROLE OF THE STUDENT IN THE DECISION- MAKING PROCESS OF THE COLLEGE.

		F	A	T/A	S
19. TO INVOLVE STUDENTS IN THE GOVERNMENT OF THE COLLEGE.	T	0-5	0-0	0-2	1-26
	G	4-21	0-3	3-8	9-75
	M	30-34	9-12	10-11	48-55
	L	34-9	10-4	8-4	92-10
	N	4-3	0-0	3-0	19-4
20. TO PROTECT AND FACILITATE THE STUDENTS' RIGHT TO ADVOCATE DIRECT ACTION OF A POLITICAL OR SOCIAL KIND.	T	0-10	0-0	1-2	0-27
	G	6-15	1-4	1-4	7-56
	M	34-27	11-12	12-12	37-62
	L	24-15	4-1	8-8	86-21
	N	5-3	1-0	0-0	40-4

		F	A	T/A	S
21. TO PROTECT AND FACILITATE	T	2-17	0-2	0-2	2-58
THE STUDENTS' RIGHT TO	G	8-28	5-12	5-11	24-78
INQUIRE INTO, INVESTIGATE,	M	32-21	4-4	11-11	61-32
AND EXAMINE CRITICALLY ANY	L	26-3	7-1	5-2	69-3
IDEA OR PROGRAM IN WHICH	N	2-1	1-0	0-0	13-1
THEY MIGHT BECOME INTERESTED.					

The responses to the three aims above are more revealing than a cursory glance at the figures would indicate. Only the administrative responses show some concern over the role of the students in the government of the College, a role which has been exclusively their own. As far as objectives 20 and 21 are concerned, there appears to be universal agreement that the twenty-first is much to be preferred. Again, there is a need for further investigation of the responses to these two goals--is there a lack of interest in political and social problems facing our society, or have the words "political" and "social" acquired connotations of an undesirable nature to the college community? Have the recent disturbances on other campuses and in other communities influenced the responses to aim twenty? Finally, does the overwhelming interest in increasing the importance of goal twenty-one on the part of the faculty and student body reflect a desire for a different type of instructional procedure than is practiced currently? These are important questions which must be investigated thoroughly by the Planning Group when the students and faculty return in the fall of 1969.

III. OBJECTIVES INVOLVING THE ROLE OF THE FACULTY IN THE DECISION- MAKING PROCESS OF THE COLLEGE.

		F	A	T/A	S
22. TO INVOLVE FACULTY IN THE	T	0-22	0-3	0-4	1-42
GOVERNMENT OF THE COLLEGE.	G	9-27	4-10	4-7	13-89
	M	38-18	6-5	13-14	71-36
	L	23-3	8-0	6-0	72-2
	N	1-0	0-0	0-0	9-2
23. TO PROTECT THE FACULTY'S	T	6-38	3-5	4-6	
RIGHT TO ACADEMIC FREEDOM.	G	25-22	6-9	4-6	
	M	34-8	7-3	11-11	
	L	6-4	2-0	2-2	
	N	1-0	0-0	0-0	

		F	A	T/A
24. TO MAKE SURE THAT ON ALL	T	0-20	1-2	0-1
IMPORTANT ISSUES (NOT ONLY	G	7-20	2-8	4-6
CURRICULUM), THE WILL OF	M	36-25	8-8	11-14
THE FULL-TIME FACULTY SHALL	L	23-3	6-0	6-2
PREVAIL.	N	4-3	1-0	1-3

In spite of protestations to the contrary, it is clear that no group believes that the faculty's role in the government of the College has been a strong one. Here, even the administration would strengthen that role. As far as academic freedom is concerned, only the alumni and trustees seem reluctant to assign greater importance to the protection of this right for the faculty. Is this reluctance the result of the faculties' roles in campus demonstrations elsewhere, or is it an expression of concern for the good name of the College, in case some member of the staff espouses a cause not popular politically or socially with the community at large?

Objective 24 could open a Pandora's box of issues, and while it is clear that the faculty wish to play an important role in decisions effecting the College, it is also to be noted that a larger portion of this group assigned only medium importance to this goal than might have been expected.

IV. ATTITUDES ABOUT THE COLLEGE IN GENERAL AND OPINIONS REGARDING CRITERIA FOR FACULTY EVALUATION.

The questionnaire included a group of items designed to tell us something about ourselves as individuals in terms of our academic attitudes. First, let us consider those items addressed to the faculty, administration, and alumni.

		F	A	T/A
25. TO DEVELOP LOYALTY ON THE PART	T	3-11	1-2	3-9
OF THE FACULTY AND STAFF TO	G	12-30	1-12	5-13
THE COLLEGE, RATHER THAN ONLY	M	35-24	7-2	13-3
TO THEIR OWN JOBS OR PRO-	L	17-4	8-1	1-0
FESSIONAL CONCERNS.	N	3-0	1-0	0-0
26. TO MAKE THIS A PLACE IN WHICH	T	3-5	0-2	0-1
FACULTY HAVE MAXIMUM OPPORTUNITY	G	13-27	1-5	3-1
TO PURSUE THEIR CAREERS IN A	M	32-26	13-10	13-16
MANNER SATISFACTORY TO THEM BY	L	18-8	5-2	4-5
THEIR OWN CRITERIA.	N	5-6	0-0	2-3

		F	A	T/A
27. KEEP COSTS DOWN AS LOW AS POSSIBLE THROUGH MORE EFFICIENT UTILIZATION OF TIME AND SPACE, REDUCTION OF COURSE DUPLICATION, ETC.	T	0-9	0-4	4-13
	G	8-33	0-7	3-11
	M	36-28	11-8	12-2
	L	23-0	7-0	4-0
	N	3-0	1-0	0-0
28. TO MAKE SURE THAT SALARIES, TEACHING ASSIGNMENTS, PERQUISITES, AND PRIVILEGES ALWAYS REFLECT THE CONTRIBUTION THAT THE PERSON INVOLVED IS MAKING TO THE FUNCTIONING OF THE COLLEGE.	T	0-11	0-5	0-8
	G	11-39	2-11	6-12
	M	38-17	9-3	15-5
	L	18-3	6-0	0-0
	N	4-1	2-0	0-0
29. TO MAKE SURE THAT SALARIES, TEACHING ASSIGNMENTS, PERQUISITES, AND PRIVILEGES ALWAYS REFLECT THE CONTRIBUTION THAT THE PERSON INVOLVED IS MAKING TO HIS OWN PROFESSION OR DISCIPLINE.	T	1-11	0-5	2-5
	G	4-32	4-9	4-10
	M	41-22	11-4	12-10
	L	21-3	2-0	1-0
	N	2-2	1-0	1-0

For the following two items, the faculty and administration were asked to rate their responses in rank order, with 1 meaning the most preferred, and 4, the least preferred response. The sets of four figures appearing in the tables below list the number of individuals rating each item as 1, 2, 3, and 4.

	F	A
30. I GET MOST OF MY INTELLECTUAL STIMULATION FROM:		
On-campus colleagues	20-16-19-8	8-3-5-1
Professional associates elsewhere	16-16-21-9	4-5-2-6
Periodicals, books, etc.	25-26-9-3	5-3-5-5
Groups in the community	8-5-12-38	1-6-5-5
31. IF MY WORK WERE TO BE JUDGED BY A "JURY OF MY PEERS," I WOULD WANT THAT JURY TO BE MADE UP MOST OF PERSONS DRAWN FROM:		
Persons employed at colleges in academic and/or administrative capacities	12-19-24-9	5-3-10-0
On-campus colleagues, associates	23-27-11-4	7-6-3-2
Professional associates (here and elsewhere)	27-14-17-5	5-9-4-0
People whom I respect in the community	5-5-9-45	1-0-1-16

While the response to item 25 might suggest that the faculty and administration were exhibiting natural caution in assessing the importance of loyalty to the College, the fact remains that a significant number of the respondents felt that little importance has been attached to loyalty to WPI, even though it clearly should be of substantial importance. Even the alumni and trustees indicated that more emphasis should be placed on this item.

It is not surprising that in consideration of the twenty-sixth goal, the trustees and alumni regarded the pursuit of the faculty careers in a manner satisfactory to the faculty by their own standards as an objective of far less importance than its predecessor. The faculty, too, was less interested in this goal, with some misgivings that it might lead to a sort of intellectual anarchy.

The twenty-seventh aim, regarded universally as a goal to be desired, is apparently of little importance now. It is significant that members of the administration, those most able to rectify the situation, were the least content with our current cost practices.

Items 28 and 29, which were placed far apart in the original questionnaire, have fairly close sets of responses, suggesting that by contributing to his own profession, the faculty member is contributing to the proper functioning of his college. What is of interest is the general agreement that faculty compensation has apparently not been based on such contributions. This response might well have been anticipated in view of the overwhelming support given by the faculty in the spring of 1968 to a faculty tenure proposal with its emphasis on a thorough review of the performance of each faculty member.

It is in the last two items, however, that the faculty and administration show their provincialism--there is a natural but regrettable tendency to prefer judgment from one's colleagues and, in spite of our proximity to other colleges, less dialogue between us and our colleagues elsewhere than there should be. And finally, it is clear that our general community relationships are social, at best.

Before turning to the students specifically, let us consider the matter of faculty evaluation, an item which all respondents were asked to answer. The questionnaire listed some of the more commonly mentioned criteria and asked each person to indicate how important each should be: very important, important, or

of little importance. In the table of responses below, three numbers appear for each group, indicating the number of responses for each category of importance in the order listed above.

	F	A	T/A	S
32. Teaching performance	63-8-0	19-0-0	26-0-0	159-6-0
Publications	14-45-12	3-14-2	3-15-6	5-57-101
Honors received	6-43-22	1-12-6	0-13-12	8-63-93
Student evaluations	10-47-14	4-13-2	4-17-5	81-78-5
Service to the community	3-39-29	1-13-5	1-13-10	11-88-65
Total effectiveness in working with students	54-17-0	19-0-0	23-3-0	155-6-3
Ability to secure research grants	5-28-38	1-10-8	2-14-10	6-58-97
Research accomplished	17-44-10	8-10-1	5-15-6	7-89-67
Research potential	7-43-20	1-15-3	2-17-7	12-94-57
Committee and other administrative service	5-53-13	0-12-7	3-20-2	25-95-40

This table needs less comment than other tables of responses, inasmuch as the importance of good teaching is so clearly paramount. It is interesting, although not surprising, to note that the relevance of student evaluations is not regarded with the same universal enthusiasm. Finally, service to the community, even though a fair number of the faculty are actively involved, is obviously not considered to have much importance.

Members of the Planning Group had been talking with students since their appointment regarding WPI's general instructional procedures. In an effort to obtain a more representative response, the following items were included in the student questionnaire: (The sets of 2 numbers indicate the number of "IS" responses followed by the number of "SHOULD BE" responses.)

	T	G	M	L	N
33. TO INCREASE THE OPPORTUNITIES FOR INDEPENDENT STUDY OR SPECIAL PROJECT WORK.	4-41	16-89	58-34	76-8	16-0
34. TO REQUIRE ALL STUDENTS TO HAVE A MINOR, AS WELL AS A MAJOR.	1-10	4-27	25-36	60-43	75-52
35. TO HAVE FULL-TIME PSYCHIATRIC COUNSELLING FOR ALL STUDENTS.	1-33	2-32	4-49	48-36	110-17
36. TO INCREASE THE NUMBER OF PROJECT COURSES.	3-11	5-50	65-75	78-22	11-5

	T	G	M	L	N
37. TO ALLOW THE STUDENTS TO TAKE EQUIVALENCY EXAMINATIONS IN ORDER TO WAIVE REQUIRED COURSES.	2-37	5-70	22-47	78-10	56-5
38. TO REDUCE THE NUMBER OF COURSES PER TERM FROM 5 TO 4.	4-27	4-36	21-29	50-25	85-50
39. TO ABOLISH ALL GRADES AND REPLACE THEM BY A DOSSIER ON EACH STUDENT, CONTAINING COMMENTS BY HIS INSTRUCTORS ON HIS PERFORMANCE IN EACH COURSE.	1-29	2-30	6-28	28-28	129-57
40. TO GO ON A TRIMESTER OR QUARTER SYSTEM.	3-17	3-24	3-16	27-29	126-81
41. TO ABOLISH EXAMINATIONS GIVEN BY THE FACULTY AND REPLACE THEM TO TWO SETS OF COMPREHENSIVE EXAMINATIONS, ONE AT THE END OF THE SOPHOMORE YEAR AND THE OTHER, AT THE END OF THE SENIOR YEAR, WRITTEN, ADMINISTERED AND GRADED BY SCHOLARS NOT CONNECTED WITH WPI.	1-5	1-15	4-25	23-28	138-98
42. TO IMPROVE THE ADVISORY SYSTEM WITHIN THE MAJOR DEGREE DEPARTMENT.	3-46	15-63	44-38	72-11	24-7
43. TO PROVIDE FOR A GREATER NUMBER OF LIBERAL ARTS COURSES.	3-50	13-60	64-38	67-11	23-13
44. TO BECOME A GENERAL UNIVERSITY.	4-21	3-23	17-26	50-29	90-71
45. TO ABOLISH ATTENDANCE IN CLASSES AS AN ACADEMIC REQUIREMENT FOR ALL COURSES.	6-71	11-38	10-22	59-20	81-15
46. TO PLACE ALL COURSES, NOT IN THE STUDENT'S MAJOR DEPARTMENT, BEGINNING WITH THE SOPHOMORE YEAR, ON A PASS-FAIL BASIS.	1-31	2-44	14-32	66-25	83-40

Before subjecting the array of responses to careful analysis, it should be noted that three of the student respondents are either totally ignorant of our educational structure or else were unable to resist the temptation to allow whimsy to replace serious objectivity. One has but to note the "is" response

array to see that top importance is given to several items not now in practice. There is always the danger that the reviewer read more into the responses than he should, but it might be that these somewhat irregular results reflect the frustration of the respondents to problems about which they feel keenly.

The most striking reaction to the questionnaire on the set of items above is the students' lack of confidence in either themselves or their instructors. Item 41 which would provide for assessment of each student by those who would not know them personally met with little enthusiasm. If the word "scholars" had been replaced by "faculty" or "professionals", there is little likelihood that the figures would have been altered significantly. The fact remains that having had a semester, at least, to learn the foibles of each instructor, the students appear to believe that their chance for a better "grade" lies with the men they have come to know well.

In spite of the current interest in our minors program, it seems that this interest is confined to a small group of students, for the results of item 34 showed no marked interest in a required minor. Here, of course, the word "required" may have sounded the tocsin for this goal. There is the possibility of an inconsistency of response to items 33 and 36, for there would seem to be less interest in increasing the number of project courses than in increasing the opportunity for special project work or independent study. One inference that might be drawn would be that students want independent study, yet if this is the case, they are unaware of the level of performance that such study demands and its close correlation with item 41.

The relatively even distribution of replies to the "should be" columns of question 39 suggests that the students were not certain of what was involved; some, who are apt to get good grades, were probably opposed, while others, who find grades difficult to come by, might have considered this approach to be highly desirable.

Responses to items 33, 35, 42, 43, 45, and 46 were not surprising to members of the Group in view of the discussions which they held with the various living groups on the campus. The students are looking for a "liberalization" of their course programs without, in some instances, being

certain of what such a liberalization involves. Nevertheless, there is a clear-cut dissatisfaction with overemphasis on grades and class attendance and a desire for more independence in study and project work. In this connection, the evaluation of the College's general attitude toward rules is worth noting:

47. DESCRIPTION OF THE RULE-ATMOSPHERE AT WPI:

I FIND IT HARD TO BELIEVE THERE ARE ANY RULES AROUND HERE. PEOPLE SEEM TO DO AS THEY PLEASE.	3
IN GENERAL, A GOOD DEAL OF LAXITY IS PERMITTED COMPARED TO WHAT I KNOW OF OTHER PLACES.	19
THE RULES ARE RESPECTED, THOUGH EXCEPTIONS ARE PERMITTED WHEN PROPER.	49
THE RULES ARE VERY IMPORTANT. EXCEPTIONS ARE VERY RARE.	49
THIS REALLY A RULE-EMPHASIZING PLACE, PRACTICALLY EVERYTHING GOES "BY THE BOOK."	44

Finally, it can be said that the student body who responded were realistic in their evaluation of where responsibility for decisions of importance to the college should rest:

	VSP	SHMI	SHMODI	SHLI *
48. AREA OF DECISIONS				
Educational policies	77-6	85-86	11-68	0-12
Faculty personnel policies	50-4	74-40	41-72	5-57
Financial affairs and capital improvements	4-2	35-11	106-90	27-70
Student affairs	4-111	47-54	89-7	33-1
Public and alumni relations	3-1	35-34	97-94	37-44

*(Faculty responses listed first, followed by student responses)

Summary The questionnaires did not reveal any unsuspected characteristics of any group on the campus. The Group regrets that a larger portion of the faculty and student body did not respond, for it is impossible to determine whether the lack of response represents indifference to the operation of the

College or an unstated desire for the status quo. Fortunately, the Group was able to probe further through discussions with living groups and the faculty, and it will be imperative for their successors to maintain a constant dialogue with both sets of individuals as the ultimate choice of educational goals is determined.

*VSP: Views should prevail.

SHMI: Should have much influence.

SHMODI: Should have moderate influence.

SHLI: Should have little influence.

V. SUMMARY OF LIVING GROUP VISITS

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Since only ten percent of the student body took part in Planning Day discussions, it seemed advisable to obtain a wider expression of student opinion by conducting open-ended discussions with the fraternities and with residents of the dormitories. It should be kept in mind that while the Planning Group was successful in reaching a larger portion of the student body in this manner, less than a majority of the students participated, and we were unable to arrange a meeting with those students living in off-campus housing.

The discussions were conducted in an informal, congenial manner, and it was apparent to the Group that the students were highly receptive to this type of relaxed communication between the faculty members and themselves. Allowing for the normal number of expected personal gripes, there were still certain recurrent themes common to most groups.

The most prominent complaint involved the manner in which the students believe they are being treated by the faculty at large. Too often, the student feels that he is considered incapable of making any decisions; as a result, he is required to attend class, turn in homework, and take specific sets of courses; and he is subjected to "pop" quizzes, closed-book examinations requiring memorization rather than thought, and laboratory sessions involving more routine work than opportunity to explore new concepts and exercise ingenuity. The student feels that he is being trained, not educated, and prevented from realizing his potential. The end result is that too many students, matriculating here without any real comprehension of either the education or role of the engineer or scientist, have been "turned off" from continuing interest in these areas. They transfer to other colleges or, where transferral is not feasible, they remain here with a negative attitude, doing the minimum amount of work necessary in order to get by.

Related to the above complaint is a concern that our humanities courses are really "humanities for engineers" courses and not the type that would be

offered to liberal arts majors. There was the belief that the WPI student must become more articulate and that "good" humanities courses might help the student reduce his sense of inadequacy when he talks with his peers at other colleges.

The respondents (among the fraternity men) seemed to have ambivalent feelings. They maintained that the fraternities had generally been remiss in providing a better atmosphere for their members, but also accused the college of neglecting to identify and support the positive aspects of fraternity life. Many expressed the feeling their fraternity provided more sense of actual community than any other subdivision within the Institute. By the same token, there was general dismay over the College's neglect of the social needs of those residing in its dormitories. The dining facilities and dormitory lounges have not been conducive to the students' social development, and the non-fraternity man living in the dormitory has felt that there is no social life open to him at all.

In one sense, the most disturbing theme coming out of the Group's discussions was the students' feeling that there has been little close contact between the students and faculty. Many students appeared to know little about college affairs, were unaware of their instructors as people, and, in general, felt apart from the other human elements of the College. The advisory system came under considerable criticism, with a substantial number of students indicating that either the faculty was not really interested in them or else could be approached on a course-related problem only. It was equally apparent that the students wanted a better relationship and at the end of many of the Group's visits, we heard the comment: "Why can't we have more discussions of this type? We didn't know the faculty was really interested or even human!"

The lack of faculty-student dialogue may have been an important contributing factor in the students' concern for their future. Few students appeared to be cognizant of professional life following graduation, and most were unenthusiastic about the future. There was general agreement that the student body is largely conservative and makes little attempt to make much contact with the off-campus world. There has been relatively little contact

even with students on the other Worcester college campuses.

The discussions with the living groups were of great value in establishing an interchange of student and faculty opinion, for the student comments involved immediate needs and problems. Few of the students in these groups had read the Planning Report, either in its published form or in excerpt form in the student newspaper. In general, the students expressed a surprising amount of good-will toward WPI, and it seems imperative to us that the College as a whole, as well as the Planning Committee, capitalize on this good-will and the sincere desire on the part of the students to talk with the faculty as we plan for the future.

VI. ANALYSIS OF WPI AT PRESENT
Financial Status (cont'd.)

VI. ANALYSIS OF WPI AT PRESENT, Financial Status (Cont'd.)

In the previous report the income position of WPI relative to several other schools was given. In what follows WPI's income and expenses for the current year and a tabulation of several relevant factors over the last several years are presented (A). A brief discussion of relationships between planning, income, and expenses is also given (B).

In any planning study the financial feasibility of the proposed operation must be considered. While the Planning Group believe it essential that the educational objectives should be the first consideration, the financial feasibility must be considered in evaluating alternatives. This does not mean that any proposed program must be financed from current revenue only. It does mean that if additional revenue is required, additional revenue will have to be generated.

A.

TABLE I

Educational and General Expenses
(Does not include auxiliary operations)

Expenses = \$4.75 million (% of total)		Revenue = \$4.55 million (% of total)	
General Administration (President's office, Dean of Faculty's, Business office)	10.20	Tuition	70.04
Student Services (Dean of Student Affairs, Admissions, Registrar's)	4.84	Endowment	16.57
Public Services (Development, Public Relations)	2.95	Gifts and Grants	6.80
Staff Benefits (For all personnel)	8.98	Miscellaneous	6.59
Instruction and Departmental Research (Salaries, equipment and supplies for all faculty and departmental administrative)	57.24		
Operation of Plant (Custodial personnel, B&G maintenance)	15.79		

TABLE II

<u>Fiscal Year</u>	<u>Educ. & Gen. Expenses (x 10³)</u>	<u>Educ. & Gen. Revenue (x 10³)</u>	<u>Enrollment</u> <u>Undergrad-Grad</u>		<u>Tuition (as % of Educ. & Gen. income)</u>
1968	\$4,369	\$4,211	1441	209	68.1%
1967	4,207	3,991	1520	200	65.5
1966	3,400	3,431	1383	176	67.2
1965	3,192	3,195	1362	162	66.7
1964	2,647	2,522	1268	134	67.5
1963	2,318	2,370	1150	110	67.8
1962	1,954	2,214	1156	119	71.6

B. Major Effects of Planning on Revenues and Expenses

It should be recognized that cost and revenue considerations which are important from a budgeting point of view may be different from those which are important for planning. One should, therefore, set out the major items in cost and revenue which are influenced by planning of the educational program (as opposed to financial planning). This discussion is not intended to be complete, but rather to indicate the most important considerations for college-wide planning.

1. Revenue.

Of the various revenue items shown in Table I, tuition charges (per student) and endowment income are governed mainly by competitive position and portfolio management and only to a minor extent by the educational program. Income from sponsored research is at least balanced by the cost of the work done and represents a direct improvement in financial operations only to the extent it pays for research which would normally come from school funds. Sponsored research does, of course, have an indirect effect on finances through good public relations and in attracting competent students and staff. The major effect of planning on revenue is in its effect on the ability of the college to attract gifts and support from private sources, industry, and government.

2. Costs.

The relationships of factors influenced by planning on costs are varied and complex. There are some considerations which may be included in any general discussion. There are others which will be of more or less importance depending on the specific educational goals and program selected.

i. Student:Staff Ratio.

Since salaries and benefits of faculty and staff are and will continue to be a major cost item, and since student tuition is a major revenue item, programs which increase student:staff ratio will clearly have a strong and beneficial effect on balancing costs and revenues.

ii. Changes in Kind of Faculty and Staff.

Again, because salaries, wages, and staff benefits are a major cost item, educational objectives which call for changes in the distribution of salary levels (e.g. more instructors and fewer full professors, et contra) will obviously influence costs. By the same token, changes in ancillary staff (secretaries, technicians) will be influenced by the choice of educational programs and thus influence costs.

iii. Facilities Changes.

There are two categories of facilities changes which must be considered. First, costs of major educational tools such as computers (and staff therefor), television equipment, electron microscopes, and mass spectrographs which are either leased or purchased are clearly program dependent and carry a utilization factor of some importance. For some objectives, a laboratory supply inventory could also affect the cost picture. Second, changes in the kind of space needed could also be a major cost in implementing a new program. For example, a program requiring a significant number of large lecture halls and individual laboratory spaces would entail major building alterations.

iv. Space Utilization.

The effect of changes in space utilization as a result of planning is more complex. To the extent that there is unused space, and to the extent that such unused space contributes to cost (fixed charges and upkeep), a program which puts that space to use improves the overall financial picture in the sense that some value will be received for money that is going to be spent anyway. But such utilization might not be beneficial from the point of view of matching income and outgo, simply because what is installed in the space may itself represent an increased cost. It may well be that the chief effect on planning of under-utilized space and facilities is that a program which can use available space will be less costly to implement than one which does not.

v. New Programs.

Establishment of a new program is, in general, a new cost item (Computer Science, Biomedical Engineering, Nuclear Engineering). One might expect that in most cases these new costs would be counter-balanced by phasing out of older programs, but this does not seem to follow generally at WPI. Note that even if a new program is "fully subscribed" in terms of number of students enrolled, there is still a net cost to the college.

vi. Size of Student Body.

Perhaps the "critical mass" for economical operation of any particular objective is the most difficult to establish. From Table I it is obvious that, because tuition does not meet the entire cost of education of the student, the mere presence of the student represents a net cost to the college. The task, then, becomes one of minimizing this net cost within the framework of the educational objectives. For example, the necessity for increased facilities resulting from increased enrollment (presuming a fixed educational policy including student:staff

ratio) would not be reached until there is maximum feasible utilization of the most used facility.

The case of the underpopulated course is much clearer, for if enrollment of students who will take that particular course is increased, an economy results. In any educational program having some diversity there will always be some courses which are over-populated and some which are under-populated. If, without further diversification of the overall academic program, we enroll students with other than traditional interests who would tend to populate the under-subscribed courses, we may be able to effect a more economical operation. However, if the student interest pattern remains constant there will be an increased enrollment in over-populated courses which will require hiring of additional staff, presuming a constant student:staff ratio.

To summarize, to the extent that increased size of the student body is accompanied by an increased student:staff ratio a cost reduction may be possible provided that the increment is not offset by the need for additional facilities. Thus, the problem of determining the critical size of student body necessary for economical operation is extremely complex and is clearly intertwined with the student:staff ratio and facilities utilization, rather than the student population itself as an independent variable.

VII. REVISED PLANNING SCHEDULE

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PLANNING SCHEDULE - 1969

(Tentative)

- September 11 - Presentation of Preliminary Model(s)
- September 17-24 - Special Briefing Sessions for Freshmen
Addition of Students to Planning Committees
Discussions with Staff and Students
- October 1 - All Campus Planning Day
- December - Presentation of Refined Model

VIII. ACKNOWLEDGMENTS

VIII. ACKNOWLEDGMENTS

The members of the President's Planning Group hoped that the first part of The Future of Two Towers would encourage all segments of our community to analyze the present status of the College and to begin examining possible goals for the future. We would wish now to express our thanks to the WPI community for their encouraging response to our endeavor, their participation in Planning Day, and their numerous, helpful, subsequent contributions.

We would thank particularly the students who perceived the value of the planning operation and who not only participated enthusiastically in Planning Day but also invited us to their fraternities and dormitories for further conversation. We have appreciated the accurate reporting of our intentions by William Hakkinen, Editor, and Glenn White, Feature Editor of the Tech News.

We would like to thank publicly those who made special contributions to the success of Planning Day: Albert G. Anderson; Owen Kennedy, Romeo Moruzzi, Richard Roche, Leonard B. Sand, Armand Silva, Carleton Staples, and Benjamin Wooten, moderators; Van Bluemel, Verne C. Edmunds, William Elliott, Albert Ferron, Arthur Kennedy, William Miller, Thaddeus Roddenbery, and Roy Seaberg, recorders; and Lawrence C. Neale, luncheon speaker. Fred Broad and Roy Seaberg coordinated the Planning Day calendar for us, and we would cite their assistance here.

The thought and hard work of many people have helped us produce this second part of the Future of Two Towers. Here again there are many students we wish to thank, particularly Steven Bolger for the essay he submitted. Members of the staff who have been particularly helpful at this time include: William Barrett, Carmen Brown, Louis Curran, Carl Eschelbach, Owen Kennedy, Peter Lanyon, Peter Larsen, David Lloyd, Lawrence Price, and Imre Zwiebel.

We have appreciated the assistance of Seymour Leventman, Professor of

Sociology at Boston College, in our consideration of the disadvantaged student.

Mrs. Mundy and Mrs. French have again given us their competent secretarial service.

We are especially grateful for the confidence and continued support of President Harry P. Storke.

Worcester Polytechnic Institute
Worcester, Massachusetts

OFFICE OF THE PRESIDENT

July 23, 1969

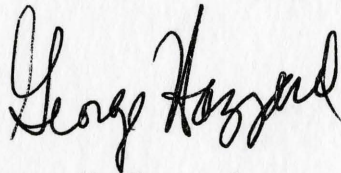
To Recipients - The Future of Two Towers, Part II:

This second progress report of the Planning Group provides many stimulating ideas. It challenges each of us to a thoughtful and constructive response.

To date the group has been presenting possibilities, collecting responses, seeking consensus. But I have encouraged it and its elected successor, the Planning Committee, to go further - to recommend goals, propose methods for reaching them, and consider the costs.

Through the mechanisms listed on page 72 the Planning Committee hopes to enlist your participation and complete its work by December. I am most eager for this to happen. Worcester Tech has been good but it may be great if we choose goals worthy of our students and faculty and the hard work of all concerned with this institution.

It is an exciting document to read. Think and respond and share my enthusiasm for the great things to come.



George W. Hazzard
President

Enclosure

ERROTA

Page 5: Correct the title to read:

"To Provide a Classical Education in Engineering and Science
in the Oxford-Cambridge Manner."

Page 14, line 10 (item 7): Insert comma after "library."

Page 45, line 16 should read:

"...would allow them, if unsure of their direction,
either to transfer to another....."

Page 69, line 24: last word should be "electron."